

# **“National Conference on Developing Scenario in Applied Sciences and Communicative English”**

**PRAYAG - 2016**

21<sup>st</sup> & 22<sup>nd</sup> April, 2016

**Organised by**



**Department of Science & Humanities  
KUMARAGURU COLLEGE OF TECHNOLOGY  
Coimbatore – 641 049, Tamilnadu.  
[www.kct.ac.in](http://www.kct.ac.in)**

**Published by**



## **National Conference on Developing Scenario in Applied Sciences and Communicative English**

Copyright © 2016 by Bonfring

All rights reserved. Authorized reprint of the edition published by Bonfring. No part of this book may be reproduced in any form without the written permission of the publisher.

**Limits of Liability/Disclaimer of Warranty:** The authors are solely responsible for the contents of the paper in this volume. The publishers or editors do not take any responsibility for the same in any manner. Errors, if any, are purely unintentional and readers are required to communicate such errors to the editors or publishers to avoid discrepancies in future. No warranty may be created or extended by sales or promotional materials. The advice and strategies contained herein may not be suitable for every situation. This work is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If professional assistance is required, the services of a competent professional person should be sought. Further, reader should be aware that internet website listed in this work may have changed or disappeared between when this was written and when it is read.

Bonfring also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.



**ISBN 978-93-85477-83-6**

### **Bonfring**

309, 2<sup>nd</sup> Floor, 5<sup>th</sup> Street Extension,

Gandhipuram, Coimbatore-641 012.

Tamilnadu, India.

E-mail: [conference@bonfring.org](mailto:conference@bonfring.org)

Website: [www.bonfring.org](http://www.bonfring.org)

## Message from the Principal

---



**Dr.R.S. Kumar**  
**Principal**

The ever increasing need for employable graduates in engineering need not be over-emphasized. The knowledge of sciences and communicative English is imperative for engineering aspirants to scale greater heights in their profession. The National Conference on the Developing Scenario in Applied Sciences and Communicative English - PRAYAG 2016 will be a forum for exchange of erudite scholarship among the participants which will lead to new materials and methods in research and development in basic sciences and English. Hence I hope the conference will open vistas in application oriented approach to learning of Science and English from a technocrat's perspective. I wish PRAYAG 2016 a grand success.

A handwritten signature in blue ink, likely belonging to Dr. R.S. Kumar, the Principal. The signature is stylized and cursive.

Principal

## Contents

Paper ID	Title/Author	Page No.
E01	Literary Reading Experience as a Means for Enhancing HOTs <i>Dr J. John Sekar</i>	1
E02	WhatsApp: An Informal Channel of learning English Language Skills <i>Dr. D. Praveen Sam</i>	7
E03	An Experimental Study on Improving Students Speaking <i>Dr.J.P. Vandhana and E. Priscilla</i>	11
E04	The Dependency Syndrome and Victimization of Women in D.H.Lawrence's 'Sons and Lovers.' <i>Dr.N. Swaminathan</i>	13
E05	Existential Crises in Shashi Deshpande's the Binding Vine <i>G. Saravanan and Dr.N. Swaminathan</i>	15
E06	Enigmatic English and Cryptic Media EN 01 Media and English <i>A. J. Ahamed Asmath</i>	18
E07	Strategies in Acquiring of English in Circumventing the Language Learning Disability: A Product and Process of Acquiring Second <i>G. Chitra and N. R. Saranya</i>	21
E08	The English Language-Learning Experiences of Students from L1- vs L2-Medium School Education in Technical Colleges: A Study in Contrast <i>Deepesh C</i>	25
E09	Challenges in learning English as a Language <i>P. Jose</i>	28
E10	Emerging Literary Theories in English <i>R. Aarthy</i>	32
E11	Exploring Avenues in E-Content Writing, E-Publishing and the New Media <i>Sreela. B</i>	35
E12	Enhancing Speaking Skills through Classroom Activities <i>Saranyadevi. P and Ramya. D</i>	37
E13	E-Learning Technologies to Enhance Educational Quality of Language Teaching and Learning <i>T. Kalpana Priyadharshini and T. Krithika</i>	39
E14	Literature in Language Learning <i>S. Mayeleswari</i>	42
E15	Resonance from the Past leads to Redemption in the Present: An Ecofeministic Study on Alice Walker's Now is the Time to Open Your Heart <i>Abirami. V and Dr.M. Leelavathi</i>	45
E16	Strategies for Professional Development of English Language Teachers <i>I. S. John Vijayakumar and R. Ramya Sri</i>	49
E17	Stance and Human Perception: Revisiting Man's Coalition with Nature through the Poems of W. S. Merwin <i>S.G. Mohanraj</i>	52



E18	Achievement of Communicative Language through Translation <i>M. Anith Prem Malaravan</i>	54
E19	Skills Develop Onscreen: Using Multimedia as a Pedagogic Tool <i>Priya Nagarajan</i>	58
E20	The Process of Translation and the Translated Work of Art - Language Acquisition in Translation and its Nuances <i>M. John Suganya</i>	61
E21	Facets enhancing Literature competency in Technical English <i>J. Srikala</i>	64
E22	A Pedagogic Perspective on Blended Approaches to Language Learning <i>B. Shobaroo</i>	67
E23	Media and English <i>Dr. I. Suhenya</i>	70
E24	A Study on Using Postcolonial Perspectives for English Language Teaching <i>I. S. John Vijayakumar and Dr.S.Radhika</i>	73
E25	Digitization of books: Learners of Text to Speech Output Method <i>Ajakesh, R.</i>	75
E26	Say no to 'No' Developing Communication Skills <i>J. Jenifar</i>	78
E27	Introducing Blogs: A Portal to improve Writing Skill <i>S. Guna Sundari</i>	80
E28	Radical Feminism <i>Arun Mozhi Thevan. D</i>	83
E29	Promoting Language Skills using Dictogloss <i>Kalaimathi.S</i>	85
E30	Developing Scenario in Communicative English <i>Prabhavathy.P and Dr.S.N. Mahalakshmi</i>	88
E31	Teachers' Empowerment through SSA: An Exploration <i>A. Sherlin Raja</i>	91
E32	Learning English Grammar through Mobile phone Apps <i>Stanley Devaraj.S</i>	94
E33	Learning Idioms: A Key to Enrich English Proficiency <i>S.A.S. Joseph</i>	96
E34	e-English In Social Media <i>K. Kavitha Raj and M.G.Shruthi</i>	99
E35	Impact of Social Media on English Language <i>K. Mahaalakshmi</i>	101
E36	Acquiring English Language – The Easier Phase and the Quicker Results <i>B. Arokia Lawrence Vijay</i>	103
E37	Enhance Communication Skill through Task Based Approach: A Study <i>J. Jeano</i>	106

E38	Strategies of acquiring English Language and Assessment on Student Learning <i>V. Arunadevi</i>	110
E39	Techno –Teaching <i>R.Vidyavathi</i>	113
E40	Use of Grotesque in the Selected Novels of Toni Morrison <i>A. Anitha and Dr.V. Arthy</i>	115
E41	Strategies of Acquiring English <i>P. Subathra</i>	118
E42	How to Enrich Your English <i>B. Sudha</i>	122
E43	Social Aspects in Samskara By U.R.Ananthamurthy <i>Dr.P. Santhi and A. Santha Devi</i>	124
E44	AN Application of NLP in ELT <i>S. Karthick and P. Sowndarya</i>	126
P01	Synthesis and Characterization of CdS Nanoparticles <i>T. Buvana Ranjani and L. Kungumadevi</i>	128
P02	Ultrasonic Studies of Intermolecular Interactions in Ternary Aqueous Mixture at Different Temperature <i>D. Ubagaramary, Dr. Kesavaswamy and Dr. Muthu Vijayan Enoch</i>	131
P03	Structural and Optical Properties of ZnS Nanoparticles <i>S. Ranjitha and L. Kungumadevi</i>	138
P04	Optical Properties of Undoped and Cu Doped Cds Thin Films Used in Solar Cells <i>T.N. Rathnakumar and K.G. Parthasarathy</i>	141
P05	Green Chemistry Approach Silver Nanoparticles Via Sida rhombifolia L. As Antibacterial Material <i>R.P.Senthilkumar, V. Bhuvaneshwari, S. Sathyavimal, Minu Venugopal, P. Sagadevan, V. Malayaman and R. Ranjithkumar</i>	145
P06	Isolation and Identification of Enterocins Produced by Enterococcus Faecalis from Home waste Vegetables <i>Sathya Vimal. S, Vasantha Raj. S, Senthilkumar R.P and Subashkumar</i>	149
P07	Growth and Characterization of KLTC Crystal <i>S. Vasuki</i>	155
P08	Antibacterial Properties of Indium Titanium Oxide Nanoparticles <i>Ranjithkumar. R. S. Sathish, R. Sengodan, C. K. Senthil Kumaran and B. Chandar Shekar</i>	158
P09	Antibiofilm Action of Silver Nanoparticles Coated Intravascular Catheter (AgNPs- IVC) Against Clinically Isolated Human Pathogens <i>R. Ranjithkumar, K. Selvam, R. P. Senthil Kumar, J. Manikantan, C. K. Senthil Kumaran and B. Chandar Shekar</i>	162

P10	Green Synthesized Silver Nanoparticles Coated Fabric: Antibacterial Textile Finishing <i>R. Ranjithkumar, K. Selvam, R. P. Senthil Kumar, J. Manikantan, C. K. Senthil Kumaran and B. Chandar Shekar</i>	167
P11	Relative study of Lithium and Magnesium salts in Polymer Electrolyte Batteries <i>R. Manjuladevi and Dr.M. Thamilselvan</i>	171
P12	Influence of Cr Doping on Structural, Surface and Optical Properties of ZnS Prepared by Chemical Precipitation Method <i>S.A.S. Joseph</i>	174
P13	Docking and Topological Analysis of Disulfiram Drug Molecule via Theoretical Charge Density Analysis <i>G. Rajalakshmi and C. Kalaiaarasi</i>	178
P14	Effect of Thickness on Optical and Photoconduction Properties of ZnTe Thin Films <i>R. Amutha, A. Subbarayan, and R. Sathyamoorthy</i>	188
P15	Characteristic Studies of ZnO Coated on Plasma Treated Fabric <i>S. Inbakumar and P. M. Andavan</i>	192
P16	Structural, Optical and Electrical properties of ZnO Nanoparticles and PANI/ZnO Nanocomposite by Microwave Assisted Hydrothermal method <i>C. Thenmozhi, V. Manivannan, E. Kumar and S. VeeraRethinaMurugan</i>	198
C01	Synthesis, Characterisation and Biological Studies on Cu (II) and Mn (II) Quinoline Schiff Base Complexes <i>N. Sudha, S. Malathi, P. Maheswari and M. Gomathi</i>	204
C02	Agricultural Waste as a Low Cost Adsorbent for Heavy Metal Removal from Wastewater <i>Malathi. S, Sudha. N, Maheswari. P and Gomathi. M</i>	210
C03	Facile Synthesis of Ni(II) Schiff Base Complexes: Spectral Investigation, Antimicrobial Activities and Catalytic Oxidation of Alcohols <i>S. Arunachalam</i>	216
C04	One Pot Synthesis, Spectral Characterization and Biocidal Investigation of Ru(II) Schiff Base Complex <i>S. Arunachalam, N. Padma Priya, P.N. Magudeswaran, M. Jayaraj, S. Deepa, C. Arun Paul and L. Jayanthi</i>	222
C05	To determine the Water Quality Index of River Noyyal Connected Ukkadam Pond, Coimbatore District, Tamil Nadu, India <i>Jeyaraj M, Arunachalam S, ArunPaul C and Magudeswaran P.N</i>	226
C06	Preparation and Characterization of Manganese, Cobalt and Copper Complexes of Tetradentate N6-Macrocyclic Ligand <i>Mary Juliet B and Amaladasan M</i>	230
C07	Synthesis and Characterization of New Polymers Having Azomethine Group <i>S.J. Pradeeba, K. Sampath and A. Ramadevi</i>	234
C08	Green Synthesis of 9-Acridones <i>M. Abirami, V. Nadaraj and S. Thamarai Selvi</i>	237

C09	Application of Eco-Friendly Natural Dye Obtained from <i>Russelia Equisetiformis</i> on Cotton Using Combination of Mordants <i>M. Kumaresan</i>	240
C10	MUSA Acuminata Plant Parts as Environment Friendly Corrosion Inhibitor for Mild Steel in Acid Media <i>Gunavathy. N and Murugavel S.C</i>	245
C11	Synthesis and Characterization of Some Novel Nano Materials for the Degradation of Commercial Dyes <i>T. Maruthavanan, C. Mageswari and R. Kannan</i>	249
C12	Synthesis and Characterisation of Ferrocenethiosemicarbozone – Ru(III) Complexes <i>Sivahari R, Mayildurai R., Aranganayagam K.R., Karthik K and Daniel S</i>	255
C13	A Comparitive Study on the Efficacy of Biogas Produced from Algae Collected from Pond with other Carbon Substrates <i>Indhumathi P, Aruna M, Muthusaravanan S, Hariharan G, Subhashree K R and Shoba U S</i>	259
C14	Carbon Sequestration and Treatment of Sewage Water using Micro Algae <i>Infant Prisillah T, Sakthipriyadarshni A, Mahant T, Vijayakumari D and Shoba U S</i>	262
C15	Association of Neural P/Q type $Ca^{2+}$ Channel Encoded by CACNA1A Gene with Migraine <i>Gouri Srinivasan and Jyothsna Desu</i>	265
M01	A Study on Nano Semi – Generalized Continuity <i>A. Ezhilarasi</i>	267
M02	Improved Medical Image Enhancement Using Mathematical Morphology with Noise Reduction <i>C. Vaishnavi</i>	273
M03	A Locally Closed Set in Ideal Minimal Spaces <i>D. Arivuoli and M. Parimala</i>	278
M04	A Notes on (S, Q)-fuzzy Subhemirings of a Hemiring <i>N. Anitha and M.Latha</i>	281
M05	Application of Tele- Control Electrical Vehicle System Using Fuzzy Logic Control <i>M. Sathya</i>	285
M06	Hybrid Approach for Prediction of Weather Forecasting Using Fuzzy Neural Network <i>R. Rajkumar</i>	289
M07	Axiomatic Digital Topology <i>S.R. Saratha</i>	295
M08	On Some Models of Intuitionistic Fuzzy Sets in Real Life Situations <i>S. Velusamy, K. Balasangu, P. Sarojini and S. Thirunavukkarasu</i>	302
M09	An Achromatic Number and b-chromatic Number of Some Star related Graphs <i>K. P. Thilagavathy and A. Santha</i>	305

# Literary Reading Experience as a Means for Enhancing HOTs

DR J. John Sekar

**Abstract---** *The need for English literature teaching in technical institutions becomes imperative in the changing global scenario that is increasingly becoming multilingual and multicultural. Technocrats who command machines and systems created by the human brain need to be distinguished from these gadgets. They are thinking beings capable of making decisions on the spur of the moment because they are not programmed the way machines have been. English language teachers with a very strong base in English literature can play a vital role in the acquisition of critical thinking skills and human values. English language teachers in such technical institutions need to re-invent their role from being a mere 'facilitator' of language skills or being 'high priests' of ethics through explication of literary texts to becoming a 'catalyst' in the formative process of the young technocrats' affective and cognitive domains through exposure to appropriate literary texts. This paper examines the role of English language teaching through literature and the complementary role of humanities and sciences in the formation of young technocrats, who should be intellectually bright, ethically honest, and spiritually inspiring.*

**Keywords---** *Higher order thinking skills, technical English, contemporary youth fiction, classics, creative and critical thinking skills*

## I. INTRODUCTION

MAJORITY of English language teachers in technical institutions and their engineering students are not satisfied with the English language curriculum meant for them. This perception is caused by three major factors. One, most teachers of English have a very strong literature background even at the research level and lack the expertise in handling ESP courses that many technical universities in the country claim to offer. Two, student population is heterogeneous in the sense that some of them are reasonably strong in English and many others are not so. Third, the 'Technical English syllabus' is

unchallenging and unproductive not only for students but also for the teachers. The English curriculum seems to be the repetition of General English Curriculum that is followed both at the secondary level and in most Arts and Science stream at the tertiary level. Strictly speaking, there is nothing special and different about 'Technical English.'

No doubt that these students ought to acquire both fluency and accuracy in English for a successful career in the field of science and technology whose medium is English world-wide. On the other hand, these technological students need what is called 'thinking skills' or 'people's skills' or 'survival skills' so that they will complement 'technical skills' or 'subject skills' in their fields of specialization. After all, technocrats are not made of technical skills alone, but life skills that make them balanced human beings before being technocrats. **Robinson (1987: 13)** puts it: "While the importance of cognitive development has become widespread, students' performance on measures of higher-order thinking ability has displayed a critical need for students to develop the skills and attitudes of effective thinking." When students develop higher order thinking skills, they will be clever, wise, smart, and brilliant. Of course, the acquisition of them does not undermine knowledge acquired in core areas. Both complement each other. There are two types of thinking skills: critical and creative. They should use them every day in their life and they should comprehend and appreciate these two skills. Arguably, it involves two domains: cognitive (understanding them) and affective (responding to them).

## II. METHOD

The principal aim of the present investigation is to establish that English literature can be exploited in technical institutions for the development of critical and creative skills. An added value in this attempt is that teaching of the English literature also appeals to the learners' cognitive and affective domains as well. Thus, there need not be any dichotomy between cognitive and affective domains of the learners. Two hypotheses were constructed for the study. They are:

1. Literature can be an ideal means to teach critical and creative skills

---

Dr J. John Sekar, MA, MPhil, PGDTE (CIEFL), PGDHE (IGNOU), PGDCE (UH), PhD, Head & Associate, Professor, Research Department of English, Dean, Academic Policies & Administration, The American College, MADURAI - 625 002. INDIA. Email: johnsekar@gmail.com

2. Teaching thinking skills via literature can produce better, more creative and critical thinkers.

Two methods were used to elicit data for the study: feedback and the examination of current syllabus followed in the technical institutions. The students of technical institutions were contacted through the social media, Facebook (fb) which is increasingly used by the college-going youths. The present researcher is maintaining a separate Page on English Language Usage at

<https://www.facebook.com/prof.jjohnsekar/?ref=bookmarks> and 1400 plus users have liked it and 300+ users on average visit this Page daily though certain postings attract more than 1000 fb users. They were asked if they would like/mind English novels and short stories being part of 'Technical English' for reading and refection in the class on varied life themes. 93 out of 102 users contacted responded. Consequently, the current syllabus, followed by 600 plus engineering colleges in the state of Tamil Nadu as designed by Anna University to which they are all affiliated, was examined in terms of contents, the books prescribed and recommended, aims and objectives of two sequential courses titled "Technical English," teaching methods and testing patterns. Extracts are given in the Appendix A.

### III. RESULTS

Two courses on Technical English offered by Anna University in the first year focus on all the four basic skills of English and they are no way different from the aims and objectives of General English courses. Besides, the course materials do not match with the objectives and units of the courses of study. Contents of ten units with innumerable items are difficult to transact in the class of 60 hours a semester each and to teach items like formatting of journal article, reading articles form journals, project reports, interpretations of data, and so on. Above all, the course title is a misnomer. The survey administered on fb reveals that majority of engineering college students find their English courses neither useful, nor challenging, nor interesting. They also believe that they could enhance thinking skills and human values through the exploitation of English literature.

S.No	Statement	A (%)	DA (%)	DK (%)
1	Technical English syllabus is challenging & useful		81	
2	The English courses are interesting		91	
3	Some simple literary pieces like poems, short stories, and short novels of contemporary interest can be prescribed	64	22	
4	Literary pieces can be used in the class for various activities like	91		

	conversing, discussing, role-playing, (re-)writing, summarizing, negotiating, presenting and so on			
5	Reading literature can trigger students' innovative thinking and creative expression	88		
6	Ability to determine authenticity & accuracy can be developed through English curriculum	64	27	
7	It is absolutely essential for youths to understand the human nature	97		
8	Higher order skills such as applying, analyzing, and synthesizing need to be integrated into curriculum	95		
9	Learning experience in English class should be complementary to that in engineering course classes	79		
10	Web 2.0 and 3.0 should be exploited for the teaching of English	75		25

### IV. THEORETICAL REFLECTION AND DISCUSSION

The main aim of teaching humanities to engineering college students should be to develop their ability to engage in careful, critical, and reflective thought since it is a sign of the educated, a requirement for responsible citizenship in a democratic society, and an employability skill for a wide range of professions. **Robinson (1987: 16)**, for instance says:

If students are to function successfully in a highly technical society, then they must be equipped with lifelong learning and thinking skills necessary to acquire and process information in an ever-changing world.

Though the relevance or importance of humanities is apparently undermined, inculcation of thinking skills through such subjects assumes importance in the context of modern technology and fast-paced change that characterize modern life irrespective of differences in geography, topography, culture, and language. After all, the aim of higher education has radically changed from imparting information to inculcation of critical and creative skills for better living conditions. **Gough (1991)** succinctly states:

Perhaps most importantly in today's information age, thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world. Many educators believe that specific knowledge will not be as important to tomorrow's workers and citizens as the ability to learn and make sense of new information.

Historically speaking, the West conquered Nature for the material well-being of human life on earth through certain movements and events like the renaissance,

Reformation, the Enlightenment, and the constant revisiting of classical views of life and letters down the ages in the form of classicism, humanism, liberalism, romanticism, new humanism, modernism, and post-modernism. Human science has always coexisted with natural science. It is the secret of the success of the West.

Humanists believe that literature study makes us better human beings, puts us in touch with human values and dilemmas, and helps us understand the human condition. They also understand literature reading as close reading and interpreting, analysing and arguing, and writing essays that have a clear thesis and strong supporting evidence. Humanism is a world-view or perspective that rejects anything supernatural as an explanation for existing phenomena. Rather than seeing the world as governed by some sort of divine spirit, like a god, which is the source of and reason for everything that happens, humanism argues that what humans can observe with their senses can be explained by human investigation and thought. This view has formed the basis for what became, in the Western world, the concept of 'science.' It is an idea that observation and deduction are sufficient means for understanding how the world works and how things happen, without reference to any kind of divine or extra-human power. **Norris (1985: 44)** sums up:

Having a critical spirit is as important as thinking critically. The critical spirit requires one to think critically about all aspects of life, to think critically about one's own thinking, and to act on the basis of what one has considered when using critical thinking skills.

Human mind is a supreme power of knowledge and creation, and it is therefore sometimes referred to as 'secular humanism.' The purpose of literature, according to them, is the enhancement of human life and the propagation of humane values. Literature should, however, always be 'disinterested' and should never have an overt agenda of trying to educate or persuade someone.

Initially, ELT practitioners were against the teaching of English literature in ELL classes for aesthetic purposes that are no way different from those of English literature classes pedagogically. When the methodology of teaching English as a second language continued to be a perennial problem, they considered the use of English literature for the promotion of the learners' communicative competence. Unfortunately, teachers were not well-equipped to handle literary texts for language learning purposes. Thus, English language classroom continued to be a traditional classroom with teachers imparting information—about the author, the background to the text, the particular literary conventions that inform the text and so on. Learners were somehow expected to acquire the ability to make something out of the text on their own. Teachers wasted learners' precious little time in a massive process of explanation or

translation. There was little room for either learners' own responses or their involvement. Personal investment of time and effort or collective responsibility was minimal. In a nut shell, it continued to be a teacher-centred approach that encouraged detailed comprehension of the texts.

When the use of English literature in English language learning classes can be considered for the acquisition of thinking skills, the aims underlying such an approach should be to stimulate learners' desire to read and to encourage their responses that would sharpen their creative and critical thinking skills. The nature of literature is such that it demands a response from readers. Reading is a process wherein fewer answers are given than questions raised. A literary text causes the reader to experience. This demand makes the literary text singular. This experience will enrich the personal and professional life of the reader. Readers here are young tech-savvy engineering graduates. They need to equip themselves strong in both affective and cognitive domains so that they can function as meaningful citizens in a democracy. Role play, improvisation, creative writing, discussions, questionnaires, visuals and many other enjoyable student-centred activities can be successfully employed for the said purposes. Basically, students lack higher order skills that are absolutely necessary for employability. **Norris (1985: 44)** affirms that "Critical thinking ability is not widespread. Most students do not score well on tests that measure ability to recognize assumptions, evaluate arguments, and appraise inferences." Hence, learners should learn to express and value their own responses and experiences so that language improvement will become a hidden curriculum.

Any literary text that appeals to the cognitive and affective domains of the teen age engineering college students can be exploited for the teaching of thinking skills directly. **Ristow (1988: 44)** believes that "a great deal of the research currently being reported indicates that the direct teaching of creative skills can produce better, more creative thinkers." For instance, Shakespearean plays can be thought of as ideal materials for the inclusion in English language classes. Many plays are available on records or cassettes these days for listening exercises. Shakespeare's **Romeo and Juliet** since its theme—love in a setting torn by civil strife—is universal and still very poignant and relevant today. The language of love and the concepts and conventions that underlie it can be exploited. Students can discuss what 'love' means and how it is expressed in their own cultures. *Students can discuss how the play would make sense if the lovers had a chance to use social media.* **Beyth-Marom, et al. (1987: 216)** recommend thinking skills for making good choices: "Thinking skills are necessary tools in a society characterized by rapid change, many alternatives of actions, and numerous individual and collective choices

and decisions.” For instance, the questionnaire evolved by **Collier & Slater (1987: 175)** for students to decide and discuss after reading the play is worth experimenting here:

V. ANSWER THE FOLLOWING QUESTIONS ABOUT THE NATURE OF LOVE.

1. Which of the following statements comes closest to your idea of what love is.

- i. Love is a paradise.
- ii. Love is hell
- iii. Love is a disease.
- iv. Love is a state of madness.
- v. Love is a religion
- vi. Love is an all-consuming fire
- vii. Love is a kind of warfare
- viii. Love is an ephemeral nonsense.
- ix. Love is-----

2. How important, how valuable is it for you?

Which of the following sentences comes closest to your opinion?

- i. The most important thing, the only valuable thing in the world.
- ii. A good thing, but not the only good thing in the world
- iii. A mixed blessing
- iv. A disaster: it always ends in tragedy
- v. A pleasant illusion, cloaking the reality of sex.
- vi. An unpleasant illusion, distorting our idea of relations between the sexes

3. If you love someone, what would you be most likely to compare him or her to?

- i. a flower: ----
- ii. a bird: ----
- iii. an animal: ----
- iv. a celestial body: ----
- v. a part of nature ----
- vi. something else: ----

4. If a man loves a woman, this is how he behaves:

- i. Writes poems to her
- ii. Sends her flowers and gifts
- iii. Weeps and sighs if she doesn't respond
- iv. Acts in a manly, masterful way
- v. Conceals his love

5. If a woman loves a man, this is how she behaves:

- i. Gives him gifts

- ii. Pretends to love someone else
- iii. Conceals her love
- iv. Tells him about it
- v. Sighs and weeps if he doesn't pay

attention to her.

Another activity can be asking students to answer the following questions, supporting their answer in each case with a quotation from the 'balcony scene' (II.2). If they haven't got an appropriate quotation, they can ask a classmate. (P.182)

VI. WHICH OF THE TWO LOVERS IS MORE PRACTICAL? R/J

- Is more imaginative?
- Is more attached to his/her family?
- Is more extravagant in speech?
- Is more fearful of the consequences of their love?
- Is more confident?
- Is more forceful?
- Is more realistic?
- Is more clear-sighted?

When students in small groups or pairs study the following list of possibilities, they are unconsciously developing critical and creative thinking skills. According to **Alvino (1990)**, creative thinking is "a novel way of seeing or doing things that is characterized by four components—**FLUENCY** (generating many ideas), **FLEXIBILITY** (shifting perspective easily), **ORIGINALITY** (conceiving of something new), and **ELABORATION** (building on other ideas). Similarly, critical thinking is characterized by "the process of determining the authenticity, accuracy, or value of something; characterized by the ability to seek reasons and alternatives, perceive the total situation, and change one's view based on evidence."

Teachers can think of short stories, short novels, poems, one-act plays, or any other genre that deals with students' interest in contemporary happenings around them.

Engineering college student need not be always be exposed to classics in which teachers may be interested, but to contemporary classics that appeal to students' heart in terms of narratology and themes for treatment. Contemporary youth fiction can be used as a powerful tool for critical and creative discussion on the issues that matter to them. For instance, Chetan Bhagat's **Revolution 2020** realistically discuss the corruption in establishment of technical educational institution and functioning of apex technical bodies who are supposed to keep up standards. Arvind Adiga's **White Tiger** deals with corruption in society while portraying two Indias: of darkness and of light. Manu Joseph's **Serious Men** deals with caste-ridden Indian society that includes scientific community with corruption and sexual exploitation. Q &



A by Vikas Swarup that was adapted into a movie “Slumdog Millionaire” that won many Oscar awards deals with a very interesting character Ram Mohammed Thomas whose life is full of question that need answers. How do engineering graduate students react to such question? Preeti Shenoy’s **Life is What You Make it** and Ravinder Singh’s **I Too had a Love Story** deal with the theme of love. **Love @ Facebook** by Nikita Singh is perhaps is the first novel where facebook becomes a dominant background for love to happen and it deals with how the youths are addicted to Facebook, the massive social networking site.

## VII. SUGGESTIONS

Here are a few suggestions for further reflection:

1. English teachers should train themselves in innovative exploitation of their literary knowledge whereby they should be capable of creating innumerable classroom student-centred activities for enhancing learners’ creative and critical thinking skills. Initially, they can make it a department work since it calls for much planning and execution.
2. Teachers must read and write research articles on contemporary youth fiction so that meaningful discussion can be initiated without any ‘guilt’ in the sense of their accumulated doubt if contemporary youth fiction constitutes the body of ‘literature’ in the Aristotelian sense.
3. Students should be prepared to attend remedial courses in English conducted outside the class hour so that language deficit doesn’t become a hindrance to their activities in the class.
4. Course materials need to be developed keeping in mind the paradigm shift hinted at the level of the aims and objectives of the English Course.
5. Grammar and skills teaching should be done in an integrated manner through activities that hone students’ higher order skills.

## VIII. CONCLUSIONS

The aims and objectives of ESP courses in Engineering colleges should be the enhancement of creative and critical thinking skills through the exploitation of English literature rather than communicative competency in terms of four basic macro skills of the language. English teachers train themselves in materials production from literary texts instead of building bridges between the world and the word, and moral policing. Technology can also be harvested for the purpose of inculcation of higher order skills. Teachers’ mindset ought to change first. Both the hypotheses stand validated. The need of the hour for engineering colleges is to produce young technocrats, who should be

intellectually bright, ethically honest, spiritually inspiring, creatively adept, critically sharp, and materially rich.

## REFERENCES

- [1] Alvino, J. (1990). A Glossary of Thinking-Skills Terms. Learning, 18/6.
- [2] Beyth-Marom, R.; Novik, R.; and Sloan, M. (1987) Enhancing Children's Thinking Skills: An Instructional Model for Decision-Making Under Certainty. Instructional Science, 16/3: 215-231.
- [3] Collier, J. & Slater, S. (1987). Literature in the language classroom: A resource book of ideas and activities. New Delhi: CUP.
- [4] Gough, D. (1991). Thinking about thinking. Alexandria, VA: National Association of Elementary School Principals.
- [5] Norris, S. P. (1985). Synthesis of Research on Critical Thinking. Educational Leadership, 42.8: 40-45.
- [6] Ristow, R. S. (1988). The Teaching of Thinking Skills: Does It Improve Creativity? Gifted Child Today, 11.2: 44-46.
- [7] Robinson, L. S. (1987). A Program to incorporate high-order thinking into teaching and learning for grades K-3. Fort Lauderdale, FL: Nova University.

## APPENDIX I: ANNA UNIVERSITY ENGLISH SYLLABUS

### TECHNICAL ENGLISH I

#### OBJECTIVES

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as interne and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

### TECHNICAL ENGLISH II

#### OBJECTIVES

- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
- To make them acquire language skills at their own pace by using e-materials and language lab components.

#### OUTCOMES

Learners should be able to

- speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.

- write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- listen/view and comprehend different spoken excerpts critically and infer unspoken

proof

# WhatsApp: An Informal Channel of learning English Language Skills

Dr. D. Praveen Sam

**Abstract---** *The increased popularity of social networking sites and mobile apps in general has led to uptake in education. In this paper, literature reporting the use of WhatsApp for acquiring language skills by tertiary level learners has been critically reviewed with a particular emphasis on learning outcomes. This paper also presents pedagogical implications of students using WhatsApp for various discussions, and an insight into the learning strategies of using WhatsApp as an informal channel of learning English language skills. As far as learning platforms are concerned, one of the effective models of teaching is flipped model of teaching. Vindications underlying these observations were analysed, and factors contributing to successful uses of WhatsApp are discussed. Also, it has been hypothesized that how WhatsApp can provide a viable support to the learners in their active participation in online discussion forums. However, the scarcity of adequate research in this area and the fragmented nature of the current information make it difficult to draw firm conclusions. It is recommend that further research should focus on systematic and in-depth examinations building on the existing findings documented here.*

**Keywords---** *social networking; mobile apps; WhatsApp; English language skills; information channel; flipped model*

## I. INTRODUCTION

THE incorporation of mobile devices, especially mobile phones, into the teaching-learning process has risen considerably. Teledensity, according to the data published by International Telecommunication Union, is 73.32%, and the total number of mobile phone subscribers is 875.48 million. There are several mobile communication & learning apps which could be downloaded to a mobile phone free of cost has resulted in the rapid increase in the number of users.

WhatsApp, a Smartphone application, was developed by WhatsApp Inc. and the first version was released in the year 2010. This application is compatible with various operating systems such as Android: 2.16.16, BlackBerry:

2.12.1663, IOS: 2.16.1, Symbian: 2.12.382, Nokia S40 devices: 2.12.68, Windows Phone: 2.16.14 and so on. The purpose of this application set by the developers was to replace the existing SMS platform for a system that is free of charge in an advertisement free environment. WhatsApp includes a variety of functions such as text messages, images attachments, audio files, video files, and web links. Over the last five years, the application has become very popular. It has gained over 350 million users and is rated the most downloaded application in 127 countries (Salem, 2013). According to Tzuk (2013), everyday an average of 31 billion messages are sent and received. It is a social network application that allows users to access information swiftly. The user-friendliness makes the application accessible to people of different ages and backgrounds. WhatsApp enables communication with anyone who possesses a Smartphone with internet connection, and has this application installed.

There are many features in this application that make it versatile. One of the features is the option to create groups. Teachers can create a group for their students that constitute a type of "simple social network" for the class (Fischer, 2013). This helps in conducting discussions among specific groups of people. The person who created the group becomes the administrator, and he can also make other members in the group administrators. Only administrator can add or delete a contact. In terms of usability, all members in the group enjoy equal privileges. Another unique feature in this application is the size of the data that could be shared or communicated. Unlike other mobile phone applications like SMS there is no word limit for messages. For example, this enables a teacher to post a reading comprehension passage for students to read and answer via WhatsApp.

Another major issue in the social networking is safety. Compared to all other commonly used social networking sites and application, WhatsApp is safer. In the face of widespread Internet surveillance, users need to be concerned about how secure their phones and computers are. Many companies offer "secure messaging" products—but are these systems actually secure? US-based Electronic Frontier Foundation analysed various mobile messaging apps for the strength of encryption and privacy they offer (The Times of India, April 7, 2016). The following table shows the result of the analysis:

---

Dr. D. Praveen Sam, Assistant Professor of English, SSN College of Engineering, Chennai. E-mail: praveensamd@ssn.edu.in & praveen.samphd@gmail.com

	WhatsApp	Secret Chats	Telegram	Google Hangouts	iMessage	Viber	Facebook chat	Signal	Silent Text	Pidgin	Threema
Encrypted in transit?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Encrypted so the provider can't read it?	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Can one verify contacts & identities?	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Are past messages secure if keys are stolen?	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Is app dev code open to independent review?	No	Yes	No	No	No	No	No	Yes	Yes	Yes	No
Is security design properly documented?	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Has there been any recent code audit?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: [www EFF.org/secure-messaging-scorecard](http://www EFF.org/secure-messaging-scorecard)

Table 1.1 Analysis of the 'secure messaging' product

## II. REVIEW ON THE USE OF WHATSAPP AT THE TERTIARY LEVEL

Over the past years, the high infiltration of Smartphones into the market has initiated growing use of WhatsApp as a communication platform for various student groups, and more recently for groups of teachers and their students as well (Bouhnik & Deshen, 2014). Virtual communication between learners, among learner and between teachers and learners is becoming an effective medium in the past decades. For such communication, various applications as mentioned in the Table 1.1 are being used. Smart mobile phones have made the access to these applications simpler. Each one of these tools has different characteristics that influence its suitability for learning purposes (Calvo, Arbiol & Iglesias, 2014). A learner has the facility of using mobile phone for learning by downloading learning apps and to learn by himself. This is referred to, by the author, as asynchronous mobile phone assisted learning (AMPAL). However, a group of learners either use a same app to learn or different apps to learn and share their ideas. This is referred to, by the author, as synchronous mobile phone assisted learning (SMPAL). Eventually, when the learning process that takes place among learners is monitored and moderated by teachers in the mobile phone context, it is termed as teacher moderated synchronous mobile phone assisted learning (TMSMPL).

Chruch and de Oliveira (2013) have listed out the following reasons why people adopt WhatsApp as a tool for communication rather than other channels such as SMS or Messenger: the low cost of the application combined with the ability to send messages without any word restriction, time taken to reach a message to a recipient is very less, the desire to feel a part of the trend since their acquaintances have already adopted the

application, the capacity to conduct an ongoing conversation among friends simultaneously, the knitting together of the kinship circle, and a sense of privacy relative to other social networks.

Riyanto (2013) claims that WhatsApp can be used not only to socialize with friends, but also to study and even learn a new language. He uses the example of English by stating non-English students are able to learn English faster, better and more fun by joining a WhatsApp group with fellow students and teachers. The teachers then are able to post small assignments and ask students to complete them by using one of the possibilities WhatsApp offers. In this way, students are able to read English and are obliged to answer in English, which improves their English language skills. Because WhatsApp is free, everyone using a Smartphone will be able to participate.

Bere (2103) conducted a study amidst students of South African University to validate the use of WhatsApp. The students registered positive feedback and they claimed that it was an easier way to communicate with their teachers and the rest of the class, that it was productive of fruitful discourse on relevant issues in an informal environment where students could learn intimately and authentically, and that it was also fun. Similarly, the study conducted by Rambe & Chipunza (2013) shows that students felt WhatsApp gave them the possibility to express themselves freely in a non-restricted environment thus removing the low participation constraints characteristic of lectures. Also their research showed students learned technical skills by sharing and searching information on WhatsApp they could also use on other study-related platforms like the Blackboard environment.

### III. AN EXPERIMENTAL STUDY

#### 3.1 Participants

This study was carried out at an engineering college in western part of Tamil Nadu, India. 40 students were involved in the study. They were in the first year of the engineering course. They study Technical English I and II courses in the first and second semesters respectively.

#### 3.2 Procedure

Students were classified into eight groups consisting of five members in each group. Each group was identified with a coordinator. The coordinators of each group were advised to create groups consisting of their group members. The teacher, on a daily basis, posted questions to answer, images to interpret, situation to discuss. Every day one hour was devoted for these activities. The teacher was added to all the group and acted as a moderator. The progress of the students was monitored and recorded.

#### 3.3 Findings

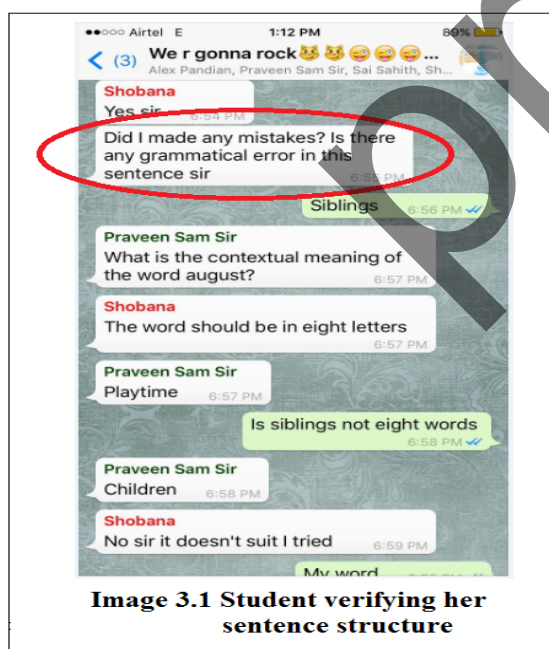
Initially, the participation of the students in the discussing was active, but in course of time it was identified that only a few students were participating. To solve this issue, the teacher had to motivate the passive listeners. The teacher did not disturb the discussion by interrupting with a call for the passive listeners to contribute, but they were counselled face-to-face individually. In the course of time, the number of people participating was growing.

- Students in the course of the discussion verified their sentence accuracy with the teacher. This is shown in the screen captured Image 3.1.
- Students were following the clues given by the moderator and trying to identify the right answer.

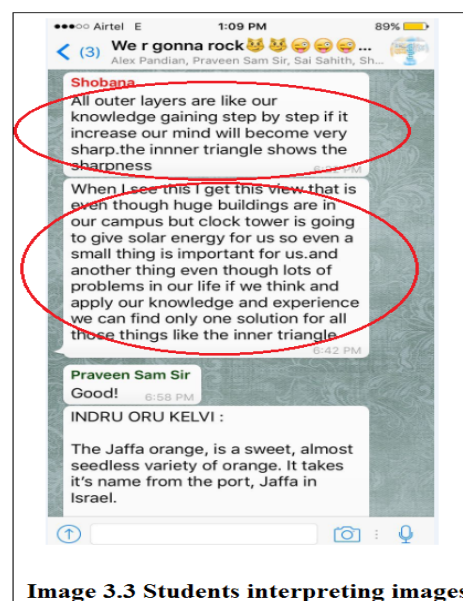


**Image 3.2 Student asking for a clue to answer question**

- Students who were hesitating to participate initially, in the course of time, started to interpret images and situation.



**Image 3.1 Student verifying her sentence structure**



**Image 3.3 Students interpreting images**

The following points were identified by the teachers:

#### IV. PEDAGOGICAL IMPLICATIONS AND CONCLUSION

The following are the pedagogical implications using WhatsApp as an informal channel for learning:

- Learning takes place within and without the classroom at the time and space comfortable for the students.
- In the course of learning outside the classroom, students participate in a self organized learning environment (SOLE), where they learn in their own pace, and they collaborate with the peers online via WhatsApp.
- While exploring content on a particular topic or an idea, students collaborate via WhatsApp with the peers and teachers.
- Students not only surf the internet for information but also share them with the peers instantly using WhatsApp. The information being shared need not be of any fixed format but of different formats such as audio files, video files, images, animation and so on.
- In the course of communication with people outside the classroom, students tend to produce language in an authentic context. And they indirectly use and learn language in a socio-cognitive perspective.
- Students design learning strategies on their own in course of exploring materials/contents outside the classroom context.
- Students verify their ideas and information they have accumulated with the teachers outside the classroom via WhatsApp.
- Teachers administer activities to students via WhatsApp groups and give individual feedback to students.
- Teachers could give individual feedback to student after the class hours via WhatsApp.

The objective of incorporating any method or model or mode of teaching English language is to equip students with adequate competence in using the language. Social constructivist learning theory seeks to improve social interactions between students and to construct and share knowledge (Vygotsky, 1978). In the current day situation, technology comes handy to overcome most of the limitations in terms communication among students and between students and teachers. The use of Internet technology by online learning communities may provide mobile learning resources in synchronous or asynchronous modes (Zengin, Arikian & Dogan, 2011). According to this study, WhatsApp servers as an effective mode for student to continue learning beyond the classroom context. It helps them to be connected with the peers and teachers in the course of leaning process outside the classroom.

#### REFERENCES:

- [1] Annetta, L. A., Minogue, J., Holmes, S. Y., & Cheng, M. T. (2009). Investigating the impact of video games on high school students' engagement and learning about genetics. *Computers & Education*, 53, 74-85. doi:10.1016/j.compedu.2008.12.020
- [2] Bere, A. (2013). Using mobile instant messaging to leverage learner participation and transform pedagogy at a South African University of Technology. *British Journal of Educational Technology*, 44(4), 544-561.
- [3] Bouhnik, D., & Dshen, M. (2014). WhatsApp goes to school: Mobile instant messaging between teachers and students. *Journal of Information Technology Education: Research*, 13, 217-231. Retrieved from <http://www.jite.org/documents/Vol13/JITEv13ResearchP217-231Bouhnik0601.pdf>
- [4] Calvo, R., Arbiol, A., & Iglesias, A. (2014). Are all chats suitable for learning purposes? A study of the required characteristics. *Procedia Computer Science*, 27, 251-260.
- [5] Fischer, Y. (2013). "The Facebook is dead – long live WhatsApp". *De Marker*. Retrieved from <http://www.themarker.com/technation/1.2126492>
- [6] Hamdan, N., McKnight, P., McKnight, K. & Arfstrom, K. (2013). The flipped learning model: A White Paper based on the Literature review titled a review of flipped learning. *The flipped learning Network*.
- [7] Riyanto, A. (July 2013). *English Language Learning Using WhatsApp Application*. khmadRianto, Love for All, Hatred for None. WordPress, the Splendid Theme.
- [8] Salem, A. A. M.(2013). The impact of technology (BBM and WhatsApp applications) on English linguistics in Kuwait. *International Journal of Applied Linguistics & English Literature*, 2(4), 64-69.
- [9] Tzuk, A. (2013). Whatsapp has 350 million active users a month. [in Hebrew] *Calcalist*. Retrieved from <http://www.calcalist.co.il/internet/articles/0,7340,L-3615097,00.html>
- [10] Zengin, B., Arikian, A., Dogan, D. (2011). Opinions of English Major Students about Their Departments' Websites. *Contemporary Educational Technology*, 2(4), 294-307

# An Experimental Study on Improving Students Speaking

Dr.J.P. Vandhana and E. Priscilla

**Abstract---** *Success of an individual is not marked by his acquired knowledge or his score but how effectively he/she is able to communicate. The aim of the research is to analyse various parameters of speaking skill and to enhance the competency in speaking. The parameters like Body Language, Fluency, Pronunciation, Discourse Marker, and Grammar are imparted to the learners who are less competent in speaking. Sixty students were trained for experimental study, they were given training on five scales in order to improve their speaking ability. At the end of research, they were tested and found that they were not sound in discourse markers which is important to convey the ideas clearly with coherence.*

**Keywords---** *Body Language, Fluency, Pronunciation, Discourse Marker, and Grammar*

## I. INTRODUCTION

“You can have brilliant ideas, but if you can’t get them across, your ideas won’t get you anywhere” – Lee Lacocca

In the modern world, speaking is given prime importance in the cooperate world. Emerging engineering are expected to be fluent speaker. The fluent speakers should deliver their insights in coherent and cohesive order. To deliver the ideas he/she should be equipped with prior knowledge on the skills and the subject in order to deliver a speech.

## II. OBJECTIVE OF THE STUDY

- To develop the learners speaking skills through fluency, coherence, grammar, pronunciation and vocabulary

## III. REVIEW OF RELATED LITERATURE

Rosa Adriana May Melendez et.al (2014) experience a research on “Teaching Speaking Strategies to Beginners” in their research the main objective was to train the

students on the basic of speaking strategy. They analysed in three stages: Pre-task, training session and Post-task. They used the strategies like Filler, circumlocution, asking for clarification and expressing not understanding. The result showed that there was an increase in the use of the strategies in post task and students gained more confidence in speaking.

Wenli Tsou (2015) researched on “Improving Speaking skills through instruction in oral classroom participation”. The research paper highlights remedies to language learners using Taiwanese students as a participants. The motif of the experimental research is to increase students’ oral participants in the class and to improve students’ proficiency in speaking.

## IV. TOOLS FOR INVESTIGATION

A group of sixty students were taken for the experimental study, each students are from different socio economic background. Among which two students were taken for case study based on progress.

In the classroom learning environment, the learners were assessed on speaking skill. In the research there are three phases in which the learner can improve their speaking skill.

### Phase I

To start learners were asked to do self-introduction, it was observed and found that the students were lacking in fluency, coherence, grammar, confidence, pronunciation and vocabulary. They struggled to use appropriate words, due to lack of vocabulary. They were not able to deliver the information in proper tense because of their poor knowledge in grammar. Learners were not able to ponder on the topic given, which resulted in lack of coherence in the thought process, which is expected to be delivered. Above all the learners were not interested to speak because of the inhibition.

### Phase II

In the second phase, the researcher motivated the students by explaining various steps involved in speaking process. The students were given practice on grammar like tenses and sentence patterns. They were thought three P’s- Plan, Prepare, and Practice. In Planning, guidelines were given to the learners how to think on the topic that they need to present. Brainstorming ideas related to the topic is important in this stage. Preparation includes how

Dr.J.P.Vandhana, Assistant Professor, Department of English, Bannari Amman Institute of Technology, Sathyamangalam. E-mail: jpvandhana@gmail.com

E. Priscilla Assistant Professor, Department of English, Bannari Amman Institute of Technology, Sathyamangalam  
Email: priseaster@gmail.com



to prepare with introduction, explanation and summary, in a logical order. In the third stage, Practice, the learners were insisted to tape their speech and were asked to listen to it. Constant practice were emphasised for the students in order to reduce nervousness. Later students were asked to narrate the stories of their own. It gave the students a confidence that they can put across the ideas effectively through their narration. Their thought process widened, and they came out with great imaginative stories. They were able to clearly express their insights fluently.

### Phase III

The learners were asked to do a book review students developed the habit of reading skill. They effectively conveyed what they read without a flaw. They introduced the author, the title of the book, the genre they belong too, the characters involved, the plot and the summary of the novel and gave their own criticism. They found it very easy to follow the sentence pattern and tenses.

## V. EXPERIMENTAL PROCESS

The students were taken for the case study. The students were from both rural and urban background. They don't have strong foundation in the basics of grammar. As a researcher we started to observe that learners were very poor in English. In the first phase they were asked to introduce themselves by telling their names, where they are from and their family background. Later they there thought what are the ideas which could be incorporated during the self-introduction. There were flawless in their sentence pattern, pronunciation, in proper choice of words. The errors committed by them were highlighted by the researcher and right usage was encouraged. The researcher motivated the students to overcome their inhibitions.

In the second phase the students came out to present their own topic here the researcher observed involvement and enthusiastic participation. They followed the inputs and ideas given by the researcher. They presented their topic in the pattern though. It had introduction, explanation and conclusion. Their ideas were coherent. It was clearly expressed. The researcher could feel that the students have followed the three P's. Here the researcher observed that the students forget the few ideas which they were in their preparation. He fumbled for words. Their thinking and speaking didn't have correlation at times. There were grammatical errors in his sentence construction. Production of certain words were thought to the students.

In the third phase the students did a book review. Here the researcher observed, the students in the interest after acquiring the language was most intense when compared to the beginning level. The familiarity and understanding of the language made him to read a novel on his own.

Here the researcher observed the understanding of the novel. They were able to clearly explain what they read like story line, plot, role of characters, morals about the author and the criticism of the book.

## VI. ANALYSIS:

Parameters	BL	F	P	DM	G
Mean Scores	6.6	5	6.2	4.5	5

BL- Body Language, F- Fluency, P- Pronunciation, DM- Discourse Marker, G- Grammar

Among the five parameters kept for analysing the students speaking skills. It was found that their DM was lowest when compared to other four parameters. It is because, they lack knowledge in connecting the ideas. BL and P was highest when compared to other scales. Since, they were shown different video clips of lectures delivered by renowned persons. The usage of grammar and fluency was on par with each other.

## VII. CONCLUSION

As a result, it was observed that the students speaking skills should be improves by grooming all the parameters like Body Language, Fluency, Pronunciation, Discourse Markers and Grammar. For an effective speaking skills each parameters has taught and given importance. Videos like Ted Talks, BBC Documentary can be screened to the students to improve the pronunciation and Body Language. Extempore, Role Play, Group Discussion, Presentation can be done to enhance, Fluency, Discourse Marker and Grammar. Above all, if an individual want to master any skill it is achieved only through practice because Practice makes a man perfect.

## REFERENCE

- [1] Rosa Adriana May Melendaz et.al (2014). "Teaching Speaking Strategies to beginners. European Scientific Journal". Vol (1), ISSN: 1857-7881 pp 548-554
- [2] Wenli Tsou (2005). "Improving Speaking skills through instruction in oral classroom participation". Foreign Language Annals. Spring. Vol (38). Issue.1 pp 46-55



# The Dependency Syndrome and Victimization of Women in D.H.Lawrence's 'Sons and Lovers.'

Dr.N. Swaminathan

With the inception of Civilization, human being started living together. Physical proximity brought man and woman nearer. They learnt to live, love and adjust themselves in their joys and sorrows, advances and adversities. As this sort of relationship goes on developing, the mutual discord and conflict have also been arising right from the primordial man to modern men. And because of the education, knowledge and skill they have acquired day by day there comes the revolutionary changes in the life style of the people. The cultural Expansion, Freedom of speech and political freedom paved the way for the big changes from the traditional system which leads to the separation of the union of husband and wife from the institution of marriage. This kind of separation of husband and wife neglecting their responsibilities to the society and custom has created a number of differences and discord's among men and women such as attitudinal, Physical, emotional, sexual, ideological and above all psychological.

D.H.Lawrence delineated this sort of psychological and attitudinal discord between the husband and wife mother and son and son and his lady-loves in his 'Sons and Lovers.' No doubt that 'Sons and Lovers' is an autobiographical novel. One could see the novel with an eye of psychoanalytic theory of Sigmund Freud which deals with the conflict of matriarchy or Patriarchy. And his theories can be seeing, to be centered on the triangular 'Oedipus complex.' i.e an incestuous desire for the mother as a model for the development of each individual's personality. The matricidal relation between mother and son, In 'Sons and Lovers' Lawrence depicted the triangular love of Paul the protagonist on his mother, his lady loves Miriam and Clara. He was not able to love them and marry either of them whole heartedly. He says that, because of his mother pull he is unable to satisfy them even in love makings. One day at home Paul told his mother that he loved Clara deeply. He had loved Miriam also. But at the same time he could not possibly marry them.

"You haven't met the right woman"

"And I shall never meet the right woman while you live."

Paul admits that he is not able to love any woman as he loves his mother Gertrude more than anybody. It is quite normal for a male child to get attached with his mother when the father is of a rude and rough nature.

Mrs.Gertrude Morel belongs to a middle class family and she thought herself superior to any of the woman in the Bottoms. She was inherited from a good old family of coppards. She had inherited from them a proud and unyielding temper. On the other hand her husband Walter Morel was a miner. He had a shining wary black hair and a black beard that had never been shaved. He had a rich fund of soft, non-intellectual and warm humour.

Mrs.Morel was quite opposite. She loved ideas and was considered very intellectual. That is why temperamentally they were too unlike each other to be harmoniously adjusted. Sometimes she tried to talk to him seriously. She saw him listen attentively, but without understanding. This killed her efforts at a finer intimacy. The happiness between them slowly faded away. The estrangement between the husband and the wife gradually increased and Mrs.Morel drew towards her son for affection. William too was greatly attached to her.

Frequently Mr. and Mrs.Morel indulged in bickering due to the ill nature of Walter Morel. One day after the birth of Paul and as Mr. Morel returned home with full booze uncaring her child who is affected from fever went upstairs. Then he wants to kiss Mrs. Morel, his wife but dared not and she too dismissed him.

The gulf between the husband and wife had widened. As Walter Morel said to his wife Mrs.Morel, if there was something to eat. She was very rude in her reply. Walter said.

*"She should wait on him'  
never milord I'd wait on a dog at the door first".*

On this Walter jerked at the drawer which fell on him. He flung it at her. A corner of the drawer caught her brow and it began to bleed profusely. After this quarrel he was virtually alienated. Lawrence has beautifully described this sense of alienation as:

*"Morel made the meal alone, brutally. He ate and drank more noisily than he had need. No one spoke to him. The family life withdrew, shrank away and became hushed*

*as he entered. But he cared no longer about his alienation”.*

This reveals the adamant nature of the Patriarchy. The man who rules the roost is no doubt will be the breadwinner of a family. For that if he behaves in such a rude and rough manner due to his superiority of the authority, it reveals his uncivilized state of a husband. So the children who witnesses these things normally began to support their mother and hates the father.

All the children, particularly Paul, were against their father Morel continued to bully and to drink. Often he made the whole life of the family a misery. Paul was rather a delicate boy affected from bronchitis. This is another reason for her to get attached with him. He wanted only his mother. Lawrence expresses this in ‘Sons and Lovers’ as:

*“Paul loved to sleep with his mother. Sheep is Still most perfect, in spite of hygienists’ when It is shared with a beloved. The warmth, the Security and peace of soul, the utter comfort from he tough of the other, knits the sleep so that it takes the body and ‘soul, completely in its healings Paul lay against her and slept and got better’ whilst she, always a bad sleeper, fell later on into a profound sleep that seemed to give her faith.”*

William was now engaged to Gyp. He brought her home. Though she was uneducated, she treated Annie, his sister as a servant to her. But he was often angry with Gyp and insulted her in the presence of his mother. Mrs. Morel remarked that it would be a fine mess of marriage, to which William replied that he had gone too far to break it. Then he died. Mrs. Morel felt that by coming in the any of his love for Gyp, she had made him suffer extreme anguish and caused his death. Wilson F. Engel says,

*“She has the shallowness of Mr. Morel and The social dreams of Mrs. Morel. Yet she Lacks the substance of either of them and She unconsciously preys on William and Ultimately kills him.”*

Then Paul met Miriam loves at the Willey farm. He got attached with her very much. Both are very intimate Paul would never admit that they were in love. One day Paul invited Miriam and Edgar for tea. Mrs. Morel didn't like it. She was cold and grudging with Miriam. Mrs. Morel remarked that:

*“She exults – she exults as she carries him Off from me. She’s not like an ordinary woman, who can leave me one share in him. She wants to absorb him, till there is nothing left of him,*

*Even for him. He will never be a man on his feet – she will suck him up.”*

As his mother is jealous of her, Paul decided to keep away from Miriam. But he could do nothing. Unconsciously he was enticed towards her. Finally Paul has given Miriam a parting letter telling of his decision not to continue with her any longer. The same happened with Clara episode. For Paul, Clara is his Queen of Sheba. He touches her and tried to smooth her dress on her breast. And both of them kissed; their bodies sealed and annealed. She looked delighted and smooth.

But Paul was again full of conflict. Though Clara was very gentle, almost loving, yet he treated her distantly. Clara was still mad with desire of him. She always wanted to be kissed and embraced. But Paul wanted to free himself.

Though in the inception Paul loved Miriam and enjoyed a lot with her, he is unable to cope up with her. In the same way Paul kissed and embraced Clara who is elder to him but liked her carvings of her breast and advances of her in love making due to the mother pull he has exploited these women and forsaken them in the middle like a child who drinks the milk to the full and crushes and throw the bottle finally. It is all because of the dependency of women on men, they were being exploited by them. The male oriented society is on the safer side until women arouse to their senses. That is why the freedom movement of women emerged. Then only such men like Walter Morel who harassed his wife Gertrude, William who abandons Gyp for the intention of his mother and Paul who exploits both Miriam and Clara could be treated fairly in the social set up. The dependency of Paul on his mother the dependency of Miriam and Clara on Paul and the dependency of Gertrude on her husband Mr. Morel made them victims to the patriarchal society and male psyche.

The lady loves Miriam and Clara were being victimized by the Oedipus pull of Paul and Gertrude Morel was being victimized and died in the end by Walter Morel's difference of character and male ideology.

#### REFERENCES:

- [1] Lawrence, D.H.: ‘Sons and Lovers’ New Delhi : Macmillan, 1985.
- [2] Farr, Judith ed., : Twentieth century Interpretations of ‘Sons and Lovers, Great Britain: Anchor press, 1970.
- [3] Sagar, Keith, : The Art of D.H. Lawrence, London : Macmillan, 1966.
- [4] Salgado, Gamini.: D.H. Lawrence ‘ Sons and Lovers.’ (A Case Book), 1969.

# Existential Crises in Shashi Deshpande's the Binding Vine

G. Saravanan and Dr.N. Swaminathan

'Feminism' meant both awareness of women's position in society as one of disadvantaged or inequality compared with that of men and also a desire to remove those disadvantages. Teresa Billington Greg wrote in 1911,

"The recognition of the world upon a basis of sex equality in all human Relations, a movement which would reject every differentiation

Between Individuals upon the ground of sex, would abolish all sex privileges and sex Burdens, and would strive to set up the recognition of the common humanity of Woman and man as the foundation of law and custom."

Shashi Deshpande in almost all of her novels and short stories delineates this kind of Feminist problems in the male oriented society. She has revealed the oppression and depression faced by women in all walks of life at all levels. As a wife, mother daughter, sister, officer or as a subordinate in the work places and society, how far they are being exploited by the male oriented society due to their physical and psychological frailty.

Woman occupies a central place in Shashi Deshpande's novels. The novelist presents a subtle analysis of conflicting phases underlying reason, and to some extent to suggest a way out of it. Her earnest aim is to analyze the image of woman in her novels and also in her short stories. Woman, today, plays diverse roles both indoors and outdoors. She participates in all the hitherto male dominated spheres. Consequently she faces the fact of tossing between tradition and modernity.

Shashi Deshpande makes an earnest effort to understand the inner dimension of the female characters. For her portrayal of the predicament of middle class educated Indian women, their inner conflict and quest for identity, issues pertaining to parent-child relationship, marriage and sex, and their exploitation. Deshpande has been called a feminist. In an interview she replied to Geeta Gangadharan:

*"Yes I would, I'm a feminist, in the sense that,*

*I think we need to know a world which we should recognize as a place for all of us human beings. There is no superior and inferior, we are two halves of one species. I fully agree with Simone de Beauvoir that 'the fact that we are human; is much more important than our being men or women'.*

*I think that's my idea of feminism".*

For the sake of the full participation of women in the activities of society by means of removing the political and social barriers, they have started this sort of 'Feminist' movement in 1960's. Shashi Deshpande in almost all her novels clearly delineated the problems of women in the traditional bound Indian society. Particularly in 'The Binding Vine' she has tried to project the realistic picture of Indian society and the middle class educated woman who is financially independent and suffering from many crises in her life.

'The Binding Vine' focuses on the themes of marital relationship, mother-daughter relationship, social kinship and family relations. Urmi is the central character of the novel. This novel deals with her attempt to assert her individuality and to realize her freedom. It depicts how it brings her into confrontation with family and with the male dominated world and society in general. Mira is Urmi's mother-in-law. She passed away at the age of 22

---

G. Saravanan, Research Scholar, Rajah Serfoji Govt. College, Thanjavur - 613 005. E-mail: saravanangovindarajan6@gmail.com

Dr.N. Swaminathan, Research Advisor, Rajah Serfoji Govt. College, Thanjavur - 613 005. E-mail: swaminathanenglish@gmail.com

in giving birth to her son. Urmi got the inner life of Mira through her diary and poems. Mira got married at the age of 18. Since then she had written poetry. She gave the poems to a promising poet Venu. However, Venu discouraged her in a male's point of view. Venu tells her:

“Why do you need to write poetry? It is enough for a young woman like you to give birth to children. That is your poetry. Leave the other poetry to us men.”P.127

In the above cited reference from ‘The Binding Vine’, one can clearly understand the value of woman in the patriarchal society. They got no freedom to speak or to write their own opinions. They should be dependent on men. That is the fact of the middle class educated women. Jasbir Jain comments on the issues of gender embedded in Mira's poetry:

“In her poems, there is convergence of the universal facts of female existence like desire, childbearing and maternal feelings and specific social conditions like paternal controls and male will, which differ from culture to culture, generation to generation and class to class. There is, in Mira's poems, a sense of enclosure, the feeling of being in Cocoon, reflecting a child's relation to the mother”.

According to Indian culture, in the name of marriage, a husband got his own powers to enjoy his wife who yielded to him to be submissive for the whole life. But Mira depicted that kind of sexual act of her husband without her willingness as rape. Mira's husband has exercised this kind of right for sexuality, as a husband against her will and strong dislike on him. Primarily there can be lack of communication between the husband and wife. But the social constraint made and compels women to behave within a frame work. They have to follow as a shadow. They got no right to talk of personal rights and what not after marriage.

The husband's wish should be the wife's will. Then only they can lead a calm and smooth life. In male dominated society, a wife's wishes and desires are not given any priority. Women sacrifice their womanhood for others during the life span. In yet another incident Shakutai, after being abandoned by her husband for another woman put up with many hardships to bring up her three children-Prakash, Sandhya and Kalpana. Kalpana was raped by a culprit and Sakutai bring her to the hospital half dead. She was ashamed to reveal the fact that Kalpana was raped as her life will be entangled with problem and nobody will marry her. Sakutai is more worried about her respect, image and dignity of her family and wants to protect the reputation. As Adrienne Rich describes:

“If it is not rape of the body alone but rape of the mind as well. The feeling of being victorious and gloating over the act makes the rapist even more detestable”.

She wants the doctor to change the case as an accident case. She believes in fate and destiny. She blames herself that she came to this world carrying a load of misfortunes. But Urmi rebels against such social injustice and issues like Kalpana's rape by Prabakar, an affluent. She, in the critical situation proves that she believes women should have courage to express themselves and expose the evils of society. When Sakutai hesitates to register the case of rape, Urmi gets outraged as the rapist will be allowed to get away scot-free, if the case is not registered as a rape. She tries to reason out with Sakutai:

“She was hurt, she was injured, wrong by aman; she didn't do anything wrong. Why can't you see that? Are you blind: It's not her fault, no, not her fault at all”.P.147.

From the book of poems, 'The Golden Treasury' it is evident to Urmi that her father was proud of her talent. But like Jaya, the protagonist of 'That Long Silence', Mira has to cease her existence as a writer. Instead she has to succumb to the traditional role of a committed wife.

The Indian tradition demands that a perfect wife should possess the following qualities:

Karyesi Dasi  
Karyeshu Mantri  
Roopecha Laxmi  
Kshmaya Daridri  
Bhukteesu Mata  
Shayanesu Veshya  
Shatkarna Yukta  
Kuladharm Patni.

This all-in-one role of a wife denies her the existence of living as an individual. For the sake of the pleasure of the husband, a wife has to follow the above cited sayings of the ancestors. As it is a duty of the wife to fulfill the desire and please her husband, she is not in the position to reveal the unwanted and invasion of woman's body without her will in the name of marriage. That is why even existence in this traditional and patriarchal society is a crisis for women.

#### REFERENCES

- [1] Deshpande, Shashi, : 'The Binding Vine', New Delhi: Penguin, 1993.
- [2] Mala, R, : 'Sexual predicament and Shashi Deshpande's Women in Indian Women novelist', ed.R.K.Dhavan, New Delhi: Prestige books, 1991.
- [3] Jain, Jasbir, : Gendered Realities, Human spaces, Jaipur: Rawat pub. 2003.
- [4] Dhawan, R.K., : Indian Women Novelist, New Delhi: Prestige Books, 1995.

# Enigmatic English and Cryptic Media EN 01 Media and English

A. J. Ahamed Asmath

**Abstract---** *English is an international media of communication that has been use either as a native or second languages that understood and reorganized by everyone. People found that being knowledgeable in English is the key component for wiser career, huge dominance terms of knowledge, eminence in society and better communication in entire world. It governs the international media which unify the people around the world together which considered as the requisite carrier of language, politics that modulates the law, and in business which most of the companies used to fence in global market. It's easy to presume that new forms of technology have taciturn down the English language. Language is always evolving and technology is a healthy part of that evolution. Social media is playing an portentous role not only in acquainting new terms into the dictionary but also in accelerating the rate at which new terms reach critical heap in the culture. Being aware of new language usages can help to understand social media effectuation and cleanse practices.*

**Keywords---** *Importance, Influence and Impact of English language, Media's efflorescence and English, Media's contravene.*

## I. IMPORTANCE, INFLUENCE AND IMPACT

English is a global language .For different reasons English has got the position of International language. In today's world of information technology and hi-tech communication, learning English is must. English is important for other reasons also. Today importance of English needs no rationalization. English is important for a number of reasons.

**In Business:** English is used widely by international business community. To communicate across national borders and maintain association with overseas business parties or professionals, English is essential.

**In Education:** English is important for higher education and specialize training. Most of the books on any subjects are written in English or quickly translated in English. English is the medium of instruction in Education in most universities and higher education institutes of the world.

**For Getting Job:** English is vital for getting a good job and better salaries. Multinational business organizations and many international corporations ask for people who have a good working knowledge of English. People who go abroad for work also need to know English. English is need for a variety of jobs as like air hostess, pilot, travel guide, media manager etc.

**For International Relation:** English is important for maintaining international relations and communications. It is the language of diplomacy, international politics and meetings and conferences.

**For Information:** In today's world of information superhighway, English is essential for getting easy access to any information. Almost any information is available in English. English is the language of information technology and internet.

**In Media And Entertainment:** English is important for access to world media and Entertainment. Satellite channels around the world telecast news and views in English. Games and sports are telecast live and their commentaries are also broadcasted in English. Cinemas, cartoons and other media productions are available in English.

**English Culture and Literature:** Knowing English gives an essay access to the vast resource of English literature. World's famous books, novels, histories, stories, poems are available in English. Besides, English helps to know about cultures of other people, discoveries, inventions and life styles of the other nations.

**English: Language of Globalization:** The present age is an age of globalization. Anything bent or invented in any part of the world gets global character or recognition very swiftly. To keep pace with the process of globalization, we need to learn English. Conversely, the globalizing process requires single language for international communication. As a result, it has crossed the national borders of English speaking countries and reached people who speak other languages.

**English As An International Language:** Today about 300 million people speak English as the first language and another 350 million use it as a second language. It is the official or semi-official language in more than 60 countries and of many international organizations. International organizations held their meeting in English

---

A. J. Ahamed Asmath, Assistant Professor, Department of English, Annai Khadeeja Arts and Science College for Women, Kandianivayal, Puthukottai District. Email:asmatfeb4@gmail.com

## II. MEDIA'S EFFLORESCENCE AND ENGLISH

In the world of today, media has become as necessary as food and clothing. It has played significant role in strengthening the society. Media is considered as "mirror" of the modern society, in fact, it is the media which shapes our lives. The purpose of the media is to inform people about current, new affairs and to tell about the latest gossip and fashion. It tells about the people who are geographically divided. The role of media has become one way of trading and marketing of products and prejudices. The media claimed to be governed by righteousness and equity, but greed and self-aggrandizement has poisoned its virtues. Media is in charge of

- **Information**
- **Education**
- **Entertainment**
- **Advertising**
- **Correlation of parts of society**

Society is predisposed by media in so many ways. It is the media for the masses that helps them to get information about a lot of things and also to form opinions and make judgments regarding various issues! It is the media which keeps the people updated and informed about what is happening around them and the world. Media has had a bad effect on a generation, mainly because youth is strongly influenced by media. Teenagers and children wish to follow the people, who get recognized and do what they do to get noticed. The media affects people's perspective. Too much intervention of media in everything is a matter of concern. Fm radios, newspapers, information found on net and television are the mass media that serve to reduce the communication gap between the audience, viewers and the media world. For the sake of publicity and selling, important figures, their lifestyles are usually targeted. No doubt, media has played significant role in making world a global village and to reduce the communication gaps amongst the people living in the far areas.

## III. MEDIA'S CONTRAVENE

Now-a-days social media is altering language. From unfriend to selfie, social media is clearly having an impact on language. The words that surround us every day manipulate the words we use. Since so much of the written language we see is now on the screens of our computers, tablets, and smart phones, language now evolves partly through our interaction with technology. And because the language we use to communicate with each other tends to be more acquiescent than formal writing, the combination of informal, personal communication and the mass audience afforded by social media is a recipe for rapid change. From the introduction

of new words to new meanings for old words to changes in the way we communicate, social media is making its presence felt. New ways of communicating is an alphabet soup of acronyms, abbreviations, and neologisms have grown up around technologically mediated communication to help us be understood. The acronyms we now think of as text speak on the online forums and 'internet relay chat' (IRC) that pre-dated text messaging. On IRC, acronyms help speed up a real-time typed conversation. On mobile phones they minimize the inconvenience of typing with tiny keys. And on Twitter they help you make the most of your 140 characters. Emoticons such as ;-) and acronyms such as *LOL* ('laughing out loud' Syntax aside, social media has also prompted a more subtle revolution in the way we communicate. Our communication styles consequently become more informal and more open, and this seeps into other areas of life and culture. When writing on social media, we are also more succinct, get to the point quicker, operate within the creative constraints of 140 characters on Twitter, or aspire to brevity with blogs.

New words and meanings is curious occurrence we've seen in recent years is the reappropriation of existing words and words based on brands to refer mostly to their social media context. Reappropriation is the cultural process by which a group claims words that were previously used in a certain way and gives them a new meaning. In this way the people who slot in with social media are quite literally creating new words and giving new meanings to existing words. Face book has also done more than most platforms to offer up new meanings for common words such as *friend*, *like*, *status*, *wall*, *page*, and *profile*. '*Friended*' and '*unfriended*' are examples of words that have been given a new meaning due to their usage online. The word '*friend*' and '*befriend*' is from Old English originating in the 13th Century, but it has been given an entirely new meaning thanks to Facebook (the process of adding or removing someone from your circle of friends). '*Like*' and '*viral*' are other popular examples of words that have had their meaning reappropriated by social media. Social media has spawned new words and morphed old ones. News casters, especially on AIR and Doordarshan, try to maintain an accent close to British Received Pronunciation. Until about a decade ago, the diction of the newscasters on AIR was regarded as a model for pronunciation. With the advent of quicker and more vivid communication channels via social media and social technologies, English has been deteriorated incredibly enough. Yet there is another aspect of it, "*English language can adapt swiftly and easily unlike any other language in the world*" Crough

Further films/movies offer the full range of language from colloquial to literary, unaffected to flowery, lending ample opportunities to learners to experience power of

language for communication. Narrative films specially make use of language to advance plot, define characters, and establish mood. Watching films particularly help in improving listening comprehension and enhance vocabulary. Subtitles and closed captioning can help students increase reading speed. Thus films can also be effectively used for developing writing and oral presentation skills. In the same line, films can be used as rich teaching resource for various other important skills such as speaking, repeating dialogues, dramatic enactments of scenes, script and dialogue writing.

The days of writing grammatically correct, perfectly punctuated sentences may seem like a thing of the past – but what role has social media played in this trend? If new research from Brand watch is anything to go by, it could be said that social networks have transformed modern day English, with Twitter presenting the greatest threat. The site analyses the effect of various social media sites on the English language to find that Twitter users are the most likely to swerve from correct spelling and grammar. A total of 0.56 per cent of words posted on the micro-blogging site is either misspelled or unofficial, although it has been optional that this might be down to its strict 140-character limit. Women were found to be more likely to deviate from the official language than their male counterparts, as well as being more inclined to elongate their words for effect. Men, perhaps naturally, showed a preference for shortening words, instead using phrases such as ‘kinda’ and ‘wanna’. Now it's not uncommon for even the greatest of spelling aficionados to struggle with the odd word or two, but Brand watch's analysis found that some words are more commonly misspelled than others.

!?... (No, That's Not a New Band Name or Profanity Bleep)

Other punctuation mark usage is changing, too. Take the exclamation point. It no longer just shows excitement, but is used to indicate that the person really meant what they typed. Question marks, too, have changed. A question mark no longer merely shows inquiry, but is now often used to indicate self-deprecation or to soften too assertive or self-serving messages (e.g., “**He's really into me?**”). And who could forget the ubiquitous ellipsis? Once used to indicate an omission of a word or sentence, or indicate a long pause or unfinished thought, ellipses now help to keep a conversation open and light, and solicit the other person to respond, as noted in a recent [Slate article](#). The worst offenders were definitely, separate, embarrass and accomplish, with peculiar and surprise also featuring on the list. It just goes to show that even in a field as broad as social media; people are still on the lookout for good spelling and grammar – something that public running Twitter campaigns should bear in mind.]

#### IV. RECOMMENDATION

The importance of English cannot be denied. Knowing English is like having an international visa. Anywhere in the world English is useful and helpful. So, learning English is very important. No doubt, media has played momentous role in making world a global village and to reduce the communication gaps amongst the people living in the far areas but regrettably, media these days has become a commercialized sector, eying the news which is hot and good at selling. The goal is to gain the television rating points. Being aware of these change language usages can also help you better understand social media performance and refine practices. For example, if all of your Face book posts lack engagement, and you have been adding short sentences that end in a period, your fans may think that your messages are overly harsh or aggressive. In short, the impact of media on people, language and education is very much in the positive and progressive direction. If the media identifies its responsibility and work sincerely and honestly, then it can serve as a great force in building the nation.

#### V. BIBLIOGRAPHY

- [1] Rita Rani , Importance Of Learning English | December 1, 2014 | Copyright © 2016
- [2] Essay And Paragraph. Theme By Mythemeshop.
- [3] Muzna Shakeel, The Role Of Media In Today's World <http://www.hamariweb.com/articles/article.aspx?id=10166>
- [4] How social media is changing language Oxford Words blog <http://blog.oxforddictionaries.com/2014/06/social-media-changing-language/>
- [5] Emma Furze , How Social Media Has Shaped The English Language. By: Castleford staff



# Strategies in Acquiring of English in Circumventing the Language Learning Disability: A Product and Process of Acquiring Second

G. Chitra and N. R. Saranya

**Abstract---** English Language Learners (ELLs) are a very large and emergent population in India. The need for effective strategies for the acquisition of English in respect of students who struggle with or are just learning English, has been strongly felt in recent times.

A small group of ELL students were identified and their proficiency in English and progression levels of acquiring English over a time was tested on several grounds; their skills in listening, reading, speaking, and writing were found to vary with each other.

Two approaches were used with students acquiring English. One is vernacular bilingual version and the other exclusively in English. The First group of students was taught to read in their respective vernacular language and subsequently transitioned to English reading with a view to assess the cognitive-linguistic benefits; Bilingual students were used as helpers. The Second group of ELLs was taught exclusively in English. The types of language tasks with which the strategies tend to be associated remained the same for both the groups.

Efficacy of SDAIE (Specially Designed Academic Instruction in English) was assessed in enhancing ELLs learning process and acquiring English. Essential Instructional strategies including Metacognitive Development, Bridging, Schema-Building, Contextualization, and Modeling were adopted in the whole process of the exercise. Participatory learning and use of cooperative-supportive learning and peer clarifications were encouraged.

Encouraging and supporting ELL students to use their native language was found to help them comprehend and learn English in an appreciable manner. Testing in English exclusively for ELLs rendered them invariably unable to make obvious of what they know in English.

Lagging academic skills of ELLs behind those of their monolingual English-speaking classmates do not conform to the language-learning disability but just a

manifestation in the normal process of acquiring a second language and proved to be transient.

The findings of both of these approaches for students acquiring English are highlighted in the present paper.

## I. INTRODUCTION

ENGLISH LANGUAGE LEARNERS (ELLs) form a considerable and evolving population in India. Students who are in the process of acquiring the English language and whose first language is not English are construed as ELLs.

Information about second language learning and augmenting the acquiring of English in particular still remains largely speculative, and in fact precluding the possibility of stipulating definitive formula for teachers. Earlier studies have elaborated on various fronts as to how communicating in a second language has always been a challenging and complex process (Lay, 1982; Arndt, 1987; Bereiter and Scandimania, 1987; Raimes, 1985; Jones and

Tetroe, 1987; Cumming, 1989; Uzawa and

Cumming, 1989; Kobayashi and

Rinnert, 1994; Kamimura, 1996; Cohen and Brookes

Carson, 2001 Sandra

Lee McKay, 2002; NCTE, 2008; Moughamian et al., 2009; Protheroe., 2011; Qiandi Liu and Dan Brown, 2015; Shelley Staples, 2016).

English Language Development (ELD) and Specially Designed Academic Instruction in English (SDAIE) are the two aspects given great attention in recent times in view of promoting acquiring of English among ELLs.

English Language Development (ELD) is the methodical use of teaching strategies intended to promote acquiring of English by students whose primary language is not English. Specially Designed Academic Instruction in English (SDAIE) includes all such specific Teaching strategies developed for teaching academic content to English Language Learners in the process of assisting their learning process. Essential Instructional strategies including Metacognitive Development, Bridging,

G. Chitra, Assistant Professor (Sr.G), Department of English, Kongu Engineering College, Perundurai, Tamilnadu Perundurai, Tamilnadu

N. R. Saranya, Assistant Professor, Department of English, Kongu Engineering College, Perundurai, Tamilnadu Perundurai, Tamilnadu edu

Schema-Building, Contextualization etc., are always considered inclusive factors and need be addressed in perspective in the whole process of the acquiring of English as Second Language.

Metacognitive Development addresses the need of providing ELLs with skills and vocabulary to converse about their learning such as self assessments, vocabulary, assignments and study techniques.

Linking/Bridging Process focuses on building on prior knowledge and creating a link between ELLs and the material.

Interspersing/Schema-Building assists ELLs to see and understand the relationships between various concepts.

Milieu perspective/Contextualization introduces and familiarizes unknown concepts through direct experience.

Novel Presentation/Text Representation is encouraging ELLs to enlarge their perception of text content and apply them in a new way.

Integrating ELD and SDAIE (Specially Designed Academic Instruction in English) strategies are believed to reinforce the acquiring of English an easier task and enjoyable exercise on the part of ELLs.

It is further widely known that supporting and encouraging ELL students' use of their vernacular language greatly assist them comprehending and learning English. It has also been recognized to develop greater brain density in areas associated to language, attention and memory (Moughamian *et al.*, 2009; Protheroe., 2011).

## II. METHODOLOGY

The four domains of ELD, Listening, speaking, reading, and writing. Students need to be instructed at their proficiency level for the different domains. It is crucial to understand that students' progress through the levels of proficiency at different rates.

The four skill areas of ELD namely function (purpose of communication), Form (Structure of English Language such as Grammar, Sentence Structure and Syntax), Fluency (Ease in speaking the language) and Vocabulary (Development of a wide and varied vocabulary) are analyzed with respect to ELLs over a study period of six months.

Students were interviewed and assessed in small groups to determine their levels in English proficiency. Strategies to assist ELLs in their learning process, involved a number of language tasks including pronunciation, grammar, vocabulary, listening, making brief presentations in class, social communication, and functional communication such as applying for a job. The types of language tasks with which the learning strategies of ELLs tend to be associated.

The study also examined two student variables-time spent and attitude toward the whole exercise of acquiring English-as well as four cognitive/affective characteristics-field independence, ambiguity tolerance, motivational intensity, and English-class anxiety. English proficiency of ELLs was measured by the TOEFL practice and an oral test of communicative competence.

Table 1. Variation in the proficiency level of acquiring English by ELLs in the Domains of ELD over a study period of 6 months

Domains of ELD	ELLs with Bilingual*			ELLs Monolingual*		
	Initial (%)	After 6 months (%)	% Progression	Initial (%)	After 6 months (%)	% Progression
Listening	32.47±0.082	51.41±0.681	58.33	31.28±0.063	50.15±0.071	60.33
Speaking	28.62±0.064	47.13±0.816	64.68	29.57±0.091	46.21±0.092	56.27
Reading	35.84±0.081	53.72±0.594	49.89	36.14±0.084	54.87±0.084	51.83
Writing	30.16±0.074	48.93±0.083	62.24	31.47±0.069	51.24±0.059	62.82

Values are Mean±SE of 30 students of language tasks specified

Table 2. Variation in the proficiency level of acquiring English by ELLs in the Four Skill Areas of ELD over a study period of 6 months

Skill Areas of ELD	ELLs with Bilingual*			ELLs Monolingual*		
	Initial (%)	After 6 months (%)	% Progression	Initial (%)	After 6 months (%)	% Progression
Function (purpose of communication)	34.54±0.072	52.83±0.068	52.95	35.16±0.082	53.14±0.065	53.14
Form (Structure of English Language such as Grammar, Sentence Structure and Syntax)	39.72±0.093	51.37±0.071	29.33	40.52±0.747	51.21±0.093	26.38
Fluency (Ease in speaking the language)	27.81±0.058	44.63±0.084	60.48	28.16±0.068	45.13±0.086	60.26
Vocabulary (Development of a wide and varied vocabulary)	31.27±0.061	51.86±0.059	65.85	32.53±0.073	53.42±0.083	64.22

Values are Mean±SE of 30 students of language tasks specified

### III. RESULTS AND DISCUSSION:

It is a common fact that ELLs are struggling academically where the medium of Instruction is English. There is a common view that ELLs are not learning English with the expected speed and their academic skills are lagging behind those of their monolingual English-speaking classmates. The formidable question is whether this is due to the language-learning disability or do the ELLs just manifest the normal process of acquiring a second language?

ELLs were found to manifest interference or transfer from their first language (L1) to English (L2). This should only be considered a normal phenomenon - an indication of a language variation, not a language disorder.

ELLs were, further, found to manifest a common second-language acquisition phenomenon called the *Quiescent or silent period*. This was normally seen when students were first exposed to the task of acquiring of English as a second language, and invariably they were more concerned focusing on listening and comprehension. ELLs remained most often quiet, speaking very little as they were focusing on understanding the new language.

Cognitive-linguistic benefits of being a fluent bilingual speaker were obvious and ELLs who are fluent bilinguals were found to outperform monolingual speakers.

ELLs developed conversational English over the period of intense exercise, that appears fluent and enough for everyday communication. They, however, still struggled with Cognitive Academic Language Proficiency (CALP).

Structured note-taking efforts for lectures and comprehension strategies facilitated the ELLs learning process.

Instructional Strategies complementing the learning process of ELLs were known to make the ELLs progress fast.

Use of such exercises as Word Search or Cross Word to bring in vocabulary in a fun way appreciably enhanced the learning process of ELLs.

ELLs were interviewed to detect their familiarity with the use of strategies on a trial basis, and to determine whether or not they introduced strategies to their students during instruction.

ELLs exhibited tendency to use strategies with less complex language tasks.

The study revealed that time spent and attitude toward acquiring of English were significantly related to field independence and motivational intensity.

The success rate on the achievement of English language learners was found to be significantly positive. Even after transitioning to English-only instruction, group taught with bilingual instruction performed better on English assessments than students who were primarily taught in English.

The general perception is that people who speak second languages may not speak or write them with native-speaker-like fluency. Such second-language limitations may be the results of strategies of learning (familiarizing the structure of the language), strategies of incorporation/assimilation (making one's learning task much comfortable and easier), and strategies of communication (optimal utilization of grammar and effective communication). Applying aspects of a second

language at a variety of phases and levels as well forms a crucial factor in the initial learning stages of acquiring English by ELLs.

It is further, essential to differentiate between performance and competence errors. Performance errors are occasional and mostly related to memory restrictions whereas competence errors are systematic and characterize a transitional stage in the progression of a grammatical rule or the phase of the speaker's knowledge.

#### REFERENCES

- [1] Ardnt, 1987. Six communicators in search of texts. A protocol based study of L1 and L2 communicating. *ELT Journal*, 41, 257-267.
- [2] Bereiter, C and Scardamalia, M. 1987. The Psychology of written Composition.
- [3] Cohen, A and Brooks-Carson, A. 2001. Research on direct versus translated communicating: Students' Strategies and their results. *The Modern Language Journal*, 85, 169-188.
- [4] Cumming, A. 1989. Communicating expertise and second language proficiency. *Language Learning*, 39, 81-141.
- [5] Jones, S., and Tet, J. 1987. Composing in a second language. In A. Matsuhashi (Ed.) *Communicating in real time* (pp. 34-57). Norwood NJ: Ablex.
- [6] Kamimura, T. 1996. Composing in Tamil as a first language and English as a foreign language. A study of narrative communicating. *RELC Journal*, 27(1), 47-69.
- [7] Kobayashi, H and Rinnert, C. 1994. Effects of first language on second language communicating: Translation versus direct composition. In A. H. Cumming (ed.) *Bilingual performance in reading and communicating* (pp. 223-255). Ann Arbor. MI Research Club in Language learning.
- [8] Lay, N. D. S. 1982. Composing process of adult ESL Learners. A Case Study. *TESOL Quarterly*, 16, 406.
- [9] Moughamian, A. C., Rivera, M. O., Francis, D. J., Center on, I., & University of Houston, T. (2009). *Instructional Models and Strategies for Teaching English Language Learners*. Center on Instruction.
- [10] National Council of Teachers of English (2008). *English Language Learners: A Policy Research Brief* produced by the National Council of Teachers of English.
- [11] Protheroe, N. (2011). Effective Instruction for English-Language Learners. *Principal*, 90(3), 26-29.
- [12] Qiandi Liu and Dan Brown 2015. Methodological synthesis of research on the effectiveness of corrective feedback in L2 writing. *Journal of second language writing*. Vol. 30. 66-81.
- [13] Raimes, A. 1985. What unskilled ESL students do as they write. A classroom study of composing. *TESOL Quarterly*, 19, 229-258.
- [14] Sandra Lee McKay 2002. *Teaching English as an International Language. Rethinking Goals and perspectives*. New York: Oxford University press.
- [15] Shelley Staples. 2016. Understanding first-year L2 writing: A lexico-grammatical analysis across L1s, genres, and language ratings. *Journal of Second Language Writing*. Volume 32, June 2016, Pages 17-35.
- [16] Uzawa, K., and Cumming, A. 1989. Communicating Strategies in Tamil as a foreign language. Lowering or keeping up standards. *The Canadian Modern Language review*, 46, 1780194.
- [2] <http://www.colorincolorado.org/> What's 'Normal,' What's Not: Acquiring English as a Second Language
- [3] <http://onlinelibrary.wiley.com>
- [4] Learning Strategies used by beginning and intermediate ESL students J. Michael O'Malley, Anna Uhl Chamot, Gloria Stewner-Manzanares, Lisa Kupper and Rocco P. Russo <http://onlinelibrary.wiley.com>
- [5] Error Analysis and Second Language Strategies. Richards, Jack <http://eric.ed.gov/>

#### ON LINE SOURCES:

- [1] Andrea J. Spillett, *Strategies for Teaching English Language Learners* <http://www.scholastic.com>

# The English Language-Learning Experiences of Students from L1- vs L2-Medium School Education in Technical Colleges: A Study in Contrast

Deepesh C

**Abstract---** *It is observed that students from Mother Tongue (MT)-medium backgrounds are highly motivated to learn English and develop a felicity in English as they see it as crucial for success. They are also good at content in their subjects at college even if they struggle with language ability. Research to suggest that a sound background in MT-medium education is ideal for education is attested by the fact that these students from MT-medium backgrounds are quick to learn English fluently and do well in academics as well, vis-à-vis students who come from so-called English-Medium schools, which are English-rich only in pretence. They have low quality teachers of English and hardly use English at school.*

*This paper argues, based on certain students' recollection of their school experience, that MT-medium education can be considered on par with, if not better than good English-medium schools in the Indian context.*

*The implication for policy-makers is to discourage the mushrooming of name-sake English medium schools in rural India and in disadvantaged urban environments of the country, and to encourage MT-medium education there.*

*The study looks at a cross-section of student respondents from the two categories and compares their improvement in English over a period of a few months when exposed to a reasonably English-rich environment at a technical college in Chennai. The growth trajectories seen for those from Tamizh-medium backgrounds is much higher and richer than those seen for those from English-impooverished English-medium schools.*

**Keywords---** *Mother-tongue medium schools, English-medium schools, English as a second language, Language education policy, BICS, CALP, National Curriculum Framework 2005*

## I. INTRODUCTION

ENGLISH enjoys a special place in the Indian emindscape. Even as a few individuals see it as a colonial tool and an agent of linguisticide, most people view English as a passport to success, as an instrument of social and economic mobility. The role of English in the Indian school education scene is determined by the push and pull of two opposing forces. One force that is prevalent in India eulogizes language as mother or divinity (Tamizh Thai, Telugu Talli) and involves itself in promoting the language of identity. The reorganization of states on linguistic basis, the anti-Hindi agitations of the mid 60's, and the movements to include languages in the VIII Schedule of the Indian constitution, which effectively mandates the State to promote the Scheduled languages. This force works on the side of identity, emotions and heritage.

The other force works on the side of pragmatics, rationality and modernity. It works in support of the languages that maximize, in their perception, the chances of success in life. This force views languages as mere tools of communication and 'at best', pushes for Hindi as multilingual India's national language. This force believes in the promotion of English and Hindi as media of instruction in schools.

Several researchers have concluded that mother tongue-medium education is more conducive to learning than second-language-medium education (UNESCO, 2008, Kosonen, 2005, Mohanty, 2009). This, they argue, is not only because learning in the home language of the child is most effective, but also because then, children are more likely to continue in school, and feel empowered and confident. Needless to say, education in an unfamiliar language (English in rural India) disadvantages, desensitivizes and disempowers such children.

"Numerous studies continue to show the poor educational achievement of children in submersion education, which has a subtractive effect on their mother tongues. In contrast, studies do show better performance of children in their mother tongue-medium schools. But, is research evidence enough? Why then are mother

---

Deepesh C, Assistant Professor, SSN College of Engineering, Chennai. E-mail: deepeshc@ssn.edu.inedu

tongues neglected despite persuasive evidence to the contrary? As the voiceless minorities suffer the sinister exclusion of mother tongues, the silent elites enjoy the pre-eminence of dominant languages such as English." (Mohanty, 2009. p.5)

## II. THE PROBLEM

However, the forces that believe in the pragmatic utility of languages exert disproportionate pressures on school policymakers as well as on local school managements especially to use English as **the** medium of instruction in schools right from the kindergarten level. An added complication is the fact that several Dalit scholars and those working to empower the marginalized communities in India have also argued that fluency in English is the single most important empowering tool apart from an effective reservation policy. The societal pressure to call a school an English-medium one is very high in India and there are innumerable anecdotal examples of parents working even in menial jobs assuming that studying in English-medium schools is the surest way for their children to succeed in life.

As a result, we have the widespread phenomenon of state governments shifting even the government schools to an English-medium system completely or at the least giving parents an option of English-medium schools at most places. Consequently, parental choice of an English-medium school has led to the reduction of the number of Tamizh-medium schools in Tamil Nadu (for example). This unreal need felt for English-medium education takes the shape of a half-baked reality in the form of innumerable teaching shops which are called English-medium 'global' or 'international' schools. English is the medium of instruction here only on paper. Tamizh is almost the only language used in these schools for classroom transactions and students are used to answering stock questions with stock answers learnt by heart. Given the extensive research in the area of mother-tongue-medium education, one may be inclined to believe that the liberal use of Tamizh in the classroom is a happy feature. Unfortunately this is not true. If one takes into account the distinction between 'Conversational Language' and 'Academic Language' (Cummins used the terms 'Basic Interpersonal Communicative Skills' -BICS and 'Cognitive Academic Language Proficiency' - CALP<sup>1</sup> earlier to distinguish between the fluency in conversational speech and the more formal and technical language needed to involve in academic discourse) that Cummins makes. It is possible that teachers use BICS in

Tamizh to explain terms that are used in English in the English-medium school classroom, and this somehow translates to no CALP in Tamizh and a weak CALP in English among the students.

This situation at the primary and secondary schools plays out even at the tertiary levels of education, as seen in the language abilities of students in engineering colleges who come from schools in rural or semi-urban Tamil Nadu, which are often English-impoverished even though they are called English-medium schools.

## III. THE STUDY

The study looked at two categories of students struggling with the English component of their first year engineering courses at SSN College of Engineering, Chennai. The college, being run by a progressive management, not only admits students of merit from urban areas who can afford the fees, but also completely sponsors any expenditure incurred by students of merit from rural schools who have been admitted to the college, but cannot afford the fees. One group of students (henceforth TM students) struggling in the English class has studied in Tamizh-medium schools, which have English as one of the subjects in school. The second group of students come from schools which claim to be English-medium ones (henceforth PEM for pseudo-English medium students) but who have English-impoverished schooling contexts. Although at first glance, there is no difference between these two categories of students, a discerning teacher in engineering colleges can see how the former (TM) bloom into confident users of the language and also do well in the other subjects, while the latter (PEM) find the going extremely arduous. At least four first-year students were interviewed from either category to take away any bias towards one side. The names of specific students and anecdotal evidence are not mentioned in the paper in order to not deviate from its central focus.

## IV. DIFFERENCES BETWEEN THE TWO CATEGORIES

### *Motivation*

A careful look at the two categories leads one to notice that the motivation levels are different for the two types of students. While the PEM students are not very highly motivated, the TM students seem to have fires in their bellies. For them it looks like learning English fluently is an issue of their survival, and take it up as a mission, and in contrast, the PEM students just want to manage to score marks in the exams. Learning has no other significance for them.

### *Adaptability*

The ability to quickly change strategies and behave according to the situation is observed among the TM

<sup>1</sup> CALP is defined as "the extent to which an individual has access to and command of the oral and written academic registers of schooling" (Cummins, 2000, p. 67)

students, whereas the PEM ones are found to be somewhat inflexible. The former is ready to adapt to the situation of being immersed suddenly in an English-rich language context and quickly change their approach from what they did as students at school. They realize that it is no longer going to be stock questions for which one can learn stock answers by heart and reproduce. They quickly learn that the best way to answer questions in the test paper is by writing original answers and not by learning answers based on a question template alone.

The PEM students however fail to do this. They are still trying to use the same strategies they used at school - trying to manage to pass the test with stock answers. While this may help them pass a test or several tests, this won't work in the long run, and the consistently poor performance takes a toll on their personalities.

#### *Personality*

The TM students and the PEM students both are low in self-confidence at the beginning of the course, owing to their lack of fluency in English and the associated feeling of lack of self-worth. But soon enough, there can be seen a shift in this sense of oneself. The TM students can be seen to be full of a steely resolve to put in their best - or whatever it takes - to pick up the nuances of the English language. The PEM students seem more resigned to the fact that they are not so fluent in English and don't seem enthusiastic enough to change this situation.

#### *Language Proficiency*

The essential difference in the two categories of students is the medium of education and the exposure to language/languages in the school curriculum. While the TM students go through a school education system that enables them to become proficient in Tamizh even in terms of their CALP in Tamizh, they don't pick up much language ability in English. In contrast the PEM students do not have CALP either in Tamizh or in English. This situation leaves them confounded and almost disabled. CALP can be argued to be crucial for one's academic success. The challenge of the TM students is to develop CALP in English and soon enough (within the first two semesters), they are able to do this quite reasonably well. The PEM students have to pick up not only CALP in English, they are deficient in content knowledge as well as low on confidence and other positive personality traits.

### V. CONCLUSIONS

What this implies is that if the school context cannot provide an English-rich environment and doesn't have the resources to provide teachers capable of using CALP in English in the various subjects including English, it is best to use Tamizh as the medium of instruction in school, irrespective of the pressure from the stakeholders. This can be argued as true across India where English-medium

schools are sprouting up exponentially. This also implies that teachers in such engineering colleges need to employ remedial strategies keeping this fact in mind.

### BIBLIOGRAPHY

- [1] Cummins, J. (2000). *Language, power and pedagogy*. Clevedon, UK: Multilingual Matters.
- [2] Kosonen, K. (2005). Education in local languages: Policy and practice in Southeast Asia. *First languages first: Community-based literacy programmes for minority language contexts in Asia*. Bangkok: UNESCO Bangkok.
- [3] Mohanty, A. (2009), Multilingual Education: A Bridge too Far? In Tove Skutnabb-Kangas, Robert Phillipson, Ajit K. Mohanty and Minati Panda (Eds) 'Social Justice Through Multilingual Education'. New Delhi: Orient Blackswan.
- [4] UNESCO (2008). *Mother Tongue Matters: Local Language as a Key to Effective Learning*. Paris: UNESCO.

# Challenges in learning English as a Language

P. Jose

The purpose of this study is to explore different challenges that exist in learning English as a language. This study is important in a time, when learning English is projected as one of the major survival skills. A country like India, where lots of English medium schools are present, hasn't done a dramatic change in the lives of many students who are still allergic to the English language, even after joining the college. Their education in English medium from PRE-KG to 12<sup>th</sup> standard hasn't done much in removing the fear and hesitation when asked to talk in English. The reasons are multi-fold, such as, **English being taught as a subject and not as a language, teachers' ability to teach in English and students' ability to understand it, Homogeneous students group (Language wise), Socio-Political scenarios and importance of mastering the mother tongue before learning other languages.** Studies have proven that most of the English medium schools have become money minting organisations, where the language is overlooked and the subjects are memorised every time without understanding them. The aversion to English language is picked up in the classrooms and expanded further in other co-curricular and extra-curricular activities. The pathetic situation continues, even in most of the colleges, where the faculty members struggle to conduct sessions in English and the reason they give is that there are students from Tamil medium. When we look at this scenario closely, the faculty doesn't care about other students who have completed their education in English medium and they also don't give the Tamil medium students an opportunity to learn English, because learning English is not a 30 days business but a continuous process.

education and business scenarios and if the globe is a village then English is the language. In India, people who talk in English, gain lots of respect from all walks of life. There were researches addressing the language skills of the government school teachers and government school students. But this study focuses on both government and private schools, both Tamil medium and English medium curriculum and both English teachers and other subject teachers.

This study covers five major challenges posed in learning English as a language. The identified problems are as follows.

1. Teachers' ability to teach in English and students' ability to understand it and vice-versa.
2. English is being taught as a subject and not as a language
3. Homogeneous students group – Language wise
4. Socio-Political scenarios
5. Importance of mastering the mother tongue

*Teachers' ability to teach in English and the students' ability to understand it*

In most of the schools, English is taught as a subject and not as a language which creates knowledge gap and language gap. The primary objective of the learning is to understand the concept taught by the teacher and acquire the skill needed to complete that subject but in most of the English medium schools in Tamilnadu, even the English language is taught as a subject and not as a language. In addition to this, most of the English medium teachers, including the English teachers, are not proficient in English. This in turn makes the delivery part very difficult from the teachers' end, as they would be monitored by the management to deliver the lessons in English but the teachers' fluency may not be enough to teach the subject in English which results in a kind of confusion among most students. They won't be able to understand the English spoken by the teacher and they won't understand the subject completely, thus ending up in rote learning.

Second issue is the English proficiency level of the students. The teacher may be very fluent in English but most students may not be able to follow their teaching in English properly. They would be physically present in the room but their mind will be wandering outside the classroom. When someone doesn't understand the medium of instruction, they get bored and this results in mugging up the subjects without understanding them.

## I. INTRODUCTION

THE word English brings mixed and varying reactions among different people such as faculty, students, parents and even the politicians. English is regarded as a status symbol by few, a challenge by few and a curse by few else. Lots of people gained confidence because of English language and lots of people have lost confidence because of the same English language. Knowingly or unknowingly, English has become part and parcel of our

---

Mr. P. Jose, M.A. Eng.Lit., M.Sc.Psychology., MBA(NET), Faculty – In-charge, Language Learning Centre (S&H), Dr.Mahalingam College of Engineering and Technology, Pollachi. E-mail – jose@drmcet.ac.in



The fact is highly visible, through the number of English medium school teachers' ability in explaining things in English. While very few schools, 5% of premium schools have got teachers, who could communicate well and teach their subject in English, rest of the 95% schools have teachers, who can't communicate or teach their subject in English, forget about teaching effectively in English. These teachers pose a great threat in improving the language skill of the students because they never communicate with the students in English.

#### *English is taught as a subject and not as a language*

The foremost reason for the aversion towards English and the adverse result of mugging up is because English is taught as a subject and not as a language in most of the schools and even in college levels. For students, it's always about reading and writing, the last two areas of language learning, whereas the first two areas of listening and speaking are given less importance or no importance at all. English Language is taught as a subject, where there is no scope for the students to improve their speaking skills, which in turn creates a fear among the students to talk in English among a group and this fear is carried even to the colleges.

Every school in the country make students memorize prose, poetry, and non-detailed for examination sake, where the real intention or target of learning the language itself is lost but the ways through which we attain the target remained. In English medium schools, the child is asked to learn in a foreign language before it becomes familiar with its mother tongue and in government schools although the students have developed competent use of the mother tongue, the next step that is introducing the second language effectively both in terms of staff and syllabus becomes a great challenge. Both the private and the government schools have English as a subject and not as a language. Almost 80% of the students who scored more than 75% of marks in English subject in their 12<sup>th</sup> standard, were not able to speak in English properly, forget about speaking effectively. It is because they learnt English as a subject by memorizing it.

#### *Homogeneous students group – Language wise*

Most of the schools have homogeneous students, who come from the same mother tongue speaking background. Most of them speak English because they have to and that too in big schools when someone is around. When they are with their friends they switch to their mother tongue. They don't speak the language consciously but for name sake. The influence of mother tongue speaking friends, is an undeniable factor that prevents students from learning the language and it closes all the doors for improvement.

This homogeneity of the students in terms of language (say all are from Tamilnadu), makes it easy for the

students to communicate in Tamil. In my experience even some of the best students who come from good schools with very good language proficiency has reported that they didn't have the same environment where they could speak in English with their peers, instead they were looked down or mocked for speaking in English. This peer pressure is one of the most difficult challenge to tackle and the struggle continues.

#### *Socio-political environment*

The socio-political environment is another area of importance to a state like Tamilnadu, where learning through any other language is considered to be a sin. The government promotes learning through mother tongue but never does anything better when it comes to the second language. The government school English teachers are in nowhere near the private school teachers but only by contrast, meaning, most of the private school teachers are no better.

Movies play their part in discouraging students from learning English effectively. Most of the heroes from the movies would be from a village and they would make fun of everyone and everything in the movie and people who speak in English are the people who suffer the most at the hand of these heroes and their comedian friends.

**It has been estimated that 50% of the world's out-of-school children live in communities which use a different language to the one used in the local schools (Pamela J Mackenzie and Jo Walker for the Global Campaign for Education).** English is given utmost importance in India and even a daily labourer wants his son or daughter to study in an English medium school, keeping his worries of finance aside. While admitting a kid into the school, even the parents are interviewed to make sure that they speak in English. Most of the first generation students struggle because they have got no one to support them at home in terms of teaching and talking in English.

#### *Importance of mastering the mother tongue*

Children at an early stage are thrown in a threatening environment, entirely new to them. Few overcome the inhibitions and get through it but most of them fail miserably. This paved the way for the mug up and vomit culture, where the high scorers are highly regarded and people who score low marks are looked over. When a child learns all the subjects in an alien language, the interest level and the understanding levels are really low, especially when most of the learning is compensated with homework and tuitions. The confidence level of the child is shattered, when the teacher starts comparing them with other children, as each child's learning speed differs and each teacher's teaching style differs. **Becoming a competent communicator and fluent reader is much easier to accomplish initially using the mother tongue**

where there is already familiarity and vocabulary (C. Arnold, K. Bartlett, S. Gowani, & R. Merali, 2006).

The child needs enough time to learn its mother tongue as research provides convincing evidence that **a second language is learned best when a first language has been learned well. Learning picks up speed with comparative learning where the child has got something to compare from the mother tongue when something is told in the foreign language.** If the child is put into the school in a different language medium before they learn their mother tongue, the chances are more that the child won't learn both the languages and would develop inferiority complex. This would in turn bring a negative attitude towards learning. Over a period of time, this would bring an aversion to learning and the final result would be a big knowledge gap.

When a child starts learning a subject in a language that the child already knows, the learning speed multiplies. The child is already familiar with the vocabulary, the concepts, the applications and the materials. They have everything in their environment and so, they could visualize it and imagine it. But when it is taught in a foreign language, the child has to start from the beginning and that makes all the difference. **A study in Mali found that, where the mother-tongue language of instruction was used, children were five times less likely to repeat the year and more than three times less likely to drop out.**

Most of the developed countries have proven that children learn quickly and effectively, when they learn through their mother tongue. The understanding level of the subject matter is far better when learned through one's mother tongue. India, a multi-lingual country, supports learning through English medium which in reality has played a devastating role in creating a gap in building knowledge. **Research has shown that children's first language is the optimal language for literacy and learning throughout primary school (UNESCO, 2008a).**

#### Recommendations

In order to learn English as a language and make learning interesting this study suggests the following recommendations.

1. Teachers in the schools should attain an international certificate such as, TEFL/TESOL courses to validate themselves in teaching English as a first or second language and mere academic qualifications should not be the measure.
2. More than the qualifications, it's about the language proficiency and delivery methodology skill that are important. Institutions have the

responsibility in providing enough training to their teachers periodically.

3. Teachers should encourage participatory learning and give ample opportunity to their students to speak in English during the classes and communicate with the students outside the classroom in English.
4. When the medium of instruction is in English, all the teachers are expected to teach and interact with the students in English and only this will create an environment where the students will get immersed in the language, of course to learn a language, one needs to get immersed in that language.
5. English should be taught as a language and not as a subject, where the students memorize few poems, prose passages and few non-detailed books but never speak.
6. Students should be counselled to develop the right attitude towards language learning. This is important in making the students strong in withstanding the peer pressure, while learning the language.
7. The socio-political scenarios should be properly explained and the benefits of learning a language should be imparted carefully. The exploitation of the politicians and the global business environment should also be informed to bring in the seriousness of learning.
8. Language learning should be participatory, only then the speaking part will be taken care of, so that the classroom will be lively, students will have an opportunity to practice whatever they learnt and this in turn will boost the confidence level of the students.
9. Children should be allowed to learn in their mother tongue during the formation period, so that they will be able to learn other language by comparing the vocabulary in the mother tongue. Once they become competent in their mother tongue, English could be introduced as the second language.
10. Schools should strive to create English speaking zones where people are empowered to talk in English.

#### REFERENCES

- [1] Arnold, C., Bartlett, K., Gowani, S., & Merali, R. (2006). *Is everybody ready? Readiness, transition and continuity: Reflections and moving forward*. Background paper for EFA Global Monitoring Report 2007.
- [2] Benson, C. (2002). Real and potential benefits of bilingual programmes in developing countries. *International Journal of Bilingual Education and Bilingualism*, 5 (6), 303-317.
- [3] Janus, M., & Offord, D. (2000). Readiness to learn at school. *ISUMA*, 1(2), 71-75. Retrieved April 7, 2008, from <http://www.offordcenter.com/readiness/pubs/publications.html>.

- [4] Kosonen, K. (2005). Education in local languages: Policy and practice in Southeast Asia. *First languages first: Community-based literacy programmes for minority language contexts in Asia*. Bangkok: UNESCO Bangkok.
- [5] King, K., & Mackey, A. (2007). *The bilingual edge: Why, when, and how to teach your child a second language*. New York: Collins.
- [6] UNESCO (1953). *The use of the vernacular languages in education*. Monographs on Foundations of Education, No. 8. Paris: UNESCO.
- [7] UNESCO (2008a). *Mother Tongue Matters: Local Language as a Key to Effective Learning*. Paris: UNESCO.
- [8] [http://www.campaignforeducation.org/.../GCE%20Mother%20To  
ngue\\_EN.pdf](http://www.campaignforeducation.org/.../GCE%20Mother%20To%20ngue_EN.pdf)
- [9] [http://www.eslbase.com/teaching/language-acquisition-vs-  
language-learning](http://www.eslbase.com/teaching/language-acquisition-vs-language-learning)

proof

# Emerging Literary Theories in English

R. Aarthy

Literary theory is the systematic study of the nature of literature and methods for analyzing literature. It is developed as a means to understand the various ways people read texts. The most important issues in literature theory are authorial intention and interpretive objectivity. Literary theory develops the significance of race, class and gender for literary study, both from the stand point of the biography of the author and an analysis of their thematic presence within texts. It offers varying approaches for understanding the role of historical context in interpretation as well as the relevance of linguistic and unconscious elements of the text. All critical practice regarding literature depends on an underlying structure of ideas. The structure of the ideas that enables criticism of a literary work may or may not be acknowledged by the critic and the status of literary theory within the academic discipline of literary studies contains to evolve. Different literary theories also tend to place the emphasis upon one function rather than another.

## I. READER- ORIENTED THEORIES

'Reader' – theories centre themselves on the reader's or 'affective', experience. Reader-oriented theories have no single or predominant philosophical starting point; the writers have considered belong to quite different traditions of thought and there are few common terms or positions among them. Jauss, an important German exponent of 'reception' theory gave historical dimensions to reader-oriented criticism. He tried to achieve a compromise between Russian formalism which ignores history and social theories which ignore the text, Jauss uses the term 'horizon of expectations' to describe the criteria readers use to judge literary texts in any given period. Ordinary writing and reading will work within such a horizon. The original horizon of expectations only tells us how the work was valued and interpreted when it appeared, but does not establish its meaning finally. In Jauss's view it would be equally wrong to say that a work is universal, that its meaning is fixed forever and open to all readers in any period. 'A literary work is not an object which stands by itself and which offers the same face to each reader in each period. Jauss recognizes that a writer may directly affront the prevailing expectations of his or her day. Wolfgang Iser, a leading exponent of German receptions theory, who draws heavily on the phenomenological aestheticians Roman Ingarden and on the work of Gadamer. Unlike Jauss, Iser

decontextualizes and dehistoricizes text and reader. He presents the text as a potential structure which is 'concretized' by the reader in relation to his or her extra-literary norms, values and experience.

In Iser's view the critic's task is to explain not the text as an object but rather its effects on the reader. It is in the nature of texts to allow a spectrum of possible readings. The term reader can be subdivided into 'implied reader' and 'actual reader'. The first is the reader whom the text creates for itself and amounts to 'a network of response-inviting structures' which predispose us to read in certain ways. The 'actual reader' receives certain mental images in the process of reading; however, the images will inevitably, be coloured by the reader's existing stock of experience. While a literary work does not represent objects, it does refer to the extra literary world by selecting certain norms, value systems or 'world-views'. These norms are concepts of reality which help human beings to make sense of the chaos of their experience. The text adopts a 'repertoire' of such norms and suspends their validity within its fictional world. In Tom Jones, various characters embody different norms. Allworthy(benevolence),squire western(ruling passion),square(the eternal fitness of things), Thwackum(the human mind as a sink of inequity),Sophia(the ideality of a natural indications).Each norm asserts certain values at the expense of others, and each tends to contract the image of human nature to a single principle or perspective. The reader is therefore impelled by the unfinished nature of the text to relate the values of the violated by the hero in specific incidents. Only the reader can actualize the degree to which particular norms are to be rejected or questioned.

Stanley Fish, the American critic of seventeenth-century English literature, developed a perspective called an 'affective stylistics'. Like Iser, he concentrates on the adjustments of expectation to be made by reader as they pass along the text but consider this at the immediately local level of the sentence. His attention is directed to the words of sentences as they succeed one another in time. Jonathan Culler has lent general support to Fish's aims, but has criticized him for failing to give us a proper theoretical formulation of his reader criticism, Fish believes that his readings of sentences simply follow the natural practice of informed readers. In his view a reader is someone who possesses a 'linguistic competence', has internalized the syntactic and semantic knowledge required for reading.

---

R. Aarthy, AP/ ENG, Sri Vidya College of Engineering & Technology, Virudhunagar.

An American critic who has derived approaches to reader theory from psychology is David Bleich. His "Subjective criticism (1978) is a sophisticated argument in favour of a shift from an objective to a subjective paradigm in critical theory. 'Subjective criticism' is based on the assumption that 'each person's most urgent motivations are to understand himself'. Reader-oriented theories fundamentally challenge the predominance of the text-oriented theories associated with New criticism and Formalism. It can no longer talk about the meaning of a text without talking into account the reader's contributions to it.

## II. LESBIAN FEMINIST THEORY:

Lesbian feminist theory emerged as a response both to the heterosexism of mainstream culture and radical subcultures, and to the sexism of the male-dominated Gay Liberation Movement. It focuses the interlocking structures of gender and sexual oppression. In particular, lesbian feminist theory has consistently problematized heterosexuality as an institution central to the maintenance of patriarchy and women's oppression within it. Lesbian feminist theory, like lesbian feminism, is a diverse field which draws on a wide range of other theories and methods.

The concept of 'compulsory heterosexuality' was first articulated by Gayle Rubin (1975), and subsequently given wide circulation by Adrienne Rich in her essay 'Compulsory Heterosexuality and Lesbian Existence' (1980). The concept challenges the common-sense view of heterosexuality as natural and therefore requiring no explanation, unlike lesbian and gay sexuality. The fact of lesbian existence is evidence of a powerful current of woman-bonding which cannot be suppressed. Monique Wittig's analogous concept of 'the straight mind' (1980, reprinted 1992) views heterosexuality as an ideological construct which is almost completely taken for granted. Judith Butler uses the term 'heterosexual matrix' to 'designate that grid of cultural intelligibility through which bodies, genders, and desires are naturalized'. Butler ceases to use the term in her later work but continues to argue for the subversion of sexual identities and for a distinction between sex, sexuality and gender in the social 'performances' that constitute them.

The concepts of 'woman identification' and 'lesbian feminist community' were introduced by Radicalesbians in their influential essay, 'The Woman-Identified Woman' (1970), and further developed once more by Adrienne Rich. Rich (1980) depicts woman-bonding as an act of resistance to patriarchal power. Her definition encompasses not simply sexual experience but all forms of 'primary intensity' between and among women, including relationships of family, friendship and politics. Rich's essay, 'The Temptations of a Motherless Girl',

perfectly illustrates the concepts of 'lesbian continuum' and the related lesbian critical 'revisioning'. It offers a lesbian reading of Jane Eyre which changes the focus from a heterosexual romance plot to a narrative of loving female pedagogy in which Jane is nurtured and educated by a succession of female mother/mentors. Rich convincingly demonstrates and denaturalizes the ideological hegemony of heterosexuality in reading and interpretative strategies. Rich's in order to argue that Toni Morrison's *Sula* can be productively reread as a lesbian novel, 'not because the women are "lovers", but because they. . . have pivotal relationships with one another'. 'Morrison's work poses both lesbian and feminist questions about Black women's autonomy and their impact on each other's lives.' An Overview of Lesbian Feminist Literary Criticism', offers a more sophisticated model of lesbian textuality.

## III. QUEER THEORY:

Queer theory is a field of post-structuralist critical theory that emerged in the early 1990s out of the fields of queer studies and women's studies. Queer theory includes both queer readings of texts and the theorization of 'queerness' itself. Queer theory "focuses on mismatches between sex, gender and desire." Queer has been associated most prominently with bisexual, lesbian and gay subjects, but its analytic framework also includes such topics as cross-dressing, intersex, gender ambiguity and gender-corrective surgery. Queer theory's attempted debunking of stable (and correlated) sexes, genders, and sexualities develops out of the specifically lesbian and gay reworking of the post-structuralist figuring of identity as a constellation of multiple and unstable positions.

Queer theory views the traditional and prescriptive essentialist model of sexuality as failing to do the conceptual work involved in the adequate description of how desires function, and how sexualities are made. Queer theory is a deeper philosophical challenge to the status quo, which at the same time aims to provide readings which at once subvert sameness and celebrate otherness. Sedgwick has similarly attacked the assumption that homosexuality today 'comprises a coherent definitional field rather than a space of overlapping, contradictory, and conflicting definitional forces'.

Accordingly, the starting-point for 'queer theory' is, in Moe Meyer's words, 'an ontological challenge to dominant labeling philosophies'. This strategy takes up Weeks's 'whirlwind of deconstruction' by contesting the binary opposition between (among other things) homosexuality and heterosexuality, and has taken important effect in gay and academic communities. In the 1980s, it was feared that the spectre of AIDS would unleash homophobic repression that gay men would be

marginalized, and the right to a diversity of sexual pleasure be strictly limited. Yet the message that sex must simply be safer, not less varied, has led to the recovery and reinvention of erotic possibilities. Gay groups are working with sex-workers (male and female), forcing a concern with sexuality to return to questions of class, economics and inequality. The appearance of AIDS and HIV shifted notions of identity, and brought with it new challenges, discourses and forms of representation. Thus queer theory and AIDS become interconnected because each is articulated through a postmodernist understanding of the death of the subject and both understand identity as an ambivalent site.

#### IV. POST-COLONIAL THEORY:

Post-colonial theory deals with the reading and writing of literature written in colonizing countries which deals with colonization or colonized peoples. It focuses particularly on the way in which literature by the colonizing culture distorts the experience and realities, and inscribes the inferiority, of the colonized people on literature by colonized peoples which attempts to articulate their identity and reclaim their past in the face of that past's inevitable otherness. Post-colonial theory questions and examines the expansionist imperialism of colonializing nations and cultures and the set of political, social, and cultural values which support imperialism, with special attention given to the complicated relations that occur between the party who colonialized and the party which colonialized. It does not adhere to a particular methodology or theory.

Postcolonial theory attempts, furthermore, to recoup the lost histories of the colonialized subjects and reveal the ways in which colonialization empires have shifted and erased the identities of the colonialized subjects. Post-colonial theorists tend to focus their theoretical examination on texts from the 19th, 20th, and 21st centuries, hence it can be more readily attached to a text such as Conrad's "Heart of Darkness" than "Hamlet". However, while Shakespeare's play might not directly confront post-colonial issues and concerns, some later productions and reworking of the play have certainly done so. Postcolonial theorists might take a particular interest in productions of which have been staged in areas of the world which have been subjected to colonialization, such as Africa and the Middle East. Theorists with a Post-colonial focus might examine how the play's political dimensions focus on abuses of political power, in justice, and conspiracy. A decolonized people develop a postcolonial identity from the cultural interactions among the types of identity (cultural, national, ethnic) and the social relations of sex, class, and caste; determined by the gender and the race of the colonised person; and the racism inherent to the structures of a colonial society.

In postcolonial literature, the anti-conquest narrative analyses the identity politics that are the social and cultural perspectives of the subaltern colonial subjects—their creative resistance to the culture of the coloniser; how such cultural resistance complicated the establishment of a colonial society; how the colonisers developed their postcolonial identity; and how neocolonialism actively employs the binary social relation to view the non-Western world as inhabited by the Other. By embracing a variety of theorem and approaches to textual analysis, Post colonization has ensured its place in literary theory and practice for many decades to come.

#### V. WORKS CITED

- [1] Ablove, Henry et al. eds, *The Lesbian and Gay studies Reader*. Routledge, London, 1993.
- [2] Bleich, David, *Subjective Criticism*. John Hopkins University Press, Baltimore, 1978.
- [3] Castle, Gregory, ed, *Post Colonial Discourses: An Anthology*. Blackwell, Oxford, 2001.
- [4] Eagleton, Terry, *Literary Theory: An Introduction* .2nd ed, Blackwell, oxford, 1996.
- [5] Fish, Stanley, *Is there a text in this class? The Authority of interpretative communities*, Harward University press, Cambridge, 1980.
- [6] Iser, wolfgang, *The Implied Reader*. John Hopkins University press, Baltimore, 1974.
- [7] Hooks, Bell, *Yearning: Race, Gender and cultural politics*, South End Press, Boston, 1991.
- [8] Selden, Broken et al. eds, *A Reader's Guide to contemporary Literary Theory*, Pearson Education Ltd, UK, 2005.

# Exploring Avenues in E-Content Writing, E-Publishing and the New Media

Sreela. B

**Abstract---** *“Selling like hot cakes” this phrase in terms of demand for the English graduates is never an exaggeration. The demand for expert hands in English is directly propositional to the high pay packages in offer, while the availability of expertise in the field is inversely propositional to the abundant job offers in the market. E-content writing, E-publishing and drafting subtitles are the various avenues where English graduates can prove their mettle and attain a covetable career path. This paper shall explore the various career option open for graduates of English and also people who are competent in the language. This avenue ramifies for greater good as it catalyses the development of English language learning Process. Therefore it’s an open career choice graduates of literature and also people of other streams making it a lucrative one.*

**Keywords---** *English Graduates, E-Content Writing, E-publishing, new media, subtitles.*

## I. INTRODUCTION

Degrees don’t determine the merit, it is definitely the skill. In the current scenario, graduates opting for careers distinct from their area of study are quite common and the lack of opportunity in their core area of study and the lure of high pay packages are the major reasons. In terms of English graduates, their core subject and opportunities are evergreen and the opportunities to enter “fresh woods and pastures new” are abundant. Everyday a new career opens up for them, the topical ones in this category are E-content writing, E-publishing and opportunities in the new media.

E-content writing is an art and science, brevity and clarity are the keywords. This area is widely sought after because of the immediate popularity and wide career opportunity. Reading the news and watching television channels to update the current events and knowledge have become outdated. The advents of smart phones have created revolution in the mode of transferring of information. Every second, articles and news items pop up in the web about

current happenings. Swiftness to script the data with the reader interest story is crucial for e-news. E-learning is another area with wide career prospects, due to the availability of global connectivity. The students in Japan, Germany, Austria and the U.S are the major consumers. Organizations like Benesse Corporation have their outsourcing centers in various places in India including Coimbatore, which employs people with good knowledge of English grammar and vocabulary.

Technical writing is preparing technical reports, brochures, manuals and various instructive data. The technical writers apart from English proficiency have to possess basic knowledge of science and good psychological understanding of the needs of the consumers. Many Multi-National Companies like Apple, Microsoft, Dell and many others introduce their new products on a daily basis; these gadgets have to be accompanied by the user manual which precisely conveys the exact process of operation. People with command over English can excel in this field.

E-publishing is popular because of its reasonable cost, environment friendly resources used and wide popularity of the internet. Apart from publication of fiction and creative works, e-publishing industry opens scope for e-publishing study materials. There is a wide demand for editors and reviewers in this area. A postgraduate degree in English or any professional certification from the international bodies is the basic eligibility requirements for this post. International journals like Elsevier pay huge remuneration to their reviewers with a qualified profile and reputation. Freelancing option is also available in this area; it also provides the additional benefit of working flexi-time.

The British Council offers various job opportunities as examiners for people with English proficiency, they offer training for the candidates and place them around the globe. Graduates keen to work abroad can opt for this option because they have operations throughout the globe including countries like Africa and Peru, not to mention the North American and European countries. There are abundant possibilities in India as well, every city in India has a recognized British Council center and the Southern Zone office is located in Chennai, while the other zonal offices are located in Kolkata, New Delhi and Mumbai.

---

*Sreela.B, Assistant Professor, Department of Science and Humanities, Kumaraguru College of Technology, Coimbatore.*

Blogs are the branches of the social networking media, the stories with reader interest becomes viral in matter of seconds, popularizing the blogger and even providing him financial remuneration and repute. For budding creative writers these blogs act as training grounds, the difficulty of convincing the publisher is eased because of the instantly available web publisher.

Creating subtitles is not a latest phenomenon, even during the previous century it was generally done. Nowadays this area has transformed into a meadow of wide opportunities. The worldwide attention of the film adoring fraternity towards the Korean, Chinese and Indian movies have widely increased the demand for professional translators. Popularity of Hollywood movies in India opens up opportunities for polyglots with the skill to translate the dialogues into regional languages. Even the Hindi and Tamil movie makers opt to have English subtitles for their films in order to create a universal appeal for their films. Apart from proficiency of grammar and vocabulary, creativity is mandatory for the professional subtitle creator.

The professional subtitle writer has the additional advantage of working flexi-time and can work from home. Freelances are welcomed in this field provided they have the expertise to excel. Mainly for women who opt to work from home, this area would be a boon, because they can work for the companies round the globe sitting in the security and comfort of their home. People with lots of spare time can also opt for it because these endeavors are not target based. Main factors to be borne in mind by the aspirers are the deadlines and clarity. Before venturing into the professional field acquiring knowledge in translation and different cultures of the world would be advisable.

New Media is an umbrella term which covers all kinds of new-fangled media forms and sources. The search engines like Google and Yahoo recruit the competent youngsters every year to facilitate their content writing crew. When a search word is entered in the tab of a search engine thousands of relevant details are displayed. The advertisements related to that search word crop up on the sides of the screen, these advertisements are very brief and the vocabulary used is precise and clear-cut. The brains behind those advertisements are the young experts in English. People having a command over English can excel in this field.

The above mentioned areas are just the tip of an iceberg; there are countless opportunities around the globe. Possessing good communication skills, soft-skills, creativity and confidence are the basic eligibility criteria for all the

jobs. These skills have to be nurtured and fostered with determination.



# Enhancing Speaking Skills through Classroom Activities

Saranyadevi. P and Ramya. D

**Abstract---** *English has become a global language and proficiency in English is essential for a person's growth in this competitive world. Effective communication is all about conveying messages to other people clearly and unambiguously with as little distortion as possible. Speaking is crucial to effective communication. Speaking is the purposeful process by which people, using audible and visible symbols, communicate meaning in the minds of their listeners. Many develop a sort of fear to speak in English. Motivation and regular classroom activities will make the students to overcome this fear. This paper deals with how to develop speaking ability through classroom activities. Repeated exposure to the language will prove to be highly beneficial to the person. Conversing in daily life will develop their skill drastically.*

## I. INTRODUCTION

COMMUNICATION in English is a skill that one can learn. To maintain relevance with the global environment of the new millennium, every person requires an ever-increasing range of skills. English has become a global language and proficiency in English is essential for a person's growth in this competitive world. Communication refers to the exchange of thoughts and ideas with the intention of conveying information. Communication is a two way street that include vocalization as well as gesticulation. Good communication skills are prerequisite for professionals in all walks of life. All over the world, speaking English immediately opens up opportunities. English Communication skills are a vital tool for this, recognized by academicians and industry. Communication skills are also important, given its widespread status across the globe as a lingua franca. Indeed, multilingual skills are considered as a salient feature in the make-up of the new global personality. English communication skills are essential for a student who aspires to carry out his professional practice in the global arena. One has to communicate with more number of his counterparts

across the globe and has to travel to many continents. But their language proficiency is not enough for them to be able to communicate effectively and efficiently. The graduates produced by the universities suffer largely due to lack of communicative skills to study in the world class institutions or work in global atmosphere.

## II. IMPORTANCE OF COMMUNICATION

Effective communication is all about conveying messages to other people clearly and communication is a must to influence people and win their minds and hearts. Unfortunately many do not possess these required skills and as a result they are not offered good jobs. Having kept this factor in mind, the English language teacher should give utmost importance to unambiguously with as little distortion as possible. Today's organizations are constantly looking forward for the candidates who have sound communication skills in addition to good technical knowledge. Effective develop English communication skills among the students.

Speaking is crucial to effective communication. Speaking is the purposeful process by which people, using audible and visible symbols, communicate meaning in the minds of their listeners. It is flexible, changing, as well as complex and varied. Many develop a sort of fear to speak in English. The teacher should motivate the students to overcome this fear.

## III. PAIR WORK

Pair work is an important component of the communicative approach, and is also a form of collaborative learning. Pair work means that students collaborate with their pairs to accomplish tasks and reach its aim. Lightbown and Spada (1999) state that in an interactive environment, children are able to advance to a higher level of knowledge and performance than they would be capable of independently. Working in pairs could help to promote meaningful interaction between the learners and as a result that will increase their interest. Pair work is an effective strategy that could lead to success in language learning because it helps to increase students' interest in term of the oral tasks. Pair work is a valuable method to implement in EFL classrooms. Advantage of pair work is that it gives learners more opportunities to use the language. It is "valuable in providing more opportunities for children to get more

Saranyadevi. P, Assistant Professor, Department of English, School of Science and Humanities, Kongu Engineering College, Perundurai-638052. E mail id: saranyadevi@kongu.ac.in

Ramya. D, Assistant Professor, Department of English, School of Science and Humanities, Kongu Engineering College, Perundurai-638052. E-mail: dramya@kongu.ac.inedu

language exposure”, according to Moon (2000, p.54). Hence, students in pairs get the chance to interact frequently with the language and to express their ideas.

#### IV. STORY TELLING

Students can briefly summarize a tale or story they heard from somebody beforehand, or they may create their own stories to tell their classmates. Story telling fosters creative thinking. It also helps students express ideas in the format of beginning, development, and ending, including the characters and setting a story has to have. In this way, not only will the teacher address students’ speaking ability, but also get the attention of the class. Story completion is a very enjoyable, whole-class, free-speaking activity for which students sit in a circle. For this activity, a teacher starts to tell a story, but after a few sentences he or she stops narrating. Then, each student starts to narrate from the point where the previous one stopped. Each student is supposed to add from four to ten sentences. Students can add new characters, events, descriptions and so on.

#### V. DISCUSSION

In classroom after a content-based lesson, a discussion can be held for various reasons. The students may aim to arrive at a conclusion, share ideas about an event, or find solutions in their discussion groups. Before the discussion, it is essential that the purpose of the discussion activity is set by the teacher. In this way, the discussion points are relevant to this purpose, so that students do not spend their time chatting with each other about irrelevant things. For example, students can become involved in agree/disagree discussions. In this type of discussions, the teacher can form groups of students, preferably 4 or 5 in each group, and provide controversial topics like “people learn best when they read vs. people learn best when they travel”. Then each group works on their topic for a given time period, and presents their opinions to the class. It is essential that the speaking should be equally divided among group members. At the end, the class decides on the winning group who defended the idea in the best way. This activity fosters critical thinking and quick decision making, and students learn how to express and justify themselves in polite ways while disagreeing with the others. For efficient group discussions, it is always better not to form large groups, because quiet students may avoid contributing in large groups. The group members can be either assigned by the teacher or the students may determine it by themselves, but groups should be rearranged in every discussion activity so that students can work with various people and learn to be open to different ideas. Lastly, in class or group discussions, whatever the aim is, the students should always be encouraged to ask questions, paraphrase ideas, express support, check for clarification, and so on.

#### VI. PICTURE NARRATION

Picture narrating activity is based on several sequential pictures. Students are asked to tell the story taking place in the sequential pictures by paying attention to the criteria provided by the teacher as a rubric. Rubrics can include the vocabulary or structures they need to use while narrating. Another way to make use of pictures in a speaking activity is to give students just one picture and having them describe what it is in the picture. For this activity students can form groups and each group is given a different picture. Students discuss the picture with their groups, and then a spokesperson for each group describes the picture to the whole class. This activity fosters the creativity and imagination of the learners as well as their public speaking skills.

#### VII. CONCLUSION

Speaking is a very important part of second language learning. The ability to communicate in a second language clearly and efficiently contributes to the success later in every phase of life. Various speaking activities such as those listed above can contribute a great deal to students in developing basic interactive skills necessary for life. These activities make students more active in the learning process and at the same time make their learning more meaningful and fun for them. Effective communication skills are very important, for sustaining in the society. Most people judge another person on the basis of their body language and form an opinion based on their perception. Hence, effective communication skills are as important to a person to communicate and express himself. Communication works for those who work at it.

# E-Learning Technologies to Enhance Educational Quality of Language Teaching and Learning

T. Kalpana Priyadharshini and T. Krithika

E-Learning technology in teaching and learning has become very significant in the education industry. Learners' interaction within the classroom is enhanced by introducing technologies in classroom learning. The presence of E-Learning is far and wide not only in the field of education but in almost every field. Language teaching and learning is one such field where the E-Learning has taken over and improved the ways of gathering knowledge through learning.

Take for example, Today's English Language Teachers use different techniques like You tube videos, Face book postings, Mobile apps, Movie-clippings, advertisements etc. It makes the session more interesting than the traditional way of teaching and also keeps the learner attentive and motivated during the class. E-learning has also changed the perspective of distance learning. The modernization of technology makes the students to be equally interactive like someone present physically

## I. PAST TEACHING TRENDS

TEACHING a Foreign Language has evolved over the centuries. Especially, the English Language was taught as a subject rather than developing a skill. The traditional teaching methods which were used in the past ignored the development of oral proficiency of the learners. The following are the few methods adopted in the past to teach the language which includes:

- Grammar-Translation Method
- Bilingual Method
- Direct Method
- Audio-Lingual Method
- Structural Approach
- Communicative Language Training

## II. E-LEARNING TECHNOLOGIES IN LANGUAGE TEACHING

A wide variety of technologies that can be used by language teachers to enhance learning and teaching situations. These technologies make learning and teaching more interesting, meaningful and interactive to the learners. E-Learning technologies and tools are more powerful and effective because they can bring changes and reform the traditional way of learning.

Some of the Effective Technologies available for Enhancing the Educational Quality of Language Teaching and Learning are as follows:

## III. E-MAIL

The learners can communicate with native speakers of the foreign language using E- mail by creating an email account (g-mail, yahoo, hotmail, etc) free of cost. The learners can correspond or send their assignment to the teachers concerned and get it corrected. The teacher can also provide revisions, feedback, suggestions for the betterment of every work and send them back.

## IV. BLOGS

A blog is a personal or professional journal frequently updated for public consumption. The blogs enable uploading and linking the files which is very much suited to serve as on line personal journals for students. Pinkman (2005) indicates blogging becomes communicative and interactive when participants assume multiple roles in the writing process, as readers/reviewers who respond to other writers' posts, and as writers-readers who, returning to their own posts, react to criticism of their own posts. The readers in turn can comment on what they read, although blogs can be placed in secured environments as well.

## V. SKYPE

This particular technology has audio and video functions with camera. The learners can communicate and share information with their teachers or friends who are far away. Likewise, they could communicate with the native language speakers and get their pronunciation checked to improve their oral proficiency.

*T. Kalpana Priyadharshini, Assistant Professor in English, Department of S & H, Jeppiaar Engineering College Chennai. E-mail: jcrkalpana@gmail.com*

*T. Krithika, I M.A. English Literature, Nirmala College for women, Coimbatore. Email: keethu2693@gmail.com*

## VI. MOBILE PHONE

Thousands and thousands of apps are available in the mobile phones which is easy to access. For example, Learners can search for new words using mobile dictionary option in the mobile phones and they can enrich their vocabulary. They can also check the spelling, usage of the specific word, pronunciation etc. Moreover, they can use Short Message Service (SMS) to send queries to their instructors and get their doubts cleared.

## VII. IPODS

IPods are one of the multimedia devices which helps the users to generate, deliver, exchange texts, image, audio and video messages as per the requirement. The teachers send text messages and the learners can read and answer to them. In addition to this, the learners can record and listen to their speeches, pronunciation, poems, news, short stories, dialogues etc. Thus, the iPods supports the learners of English to enhance their listening, speaking, pronunciation, grammar, vocabulary, sentence formation and also writing.

## VIII. E-LEARNING TOOLS

There are three important types of E-Learning tools: (i) Curriculum Tools, (ii) Digital Library Tools and (iii) Knowledge Representation Tools. Each type of tools emphasis different parts of the process. Curriculum tools provide a systematic and standard environment to support classroom learning; their functions are particularly helpful in the initiation and selection stages. Digital library tools facilitate effective and efficient access to resources to support exploration and collection while knowledge representation tools focus on formulation and representation.

### A. Curriculum Tools.

Curriculum tools are widely used in high school and college of education. Materials are selected and organized to facilitate class activities. Additional tools, such as discussion forums and online quizzes, are integrated to support collaboration and evaluation. A typical commercial curriculum tool includes three integrated parts: instructional tools, administration tools, and student tools. Instructional tools include curriculum design and online quizzes with automated grading. Administration tools include file management authentication, and authorization. Student tool functions include:

- Browsing class material: readings, assignments, projects, other resources
- Collaboration and sharing: asynchronous and synchronous bulletin boards and discussion forums.

- Learning progress scheduling and tracking: assignment reminders and submission, personal calendars, and activity logs.
- Self-testing and evaluation: tests designed by instructors to evaluate student performance
- WebCT and Blackboard are the most popular commercial curriculum tools. A review comparing these two tools suggests that Blackboard's flexible content management and group work support [3] make it more suitable for independent and collaborative learning. WebCT's tighter structure and fully embedded support tools make it more appropriate for guided, less independent learning. In general, these tools are tailored more to support class activities than independent research or self-study. (IJACSA)

### B. Digital library Tool

While curriculum tools support class functions, digital library tools focus on locating resources. These functions support the exploration and collection phases of information search. Digital library tools help users find the right information amidst a huge amount of digital material. Digital library features usually include search, browsing, and discovering special collections or exhibits. Search and browsing are used to locate resources and explore related topics. Special collections or exhibits contain organized materials representing a unique treasure for interested users.

### C. Knowledge Representation Tool

Tool Knowledge representation tool help learners to visually review, capture, or develop knowledge. Curriculum tools rely primarily on a text-based, syllabus approach to describing course content. This approach often fails to delineate the relationship of concepts and skills covered in one course to those covered in another. It also fails to show the knowledge base that a learner will have acquired at the end of his/her course of study. A visualization tool can engage both learners and instructors in an active learning process when they construct spatial semantic displays of the knowledge, concepts, and skills that the learner possesses and acquires

## IX. CONCLUSION

Since English has turned into a global language, its presence and value in the universe has expanded enormously in the past decades. But if language teachers teach using the traditional methodology as they taught earlier, then the required goals of learning English Language may not be achieved in the present global scenario. In the past, no creative and constructive activity was given to the learners to develop the language skills. With the changing needs of the hour (time), technology is developing day-by-day. We are living in the 21st century

and it is the age of technological advancement. Thus the recent trend in teaching English is the use of modern technological tools as English language teaching has been affected a lot with the availability of these tools

#### REFERENCE

- [1] Nagaraj, Geetha. English Language Teaching Approaches, Methods, Techniques 2nd edition. Orient Black Swan Hyderabad 1996. Print.
- [2] Bracewell, R., Breuleux, A., Laferriere, T., Benoit, J. & Abdous, M. (1998) The emerging contribution of online resources and tools to classroom learning and teaching.
- [3] Horton, W. and Horton, K. (2003). E-Learning Tools and Technologies. Hoboken, NJ: Wiley Publishing, Inc

#### ONLINE REFERENCES

- [1] <http://elearningindustry.com/learning-a-language-interactive-videos-and-spaced-repetition>
- [2] International Journal of Advanced Computer Science and Applications, Vol. 3, No.2, 2012 51 | Page [www.ijacsa.thesai.org](http://www.ijacsa.thesai.org)

proof

# Literature in Language Learning

S. Mayeleswari

Literature is the mirror of society. It gives permanent happiness to anyone who reads with diligence and passion. It starts in delight but ends in wisdom. In other words literature not only instructs but also delights. Literature for time immemorial has appealed to students of all ages. It helps students to appreciate diverse cultures apart from their own countries. Certain emotions like anger, greed, love, jealousy etc are universal. Once the students have absolute control over their emotions, it will help them in their professional lives also. In other words one can say that literature plays a dual role. It informs and delights at the same time.

Literary texts are representational rather than referential. (Mc.Rae.1994). Referential language communicates at only one level and tends to be informational. The representational language of literary texts involves the learners and engages their emotions. Literary works help learners to use their imagination, enhance their empathy for others and lead them to develop their own creativity.

Literature plays an important role in teaching four basic skills like Listening, Speaking, Reading and Writing. However, when using the literature in the language classroom, skills should never be taught in isolation but in an integrated way. Literary texts offer a rich source of linguistic input and can help learners to practice the four skills (Listening, Speaking, Reading, and Writing) in addition to exemplifying grammatical structures and presenting new vocabulary. So the language teachers should try to teach basic language skills as an integral part of oral and written language use, as part of creating both referential and interactional meaning, not merely as the aspect of the oral and written production of the words, phrases and sentences.

The use of literature as a technique for both basic language skills (Listening, Speaking, Reading, and Writing) and the language areas (vocabulary, grammar and pronunciation) is very popular within the field of foreign language learning and teaching nowadays. Many language teachers make their students translate literary texts like drama, poetry and short stories into the mother tongue. Translation gives students the chance to practice the lexical, syntactic, semantic, pragmatic and stylistic knowledge they have acquired in other courses. Translation both as an application area covering four

basic skills and as the fifth skill is emphasized in language learning.

Language teaching is incomplete without literature. The earlier generations had solid foundation in language because they learnt classics written by literary writers like Shakespeare, Wordsworth and so on. Unfortunately the modern generation does not have any exposure to classics. This severely hampers not only their intellectual but also emotional growth. Berardo and Wallace highlight the importance of authenticity to make language learning a beautiful experience. In other words, students find it really fulfilling to read authentic texts instead of the artificial language used in certain sources. Literary texts will expose students to appropriate language according to the situation and condition. Care should be taken in selecting appropriate texts.

When selecting literary texts to be used in language classes, the language teacher should take into account need, motivation, interests, cultural background and language level of the students. Reading a literary text is more likely to have a long-term and valuable effect upon the learner's linguistic knowledge when it is meaningful and amusing. Language difficulty has to be considered as well. If the language of the literary work is simple, this may facilitate the comprehensibility of the literary text. Interest, appeal and relevance are also important.

Enjoyment; a fresh insight into issues felt to be related to the heart of people's concerns; the pleasure of encountering one's own thoughts or situations exemplified clearly in a work of art; the other, equal pleasure of noticing those same thoughts, feelings, emotions or situations presented by a completely new perspective: all these are motives helping the learners to cope with the linguistic obstacles that might be considered too great in less involving material. (Collie and Slater, 1990: 6-7)

Technical education is not completed, if one does not pay any attention to values, character building and soft skills etc. All the above mentioned things can be easily and effectively inculcated in students through literature.

Literature can be taught to students through audio-texts, music CDs, film clips, etc which will help the students to understand the beauty of language without much difficulty. Students may have a joyful experience while learning English through various literary genres like short stories, poems, novels, plays, etc in the language classes.

---

*S. Mayeleswari, M.A., M.Phil., Assistant Professor in English, Dhanalakshmi Srinivasan College of Engineering, Coimbatore.*

English Language teacher should adopt a dynamic, student-centered approach toward comprehension of literary work. In reading lesson, discussion begins at the literary level with direct questions of facts regarding settings, character and plot which can be answered by specific reference to the text. When students master literal understanding, they move to the inferential level, where they must make speculations and interpretations concerning the characters, setting and theme, and where they produce the author's point of view. The third level, the personal evaluative level stimulates students to think imaginatively about the work and provokes their problem-solving abilities. Discussion deriving from such questions can be the foundation for oral and written activities (Stern 1991:332)

Literature houses in immense variety of themes to write on terms of guided, free, controlled and other types of writing. In a composition course whose reading content is literature, students make inferences, formulate their own ideas, and look closely at a text for evidence to support generalizations. Thus, they learn how to think creatively, freely and critically. Such training helps them in other courses which require logical reasoning, independent thinking, and careful analysis of the text (Spack 1985:719)

Language teachers can make listening comprehension and pronunciation interesting, motivating and contextualized at the upper levels, playing a recording or video of a literary work, or reading literature aloud contributes to developing speaking as well as listening ability. When teaching English through literature, some of the group activities use in language classroom are general class discussion, small group work, panel discussions, and debates. All these group activities both develop speaking abilities of the students and give importance to pronunciation practice. Teachers indicate pronunciation errors of the students during the group activities so as to correct such errors. (Stern 1991:337)

Poetry employs language to evoke and exalt special qualities of life. Poetry is one of the most effective and powerful transmitters of culture. Poem comprise so many cultural elements – allusions, vocabulary idioms, tone that are not easy to translate into another language. (Sage 1987:12-13). It provides readers with a different viewpoint towards language use by going beyond the known usage of grammar, syntax and vocabulary. The students may familiar with figures of speech like simile, metaphor, irony, personification, imagery, etc., due to their part of daily language use.

The use of short story seems to be a very helpful technique in today's foreign language classes. It makes student's reading task and the teacher's coverage easier due to being simple and short when compared with the other literary genres. It gives students the chance to use

their creativity, promotes critical thinking skills, helps students coming from various backgrounds communicate with each other because of its universal language. It helps students to go beyond the surface meaning and dive into underlying meaning. To put it differently, students all over the world have experienced stories and can relate to them. Moreover, short fiction, like all other types of literature, makes contribution to the development of cognitive analytical abilities by bringing the whole self to bear on a compressed account of a situation in a single place and moment. (Sage 1987:43)

The use of drama seems to be an effective technique in today's communication-based, student-centered foreign language teaching. Since it is an authentic material, it helps students to promote their comprehension of the verbal and non-verbal aspects of the target language they are trying to master. It provides the students a solid basis for bridging the gap between their receptive and productive skills. It offers the space and time to the students to develop new ideas and insights in a range of contexts. The use of novel is also a very beneficial technique in teaching language. If selected carefully, using a novel makes the students' reading lesson motivating, interesting and entertaining. It through reading that students broaden their horizons, become familiar with other cultures, and hence develop their intercultural communicative competence, learning how to view the world from different perspective. The result will be the possession of critical thinking and writing.

The teacher has an important role in teaching English through literature. First, he should determine the aim of language teaching in relation to the needs and expectations of the students. Giving a questionnaire or interviewing with the students orally, the teacher can set up the aim and the objectives of the language teaching. Second, he should select the appropriate language teaching method, teaching techniques and classroom activities. Then the teacher should select the literary texts relevant to the aim and objectives of his teaching. While selecting the literary texts to be used in the language classroom, the students' language proficiency, interest, age, sex, etc should be taken into account in order not to bore students with inappropriate materials.

There is no doubt that literature will help the learners to get good command over the language. In other words, language is something that has to be caught and not taught. If literature is made part of the curriculum in technical education, language learning will become a really enriching experience for the students. So it is clear that teaching English language through literature is viable in technical institutes. The important point to be noted is that the literature prescribed should be interesting and understandable for young engineers. And students can enjoy learning English through literature. Literature is for

all ages and never ceases to inspire the students irrespective of their age and gender. In sum, literature provides the students with an incomparably rich source of authentic material over a wide range of registers. If students can gain access to this material by developing literary competence, then they can effectively internalize the language at high level. (Elliot 1990:198). Literature is not only the tool for developing the written and oral skills of the students in the target language but also is a window opening into the culture of the target language, building up a cultural competence in students.

#### WORK CITED

- [1] Berardo, S.A. The use of authentic materials in the teaching of reading. The reading Matrix, 2006.
- [2] Collie, J. and S. Slater. Literature in the Language Classroom: A Resource Book of Ideas and Activities. Cambridge: CUP, 1990.
- [3] Elliot, R. "Encouraging reader-response to literature in ESL situations" in ELT Journ .00al. 1990. Vol 44, No.3, p.p: 191-198.
- [4] McRae, J Literature with a small 'l', Macmillan Education, 1994.
- [5] Sage, H. Incorporating Literature in ESL Instruction. New Jersey: Practice-Hall, Inc., 1987.
- [6] Spack, R. "Literature, Reading, Writing, and ESL: Bridging the Gaps" in TESOL Quarterly,1985. Vol 19, No.4, p.p: 703-721.
- [7] Stern, S. "An Integrated Approach to Literature in ESL/EFL" in Teaching English as a Second or Foreign Lnaguage. Ed. Murcia, M.Boston: Heinle & Heinle Publishers, 1991.
- [8] Wallace, C. Reading Oxford. New York: Oxford University Press, 1992.



# Resonance from the Past leads to Redemption in the Present: An Ecofeministic Study on Alice Walker's *Now is the Time to Open Your Heart*

Abirami. V and Dr.M. Leelavathi

**Abstract---** *Ecofeminism aims to level out the differences and establish an earth based democracy. Alice Walker's commitment towards nature and women is exceptional that her writings reflect her as a strong ecofeminist advocate who stands tall to fight against all odds. She imbibes an important principle of ecofeminism namely inclusivity wherein, she enables women to work together across race, class and national differences and also voices for the true value of nature which otherwise would go unheard. Through her fiction *Now Is the Time to Open Your Heart*, Walker journeys woman's search for identity through connection with nature and thereby positions her as a significant ecofeminist warrior. A novel with strong autobiographical connections, the protagonist Kate Talkingtree identifies that knowing one's roots, remembrance of the past, worshipping ancestors, sisterhood, love and forgiveness are ways of to redeem the void in one's life. The resonance from the past ranging from the pre-historic times to the recent past, leads to a realization that marks a new beginning or rebirth of the characters.*

**Keywords:** *Ecofeminism, nature, women, inclusivity, remembrance, realization*

## I. INTRODUCTION

THROUGHOUT the history of evolution of life on Earth, dominance and subjugation go hand in hand. The suppressed class seamlessly engages in a passive, silent fight to break the clutches, while the dominant group struggles to reinforce their power on the oppressed, subservient group. The life begins and ends with a struggle for both the groups. The androcentric society for ages together have reigned the minority group that includes Afro-Americans, women, lesbians, gays, colonized people and nature. Through her fiction *Now Is the Time to Open Your Heart* (NTOH), Walker journeys woman's search for identity through connection with nature and thereby positions her as a significant

ecofeminist warrior. A novel with strong autobiographical connections, the protagonist Kate Talkingtree identifies that knowing one's roots, remembrance of the past, worshipping ancestors, sisterhood, love and forgiveness are ways of to redeem the void in one's life.

The acknowledgement and the introductory note written by Walker for *Now Is the Time to Open Your Heart* signifies that she is delving deeper into the past on a personal level this time. Walker in her acknowledgement states, "with this writing, whatever its faults, I express my gratitude to all devas, angels and bodhisattvas who accompany, watch over, and protect explorers, pioneers and artists" (NTOH "Acknowledgements"). Walker quotes Marlo Morgan's *Mutant Message Down Under*, which elaborates on the four month-long journey through the Outback with the Australian nomadic aboriginals which leads to the realization that the world can be saved from destruction if the people live in natural harmony with the plants and animals and human lives can be filled with a great sense of purpose. Morgan says, "These people believe everything exists on the planet for a reason. Everything has a purpose. There are no freaks, misfits, or accidents. There are only misunderstandings and mysteries not yet revealed to mortal man . . . Everything in oneness has a purpose" (51). Next, Walker cites Winnie Mandela's, "So far, there's no law against dreaming" (NTOH:). She also remembers and venerates her paternal grandmother Kate Nelson with whom the protagonist of NTOH shares her first name. Kate Nelson married Walker's grandfather Henry Clay Walker and was murdered when Walker's father was a boy of eleven. In her prefatory note, Walker states, "This novel is a memorial to the psychic explorer she [her grandmother] might have become" (NTOH). Further, during her interview with Patricia Gras, Walker mentioned that "Her grandmother was obviously someone whom I never met and then . . . realized, I missed her terribly . . . I missed the woman that I was myself becoming . . . the elder feminine voice is suppressed in Western cultures, we are missing grandmother and added to that was the fact that the medicine that I was taking has as its primary spirit that of the grandmother. That spirit is the spirit that says, 'Stop, don't drop bombs. Stop, feed all the children. Stop do what's really good for all' ... is clear grandmother voice." (you tube)

Abirami.V, Assistant Professor of English, Kumaraguru College of Technology, Coimbatore

Dr.M.Leelavathi, Head, Department of English, .R.G. Government Arts College for Women, Tirupur.

The protagonist of the fiction is the 57-year old well-published writer Kate Nelson who is struggling hard to salvage the failing romance and overcome the mid-life conflicts. Married for several times, she had always been a wanderer, trying to explore both the natural world and the human soul. Writing about Kate, Bates states that, "This unforgettable woman of deep truth, honesty, and sensitivity chronicles from a woman's perspective the fears and weaknesses and even strengths involved in confronting advancing age and a midlife crisis" (Bates 2005: 157). Kate undertakes a therapeutic river journey to re-explore her past in order to comprehend the future. During this journey, she gets closely connected to nature than ever before which provides her with further impetus to undertake several soul-searching voyages in order to understand her true self, her roots and connections with nature and people around her.

Embraced by the tree spirit, Kate changes her surname 'Nelson' to 'Talkingtree'. To escape from the clutches of her domineering husband, she often dreams of "being high on a hillside in the sun" (NTOH: 28) and she also recollects as how her "bird nature became activated" (NTOH: 20) and even thought that she could fly. Further, Walker's ecofeministic inclination is evident in relating the emptiness in the life of Kate with the dry rivers that she often dreams of. This recurring dream of dry river pushes the natural wanderer in Kate to go in search of the spiritual meaning and significance of this dream. Encouraged by her friends, she travels to the Grand Canyon: The Colorado River. "You must find a real river somewhere in the world...to travel down...one of the deepest, swiftest, most challenging of all: the Colorado" (NTOH: 12).

Kate's journey is now with only the women because "... she had seemed to feel, and to wonder aloud, about the possibility that only women these days, dreamed of rivers and were alarmed that they were dry" (NTOH: 16). This initial boat journey induces motion sickness and her body starts the purgatory ritual in the body which is the prerequisite for her travel towards spiritual advancement. Through this regurgitation she feels, "an internal roar as of the sound of a massive accumulation of words, spoken all at once, but collected over a lifetime, now trying to leave her body (...) All the words from decades of her life filled her throat. Words she had said or had imagined saying or had swallowed before saying to her father, dead these many years. All the words to her mother. To her husbands. Children. Lovers. The words shouted back at the television set, spreading its virus of mental confusion" (NTOH: 22)

Kate, since the beginning of the voyage, undergoes a purging of her soul, and in the process, hidden memories and repressed emotions surface up and she is now able to confront them and neutralize the negativity associated

with those past events. She contemplates over her first marriage, her husband and children and their approach towards her who treated her as "a service, a servant" (NTOH: 28). She also recollects how her husband abandons her hundred miles from home, when she expressed her thought to get out of that lopsided marriage. Left penniless, when she returned home, she was sexually assaulted and left by her husband. Kate gains a sense of inner peace and settles down in the Colorado Rapids when she ponders over her resistance to her dominant husband. "As her body gave up the last of its bitter memories of her first marriage, she experienced a lightness that actually made it easier to remain seated the long hours necessary, in the boat" (NTOH: 37). Kate's connection with nature begin with the instinct ingestion of an unknown yellow flower which soothes her stomach and slowly starts appreciating nature and the natural indications of ageing such as the grey hair.

The Colorado river journey only initiates and kindles Kate into her search for spiritual wisdom, to comprehend the true self-hood and the deep connections with nature. She therefore continues her spiritual retreat to the South America, a sojourn to the Amazon river. Kate is guided by a powerful Native American shaman named Armando and the herbal medicine of the Grandmother, *yage*. Kate and her fellow retreaters are totally under the powerful influence of the mysterious spiritual world of the Native Americans which aids them to be metamorphosized into newer, cleaner and a balanced version of people. Under the mysterious power of the *yage*, they gain meaningful insights into their own lives and those around them. They are also made to realize the existence and the healing power of Mother Earth. As mentioned by Sunila Pillai, "Grandmother, the symbol of Mother Earth and African wisdom, opens a whole new world, where co-existence, mutual accommodation and interconnectedness with all entities in the planet, brings forth a universal spiritual and emotional consciousness" (Research Spectrum, 1).

Kate has always demonstrated her deep reverence for her forefathers. Instead of erasing the horrific memory of father's death in an accident, she states that "she must remember it, linger over her response to it" (NTOH: 42). Kate often thinks about her mother who also died in an accident and states that this thought has motivated her to develop the art of story writing. Listening to the heart-rendering experiences of her forefathers, she is able to strike a chord with her ancestors which not only relieves her of her memories about her painful past but also channelizes her towards spiritual advancement. Her dream-interaction with her ancestor Remus results in demystifying the assumptions about her ancestral image "plagued by those ancestors of hers ... who'd lived and died miserably" (NTOH: 90). Remus was brutally murdered by Ku Klux Klan nightriders. Kate is dreadfully disturbed to see him with bleeding gums and toothless

mouth. The man with no teeth “seems demoting and deconstructing the so far established superiority of ancestral reverence” (NTOH: 90). These ancestors are former slaves, and delineate with African American history of slave trading. It is rather ironical to observe Remus pleading Kate to sort out problems and strengthen his psychological stand. This interface between the past and the present results in a natural coordination and gain better grounds about the past as stated by Le Goff: “history must not only make it possible for us to understand the present by means of the past – a traditional attitude – but also to understand the past by means of the present” (107).

Kate after a while does not respond to the herbal medicine, which indicates that she has undergone a spiritual rejuvenation. Armando elaborates on the difference between existence and living. *“When you are caught up in the world that you did not design as support for your life and the life of earth and people, it is like being caught in someone else’s dream or nightmare. Many people exist in their lives in this way. I say exist because it is not really living”* (NTOH: 150). An inner peace slowly settles down and all the fellow group members start confessing about their past experiences to Kate. Missy, an incest victim accounts about her inability to build healthy relationship with men and Lalika expounds on killing a man who raped her and attempted to rape her friend. These two women were later imprisoned and sexually assaulted for months together by the inmates and guards. Another affluent Italian immigrant named Rick confesses about profiting from selling drugs to black people. This open but intimate talk establishes a sense of strong connection and their feeling is described as “very ancient and very sweet” (NTOH: 154).

The Shaman helps Kate realize that man’s survival on Earth is actively connected with Earth’s survival. He further makes Kate realize that self-healing and earth-saving should be done simultaneously. Shaman, through the grandmother’s voice ardently states that: *“Do you think when a tree dies all its work is finished? Of course not. It then has the work of decomposing, of becoming soil in which other trees grow. It is very careful to do this, left to itself, and not hauled off to a lumberyard. If it is hauled off to a lumberyard and if nothing is left to decompose and nurture the young trees coming up...Disaster!”* (NTOH: 96). Kate, towards the end of her session at Amazon with grandmother spirit, is completely relaxed and comfortable and feels an inner peace when she comes to understand that Mother Nature has sent her a message and that the message has reached her children. *“I am peace, said grandmother, and nothing has died for me to exist. Not tobacco, not grapes of sugarcane. Not human beings and not me! She added laughing. When you circle, paint your faces with yage to remember this*

(NTOH: 118). Materialism and consumerism receive a heavy blow from Kate and in order to reiterate that money has little significance in life, she burns several hundred-dollar bills.

Kate’s partner Yolo, left behind in America during Kate’s journey to Colorado Rapids, embarks on a vacation trip to Hawaii which later adds more valuable experience, resulting in he undergoing a spiritual metamorphosis. Bates describes Yolo thus: “Kate’s live-in younger lover, Yolo, is a complex character but not the antagonist; he is more like a parallel protagonist. Changing his name from Henry to Yolo a Poewin Indian name meaning ‘a place in the river where wild rushes grow,’ he feels his name is more suitable to his personality; he thus has in common with Kate the changing of names. . . . A charismatic, handsome, monogamous, sincere individual who embraces feminism, Yolo is an independent, self-sufficient successful artist. He enjoys the middle-class lifestyle of freedom, mobility, options, and choice. His flaws are unworthy of serious attention, but Walker’s creative impulse makes him a little less than perfect” (165). Yolo meets his former girl friend Alma mourning the death of her son who succumbed to drug overdose. The need to remember and relate to the past is emphasized through Alma to Yolo. He learns about the history of the island, and the reign of Queen Lili’uokalani and the significant connection between land, nature and Hawaiian people. A cross-dressing Mahu, Aunt Pearlua is the transmitter of ancient knowledge to the younger generation in Hawaii. She relates to them about the times when only women ruled the Earth. When women were displaced off their place, the Mahus chose to live her (woman’s) life to understand and empathize with the humiliation suffered by women and children and shall continue living so until their (women’s) due place was restored in the society. She also teaches the Hawaiian women the true hula dance of the traditions and of the soul. She accentuates that men should keep all kinds of addiction at bay and encourages them including Yolo to take a vow. “No drugs, no alcohol, no ‘recreational’ sex, no caffeine, and no tobacco. She asked the men in the gathering to make this vow” (NTOH: 179). Alma quotes John Lennon’s song ‘Cleanup Time’ and stresses that it is the time to clean up not only for the people of Hawaii but across the world.

Yolo and Kate, after they return from their journeys, share their experience on how they have successfully rejuvenated their connections with the past. The lost compatibility is regained and the individual journeys they embarked facilitate to regain peace and harmony in their life together. Thus Kate and Yolo clearly realize and appreciate the need to remember and relate to the past and establish a communion with Nature to attain wholeness in life.

## WORKS CITED:

- [1] Bates, Gerri. *Alice Walker: A Critical Companion*. London: Greenwood Press, 2005.
- [2] Le Goff, Jacques. *History And Memory*. Trans. Steven Rendall and Elizabeth Claman. New York: Columbia UP, 1992.
- [3] Pillai, Sunila. In *Search of the Ecological Self: Ecspirituality in Alice Walker's Now Is the Time to Open Your Heart*. Research Spectrum.
- [4] Walker, Alice. "Interview with Patricia Gras." HoustonPBS. Web. 20 April 2011.
- [5] Walker, Alice. *Now Is the Time to Open Your Heart*. New York: Phoenix, 2004.

proof

# Strategies for Professional Development of English Language Teachers

I. S. John Vijayakumar and R. Ramya Sri

**Abstract---** *The language teachers of today need to explore new possibilities and avenues for promoting better language skills development among learners. With a lot of changes happening in the academic and professional environment in developing knowledge societies, skills development especially language proficiency enhancement has acquired renewed focus. All these mean a lot to ELT teachers who need to equip themselves adequately to train a whole new generation of young minds. This paper attempts to identify the strategies to be followed by ELT teachers to make the language learning process of learners more effective and meaningful. The purpose of this research study is to help ELT teachers understand existing ELT theories, update their knowledge about Language Teaching and enhance their ability to design content based languages modules for classroom purposes. This would help teachers create corresponding learning materials. Finally, this paper focuses on the need for ELT teachers to arrive at best methods through constant trial and error.*

## I. INTRODUCTION

**P**ROFESSIONAL DEVELOPMENT can be defined as an unending learning process in which teachers mainly seek the new strategies to teach in par with the expectations and the needs of the students. Naom Moraa Nyarigoti quoted Kelchetermans' point on professional development as a learning process in which outcome not only become noticeable in one's professional practice but also in one's idea about the how and why of that practice. This development goes beyond individual reflection to include new trends and theories in language teaching and becoming accustomed with development in the subject matter knowledge and designing materials. The quality and the knowledge of the language teachers are built up with experience, manifestation and collaboration. (Roberts) This paper tries to explain the different strategies to enhance the knowledge of English Language Teachers which involves the understanding of learning hypothesis which

will help the teachers to understand the general understanding and societal characteristics of the students, various ELT theories and its practice and material production which makes the language teacher more productive in the classroom teaching.

## II. ELT THEORIES – A HRONOLOGICAL UNDERSTANDING

A good understanding of ELT theories and a strong foregrounding in it is essential for ELT practitioners. From Modernism to Structuralism and then to Post Structuralism, learning theory has undergone a lot of change. In parallel to that, ELT theory has also been through a process of change as several methods were adopted in language teaching. A brief look at this change will help understand the current position of ELT and its future trends.

In the modernists era, Skinner believed that language was to be considered as verbal behavior and this behavioral aspect of the learner is well tuned by the teacher it was certain to help the learner develop good language skills. Modernists rejected the traditions of the 19<sup>th</sup> century (Baldick) and viewed their world with skepticism because they found everything in utter chaos and confusion in the aftermath of the World Wars. So their answer to unifying fragmented details and reality and to bring about a change in the thoughts of people that were fragmented and disjointed was emphasized on external behavior achieving through positive reinforcement and repetition. Skinner's belief was that incorporating a behaviorist approach in classroom teaching will allow the teacher to assist their students in excelling both academically and personally. As the teacher takes complete control over the students and the learner necessarily needs to respond to the inputs and thereby participate in the learning process. In the field of English language teaching, the Grammar Translation method that made learners learn grammar rules and apply the rules to translate from one's mother tongue to the target language was used by ELT practitioners. The Grammar Translation Method has been practiced so widely and its mode of teaching method has helped teachers achieve partial success in their efforts.

Structuralism is put together by the way of an edifice, machine and implementation. (Gary P. Radford and Marie L. Radford). Ferdinand de Saussure, the

I. S. John Vijayakumar, Assistant Professor [Sl.G], Department of English, Kongu Engineering College, Perundurai, Erode-638052

R. Ramya Sri, Assistant Professor, Department of English, Kongu Engineering College, Perundurai, Erode-638052edu

linguist considered structuralism as a system of signs and signification, the elements of which are understandable only in relation to each other and to the system. It gives strength to the language's deeper codes and meaning (Gary P. Radford and Marie L. Radford). The language is made to understand to the learners using the structures. Jacques Derrida says the original or transcendental signified is never present outside a system of differences and it creates the reason for extending the domain and interchange of signification.

Structuralism focused on Cognitive domain of the learner. Cognitive psychologists share with behaviourists the belief that the study of learning should be objective and that learning theories should be developed from the outcome of experiential research. However, Cognitive psychologists disagree with the behaviourists in one critical aspect. By observing the responses that individuals make to different stimulus conditions, Cognitivists believe that inferences can be drawn about the nature of the internal cognitive processes that produce those responses. According to Piaget's theory, as an outset human development can be summarized in terms of functions and cognitive structures. Language learning functions are inborn biological processes for everyone and it remains unchanged throughout one's lives. Internal cognitive structures have been constructed from these functions. (Piaget Jean). This trend can be seen in Transformational grammar theory which considers grammar to be a system of rules that is intended to generate exactly those combinations of words which form grammatical sentences in a given language. In linguistics, transformational grammar or transformational-generative grammar (TG, TGG) is a generative grammar that exhibits a natural language clearly involves an interaction of various systems such as grammatical knowledge, beliefs, expectations, etc. It generates the well formed or grammatically correct sentences of a language by adding, deleting, moving and substituting of words. The U.S. linguist Noam Chomsky said that every language is unique there by rejecting Ferdinand de Saussure's doctrine of Structuralism. (James A. McGilvray) These changes take place through specific rules which are called transformational rules. The knowledge of transformational rules allows the people to construct and understand grammatical sentences easily.

Post structuralism was an approach against Structuralism. In this approach, meaning was given more importance than the structures. The text and the reader gained importance than the author in the post structuralism theory because the meaning exist inside the text which is not fixed. Weedon indicates, post-structuralism can be implied as a theory of social meaning and power. (Bill Green and Jo-Anne Reid) It also emphasizes that to understand a text it is more necessary to know about the text and about the

knowledge system which has produced it. Foucault's 'power-knowledge' couplet has been distinctively contributed to the lexicon of social and educational analysis. (Bill Green and Jo-Anne Reid)

An important technique which evolved during this period is the theory of 'deconstruction'. The theory of socio cognitivism explains this condition clearly as it stated that individual knowledge acquisition is directly related to the person's ability to socialize and interact with other people. It is in context that Communicative Language Teaching (CLT) was propounded by Theorists who explained that CLT aimed to build the learners communicative competence. A distinction is made between the grammatical rules of usage that enabled users to construct correct sentences and the use of language to accomplish some kind of communicative purpose.

CLT aims broadly at applying theoretical perspectives of the communicative approach by making communicative competency the goal of language teaching. In this approach, interaction is also the primary function of language. The structure of language reflects its functional and communicative uses. Teachers help the learners to work with the language. Advantages of CLT are given more important to meaning, introduction of authentic texts into real life situations, opportunities for learners to enhance learner's own personal experiences. Communicative Language Teaching mainly focus on real communication, provide opportunities for learners to experiment, provide space for the learner in building up his or her communicative competence, accuracy and fluency. Allow the students to induce or discover grammar rules. (Jack C. Richards) Communication Language Teaching helps learners to use the target language as much as possible and helping learners to create meaning rather than helping them to develop grammatical structures. It is very important to develop students' confidence and thus the teacher should use a lot of fluency-based activities. The communicative methodology is a learner-centered approach to language learning.

### III. MATERIAL PRODUCTION

English language teachers in India and in most of the non native English speaking countries have traditionally depended on prepared and readily available teaching material for classroom use. At the school level, the prescription and use of standard text books is the usual practice. However in Autonomous institutions and universities and, a few teachers do experiment with materials production but such cases are rare. One of the reasons for languages teachers to shy away from preparing materials is their lack of foregrounding in ELT principles and Theory and hence if at all they attempt to create their own materials the outcome in most cases is not productive. Hence a good framework

using best methods is the need of the hour to teachers to be self supportive.

Materials production in today's digital world goes beyond the printed material to include the digital content comprising of videos, audios, multi media texts etc. However materials production must be based on current established theoretical notions governing English language teaching and should encompass the material producers own understanding of the issues based on theoretical inputs. David Hayes believes that all teachers decide what is suitable for their own classrooms. For example, knowledge of Saussure's structures, Chomskian linguistics including the concepts of Linguistic competence/ Grammatical competence, Hyme's defining notion of Communicative Competence, and modern applied linguistic domains will definitely enhance the material producers ability to excel in his/her work.

Material production has to basically take into account the requirements like the purpose of the producing the text, the theoretical framework to be used, need specific of the target audience, expected outcomes etc. So from this aspect it is very important that well before starting the actual work of producing materials it is very important to a map for each unit of material to be produced. For example making use of the "best method practice" in the post method condition in ELT, activities can be devised keeping in mind aspects of CLT and TBL.

#### IV. CONCLUSION

Each of the strategies furnished in this paper has a specific role in the development of enriching the knowledge of a language teacher. There is no one size fits all approach; the teacher should come out of their docile position and it is the responsibility of the teacher to identify an eclectic method to improve and enhance their profession. These kinds of policy will help the teacher to sustain in the field of teaching, renew the commitment, create interest in the mind of learners thereby they can prevent to have a weakened profession. Future research can be made to create the best model to standardize the classroom teaching and thereby achieving fineness in teaching.

#### REFERENCE

- [1] Baldick, Chris. *The Oxford Dictionary of Literary Terms*. Oxford: Oxford UP, 2001. Print.
- [2] Bill Green and Jo-Anne Reid. "Educational Research, Teacher Education, and Practical-Theory: Towards an Account of Poststructuralism and Pedagogy." *Proc. of Annual National Conference of the Australian Association for Research in Education*, Hobart. AARE Conference Proceedings. Web. 04 Apr. 2016.
- [3] Derrida Jacques. "Structure, Sign, and Play in the Discourse of the Human Sciences." *Translation Is in Public Domain*. Johns Hopkins University. 02 Apr. 2016. Lecture.

- [4] F, Skinner B. "Behaviorism." <http://behaviorismskinner.blogspot.in/>. 16 Feb. 2010. Web. 02 Apr. 2016.
- [5] Hayes, David. "Cascade training and teachers' professional development." *ELT journal* 54.2 (2000): 135-145.
- [6] <http://www.britannica.com/biography/Noam-Chomsky>. Web. 03 Apr. 2016.
- [7] <http://mennta.hi.is/starfsfolk/solrunb/cognitiv.htm>. Web. 02 Apr. 2016.
- [8] [https://en.wikipedia.org/wiki/Generative\\_grammar](https://en.wikipedia.org/wiki/Generative_grammar). Web. 02 Apr. 2016.
- [9] Larsen-Freeman, Diana. *Techniques and Principles in Language Teaching*. Oxford: Oxford UP, 2004. Print.
- [10] Markos. "What Is the Grammar-Translation Method?" 14 Dec. 2014. Web. 03 Apr. 2016.
- [11] Murray, James A. H., and R. W. Burchfield. *The Oxford English Dictionary; Being a Corrected Re-issue with an Introduction, Supplement, and Bibliography of A New English Dictionary on Historical Principles*. Oxford: At the Clarendon, 1933. Print.
- [12] Nyarigoti, Naomi M. "Continuing professional development needs for English language teachers in Kenya." (2013).
- [13] Piaget Jean. "The Jean Piaget Society." [Http://www.piaget.org/](http://www.piaget.org/). Web. 03 Apr. 2016.
- [14] James A. McGilvray. "Noam Chomsky American Linguist."
- [15] <http://www.britannica.com/biography/Noam-Chomsky>. web.08 Apr.2016
- [16] Radford, Gary P., and Marie L. Radford. "Structuralism, Post-structuralism, and the Library: De Saussure and Foucault." *Journal of Documentation* 61.1 (2005): 60-78. Web. 02 Apr. 2016.
- [17] Rahul Mahasabde. "FUNCTIONAL LINGUISTICS."
- [18] <http://documents.mx/documents/functional-linguistics.html>. 18 Apr. 2015. Web. 03 Apr. 2016.
- [19] Richards, Jack C. *Communicative Language Teaching Today*. New York: Cambridge UP, 2006. Print.
- [20] Roberts, Jon. *Language Teacher Education*. London: Arnold, 1998.

# Stance and Human Perception: Revisiting Man's Coalition with Nature through the Poems of W. S. Merwin

S.G. Mohanraj

**Abstract---** *The well-being and flourishing of human and nonhuman life on Earth have value in themselves regardless of their usefulness for human purposes says one of the deep ecology principles. This thought has been clearly provoked by W. S. Merwin, former Poet Laureate of United States and a contemporary writer, in many of his poems. This is not a lonely plaintive call of Merwin. It can also be substantiated through a number of examples from Indian mythologies. To highlight the contribution of Merwin to ecocriticism, his words from the poem "After the Alphabets" can serve as the best example where he says "I am trying to decipher the language of insects / they are the tongues of the future" (1-2) depicting the importance of insects. It is also significant for one to remember the intrinsic value of natural elements. Usefulness of elements to human community does not add value to them. Realization of this fact would help for a sustainable development and also would help to maintain the richness of elements within an ecosystem to ensure a safer world than the present one.*

**Keywords---** *Ecocriticism, Ecology, Ecopoetry, Nature writing, W. S. Merwin, Poetry*

## I. INTRODUCTION

"The well-being and flourishing of human and nonhuman life on Earth have value in themselves. These values are independent of the usefulness of the nonhuman world for human purposes" (Drengson) states one of the most significant principles of deep ecology. This thought has been clearly insisted in many of the poems of W. S. Merwin, former Poet Laureate of the United States and a contemporary writer, who has written a number of poems insisting the importance of ecological balance and the need to stop the atrocities against the natural world. This basic concept has its own significance for the welfare of nature as well as humans, who are supposed to be an integral part of it. Each element in the universe has its own value in terms of its uniqueness, individuality and usefulness and hence it is merely unfair to compare one element with the other with regard to its size, shape or

use. A number of examples may be derived from Indian mythologies to prove that the intrinsic value of things does not depend on its size or shape. "Vamana Avatar" of Lord Krishna stands testimony to the fact. Similarly, one cannot assume that life of a tiny organism is inferior to that of an ordinary man or a great saint. Every organism plays its fundamental part in a complete or complex ecosystem. In the poem "After the Alphabets," W. S. Merwin says "I am trying to decipher the language of insects / they are the tongues of the future" (1-2) depicting the importance of insects. He ends this poem in a more persuading manner saying "they are never important they are everything" (13).

No one, including man, has right to destroy an element of Nature unless there is a vital need for it. This may be achieved only by abolishing the concept of hierarchy among life forms. The hierarchical order of life forms given by some theorists is objectionable as every life has its own intrinsic value and one can say that these theories are as a result of the anthropocentric mindset of man. This would rather lead only to deterioration of nature and extinction of animals and mankind. In the poem "Green Fields," Merwin comes up with the real picture of anthropocentric approach by saying "there is still game for the pleasure of killing" (5).

It is a proven phenomenon of science that the existence of human beings is a result of various stages of development of unicellular organisms into multi-cellular organisms and so on. If one considers man to be of higher hierarchical order, then they should not forget the fact that man came into existence only because of the chemical reactions of algae and bacteria and he is nothing more than that. Even from a religious standpoint, one can cite the notions that man cannot destroy nature except to satisfy his vital needs and it is his responsibility to safeguard the gift of nature to ensure his existence as a part of it.

From Hinduism perspective, all life forms are considered to be one and the same, and one may even notice the culture of worshipping non-human life forms like cow, elephant, rat, peacock, lion, tiger, dog, etc., as the vehicles of Gods and goddess. Even the natural elements like earth, rain, fire and air are symbolized as God whereas rivers, oceans and mountains become sacred

S.G.Mohanraj, Assistant Professor of English, Kumaraguru College of Technology, Coimbatore – 641049. E-mail: sgmohanraj@gmail.com



and are worshipped. This idea is expressed by W. S. Merwin in his poem "Coming to the Morning" stating "a blood kinship with rain" (6). He further insists the equality of elements by saying "the world is made / from a single star" (9-10). Idol worship may also serve as the best example for worshipping nature. This has become the part and parcel of Indian culture. John Daniel admires the culture and tradition of India, which is more than 9000 years old, and its ecological relationship and states "I believe that to realize the ethical relationship to land that Leopold envisioned and Indians have lived, we need to rediscover . . . a religious relationship to the natural world" (Slovic 181). As far as the Christianity is concerned, God created everything before he created man, and only on the 6<sup>th</sup> day of creation, he created man thereby leaving the responsibility to mankind to have a harmonious relationship with all the elements and use the natural resources only to satisfy their vital needs like food and shelter. W. S. Merwin is a strong believer of Zen Buddhism which preaches the importance of nature and insists a communal harmony among its elements. This has enhanced his passion toward nature and this can be witnessed in most of his poems. In "To the Insects," he calls all the insects "Elders" applying both the scientific and religious knowledge.

Every ecosystem is a complex web of interconnected elements which cannot exist without the other and man is also a part of it. The complexity of each system is beyond human comprehension and it is better not to disturb them to have a safer universe. This may be achieved only with the understanding that universe is not a resource that is to be exploited by the human community. One must have "a long-range vision of what is necessary to protect the integrity of the Earth's ecological communities and values" (Drengson). This may be possible only by celebrating the virtues of smallness and slowness rather than the development of science and technology. Right to existence should be independent of the economic value of the element, but the saddest part is that most of the times economic values of things add significance to its existence. In the poem "Place," Merwin words

On the last day of the world I would want to plant a tree what for not for the fruits the tree that bears the fruit is not the one that was planted (1-6) throw light on the fact that usefulness of elements to human community does not add value to them, but surprisingly in the current scenario, even the decisions made by governments and large organizations are revenue based and short-term benefit oriented. This will not help for a sustainable development and may result in the collapse of the entire system. If similar situation prevails "the worst consequences of global change will be experienced in the future. If all people intently pursued their individual economic self-interest, based on their own past

experience, nothing would be done to improve the situation (qtd. in Slovic 1).

It is high time for man to "know what is valuable and what is worthless" (Sumathy 16) and "creatures with less economic value also are a part of biotic community" (Sumathy 18). One must think beyond the conventional anthropocentric point of view and respect the intrinsic value of beings and help to maintain the richness of elements within an ecosystem. "One can't serve God by misusing or destroying His work" (Slovic 182) and only the equality of all elements would ensure a safer world than the present one.

#### WORKS CITED:

- [1] Merwin, William Stanley. "To the Insects." Web. 14 July 2012.
- [2] "Coming to the Morning." Web. 14 July 2012.
- [3] "After the Alphabets." Web. 14 July 2012.
- [4] . "Green Fields." Web. 14 July 2012.
- [5] "Place." Web. 14 July 2012.
- [6] Drengson, Alan. "Ecophilosophy, Ecosophy and the Deep Ecology Movement: An Overview." 19 May 2009. Web.
- [7] Satterfield Terre and Scott Slovic. eds. What's Nature Worth? Narrative Expressions of Environmental Values. Salt Lake City: Utah UP, 2004. Print.
- [8] Sumathy, U. Ecocriticism in Practice. New Delhi: Sarup, 2009. Print.

# Achievement of Communicative Language through Translation

M. Anith Prem Malaravan

This paper exclusively discusses how it is to expand our understanding of how words make meaning. Content of this paper will analyze language on several levels. Acquisition of language through translation is the most important facets of this paper. Teaching English to non-natives is always regarded as a daunting task for the teachers of ESL. English has become a language that bridges ESL and EFL candidates with the other part of the world. Teaching for ESL students is not only interesting but also requires skills for teaching English for specific purposes. Language is everything. Through words whether it is spoken, written, or signed, it is proposed and seal, agree and argue, analyze and worship, amuse and enlightened. Languages and its words are between us, around us, and within us, since language reflects a great deal about the people who speak it, it also will continue to discuss with and to look closely at how humans think and interact. On psycholinguistics and sociolinguistics, for example, it is studied on how children's acquisition of language, the way brain processes language, and the temperament and effects of dialect, register, slang, taboo, and other linguistic phenomena. It also examines many fascinating facets of English, including its structure, history, acquisition, and use. It will explore some fascinating subjects, such as slang and dialect.

## I. TRANSLATION AND ITS THEORY

A great age of literature is perhaps always a great age of translations. (Ezra Pound). Translation is said to be the

communication of the meaning of a source-language by means of an equivalent target language text. Translators have done a work of art for the target language. Indeed the translators have given innate features for the target language as they do not only translate with the equivalent words, they do carry beatifies of the source language from any form to the target language. The western theory states that what is beautiful in one language becomes or may not be the same, sometimes barbarous in another language. It is because of the two methods of translations in distinguished between *metaphrase* (literal translation) and *paraphrase*.

**Metaphrase** is a translation term referring to literal translation, i.e., word by word and line by line translation.

**Paraphrase** is restatement of a text or passages, using other words. The term "paraphrase" derives via the Latin "*paraphrasis*" from the Greek *para phrasein*, meaning "additional manner of expression". The act of paraphrasing is also called "paraphrasis."

Unlike a *metaphrase*, which represents a "formal equivalent" of the source, a *paraphrase* represents a "dynamic equivalent" thereof. While a *metaphrase* attempts to translate a text literally, a *paraphrase* conveys the essential thought expressed in a source text — if necessary, at the expense of literality.

Translation as a *paraphrase* helps to contribute a dynamics in bridging the constitutions and sometimes in the country like India in building up the society in a better way itself. It also helps to share the technical and scientific information.

“Any translation which intends to perform a transmitting function cannot transmit anything

---

M. Anith Prem Malaravan, Asst. Prof. – Sr.G in English, Kumaraguru College of Technology, Coimbatore. E-mail id: prem3138@gmail.com

but information -- hence, something inessential. This is the hallmark of bad translations" (Walter Benjamin). Sometime or the other metaphrase translation fail in its task, consequence of such failure lead to transmit the wrong structure of the L2. Most of this could be witnessed in media, specifically through advertisements, which are originally directed in Hindi and translated to the other languages through other channels. They fail to take the message only due to the word to word translation. Example of one such is "Pappu bangayana" it's a Hindi word which means "foolish act/ act fool" the word to word translation in Tamil is as such "Appa ahittingala" means "have become father". The entire meaning of the context has been taken away while translating. There are several more.

## II. LEARNABILITY THEORY AND UNIVERSAL GRAMMAR

Learnability theory brings down the various methods of language acquisition with the principles and strategies of the linguists, who have analysed the difficulties in learning the second language. It helps to explain how a language learner progresses from one state of knowledge to another based on language input. If taken in limit, the formal Learnability theory could be very mathematical. This may have a derivation for the language and the function of the input method or the method of acquisition. The Logical Problem of first Language and Second Language Acquisition:

First Language (L1): Why all children manage to acquire L1 despite the degenerate nature of the input?

Second Language (L2):

1. Same as L1;
2. Why people fail to learn despite the available evidence? (Orwell's Problem, the problem of unlearnability).

*Linguist take up the task of analyzing the various factors to find out the real difficulties in second language acquisition in which one such*

*description is given by Gregg. The elements of the First Language acquisition and the Second Language acquisition are noted as follows:*

## III. ELEMENTS OF L1 LEARNABILITY MODEL (GREGG, 2001)

The initial state of the learner

The final state of the learner

Input

Learning mechanism

Evaluation metric

## IV. ELEMENTS OF ADULT L2 LEARNABILITY MODEL (GREGG, 2001)

The adult L2 learners' initial state vis-a vis the L2

The L2 learner's final state

L2 input

L2 learning mechanism

Evaluation metric

Universal Grammar as the general human ability to learn and use the language is assumed to be innate in the learners' mind (Chomsky, 1975:29); Cook, 1988:1; Haegeman, 1991:12; Safir, 1985:2). This is in line with the rationalist view to language learning which concludes that one cannot really teach language but can only present conditions for the learners to develop it in their mind. If this is related to second language acquisition research, there are still controversies on whether or not universal grammar (UG) is available to adult second language learners.

Universal grammar is a theory in linguistics that suggests that there are properties that all possible natural human languages have. Usually credited to Noam Chomsky, the theory suggests that some rules of grammar are hard-wired into the brain, and manifest without being taught. It has been analysed through various research by the linguists that learning a language cannot be done through memorizing rules. Learners are insisted to have linguistic creativity. The creative construction that learners have refers to the subconscious process by which language

learners gradually organize the language they are exposed to in other words, children learned their mother tongue by simple imitation, listening to and repeating what adults said. The learners generate sentences by constructing rules. The form of the rules is determined by mental structure (language acquisition device) which is responsible for human language acquisition which is believed to be natural.

#### V. MACHINE TRANSLATION

Translation proves to be the most required element. Research has proved that the internet users are significantly more likely to read to content in their own language. There are simply not enough translators in the world to translate the text, one need in local language at the speed and quantities required. Scientists and research institutions for machine translation believe machine translation will become an integral part of creation and strategy of various organizations and industries.

Within few years from now machine translation might have translated the most of the content from one language to another. Most of the content available through the web today has increased dramatically and includes marketing content, manuals and support content as well as user generated content such as blogs and tweets. The availability of human translators makes the big difference with the content available for translation. Scientists and technologists believe that machine translation is the only solution for this problem.

Telecommunications and supersonics have made the world shrunk, but the translation as an ancient techniques helps impart knowledge from various resources. Seeming to simplify the requirements of an individual searching for the knowledge enrichment quenches his thirst through the translation. Translation from various resources for simple need pays way for linguistic analysis. Linguists try to bring down the different analytical study to prove without the 'linguistic structure' in the language they

may not exist or could not be inherited by the second language learner.

#### VI. TRANSLATION: WORK OF ART

Translations strictly express the meaning of source language text to the target language text. But the penmanship is the ultimate texture that one realizes when reading the translated works. They do not only follow the interpretation of meaning but as a paraphrase techniques has made so many translators to look beyond what have been achieved.

On a particular period of time translation was strictly prohibited from the language classes, but not from every country. Translation is very much essential for the Foreign Language Learning classes. The students are made to understand the methods and the rules of the Second Language might be imparted through the First Language of the particular set.

Translation becomes the ultimate need for the Second Language Learners, the set of rules for the Second Language has to be defined and redefined in the First Language. That becomes necessitate for the acquisition of the Second Language in most cases. The Bridge needs to be built by Second Language Teachers, where the classes do not fill in only with the First Language. It needs to be utilized judiciously. As one has acquired the Second Language, he does not stop to translate. Hence the refinement of the Second Language either in the Language or in the Culture of the Second Language is carried in his daily routine. The empirical research has proved that the translation if effective and beneficial.

The need for translation in the present scenario pays way for the literary foresight and the contributions of the great writers in any language. A Bengali writer's work of art in Bangla language becomes familiar to the literary world most of the time by translation. It destines to access the world literature. "Translation is not a matter of words only: it is a matter of making intelligible a whole culture".

The Various regional literatures in India are promoted through the translation with its best outcome.

Literature could be in any form, the contemporary writers translate to the required target Language with the paraphrase translation, so then the additional information and contemporary issues like social, economical and cultural from the society is best registered in their work of art. This type of translations has a greater demand in the literary world and the critics add up further more. It is evident that speaking the foreign Language does not help too much in the transfer of knowledge to human communities as translation does. So translation is considered to be the fifth language skill.

Taking up the contribution of theories, Universal Grammar and Media for translation evolves to be the facets of Language, to refine the statement “The world Literature is Translation”. Literature is all alive in its own perfect world – Translation.

#### REFERENCE

- [1] Masataka Nobuo, *The Onset of Language*, Cambridge University Press, 2003.
- [2] Namhee Lee; Lisa Mikesell; Anna Dina L. Joaquin; Andrea W. Mates; John H. Schumann, *The Interactional Instinct: The Evolution and Acquisition of Language*, Oxford University Press, 2009.
- [3] Dale, Rick, *Cognitive and Behavioral Approaches to Language Acquisition: Conceptual and Empirical Intersections*, *The Behavior Analyst Today*, Vol. 5, No. 4, Fall 2004.
- [4] Eric Amsel; James P. Byrnes, *Language, Literacy, and Cognitive Development: The Development and Consequences of Symbolic Communication*, Lawrence Erlbaum Associates, 2002.

# Skills Develop Onscreen: Using Multimedia as a Pedagogic Tool

Priya Nagarajan

**Abstract---** *Multimedia is a method of communication which associates with audio, video, internet, television, newspaper, radio etc. Nowadays it has penetrated through every part of the education of the students from kindergarten to post graduation. It has distinguishable role in teaching and learning English language in global arena. It is experienced that, to teach anything there should be a methodology for effective learning. The methods in teaching were set out with the specific reasons to change the society as learned in all aspects. English language teaching commenced in the 20<sup>th</sup> Century with the methodologies like Grammar Translation, Direct and Audio -Lingual methods. The employ of multi media in class room for effective English teaching can be endorsed as another method for easy and effective language learning as it plays a vital role. In the process of learning we necessitate text, audio, video, stills, and animations. We can ensure that Multimedia is serving us to learn language very well. Students are using social media for instance particularly Facebook, Twitter, and WhatsApp for communicative purpose. These social media further help to facilitate direct, face to face, oral and written communication. Since students are living in a highly technified ambience, they are learning and developing skills on screen. They can read jokes, stories, poems, proses, and see dramas visually. Like literature, students gain knowledge via twitter- literature as twitterature, and net- literature as nettrature. The present paper aims at analyzing the importance of using Mass Media in the classroom. Further more, this article tends to deal with some of the key issues of using media in the classroom.*

**Keywords---** CMC, multimedia, CALL, HOTs, Multi-modal CMC, Twitterature, Nettrature.

## I. BACKGROUND TO THE STUDY

WE are living in a highly technified society. Multimedia is the new buzzword in education. One of the substantial resources especially in education is multimedia. The 21<sup>st</sup> century advances further, it will be even more crucial that the students comprehend multimedia and they transform themselves from passive to active thinkers. Incorporation of technology ameliorates the quality teaching in the language labs.

Priya Nagarajan, Asst. Prof., Dept of English, PSG Arts and Science College, Coimbatore

Multimedia is one of the techniques to improve the language skills of the students. It has been greatly used in Schools, Colleges, and Universities across India. Multimedia is used in the language labs, which furnishes features to listen, record, understand dictionary tools, word pronunciation, voice and text chat, broadcast, conference, resume preparation, public speaking, interview skills, debate, body language, group discussion, telephonic skills, examination modules etc. According to **Seymour Papert (2008)** “you can’t teach people everything they need to know. The best you can do is position them where they can find what they need to know when they need to know it”. The studies in this field contribute some practical advice and tip how to use Media in the classroom. As classroom teachers it is essential to take mass media in our classrooms precisely for all these reasons referred above. We should empathize the media, the messages they establish and their influence upon us, how to explore this abundant information and create a continuum of the activity media create in the life of people and why not in the classrooms where students give a lot of their time. Employing several sorts of Media in the classroom has always been a dare and how to take these Media in the classroom is more than a dare. Students and teachers should be able to employ in their classrooms different media through different technologies. Media furnish teachers and students with productive and practical ideas. They capacitate teachers to encounter various needs and interests of their students. They also afford students with a lot of language practice via activities using newspapers, magazines, radio, TV, movies, books, Internet, etc, and tasks which generate reading, writing, speaking and listening skills.

## II. AIM OF THE STUDY

It aims at indoctrinating them about how to make use of the multimedia for learning at the undergraduate level. It aims to encourage students, to manipulate it skillfully and to embolden them to use it outside of the classroom for learning purposes.

## III. REVIEW OF LITERATURE:

**James Simpson (2015)** discusses on computer-mediated communication. He elaborates CMC and CALL methods of teaching and talks about new ways of learning. “The English language in the Digital Age” by **Sophia Anariadou and John McNaght (2008)** talks

about digital revolution that is dramatically impacting communication and society. “The Impact of Using Electronic Media in English Teaching for Elementary and Secondary Students” by **Unchana Klentien and Weeranan Kammungwut (2012)** who dealt with the impact of using electronic media software program in teaching English for students in 100 elementary and secondary schools under the Office of Basic Education Commission (OBEC).

#### IV. METHODOLOGY

CMC is an umbrella term which denotes human communication *via* computers. Temporally, a distinction can be made between synchronous CMC, where interaction takes place in real time, and asynchronous CMC, where participants are not necessarily online simultaneously. Synchronous CMC includes various types of text-based online chat, computer, audio, and video conferencing; asynchronous CMC includes email, discussion forums, and mailing lists. CMC can take place over local area networks (LANs) or over the Internet. Internet CMC, as well as allowing for global communication, also provides for the added dimension of hypertext links to sites on the www, and to email addresses.

#### V. RESEARCH QUESTIONS

1. To what extent is multimedia useful for language learning?
2. How is Computer-mediated Communication method useful to UG students?
3. What is the role of multimedia in language classes?

#### VI. HYPOTHESES

1. Media furnish vast material, they prompt students to speak and serve them incorporate listening, reading, talking and writing skills, through various kinds of activities.
2. By Media, there is more communication and collaboration amongst students, as working with the pages of a book is more individual, less collaborative and less reciprocal.

#### VII. DISCUSSION

“We live in a world where media are omnipresent. An increasing number of people spend a great deal of time watching television, reading newspapers and magazines, playing records and listening to the radio...”

The school and the family share the responsibility of preparing the young person living in a world of powerful images, words and sounds” (**UNESCO Declaration on Media, 1982**).

These are the rapid improvements that constitute themselves to 21st century students, the “digital natives,” as **Prensky (2001)** referred to them, who make such fluent and natural uses of technology. In today’s rapidly changing world of technology, we are forced to consider our responsibility as teachers and educators, to prepare our students to be successful in the world of tomorrow. Multimedia in classroom paves the way for the world of visual literacy and authentic learning experiences, which engage the learner in HOTs. An analysis of multimedia in classroom indicates that students are able to differentiate among the media in terms of their contribution to maintain or increase student interest as well as in understanding the course materials. Multimedia classroom provides the students chances for interacting with diverse texts that give them a solid background in the tasks and content of the syllabus. This motivates students in self assessment and to take control of improving their skills. Not only that, nowadays all students from undergraduate are having mobiles and so they are well versed in using the mobiles, so they can be taught how they can use the mobile for education purpose as well as, with friends outside in a affective way. For English, we can guide them with different websites that are available in online particularly for grammar, vocabulary development through games. We can also have face to face video call for pronunciation development in classroom. Even interviews can be conducted through video conferencing in classes.

“People learn through reading, and reading about interesting new things in one’s interest subject, undoubtedly helps motivation”, **Paul Sanderson, (2002)**. The rapid development of information and communication technologies in recent years is associated with a corresponding growth in interest in computer-mediated communication (CMC). Since the late 1980s, this trend has led teachers and learners alike to engage with the possibilities and complexities of CMC for language teaching and learning.

#### Technology enabled language learning

1. Fluency and creativity
2. learner-centered approach
3. collaborative learning
4. non-native speakers of English and their variety
5. Networking, internet and supporting groups.

Learning English through the internet network is one way to strengthen effective English learning of students. Students can exercise language by taking topics and levels of lessons from a large collection of activities based on their curiosity and skill stages. Language learning from electronic media on the internet is the handling of materials and resources obtainable online as a medium to acquire knowledge for successful teaching and exploitation of learners. E-lessons generally have

particular contents, learning activities, exercises, and tests and allow students to remember them at anytime. Students will also be recommended to react to the contents of the lessons. E-lessons can also associate with many other learning resources of the pertained subjects. This learning method furnishes students with fascinating lessons that construct study more enjoyable.

#### VIII. CONCLUSIONS

Learning subjects that necessitate memorization or have same teaching pattern always induce tedium to students. Therefore, teachers must allow for instructional materials to evoke and increase the students' fulfillment in learning. Electronic media can be used to relieve the overburden of teachers as a secondary course by applying the learning contents with activities or game for students' enjoyment. Most importantly, electronic media and teaching material will help students to broaden their concepts of knowledge from just textbooks. It will also help satisfy students with what there are learning and help them to understand the lessons better.

#### REFERENCES

- [1] Alessi Stephen, Trollip Stanley, 2001, Multimedia for Learning; Methods and Development, Allyn & Bacon, Boston, MA.
- [2] Chapelle, C. 2001. Computer Applications in Second Language Acquisition. Cambridge: Cambridge University Press.
- [3] Crystal, D. 2001. Language and the Internet. Cambridge: Cambridge University Press.
- [4] K. Jintawee, 2010, Research on Proper Patterns of Websites and Electronic Lessons for E Learning in Undergraduate School, Office of the Higher Education Commission, Ministry of Education.
- [5] Morrison Gary, Lowther Deborah, DeMeulle Lisa, 1999, Integrating Computer Technology into the Classroom, Prentice-Hall, Inc, New Jersey.
- [6] Norton Pricilla and Sprague Debra, 2001, Technology for Teaching, Allyn & Bacon, Boston, MA.



# The Process of Translation and the Translated Work of Art - Language Acquisition in Translation and its Nuances

M. John Suganya

**Abstract---** *This paper exclusively discusses the most important aspects for translation and language acquisition. And it is where the author takes up the role of language imparter. The more the author translates the more he expresses the world to the promotion of regional literature. Language stands as a chariot or as any cheap vehicle; it is destined by the work of art of the translator from the original work. Translation in wider aspect looked upon as the need of the hour for world literature. Most of the renowned writers are familiar only through the translated works.*

## I. INTRODUCTION

LANGUAGE acquisition through translation is the wider platform than any other source of work in which any language teacher tries to impart ESL. Translation fills in the gap between the author and the foreign reader, who is unaware of traditional and regional language. Acquisition of language through translation for the learners of English as a second language has been widely discussed. English as a second language is now of greater demand due to the raise in demand for the English speakers and a profound language of English does feed a group. Time from now and a decade back have a higher difference in the raise in the learners' crowd. It is always the bridge language between the countries. Country like India being the multi-lingual nation would have faced so many problems if it hasn't taken English as the common language. Even though we have more than twenty two official languages in our nation, English has the major role and it widely plays its part.

This paper exclusively discusses one most important aspect of translation and language acquisition. Translation fills the gap between the author and the foreign reader, who is unaware of traditional and regional language. English is always the bridge language between the countries. Country like India being the multi-lingual nation would have faced so many problems if it hasn't taken English as the common language. Even though we have more than twenty two official languages in our

nation, English has the major role and it widely plays its part fair and effective.

Mahasweta Devi is a major literary force in contemporary literature. Born on 14th January, 1926 in Dhacca, she shared literary tradition with her parents. Her father Manish Ghatah was also a poet. Her mother was a social worker. From her mother, Mahasweta Devi inherited a concern for the poor and the downtrodden. After Partition, she shifted to West Bengal with her parents.

Mahasweta Devi has enriched the Indian Literary tradition. She has been recipient of prestigious awards such as the Jnanpith Award (1995), the Magsaysay Award (1996), Padmasri, Sahitya academy Award. In 2006, she received the prestigious Padma Vibhushan Award. After retiring from her teaching profession Mahasweta Devi has focused on the portrayal of the poor tribal in Eastern parts of India. She has traveled a lot in these remote parts to gain the first hand knowledge of their lives and problems. She has published more than forty books including novels and stories in Bangla. Her literary works are a commentary on the simplistic lifestyles of the tribes as well as on their suffering and exploitation and helps the readers to know about the style of language that tribal people use in their life.

Mahasweta Devi's 'Rudali' is a powerful work that deals with the exploitation and misery of the poor tribals in the Eastern part of India. The story is a powerful indictment of socio-economic and religious system. The two female characters Sanichari and Bhikhani are shown as suffering. They do not see any hope of redemption. They are exploited by the rich feudal Lords. Death has been presented as an occasion of jubilation because they get an opportunity to earn money. The profession of rudalis' unites the poor women and prostitutes, and they become empowered.

The novel helps us to earn the life of a community. The text evolves around a central character, Sanichari, who emerges at the end as better equipped to adapt, survive and manipulate system. The opening sentences of Rudali situate Sanichari in a socio-economic context, which shares the condition of poverty with the other villagers, is one of a community;

---

M. John Suganya, Lecturer, Department of English, Psg College of Arts and Science. Email:suganyajohn@gmail.com

In Tahad village, ganjus and dushads were in the majority. Sanichari was a ganjus by caste. Like the other villagers, her life too was lived in desperate poverty.

Sanichari is a victim of that dichotomy where woman is worshipped as a Goddess and whipped as a Goddess and whipped as slave. Her mother-in-law would often remark that, being born on an unlucky day of the week (Saturday or Sanichari, hence her name, Sanichari), She was cursed, manhoos, doomed to suffer. To herself she would say:

Huh! Because I was born on and named after Saturday, that made me an unlucky daughter-in-law! You were born on a Monday –was your life happier? (p.54)

It is not fate, not a question of being born on this or that day. It's an economic condition, and the problems of Sanichari are common to her class, caste and gender. Thus the very first paragraph shows the tension between the fate/karma and a politically and economically constructed situation. Right from the beginning, the Novella places the central character and provides a socio-economic context and emphasizes that her problem are common to her class. Through the description of Sanichari the readers can get the clear picture of their (community) habits of speech, appearance, clothes, mannerism and dialect. In the village everyone is unhappy. They understand suffering. There is a continuous suturing of her private life to the socio-economic situation.

When her mother-in-law died, Sanichari does not cry. At that time, her husband and his brother were in jail because of Malik-Mahajan Ramavatar Singh. Enraged at the loss of some wheat, he had all the young dushad and ganju males of the village locked-up. When her brother-in-law and sister-in-law die, she is unable to weep because she is tense over the fact that Ramavatar is trying to have all dushads and ganjus evicted from the village. Ramavatar's oppression is a constant presence.

If we look AT ALL 'THE EVENTS' IN Sanichari's life as shown in the text, we find a direct connection between the proposal event and the exploitative system. Every death is mediated by the religious demands that follow for rituals which further impoverish the already poor. Sanichari's husband dies of cholera after drinking the contaminated and sanctified milk donated to the Shiva idol by the rich. She is made to pay twice over for ritual offerings. In another occasion, to appease the local village priest, she is forced into indebtedness to Ramavatar.

The author shows the subaltern view of local politics and the hypocrisy of the privileged classes. By showing the dire poverty of the villagers, the ways in which they are exploited, the burden of ritualized religion, the absolute power of the Malik-Mahajans, the corruption

within the privileged classes, the author constructs a powerful indictment. This indictment is spoken by the villagers and address 'everything in this life is a battle'. The references for getting on a half-empty stomach, the hard struggle to produce food, the imposed austerity like bangles or a comb appearing to be impossible dreams, are juxtaposed against the wanton ways in which the rich spend money on funerary ceremonies. The price paid by the people, from the hides of whom the overloads extracted the sums they had overspent. Sanichari, who borrows a meager amount of rupees twenty for her husband's Shradh, has to pay back as rupees fifty through bonded labour of the next five years, while thousands of rupees are carelessly spent on the lavish of her masters. Malik-Mahajans like Ramavatar and his son Lakshman Singh are shown as controlling and influencing almost every aspect of the lives of the lower caste villagers.

It impoverishes and enslaves, causing indebtedness through demands and obligations. When Sanichari's mother-in-law dies at night, in the pouring rain, Sanichari is hard pressed to carry out the necessary rituals before daybreak, with no grain in the house and no men folk to help lay out the body. When her brother-in-law and sister-in-law died, 'There was no crying over their deaths, either, was one to weep or to worry about how to burn the corpses and feed the neighbours cheaply at the Shradhs?' when her husband is dead, she has barely had time to register the fact when Panda of the Siva temple at Tohri demands that she makes ritual offerings before returning to the village. It is a perfect example of how religious and economic exploitation reinforce and strengthen one another.

Sanichari is careful to show the clan and class solidarity among the rich when facing a challenge. There may be bitter infighting amongst them over land riches, but they band together to present a united front when threatened from without. If community can be a tool of offence and defense for the exploiters, it has to be a form of protection and strength for the exploited.

After Budhua's death when Sanichari finds herself totally alone, she experiences the support and bonding that a community can offer. She is having hard time tending to her infant grandson, who won't stop crying. One day Dulan's wife comes and picks up the baby, stating that her daughter-in-law would breastfeed this child along with her own. She also brings Sanichari news of a job which can help her to earn some money. Sanichari herself is shown as being fully aware of how essential the community is. She thinks, 'In order to survive, the poor and the oppressed, without that support, it is impossible to live in the village even on milk and ghee provided by the Malik.' The men and the women of the lower classes/castes are as helpful and supportive of each other. Sanichari and her husband are shown as

partners, both working equally hard, but together for home and livelihood. She leaves her six year old son at home and goes for the cattle and at harvest season works shoulder to shoulder with her husband. Together the two of them erect a hut on the piece of land they have inherited after the death of her brother-in-law. She draws decorative pictures on the walls, he plans a vegetable patch in their courtyard, and she arranges to rear one of the Malikin's calves.

Sanichari's son Budhua is shown as a sensitive, thoughtful, gentle, caring both towards his mother and wife. He understands both these are very different women and is capable of being compassionate and not judgemental. There is a detailed description of how Budhua laboured to develop the vegetable patch in their courtyard. So Sanichari cannot imagine a life without him, but the experience of losing him makes Sanichari to feel the loss of a sympathetic, supportive, caring companion.

She couldn't remember a time when he wasn't there with her. While she was enslaved in the Malik-Mahajan's fields, he would clean the house and fetch water from the river.

The author balances this close relationship with Bikhni's sad tale of a selfish son who walks out on his mother for a better life. The relationship between Sanichari and Bikhni, childhood playmates who rediscover each other as aging, lonely women and decide to team up, is the major statement of bonding and supporting within a community. These women are not related, they have only their circumstances in common both are poor, struggling to find means of survival.

The author clearly traces their evolution into a professional team. Bikhni would visit the markets and bazaars, the shops near the bus-stop. She would bring news of the death in the bighouses to her friend. Two of them would wrap black cloth round themselves and knot a sack into their anchals. They would present themselves at the bighouse, negotiating directly with the account keeper (Gomastha) showing no hesitation or shyness. A social ritual evolves into a profession, a business. In addition to ease and accord between them, the women are sensitive to each other's emotional states. When Bikhni returns from her visit to the Tohri prostitute quarter, she reports, 'I saw your son's wife there as well'. When Sanichari refuses to discuss the subject, she tactfully keeps quiet.

This delicate sensitivity to one another's inner emotional states itself again when Bikhni suddenly announces that she wants to go to Ranchi for a brief visit in the hope that she will meet her son. Afterwards Sanichari learns of Bikhni's death and feels for her. She will not cry for Bikhni; tears are a commodity now, part of a commercial transaction. Her loss lies deeper, but life must go on.

Through translation the acquisition of the language is in great deal. However, translations contribute socio-economic, cultural, religious and tradition of the source language to the target language. Reader who possesses the translated work of art as his first language acquires the above from the source language. Taking in account of the novel discussed hasa given up the socio-economic system of a particular class/caste to the foreign language reader, which is absent in their systems.

The concealment of the language through various dictions in the source language were been learnt by the reader. Few to digest:

- Shradh – a ritual performed in remembrance for the elders' demise.
- Gomastha – account keeper or accountant
- Manhoos – ill omen
- Rudali – Female weeper, weeping woman, professional mourners
- Sanichari – Named after Saturday carries a meaning unlucky
- Malik – Rich man
- Ramavtar, Lakshman – names from Hindu Myth.

As a writer Mahasweta makes it clear that her aim in writing is to highlight the miserable condition of the poor tribals in eastern India. She is fired with zeal of work for the downtrodden and the oppressed. She is concerned about the exploitation of poor tribal by the feudal Lords. She wants the poor people to get their basic needs fulfilled. So the novella 'Rudali' traces the evolution of the protagonist, Sanichari from a suppressed 'voiceless' subaltern woman to an empowered and empowering agent of resistance carrying the potential of deconstructing the exploitative forces. Reconstructing Sanichari's saga of suffering, Mahasweta devi puts her in a specific Socio-historical context, and a powerful narrative of the subaltern being dehumanized and dispossessed by the socio-economic politics of repression emerges out of the story is only incidental to the broader narrative of the subaltern life and its struggles the story records. This narrative of the marginalized is pervaded by eternal hunger, poverty, deprivation. While charting the course of the lived lives of the individual characters, the narrative traces the historicity of the socially and economically constructed situation that causes their plight.

#### REFERENCE:

- [1] C. Addison Stone; Elaine R. Silliman; Barbara J. Ehren; Kenneth Apel Handbook of Language and Literacy: Development and Disorders; Guilford Press, 2004.
- [2] Jeri J. Jaeger, Kid's Slips: What Young Children's Slips of the Tongue Reveal about Language Development, Lawrence Erlbaum Associates, 2005.
- [3] M. Schlesinger, Steps to Language: Toward a Theory of Native Language Acquisition, Lawrence Erlbaum Associates, 1982.

# Facets enhancing Literature competency in Technical English

J. Srikala

**Abstract---** *The enhancement of Technical English has led to the gradual sidelining of Literature, as focus shifted to functional use of language. The revival of literature is inevitable as students find it hard to decipher the nuances of language in the Technical English classroom. It is difficult for students to learn good vocabulary without the assistance of literature. Various genres of literature like short stories, poems, novels, plays etc can be used effectively in the Technical English classroom to make learning a joyful experience for students. To teach the elements of literature to be used as a crucial reading skill, an instructor must start with an elementary text. Once the reader can identify the elements within a simple story, knowledge can then be transferred to higher-level readings. This works best with traditional children's stories that are time-honored, so that the learner has a level of familiarity with the text, at least by hearsay. If syllabus designing is taken proper care of half the battle is won. The ambience in the classroom changes dramatically with the introduction of literature. It is no surprise that the budding engineers enjoy learning English language through literature. Literature is for all ages and never ceases to inspire the students irrespective of their age and gender.*

## I. INTRODUCTION

THE augment of Technical English has led to the gradual sidelining of Literature, as focus shifted to functional use of language. The revival of literature is inevitable as students find it hard to decipher the nuances of language in the Technical English classroom. It is difficult for students to learn good vocabulary without the assistance of Literature. Various genres of literature like short stories, poems, novels, plays etc can be used effectively in the Technical English classroom to make learning a joyful experience for students.

In the current classroom scenario, students are jam-packed inside their classroom from morning till early evening with emphasis solely on rote learning. Due to immense pressure from higher authorities and peer groups there is a barmy rush to complete the syllabus in time, which enables the students to revise and perform well in

the examinations. Though this method is highly productive in giving good results, the problem is students are not able to retain anything substantial once the exams get over.

## II. TECHNICAL ENGLISH THROUGH SHORT STORIES:

To teach the elements of literature to be used as a crucial reading skill, an instructor must start with an elementary text. Once the reader can identify the elements within a simple story, knowledge can then be transferred to higher-level readings. This works best with traditional children's stories that are time-honored, so that the learner has a level of familiarity with the text, at least by hearsay. Such traditional stories make finding elements simple because they are generally short and uncomplicated in their approach to storytelling. For example, the fantasies and creativity counts a lot in fact the pinnacle in "*Cinderella*" is undoubtedly when the prince charming marries the sweet little girl. The meaning of cinder is dust and her name seems to be 'Ella'. In this case, it is undemanding for a reader to comprehend the point of most intensity in the story. Consequently, the reader should begin to have acquired the ability to find vocabulary in other stories and stories new to them as a reader, progressing toward his or her level of ability.

Literature can be taught to students through audio-texts, music CDs, film clips etc which will help the students to understand the beauty of language without much difficulty. ELT experts lay emphasis on four skills-Listening, Speaking, Reading and Writing. Through Literature, students can be taught all the four skills by paying attention to sentence structures and new vocabulary.

## III. TECHNICAL ENGLISH THROUGH POEMS:

Literature starts in delight but ends in wisdom. In other words, literature not only instructs but also delights. Literature helps students appreciate diverse cultures apart from their own cultures. Certain emotions like anger, greed, love, jealousy etc are universal. Once the students have absolute control over their emotions, it will help them in their professional lives also. In short, one can say that literature serves a dual purpose. It informs and delights at the same time. Poems in the class rooms are a great motivator. For example the Poem '*Daffodils*' by Wordsworth is still a treat to the mind for those who have

J.Srikala M.A., B.Ed., M.Phil, Assistant Professor –II, English Division, Department of Science and Humanities, Kumaraguru College of Technology. Email-srikala.j.sci@kct.ac.in

read it and the lines 'ten thousand saw I at a glance' still flashes upon the readers inward eye. Poems are often rich in cultural references, and they present a wide range of learning opportunities. As the aim is to teach English through poetry, not to teach the poetry itself, so one doesn't need to be a literature expert. It improvises communicative speaking activities, students can be provided with plenty of pre-reading activities so that they are adequately prepared. One other important feature of handling poems in technical English syllabus is it helps in working on pronunciation. It can be fun to get students to rehearse and perform a poem. A poem can spark off some magnificent creative writing. Students can add more lines or stanzas individually or in pairs or groups. One of the things about using poetry in the classroom is that it usually creates lots of opportunities for personalization. This means that the students have plenty to say, and the communication is genuine because they are talking about their own experiences or hypotheses.

#### IV. TECHNICAL ENGLISH THROUGH PLAYS:

Even after years of English teaching, the learners do not gain the confidence of using the language in and outside the class. The teaching of English language falls short of fulfilling its goals. Their output in the language is limited to writing run-of-the-mill answers for literature chapters and producing grammatically accurate, but, isolated sentences. For example Shakespeare's "*Macbeth*" can bring such good theatre performances from the students if enacted as a play. Real communication involves ideas, emotions, feelings, appropriateness and adaptability. The conventional English class gives the learners an opportunity to use language in this manner and develop fluency in it. Thus, the main purpose of the language teaching course, i.e., developing skills in communication unfortunately should not be neglected.

An attractive alternative is teaching language through drama because it gives a context for listening and meaningful language production, forcing the learners to use their language resources and, thus, enhancing their linguistic abilities. It provides situations for reading and writing. It is very useful in teaching literary texts as it helps in analyzing plot, character and style. It also involves learners more positively and actively in the text. As Wilga Rivers (1983) states, "the drama approach enables learners to use what they are learning with pragmatic intent, something that is most difficult to learn through explanation." By using drama techniques to teach English, the monotony of a conventional English class can be broken and the syllabus can be transformed into one which prepares learners to face their immediate world better as competent users of the English language because they get an opportunity to use the language in operation. Using drama techniques also fulfills socio-affective

requirements of the learners. Moreover, this learner centered approach makes the syllabus personally fulfilling.

Rote learning can be replaced by participative learning. Students can be encouraged to participate in skits, one act plays, presentations; etc once they have a good command over the prescribed literary texts. Literary texts may be selected based on interest and relevance to students. The level of students should be checked thoroughly before prescribing any literary texts. It is suggested that the texts be slightly shorter so that the students make optimum use of them before the stipulated time. Meticulous planning is necessary to ensure that the learners get literary knowledge to raise a wide variety of questions to analyze the congruity of suggesting certain literary texts for students.

One should proceed gradually from easy tasks to difficult tasks. Teachers can completely exploit the material by conducting brainstorming sessions, pre-reading tasks etc for the benefit of students. Teachers should make learning English language a joyful journey. In order to draw the attention of students, teachers are expected to pay a lot of attention to pre-reading tasks, icebreakers etc. Students can be encouraged to modify the texts, change the ending etc using their creativity, ingenuity etc. Over the years, teaching language to students has undergone a sea change. Nowadays language is taught to students without the help of literature. Technical English and English Language Teaching (ELT) gained prominence in India in the last two decades after the rapid mushrooming of Engineering Institutes all over India.

#### V. TECHNICAL ENGLISH THROUGH NOVELS:

Language teaching is incomplete without literature. The earlier generations had solid foundation in language, because they learnt classics written by literary writers like Shakespeare, Wordsworth etc. Unfortunately, the modern generation does not have any exposure to classics. This severely hampers not only their intellectual growth but also emotional growth. For example reading novels of Indian Diaspora writer Anita Desai's can actually be interesting and enjoyable. Her novels like "*Cry, The Peacock*", "*Bye, Bye Blackbird*", "*Where Shall We Go This Summer*" etc. speaks of the life of the immigrants who left the country for better prospective, those suffering from existential predicaments and are left in a quandary of restlessness. The students can thus be updated with the current social problems of 'brain drain' major challenge of our youth in India and educate them about the rat race to the European countries. Technical education is not complete, if one does not pay any attention to values, character building, soft skills etc. All the above mentioned things can be easily and effectively inculcated in students through literature.

It is easy for students to make a note of new vocabulary. If there are four or five new words on a page, learning them improvises the vocabulary. Students should be let to try to guess their meaning as they read and finished reading to check in a dictionary and add them to your vocabulary book. Fiction is easier to read than others. It often depends on the author. Agatha Christie, for example, wrote in an easier style and with simpler vocabulary than Stephen King. Students can be encouraged to read books in specialised English-language

In this context, literature can first play a supporting role to subjects like Technical English, Professional Communication, Human Values etc. before taking a full-fledged role to create versatile engineers. For beginners, classics from Indian Writing in English can be introduced so that they get a peek into the glorious culture and tradition of our motherland. Great writers like R.K.Narayan, Mulkraj Anand, Rabindra Nath Tagore etc. have permanent sway over the readers. Further, the students should be exposed to literature from commonwealth countries like Canada, Australia, New Zealand etc. This will help them to appreciate the cultures of different countries. Shaping the personality of the student is the need of the hour. Literature will play a pivotal role in this direction if it is inculcated in students right from the beginning.

## VI. CONCLUSION

Certain factors should be taken into consideration while selecting authentic material in the Classrooms. The factors are as follows:-

- They should have a positive impact on students.
- They should expose students to real language. (language in day to day conversation).
- They should cater to the different needs of the students.

Literary texts will expose students to use the appropriate language according to the situation and condition. In the present scenario teachers are to speak about the importance of fifth skill that is learning culture apart from the four skills – Listening, Speaking, Reading and Writing. Once the students get good command over the language doing well in campus interviews, group discussions etc. will become a cakewalk. In addition, one can say that time can be saved for students if any extra lecture in the form of career development classes and personality development classes are reduced considerably. There is no doubt that literature will help the learners to get good command over the language. In other words, language is something that has to be caught and not taught. If literature is made part of the curriculum in technical education, language learning will become a really enriching experience for the students. It is clear that teaching English language through literature is viable in

technical institutes. The important point to be noted is that the literature prescribed should be interesting and understandable for young engineers. If syllabus designing is taken proper care of half the battle is won. The ambience in the classroom changes dramatically with the introduction of literature. It is no surprise that the budding engineers enjoy learning English language through literature. Literature is for all ages and never ceases to inspire the students irrespective of their age and gender.

## REFERENCES:

- [1] Duff, A & Maley, A. Literature Resource Books for Teacher. Oxford University press. 2007.
- [2] Maley, A. Literature in the language classroom in The Cambridge Guide to Teaching ESOL. Cambridge University Press, 2001.
- [3] Pulverness, A. 'Literature' in English Teaching Professional, October, Issue 29, Modern English Publishing. 2003.
- [4] Berardo, S.A. The use of authentic materials in the teaching of reading. The reading matrix. 2006.
- [5] Wallace, C. Reading Oxford. New York: Oxford University Press, 2006.
- [6] Cruz, J.H.R. The role of literature and culture in English language teaching. 2010.
- [7] Kramsch, C. Language and Culture. Oxford: Oxford University, 1998.

# A Pedagogic Perspective on Blended Approaches to Language Learning

B. Shobarao

**Abstract----** *Blended approaches to language learning are currently becoming popular with the development of communicative technology. Masie(2006) states that nearly all teaching and learning is 'blended' with technology in some way. This blending is a complex issue as it involves commitment, time, course design and competence on the part of the teachers. Many institutions initially spend a lot of money to enable teachers apply these approaches in the classrooms, but discard this idea as the teachers are unable to utilize the novelty effects of blended teaching. The concept of blended learning first gained prominence in the corporate training situations to describe the combination of teaching and learning approaches that included coaching, mentoring, online interactions, face to face classes and on-job training (Thorne,2003;Valiathan,2002). Garrison & Vaughan (2008) state that these approaches are superior to classroom-based approaches to learning. This paper thus highlights various practical aspects of blended approaches to language learning that are of pedagogic importance to the learners, teaching fraternity and the management at large.*

**Keywords---** *Blended Learning, Competence, Novelty Effects, Fraternity*

## I. INTRODUCTION

**B**LENDED approaches in language teaching have come into being as there is a growing need to combine face-to face instructions with technology. According to Gruba and Hinkeliman (2012), this is possible through purposeful, appropriate, multimodal and sustainable considerations. For these approaches to be successful, it requires teachers to be time conscious, be commitment and competent in course designing and teaching, have sufficient teaching experience and be reflective (Moser, 2007). However, if the focus is only on the 'novelty effects' of computers, these approaches fail to be sustainable (Hubbard, 2005). While Garrison & Vaughan(2008) affirm that these approaches are superior to classroom-based approaches to learning, Gruba & Hinkelman(2005) are of the opinion that innovations and effective teaching and learning are not necessarily based on the use of new technologies. But they do promote the view that blended approaches can open a 'third space' or

'middle ground'(Cuban,2009)that would lead educators to think of new media and technologies in language learning at the tertiary level.

## II. THEORETICAL ASPECTS OF BLENDED APPROACHES

### Definition

According to Bonk and Graham (2006) defined blended learning systems as 'the combination of face-to-face instruction with computer – mediated instruction' (p.5). It is about teaching using technology. To support this, Garrett(2009) states that university language teaching and learning is being done in smart classrooms that are equipped with whiteboards, networked computers and display screens alongside a range of digital mobile devices.

### Goals and Objectives of a Blended Learning Programmes

There are three objectives to use technology in the blended language programmes. They could be:

- a) Macro objectives focus on global and national guidelines. These examine the influence of international and institution standards on blended learning. Standardization promotes educational innovations. It assists teachers to work with sound principles (Rea-Dickens,2008).For language teachers, the standardized code is the well-known 'Common European Framework(CEF) of References for Languages'(Council of Europe,2001) that adopts an action-oriented' approach to language learning.CEF lists a series of 'can do' statements in six different proficiency levels. Learners are seen as social agents who are motivated to accomplish a range of linguistic and non-linguistic tasks in particular real-life settings. Members of TESOL (The Teachers of English to Speakers of Other Languages) have drafted a 'Technology Standards Framework' (Healey et al.,2009) that sets out baseline expectations for both learners and instructors with regard to technologies. Some specific goals at this level are:
  - Goal 1: To acquire and maintain foundational skills and knowledge in technology for professional purposes.
  - Goal 2: To integrate pedagogical knowledge and skills with technology to enhance language teaching and learning.

---

B. Shobarao. Email: bshobarao@yahoo.com edu

Goal 3: To use technology to improve communication, collaboration and efficiency.

- b) Meso objectives focus on programme and syllabus. These are about how programmes or syllabus may have an impact on blended approach. Here the focus is on how each level of study establishes a solid basis for advanced studies. It touches on overall institutional policies and graduate attributes faculty or departmental guidelines and a course structure. Some specific goals at this level are:

Goal 1: To be adept at learning in a range of ways, including information and communication technologies

Goal 2: To have set flexible and transferable skills for different types of employment

Goal 3: To have excellent interpersonal and decision-making skills, including an awareness of personal strengths and limitations

Goal 4: To have an understanding of the social and cultural diversity in the community

Goal 5: To have a broad global understanding with a high regard for human rights, equity and ethics (Attributes of the Melbourne graduate).

- c) Micro objectives focus on lessons and tasks. These are about how instructors may make considered decisions about technologies for certain activities.

Goal 1: To create unique learning activities for each lesson plan

Goal 2: To develop a coherent and defensible plan for each integral period of instruction

Goal 3: To inform students and other stakeholders about the progression of learning activities and goals

### III. CATEGORIES OF BLENDED LEARNING

Bendes and Graham(2006) categorized blended learning into three kinds. There is a progressive development of the learner in each approach. They are as follows:

a) **Enabling approach**-This is based on the tradition of distance education. These approaches seek to provide greater flexibility, access, and convenience to learners by providing similar learning materials. For instance, an instructor may deliver a live lecture, record the presentation, upload the recorded lecture and accompanying slides online. In this way it enables students to attend the lecture as well as download what they require when they need it.

b) **Enhancing approach**: This approach promotes incremented adoption of technologies in face-to-face setting so as to slowly integrate digital resources. In this

approach, students may use few networked capsules in a collaborative manner to help answer live discussion and questions. Outside the classroom, students are able to access supplementary materials, upload their own contributions and participate in online forums.

c) **Transformational approach**: This approach explicitly sets out to foster radical changes in pedagogy. These transform learners from a passive receiver of information to active constructors of knowledge. For instance, students and instructors may be engaged in a collaborative project to produce their own video clips, use the mobile technologies, record feedback data and set up an interactive website. Here the aim is to use interactive technologies that foster transformation in the learners.

### IV. PRACTICAL ASPECTS OF BLENDED APPROACHES

This section deals with blending technologies within the context of language learning. The micro objectives best suit here as it deals with how instructors may make considered decisions about technologies for certain activities. Here the teachers create task based or content-based learning with a focus on communicative or interactive outcomes. A practical guidelines to these approaches are given by Leaver and Willis(2004).

**Practical tip 1**- Frame objectives regarding the appropriateness of the design, configuration, materials and sustainability of the blending approach that the teacher plans to use in the class. Provide space for students to work in pairs, groups or alone.

**Practical tip 2**- Divide the text book into two – a) classroom-based tasks and on-line tasks.

**Practical tip 3**- On-line task needs to serve as a consolidation, review or follow-up of what is done in the face-to-face teaching. The tasks should be so blended that the face-to face dimensions merges with the on-line dimensions.

**Practical tip 4** - Use narratives that may include mini-lectures, explanations and demonstrations by the teacher.

**Practical tip 5**- Include interactive actions such as choral drills, quizzes and web information searches with fill-in –the blank sentences.

**Practical tip 6** - Techniques such as information gap activities give chance to students to communicate and they give them scope to practice the language, and adapt the sentence patterns with varying vocabulary.

**Practical tip 7**- Provide as many options for students to produce their work as a wiki posting, blogs, pair dictation, speech, PowerPoint presentation etc.



## V. LIMITATION OF BLENDED APPROACHES TO LANGUAGE LEARNING

The macro and meso objectives do affect the use of technology in the face-to face classroom. Besides there are constraints stated below that do not allow teachers to think and plan of a blended approaches in the classrooms. These constraints are:

- a) Fixed textbook and syllabus to complete becomes a major constraint. Teachers have to complete the portion and prepare students for exams, so blended approaches may not motivate the teacher.
- b) Large classrooms can be another constraint that does not give scope to uses these approaches in the classrooms.
- c) Time schedule fixed for each class could be a major constraint for the teachers.
- d) Teachers' own belief in the use of technologies in language teaching.

## VI. CONCLUSION

Blending technologies into language learning involves both external and internal influences (Oxford & Jung, 2007) and the right attitude and dedication for which there is a requirement of committed teachers. These approaches open rich areas for pedagogy and research (Coiro, Lankshear, Knobel & Leu, 2008, Jewitt, 2009) which could be explored further in the area of ELT.

## BIBLIOGRAPHY

- [1] Bonk, C.J., & Graham, C.R. (Eds). Handbook of blended learning :Global Perspective, local designs San Francisco: Jossey-Bass. 2006. Print.
- [2] Council of Europe. Common European framework of reference for languages. Learning, teaching, assessment. Cambridge, U.K.: Cambridge University Press. 2001. Print.
- [3] Cuban, L. Hugging the middle: How teachers teach in an era of testing and accountability. New York: Teachers College Press, 2009. Print.
- [4] Coiro, J., Knobel, M., Lankshear, C & Leu, D. (Eds) The handbook of research on new literacies, Mahwah, NJ: Erlbaum 2008. Print.
- [5] Garrett, N. Computer - assisted language learning trends and issues revisited. Integrating innovation. The Modern Language Journal, 93:719-740 (2009) .Print.
- [6] Garrison, R., & Vaughan, H. Blended learning in Higher Education: Framework, principles and guidelines. San Francisco: Jossey-Bass. 2008. Print.
- [7] Gruba, P., & Hinkelmann, D. Blending Technologies in Second Language Classroom. New York: Palgrave Macmillan. 2012. Print.
- [8] Healey, D., Hegelheimer, V., Hubbard, P., Ioannou-Georgiou, S., Kessler, G & Ware, P. TESOL technology standards framework. Alexandria, VA: TESOL 2009. Print.
- [9] Jewitt, C. The Routledge handbook of multimodal analysis. London: Routledge 2009. Print.
- [10] Hubbard, P. A review of subject characteristics in CALL research. Computer assisted language learning. 18(5):351-368 (2005). Print.
- [11] Leaver, B & Willis, J. Task-based instruction in foreign language education. Washington, D.C: Georgetown University Press 2004. Print.
- [12] Masie, E. The blended learning imperative. In C.J. Bonk & C.R. Graham (Eds) Handbook of blended learning: Global perspective,

local designs (pp.22-26). San Francisco, CA: Pfeiffer Publishing. 2006. Print.

- [13] Moser, F.Z. Faculty adoption of educational technology. *Educational Quarterly* 30(1):66-69 (2007). Print.
- [14] Oxford, R & Jung, S.H. National guidelines for technology integration in TESOL programs. Factors affecting (non) implementation. In M. Peters, K. Murthy-Judy, R.Z. Lavine & M.A. Kassen (Eds.) Preparing and developing technology-proficient L2 teachers (pp.23-48). San Marcos, TX: Computer Assisted Language Instruction. Consortium, 2007. Print.
- [15] Rea-Dickens, P. Classroom-based assessment. In E. Shohamy and N. Hornberger (Eds) *Encyclopedia of Language and Education* (pp.257-272) 2008. Print.
- [16] Thorne, K. Blended learning. London and Sterling, VA: Kogan Page 2003. Print.

## INTERNET RESOURCES

- [1] Attributes of the Melbourne graduate [http://www.unimelb.edu.au/about/attributes.html]
- [2] Valiathan, P. Blended learning models, learning circuits. Retrieved from http://www.learningcircuits.org/2002/aug2002/valliathan.html

# Media and English

Dr. I. Suhenya

## I. INTRODUCTION:

AS English expands in the 21st century as a language of international communication, the number of learners who master Basic English skills will grow. In the realm of electronic communication, a phenomenon that has revolutionized the world today, English has only a few murmuring rivals and no equals. Eighty per cent of the world's websites are in English, and ninety per cent of the internet users use the English language. Seventy-five per cent of the IT-enabled services, emails, faxes, telexes, cables, blogs and SMSes are in English, while radio communication in English constitutes 60 per cent. English is the most preferred medium of computer software, and the software giants like IBM and Microsoft are based in the English-speaking countries. Statistics speak of the English speaking USA having more number of computers than all the countries of the world put together.

## II. MEDIA AND COMMUNICATIVE INTELLIGENCE:

The media provide a substantial amount of content in English. Different countries and linguistic environments provide different opportunities for English contacts via the media. The term "media" as used here includes the whole range of modern communications media: television, the cinema, video, radio, photography, advertising, newspapers and magazines, recorded music, computer games and the internet. Media texts are the programmes, films, images, web-sites (and so on) that are carried by these different forms of communication. In recent years, there have been several developments in the media environment that make the case for media education all the more urgent. The screen in the living room is now the delivery point for a wide range of electronic goods and services, and for a plethora of information and entertainment.

## III. THE NEED FOR CNA: (CURRENT NEWS AWARENESS):

English is taught as a second language in all the states of India. It is the language of higher education, the higher courts of law, the national newspapers, many works of literature and India's growing international business. Nevertheless, it comes as a surprise that many university students lack adequate reading and communication skills.

This has prompted the local public universities to conduct English Language courses for their undergraduates. While they were in schools these students rarely practiced reading English outside the English language classroom. Many of them did not even take the trouble to read the local English dailies!

There is a need to create a classroom experience in which English language newspapers and TV News Channels are used to encourage functional literacy in English among the students. At the same time, the students are also provided with the necessary experience to improve their reading skills, enhance their knowledge of current issues and improve the communication skills. Functional literacy is confined to reading so as to be able to answer comprehension questions, complete grammar based exercises, or write a composition/essay. Occasionally, for core subject reference materials, students read books and journals in English to obtain additional domain knowledge.

The objective of this module is to share an enriching classroom activity called the Current News Awareness (CNA) which can be introduced and managed on an on-going basis using some of the local English newspapers, TV News Channels and the E-Magazines. The main objective would be to encourage the students to improve their knowledge of current issues, assimilate and express it, thereby improving their communication skills as well as enhancing their knowledge of current issues.

## IV. IMPORTANCE OF CNA SESSIONS:

Most candidates go through a screening test before the preliminary interviews. This screening test consists of MCQs based on current issues. In an interview too, they may be tested on their awareness of national and international issues related to Industry, Entertainment, Sports, and Games, The Share market and Social Awareness. If they exhibit their awareness and communicate it effectively, they end up impressing interviewer.

## V. MEDIA EDUCATION WITHIN LANGUAGE AND LITERATURE TEACHING:

The wide spread availability of computers are causing tremendous change in English language. Teaching Asian countries in general and India in particular are at the heart of this change. Let us see how computers contribute for learning English language with pedagogical application and by helping us to understand the nature of language.

---

*Dr. I. Suhenya, Prof/ English, Mookambigai College of Engineering, Kalamavur, Pudukottai dt*

As communication progresses from denotation to connotation and from text to context the resources of multi sensory imagery become increasingly valuable. Teachers are turning to technologies to make many of their tasks more efficient. Technology can make language learning faster and easier. A modern electronic computer is capable of rapid and precision of a variety of pieces of equipment; it could present a program of films, tape recording etc., according to an arbitrarily complex plan, and might therefore be programmed to make instructional or groups in a classroom.

Media such as video or photography are sometimes used to record classroom activities or as an alternative way for students to present their work; and some have argued that media production of this kind offers a new method of learning that can be used in many situations. In some secondary schools, for example, media production activities are used in this way in a wide range of curriculum areas, including Art, History and Science: rather than writing up their work in essay form, students present it using audio-visual means. In presenting their work in media formats, and to a wider audience than simply their teachers, students can be enabled to reformulate their existing knowledge, and to learn at a more profound level. Furthermore, it could be argued that many students' existing knowledge of school subjects—their "commonsense ideas" about science and technology, about other countries or about the past—are at least partly derived from the media in the first place.

the most accepted means of written communication in corporate. **CALL** (Compute Assisted Language Learning) programs designed to facilitate the language learning process. It is a student centered learning material, which promotes self paced learning and includes a substantial degree of interactivity. Call programs can improve grammar, vocabulary, knowledge, reading comprehension and also writing skills. More flexible than text books, workbooks or tape recorders, these programs do not pre determined sequence, but allow students to control their own progress, selecting options from a 'menu' as to what they will practice according to their interests or perceived level of proficiency. The computer graphics capability distinguishes it further from pedagogical tools with graphics; an activity can be done through color drawings or animations.

Games involving vocabulary will help students a lot in vocabulary development. Adventure games, in which the use interacts with a program to solve mystery or to survive in an imaginary environment, provide an excellent call experience for students. Requiring decision making on the part of the players and including a great deal of text display, these games promote comprehension skills and thoughtful response. At the same time they

simulate interest in the language by associating it with an enjoyable leisure time activity.

Drill and Practice program consists of mechanical manipulations of words or sentences using transformation and substitutions or multiple choice and fill in the blank questions. These exercises items are usually limited to single sentences eliciting one word answers or substitutions. The value of drill and practice programs depends on the accuracy and relevance with which vocabulary and structures area used and on the quality of error analysis in the program.

## VI. ENGLISH LEARNING AND THE INTERNET

The internet is very useful for teaching English. Teachers can use it for gathering information for their classes, including teaching plans and materials for classroom use. They can subscribe to mailing lists related to TEFL/TESL, and exchange information with other teachers. They can subscribe to electronic journals or newsletters either by e-mail or using the World Wide Web and keep up with new trends of English teaching, finding new or interesting publications they can consult with publishers on teaching materials.

There are a wide variety of ways that the Internet can be used in the classroom. Teachers can organize 'keypad' exchanges, and students can exchange letters with their keypads and have the experience of corresponding with people from all over the world. Students can use a mailing list. They can subscribe to student lists to exchange ideas with other students around the world. There many learning materials on the World Wide Web and students can use them to study English. They can read news in English using either by e-mail or on the World Wide Web. Students' newspapers or newsletters can be posted on the World Wide Web.

In the latest educational scenario, computer and its application have been emerging as the trendsetter largely for the benefit it provides in any field. The advent of the high powered multimedia kept the learner close to authentic situations where learning simultaneously involved listening, seeing, reflecting, doing and participating

Multimedia additionally provides further and more powerful dimensions to communication when the control and manipulation of this meaningful information is passed into the hands of the learner. The ability to interact with these communication elements via interactive multimedia allows language learners to explore, discover, ponder, search, question, answer and receive feedback. Owing to the rapids to development of industry and technology, and increasing need has been felt for improving the communication skills at all levels of administration. However the available teaching and training are not

adequate to meet the demand of the industry. Hence, it has become necessary to identify more methods to suit the present trend. Undoubtedly multimedia is capable of bringing authentic, like, real world impressions before the learners to give the maximum insight or experience in the subject or field in which a learner is interested.

#### VII. MULTIMEDIA – A FLEXIBLE LEARNING RESOURCE:

The PC based learning center has all the needed, resources. Hence the responsibility for any learning decision during the use of multimedia is passed over to the learner. The learner only can decide how to study, when to study, how to relate with the other subjects and projects. Therefore, any successful language learner is the responsible for his own learning. Multimedia with its wealth of in built materials and its feedback makes the learning autonomous. In the multimedia environment, the learner need not worry about his mistake or weakness. Working in the computer environment is a private. Only the learner knows the error that too the media points out to the error.

Only when the error is detected and rectified the computer switches onto the next move. In that case the learner no needs to feel shy or need not to have any inferiority complex about the error or regret feelings in front of the others. Interactive computer network allows student to test the result learning without the risk of being punished for any mistake, therefore this non- punishment interference from any sector pave s way for the learner to build their self confidence thereby they develop more interest to learn at a faster rate.

#### VIII. MOBILE LEARNING

Recent developments in the field of Information and Communication Technologies (ICT) in general and global wireless technologies in particular that includes 3G networks, GPS, GSM, GPRS and satellite systems. Other communication technologies including Wi-Fi, Wi-Max and Bluetooth have created a wide array of new possibilities for the common man.

When these technologies are used in the learning paradigm, mobile learning emerges. Mobile learning or m-learning has been defined as learning that takes place via such wireless device as mobile phones, personal digital assistants, or laptop computer. In the different definitions encountered in the literature, it is only the employment of specific types of technology that seem to differentiate mobile learning from thither forms of learning. However when considering mobility from the learners' point of view rather than the technology's it can be argued that mobile learning goes on everywhere- for example, pupils revising for exams on the bus to school doctors updating their medical knowledge while on

hospital rounds, language students improving their language skills while traveling abroad.

#### IX. CONCLUSION

The role of the teacher in the multimedia classroom is entirely different from the normal classroom environment. Hence the teacher has the important role to play in the conventional classroom atmosphere where he enters the class with some books and ready-made notes and conducts the tests to assess the students. There is no self evaluation method for the students. However, in this new mode, the teacher is only a facilitator or a coordinator and the teacher should have hands on experience on the computer, with improved instructional capabilities and a vehicle through which to apply the instructional technology skills acquired through training and professional development. The role of teachers and the students apparently change .the teacher orchestrates the follow of communication for the whole class.

In case that learning-oriented computer software is used in multimedia lab, the teacher has to be aware that students no longer depend on the only source of knowledge. The computer software will 'teach' students the knowledge that teachers are supposed to teach. As a result, a teacher must transform his role form a coach or a director under the communicative framework to a coordinator. The teacher coordinates the flow of communication between the teacher and the students as well as between the students and the computer. Using technology in teaching is highly advantageous to a teacher as it gives the teacher the power to create ideas in the visual medium.

#### REFERENCES

- [1] Mobile Books portal of Mobile Veda at [www.publish.com](http://www.publish.com)

#### WIKIPEDIA RESOURCES

- [1] Advantage s of Visual Aids and Effective Design. 1.june 2009
- [2] <http://www.hyu.Edu/class/keefers/wave/samans.html>
- [3] Browne,C.(2004) New Perspectives on CALL for Second Language Classrooms – Sandra fotos.
- [4] Levy,M. (1997) Computer –Assisted Language Learning Context and Conceptualization Oxford Linguistics.

# A Study on Using Postcolonial Perspectives for English Language Teaching

I. S. John Vijayakumar and Dr.S.Radhika

**Abstract---** *Postcolonial literature portrays the socio-cultural identities and responses of a nation or a group of people in relation to postcolonial relationships. Postcolonial writings can also be viewed as literature placed in a setting in which the colonized have managed to extricate themselves from the clutches of the colonizer and have taken responsibilities of the socio-cultural development process of the society. Also, postcolonial literature lends excellent scope for ELT teachers to effectively utilize texts written in the present era for communication skills development. By using postcolonial texts for English language learning, the Thems' (the colonized nations) must resist or desist from seeing the English language from the colonial perspectives and approach learning English from a professional perspective. This study is an attempt to create task based learning materials for use in ELT classrooms using post – colonial literature of the target learners.*

**Keywords---** *English language, teaching, learning, post colonial literature, tasks*

## I. INTRODUCTION:

POST colonial literature is a literature that portrays the socio-cultural identities and responses of a nation or a group of people in relation to post colonial relationship. Post colonial literature is placed in a setting in which the colonized have managed to extricate themselves from the clutches of the colonizer and have taken responsibilities of the socio-cultural development process of the society. The study is an attempt to create task based learning materials for use in English language classrooms using post colonial literature of the target learners. Learning of English should not be seen from a colonial perspective instead from a professional perspective.

## II. IDENTIFYING POSTCOLONIAL TEXT:

The importance of identifying relevant extracts of texts in post colonial writings is bound to help the reader

---

*I. S. John Vijayakumar, Assistant Professor (Sl.G.), Dept. of English, School of Science & Humanities , Kongu Engineering College, Perundurai – 638052. Email: isjvk@kongu.ac.in*

*Dr.S.Radhika, Assistant Professor, Dept. of English, School of Science & Humanities, Kongu Engineering College, Perundurai – 638052. Email: sradhika@kongu.ac.in*

understand different perspectives in post colonial writing. This understanding will in turn help the learner to become aware of the social aspects like culture, custom, and historical details interwoven in the text. Such an experience will help the learner become more involved and this involvement of the learner will provide a fertile ground for the English language teacher to use the post colonial texts for English Language Teaching (ELT) related tasks.

One of the advantages of using a post colonial text with a native setting is the ease with which the learner can understand and perceive the happenings and the environment in the text. This ability of the learner to get associated in a more personal way will help to approach the tasks and perform them in a more meaningful manner.

One of the important aspects of socio-cultural theory is the idea that learning is equally a social process as much as it is a cognitive process and the development of communication skills has been explained by socio-cultural theorists that it is a process that also has a social element attached to it. A post colonial text, hence, lends excellent opportunities to English language teachers to enhance language proficiency of learners under the Communicative Language Teaching framework.

## III. USING POST COLONIAL TEXTS IN ENGLISH LANGUAGE LEARNING:

By using post colonial texts to English language learners, the teacher can adopt both the top-down approach as well as the bottom-up approach depending upon the need. Also, using content based learning techniques, the teacher can substantially improve the level of engagement of learners and also to provide them to have a rich experience of both understanding the world present in the text and the English language aspects important for using it as a skill to express their ideas.

Time and again, researchers have expressed the view that post colonial texts are excellent reference materials to be used by English language teachers to students who belong to the region of the text. This goes on to create awareness among teachers that the use of random materials taken from the internet can be substituted with texts of this nature. As Fakrul Alam rightly pointed out, the task of post colonial language pedagogy should be to sever free of false divides formed between language and literature, to give more attention to language in its most

living form as personified in literary language, and to discover postcolonial writing in English as a resource for teaching reading and writing skills to our students in our part of the world. McKay notes that literature promotes creativity, although the success of literature in the ESL classroom depends on the use of texts that are not too difficult or too far removed from the learner's world.(1986:193)

#### IV. FRAMING TASKS:

Content selected for framing tasks is an excerpt from *The Greater Common Good* by Arundhati Roy. Approach on which the tasks are framed is the top-down approach.

*I had crossed the Narmada by boat from Jalsindhi and climbed the headland on the opposite bank from where I could see, ranged across the crowns of low, bald hills, the tribal hamlets of Sikka, Surung, Neemgavan and Domkhedi. I could see their airy, fragile, homes. I could see their fields and the forests behind them. I could see little children with littler goats scuttling across the landscape like motorised peanuts. I knew I was looking at a civilisation older than Hinduism, slated - sanctioned (by the highest court in the land) - to be drowned this monsoon when the waters of the Sardar Sarovar reservoir will rise to submerge it.*

Task 1: Write the paraphrase of the given text

This task aims at the learners' understanding of the given task and enhances the writing skills of the learners.

Task 2: Identify any four common ideas associated with the passage

The learners after paraphrasing the text will be able to identify some common areas from the given text. For example, River, Construction, nature, Social issue, viz-a-viz.

Task 3: Pick out the words from the passage indicating the four identified areas

After identifying the ideas the learners will be able to associate words from the passage related with the ideas. For example, River – Narmada, boat, water, drowned, reservoir

Task 4: Understanding the words identified

After identifying the words related to the ideas, the learners will be able to locate the words in their parts of speech; verbs, adjectives, prepositions related to the word in the particular sentence.

Task 5: Rewrite the passage

After understanding the language nuances in the text, the learners will be able to write a passage on their own by putting them in the situation of the writer.

#### V. UNDERSTANDING THE LEARNING EXPERIENCE:

The use of texts and associate activities that are familiar to the learner will create a comfort zone that will induce a better learning experience. Post colonial texts from the world of the learners will easily appeal to the learners' intellect and crate a consciousness for the learner to react to the content of the text. When this social understanding part of a text is imbibed by the learner as mentioned by the social theorists, it will be easy for the English language teachers to set on their tasks to teach learners communicative competence.

#### VI. CONCLUSION:

An attempt has been made to use post colonial texts from the 21<sup>st</sup> century social writings and help learners to develop communicative competency especially to enhance the creative skills like writing and speaking of the learners. In future, attempts can be made to help learners produce literary texts of their own. So from using post colonial texts for teaching and learning English, a conscious effort should be made by English language teachers to create new writings in the present age. When a comparative study is made on the post colonial writings on the early part of the 21<sup>st</sup> century with creative writings written by present generation learners, a whole new dimension of Indian writing in English will be available to the readers.

#### VII. REFERENCES

- [1] Brumfit, C.J. and R.A. Carter (eds.) (1986) Literature and Language Teaching. Oxford University Press
- [2] Alam, Fakrul. N.D. Using Postcolonial Literature in ELT
- [3] Thamas, Mona. How And Why Jamaica Kincaid's A Small Place Can Be Used In The Language Classroom In Sweden. 2015
- [4] Panavelil, Abraham. Teaching Poetry in an EFL/ESL Class: An Integrative and Communicative Approach. ELT Voices, India. June, 2011.
- [5] Dewi, Novita. Teaching Postcolonial Literature: The "Know – What", the "Know – How" and the "Know-Why". The Graduate Program of English Language Studies, Sanata Dharma University, Indonesia.
- [6] Kerstin W. Shands. Neither East Nor West - Postcolonial Essays on Literature, Culture and Religion. English Studies 3. Elanders, Sweden.2008

# Digitization of books: Learners of Text to Speech Output Method

Ajukesh, R.

**Abstract---** *Because of the increase of 'digitization of Books,' learning has become an easy task for the present-generation. More than ever, this has paved a way for the visually challenged learners (VCLS) to exploit 'text to speech output (TTSU)' method to develop their learning interest. At first, this method has been carried out only in the special schools that are meant for visually challenged children. This paper believes that the (I) the increased number of screen reading software; (II) viability of the portable screen reading software; (III) specially designed technical devices with Speech Recognition Software for VCLS; and (IV) available screen magnifiers enable visually challenged learners to make use of the available digitized materials in the general library. Moreover, this paper gradually explicates the above stated methods in connection with visually challenged learners and digitization of Books.*

**Keywords---** *Digitization; visually challenged; Screen readers; text to speech output; Braille; Opportunity to Learn (OTL).*

## I. INTRODUCTION

**D**IGITIZATION OF BOOKS (DB) provides VCLS the 'Opportunity to learn (OTL)' is the fundamental concept of this paper. Christopher Johnstone, Jason Altman, Joe Timmons, and Martha Thurlow have brought in the term 'OTL' to ensure the importance of assistive technologies (AT) in the learning process of visually challenged learners. (2009). since VCLS have become technical assisted learners, Braille materials are unexploited. Hence, this research believes that, in recent years, AT and VCLS are indivisible in the learning process. Moreover, this paper will gradually explicate blindness, Braille method, and other accessibilities to ensure how AT VCLS and DB are interrelated in the learning process.

## Definition of Blindness

According to oxford dictionary, the word blindness is stated as "Unable to see because of injury, disease, or a congenital condition."

## II. TYPES OF VISUAL DISABILITY

The word 'visually challenged' may indicate a particular group but, their visual disability has been classified into four major kinds. They are: Partially sighted, Low vision, Legally blind and Totally blind. (2015)

### Partially Sighted

The term 'Partially sighted' refers to a person with some type of visual difficulty which results in the need of special education. Here, the level of suffering is less by comparing with the other kinds of blindness. Even though they are thought in special ways, they mostly try using their eyes to get the things done. They would be medically blind and physically sighted (May 2009).

### Low Vision

It refers to the next level and the problem is quite serious than the previous. There is a severe visual impairment in a person. It does not necessarily have to be a distance vision problem. The term applies to all individuals who are unable to read a newspaper text of common size at normal reading distance and this disability cannot be corrected by glasses or lenses. Unlike partially sighted, these people usually use another sense or possibly other senses to learn. Some of them have the habit of making use of additional lighting and screen magnifiers or text size change/variation or optical character recognition software (OCR).

### Legally Blind

A person has less than 20 / 200 sight in the better eye (the first number indicates the length in meters needed by a visually impaired person to see an object and the second number indicates the length in meters needed by a non-visually impaired person to see the same object. This is often accompanied by a very limited vision field.

### *Totally Blind*

Those people have to learn with the help of Braille print and other non-visual aids. Some of the people are able to recognize darkness and light, some of them do not perceive the difference at all. Besides, there are some categories also found such as Colour blindness and Night blindness etc. They do not directly fall into the category of visual disability (2015). All visually challenged would be familiar with 'Braille method', unless one is not blind by birth.

### *Braille method*

Braille is a tactile writing system used by blind people and was invented by Louis Braille, a visually challenged and developed in the year 1824 by himself. Therefore his name was given to the system. Braille generally consists of cells of 6 raised dots conventionally numbered and the presence or absence of dots gives the coding for the symbol. In 1852, it has his 6/dot method became worldwide standard, helping the blind read books, clocks, wristwatches, thermometers, sheet music and even elevator buttons (2006). In recent years, this system has been replaced by technical devices that have been dominating the present-day world.

Why is digitization of Books required for VCLS?

1. Visually challenged learners could not make use of printed copy of materials;
2. High cost of Braille printers as well as printed materials;
3. Shortage of readers and convincing readers;
4. Shortage of Braille materials;
5. Hardly concerned Braille materials, because of its dying nature;
6. over reliance on technology assisted learning;
7. Hardly produced Braille materials of new publications; and
8. Digitization of Books is easy to access.

### *Accessible screen readers*

A screen reader is a specialized type of software that converts electronic text to speech and outputs it to headphones, speakers or refreshable Braille devices, in line with user preference. Screen readers utilize an accessibility API (a software 'hook' to access either a computer's operating system, which in turn communicates with certain computer software or a web browser and the web content it renders.

### *Screen Magnifiers*

A screen magnifier is software that interacts with a computer to present enlarged screen content which is specially designed for low-vision.

There are different kinds of screen readers and screen magnifiers that assist VCLS to develop their

acquaintance with all subjects. Speech recognition software allows VCLS to operate their computer and enter data using voice rather than a mouse or a keyboard. Text-to-speech software converts written text such as, text files, web pages, PDFs and emails into audio files that can play on a wide range of devices, such as computers, MP3 players, iPods and CD players. (2015). Job Access with speech (JAWS), assists VCLS to read materials in English and 30 different foreign languages (Freedom scientific 2016). Non visual desktop application (NVDA) can assist VCLS to read materials that are in vernaculars. These screen readers have been established in some of the general libraries to stimulate the learning interest of VCLS.

Will digitization of books really benefit them?

1. VCLS can learn things on his/her own;
2. They can read more than once. There is no time limitation;
3. They can fearlessly participate in the academic activities;
4. They can read materials with regard to other studies, that are not their area of study; and
5. It will ensure their learning ability and their capability of analyzing and approaching things.
6. Will it affect their learning process either way?
7. VCLS may not look for authenticity of text, that he/she reads;
8. VCLS may enjoy reading/learning, they might fail to recall what they have read/learned;
9. Their option for reading will certainly be technical readers (Screen readers); and
10. They may develop their hatred for manual readers.

Generally speaking, VCLS have become the learners of 'text to speech output' method, because of several shortcomings in Braille method.

### III. CONCLUSION

Since technology assisted learning has been playing a convincing role in the present-day world, screen readers installed technical devices that are designed for visually challenged learners provide a space for them to participate in the act of reading/learning. Hence, digitization of Books can very well accommodate Visually Challenged Learners to stabilize their learning process with screen readers. At present this has been practiced in some of the general libraries such as, Anna Library, Chennai, (MRCDA) Loyola College, Chennai, (MRCDA) Madras University, Helen Keller Talking Book Library Madurai and Mohan Library EFL University Hyderabad. If it would be introduced in all schools and colleges in India that will benefit VCLS at all levels.



## REFERENCES

- [1] Freedom scientific, (2016) Blindness Solutions: JAWS the world's most popular Windows Screen reader accessed on Monday: 8, March 2016.  
<http://www.freedomscientific.com/Products/Blindness/JAWS>
- [2] Johnstone, C., Altman, J., Timmons, J., & Thurlow, M. (2009). Students with visual impairments and assistive technology: Results from a cognitive interview study in five states. Minneapolis, MN: University of Minnesota, Technology Assisted Reading Assessment.
- [3] Mellor, Michael. (2006), Louis Braille: A Touch of Genius. Boston: National Braille Press.
- [4] SSMR. RNIB, (May, 2009) Understanding the Needs of Blind and Partially Sighted People: their experiences, perspectives, and expectations, Case Studies, The University of Surrey
- [5] Vinoth, Subramanian. (2015) Activity Based Learning: Sharpening English Language Skills of Visually Challenged Learners at Tertiary Level, M Phil dissertation. Loyola College. Chennai.

proof

# Say no to 'No'

## Developing Communication Skills

J. Jenifar

**Abstract---** *Communication is the process of transferring thoughts or messages between a sender and a receiver through various methods such as written words, nonverbal cues, and spoken words. A good communication skill is quality of a well-educated person. It is also the mechanism we use to establish and modify relationships. It takes time to improve one's communication skills. It begins with simple interactions. It gives opportunities each time by using skills. Development of technology also plays an important role in student's communication skills. The students can increase their written and oral communication skill using technology. There are many barriers like physical barriers, psychological barriers, and language barriers. This paper gives some tips on how to avoid those barriers and to develop communication skill.*

**Keywords---** *Communication, transferring, well-educated person, modify, interactions, technology.*

### I. BACKGROUND TO THE STUDY

COMMUNICATION is very important for all beings, because no one can survive without communicating. Communication skills are a part of the spoken and written language. Communication refers to the exchange of thoughts and ideas with the intention of conveying information. The importance of communication skills cannot be underestimated. It has been so long that people used hand gestures, body language etc to converse with each other. The lack of effective communication skills has a negative impact on the personal as well as professional life of a person.

Communication skills are fundamental to success in many aspects of life. If someone wants a job in any institution or offices, they must have good communication skills. The organizations expect this qualification from the candidates to develop their business. The people who improved their communication skills usually enjoy better interpersonal relationships with friends and family.

### HYPOTHESIS

This paper is about developing communication skills through practice. There are many difficulties faced by the beginners according to their age, cultural background and etc. Here are some problems of learning communication skills and tips for overcoming those problems and how to become a better communicator.

### II. RESEARCH QUESTIONS

1. What is mean by communication?
2. What is the importance of learning communication skills?
3. What are the common barriers of learning communication skills?
4. How to develop communication skills?

### III. DISCUSSIONS

Communication is the method by which people share their ideas, information, opinions and feelings. It is a two-way activity between two or more people. There are various modes of communication some of them are used more commonly in some workplaces than others. There are various forms of verbal and non verbal communication. Human involved in communicating his thinking and understanding others point of view. Communication help people relate, interact, understand, believe and get connected to others. For some instance the communication becomes one way process. For example, sometimes while a teacher is trying to interact with the students, students don't respond although it was to be a two way communication it has became a one way communication process.

According to most of the researchers the best way of communication is reading, this helps the learners to gain knowledge, helps them to invest their time with themselves and it is also means of entertainment. If a person wants to gain knowledge then he can approach to some biographies, or newspapers or magazines. This will help the person know the world around him in a better manner.

Good communication skill is one of the best qualities of professionals. For instance, the doctor needs good communication to convey the patient's condition to him. A doctor may be knowledgeable and may have considerable expertise in his area of work but he should

have understand the patient's needs. Then only he could be a good care taker. A teacher must be able to communicate well with students. This quality can inspire the students to have attention and make them participate in class.

Communication skills are very important for surviving in the society. Most people judge another person on the basis of their body language and form an opinion based on their perception. Effective communication skills are as important to humans as, basement is to a house, to communicate and express them. If the spoken language fails to express, that is easily expressed with certain hand and facial gestures. Reading, writing and listening carefully are the three most important communication skills for students.

#### IV. BARRIERS OF LEARNING COMMUNICATION SKILLS

There are many barriers affect the learners from learning communication skills. The most common problems are,

1. Lack of attention, interest and distractions
2. Physical disabilities such as hearing or speech difficulties.
3. Physical barriers to non-verbal communication. They are unable to see the non-verbal cues, gestures, posture and general body language can make communication less effective.
4. Language differences and the difficulty in understanding unfamiliar accents.
5. Expectations and prejudices which may lead to false assumptions or.
6. Cultural differences. The norms of different cultures, as the way the emotions are expressed. For example, the concept of personal space varies between cultures and between different social settings.

Here are some tips to improve communication skills.

1. The learner should have confidence when talking, and do not consider what other people think.
2. They must make sure that they are using proper grammar.
3. They should not over-praise themselves in front of the audience.
4. They should avoid thinking that what they are saying is correct.
5. They must try to speak fluently and try to make sure people can hear them when they speak.
6. They should not interrupt or talk over when the other person is speaking because, it breaks the flow of conversation and timing is important.

7. They must make eye contact when speaking and listening.
8. If the learners want good communication skills, first be confident and do not stammer in front of people and try to speak more with people. This will give them the idea how to talk with different people.
9. Practice makes the learner's communication get better and better.
10. They must start practice speaking in public places.

#### V. SUMMATION

Communication skills are very essential for the successful future career of a student. In today's competitive world, communication skills in the society are the most sought after quality of an educated person. Apart from reading and writing presentations, reports and speeches are a part of college curriculum. This has been introduced in schools and colleges for the overall development of students. This makes expressive skills and managing skills also important for a student. It is also important to develop communication skills in relationships. Learning is the only way to improve skills. Not only skills but also the other aspects in learning, so try to "say No to no" in learning. Otherwise there won't be any improvement in education.

#### REFERENCES

- [1] <http://nastava.tvz.hr/komunikacijske-vjestine/index.php/en/introduction/theoretical-background-introduction>
- [2] <https://www.natcom.org/CommCurrentsArticle.aspx?id=860>
- [3] <https://www.ukessays.com/essays/english-language/communication-skill-importance-english-language-essay.php>
- [4] <http://www.skillsyouneed.com/ips/barriers-communication.html#ixzz44h4hHKfw>

# Introducing Blogs: A Portal to improve Writing Skill

S. Guna Sundari

**Abstract---** *Teachers of English have become increasingly concerned with the need to teach writing to the students of science and technology for whom ability in the spoken language may be secondary. Writing is a basic communication skill and a unique asset in the process of learning a second language. Writing to communicate can be possible only when students have sufficient control of the writing system. Most students even dislike writing assignments. Professional writers have a reason to communicate. Normally, they have a specific audience in mind. But in the case of students, they don't have any audience other than the teacher. It is a fact that in the real world, students' written products are not exposed to others. They don't have any audience who have real interest in their contents, encourages and criticizes their writing. This has caused a negative psychological reaction to writing in the classroom. Technology has provided us with new opportunity and challenges for learning the skills of writing. The students will try to write properly when they write for a wider audience. This paper aims at introducing weblogs to improve students' writing skill. Blogs have been a very popular means of creating such an audience. Keeping a blog on regular basis can help students to develop writing skill. It is a medium in which they are free to explore and reflect.*

**Keyword---** *Science and technology, spoken language, communication, second language, opportunity, challenges, audience and blogs.*

## I. INTRODUCTION

**I**N the present world everything is digitalized. Technology rules everywhere. The impact of digitalization is visible in all the fields and the field of education is one of the primary benefactors. As like as English language, technology is also needed for an individual to survive. Both the teens and adults spend more time with digital tools. The adverse effect of technology is clearly reflected in their education too. Several advancements of technology entered in the field of education. Technology teaches a lot more than a teacher. So the students demand a different learning method which should be elicit as well as interesting. The

Internet allows for a variety of opportunities to communicate in the target language, access textual and multimedia information, and publish for a global audience. Such an opportunity is using weblogs to improve the students' writing skill.

## II. REVIEW OF LITERATURE

The researcher got the spark for the paper while reading Aisha Walker and Goodith White's "Technology Enhanced Language Learning". Bruce and Levin (1997) looked at ways in which the tools, techniques, and applications of technology can support learning to "engage children in exploring, thinking, reading, writing, researching, inventing, problem-solving, and experiencing the world." Will Richardson (2010) in his book explained about almost all types of technological tools that will improve students' learning. Graham Stanley (2013) suggests some interesting ways of language learning with the help of technology. As mentioned above it is very clear that the role of computers and the internet in the teaching/learning process has changed significantly. Technological and pedagogical developments now allow us to better integrate computer technology into the language learning process.

## III. STATEMENT OF PURPOSE

This paper proposes to introduce weblogs to improve students' writing. It suggests that uploading the students' writing online will make the students' conscious of what they have written for their audience.

## IV. HYPOTHESES

The present study was started with the following assumptions in mind:

1. The students learn a lot from technology than from caged classroom.
2. But still the students are careless while they write as it involves only the teacher and the student.

## V. RESEARCH QUESTIONS

1. What is the importance of writing?
2. What do students think about writing?
3. How technology has supported in improving writing so far?

---

S. Guna Sundari, M.Phil. Research Scholar, Research Department of English, The American College  
Madurai. Email: guna.sundari05@gmail.com

4. Can introducing weblogs help in improving writing in a better way?

## VI. DISCUSSION

Technologies make more of our lives transparent to other ways that many find unsettling. To students, making their lives come alive online is a part of the way they live. Communicating and collaborating with peers using instant or text messaging, or Facebook or Hike or Whatsapp, accounts allows them to be “always on” and always connected. That is their expectation, one that has changed greatly in just the past ten years. Our student realities in terms of the way they communicate and learn are very different from our own. By and large, they are “out there” using a wide range of technologies that they are told they can’t use when they come to class.

Writing is an important skill for both first language and second language learners. Written examinations, letters of application, curriculum vitae, and so forth act as important means of entry to education and jobs: if one cannot write proficiently, the sad fact is that they will probably be excluded from a wide range of social roles. Technology has provided us with new opportunities and challenges for learning the skills of writing; at the same time it has altered the ways in which we conceive of and perform many writing tasks. The exponential increase in written digital communication poses some new challenges for teachers of second language writing skills. Today’s students are far ahead of their teachers in computer literacy. They prefer to access subject on the internet, where it is more abundant, more accessible and more up-to-date. So the teacher must be very careful in introducing blogs. Before introducing it to the students, the teacher must have enough knowledge and experience in weblogs.

A Weblog or blog as it is commonly called is a special type of web page that can be created and easily updated using a web browser. Each new entry has a comments section where the visitors to the blog may leave comments for the author. Thousands of teachers and students in the world have already incorporated Weblogs into their classrooms and into their practice. Blogs, as they are known, are easily created, easily updateable websites that allow an author (authors) to publish instantly to the internet from any internet connection. They can also be interactive, allowing teachers and students to begin conversations or add to the information published there. Weblogs are the most widely adopted tool of the read/write web so far.

A common class blog or individual student blog can be created to share the students’ writing among the world. The students may care less in writing as their writing does not have any audience other than the teacher who corrects it. They get comments from the teacher alone. As the

present generation is used to “likes and comments” in Facebook and Hike, they need someone to like or comment on their all activities. But they expect that the comments should be positive alone. While writing and posting in the blog, the students feel proud that they are doing something great. They will be careful in each and every move. In addition, students need to know that any content they create online will become a part of their web portfolio. They need to ask themselves, “what if someone finds this piece five or ten years from now?” Thus, the students will be able to think better and write better.

But there is a problem of balancing the safety of the student with the benefits that come with students taking ownership of the work they publish online. First the teacher need to decide who the audience is. Is it just a small peer group? The whole class? The entire internet? The teacher can set the limits. The institution name or the students’ name should not be mentioned for safety purpose. The students can comment on his/her friends writing, the teacher can give comments and suggestions and even parents can leave feedback in the blog. With blogs, the ability for people to leave comments can be a very powerful and positive learning tool.

The emphasis is on the quality, not on the quantity of what they write. When students are done polishing on their writing, they have it reviewed by the teacher before it is published to the web. Students should be given two extra computer sessions most week to provide them with the time needed to complete their blogging assignment. Publishing the content in the blog needs much skill as sending an email. Blogs engages readers with ideas and questions and links. They ask readers to think and respond. They demand interaction. In fact, learning specialists Fernet and Brock Eide’s research shows that blogging in its truest form has a great deal of potentially positive impact on students.

Without any question, our ability to easily publish content online and to connect to vast networks of passionate learners will force us to rethink the way we communicate with our constituents, the way we deliver our curriculum, and the expectations we have of our students. The web also has the potential to radically change what we assume about teaching and learning, and it presents us important questions to consider. Because the content that students and the teachers create is on the World Wide Web, it is content that becomes a part of the wider body of knowledge that the Internet represents. Weblogs are truly a constructivist tool for learning. So introducing blogs will definitely help the students in improving their proficiency in writing.

## BIBLIOGRAPHY

- [1] Bruce,B.C and Levin,J.A. 1997. Educational Technology: Media for inquiry, communication, construction, and expression. *Journal of Educational Computing Research*, 17(1), 79-102
- [2] Richardson. W. 2010. Blogs, Wikis, Podcasts, and other powerful web tools for classrooms. USA: Corwin.
- [3] Stanley. G. 2013. *Language Learning with Technology: Ideas for integrating technology in the language classroom*. Cambridge University Press: Cambridge
- [4] Walker.A. and White.G. 2013. *Technology Enhanced Language Learning: Connecting theory and practice*. China: Oxford University Press.

proof

# Radical Feminism

Arun Mozhi Thevan. D

**Abstract---** Central concern of this study is that 'Radical Feminism, which is a modern theory to understand the female problem under the patriarchal society'. Radical feminism is a second way of feminism. It discusses the conflict between men and women, the dialectics of sex as the primary contradiction in human society and is seen as based on male power. This theory clearly explicates the commodification of women at home and at work. Radical feminism is an emerging study to understand the female psychological problems. This includes challenging the notion of traditional gender roles, opposing the sexual objectification of women, and raising public awareness about such issues as rape and violence against women. It includes other categories such as oppression, cleaving, Etc. But, they are not limited to it. Oppression based on race, social class, perceived attractiveness, sexual orientation and ability. Radical feminism argues that man dominated women not so much for material benefits as for the ego satisfaction intrinsic in domination. The researcher discusses the female psyche and male psyche. So-called "radical feminism" purports to be concerned with equality for women. The researcher confers the principals and ideas of radical feminism. The researcher believes that radical feminism is one of the feminist theories to understand the female emancipation.

**Key Words---** Radical Feminism, patriarchal society, female psychological problems, domination, female emancipation

## I. INTRODUCTION

FEMINISM is a tool to analyses the women problems in society. It rejects the false identity about women. Feminism fights for women identity and empowerment. Women emancipation is a center problem in society. Women have been seen as pleasure principle objects in society. Feminism talks about the women psychological problems in society. The inequality is a major problem for all the women violence. Feminism finds out the problem and brings the problem to the people view. Feminism is a wide ideology for women emancipation. Radical feminism is one of the ranches in feminism. It starts in the year 1967-1975. Sexism is the ultimate tool used by men to keep women oppressed. And therefore, Radical feminism fights for the women emancipation. Radical

feminism is against the patriarchal society. It talks about the women's suffering for equality and sexual violence, women violence by the name of the tradition.

This paper discusses the principles and root of the radical feminism. The researcher believes that radical feminism is the key for women empowerment. The researcher tries to analysis the radical feminism principles and ideas.

## II. RADICAL FEMINISM

Radical feminism is a movement that started in United States at 1960. It is a women liberalization movement. It developed under the civil rights movements. It was seen as a second wave feminism that started in the 1960s. Many women took radical feminism as a protest for freedom in the patriarchal society. By the time, racism became a major problem in the United States. Women were treated as slaves under the racism. The radical protest against the racism was the first setup for the radical feminism movement. Radical feminism took racism and inequality as a women empowerment problem. It started in the United States then later extended to United Kingdom and Australia. Radical feminism, not only talks about the middle class oppression against women but also, talks about the women rights in the patriarchal society. Radical feminism grows in the United States and United Kingdom in enamors way. Radical feminism replaces the Trotskyism theory. In 1970 the British feminists split into two major schools of thought: socialist and radical. Another splits occurred, with a third grouping calling itself "revolutionary feminism" break away from the two. Radical feminism produced many intellectuals, works and middle class women in developed western countries to discuss their experiences. Then it later it split into many groups in United States and United Kingdom. Radical feminism became as a new ideological and principles in the end of the time they named "Feminism".

## III. RADICAL FEMINISM AND SOCIETY

Radical feminism rejects the patriarchal life style, prostitution, pornography, and love.

## IV. PROSTITUTION

Prostitution is another type of violence for both of them. Women were treated as slaves in this job. Women were not enjoying this kind of job. Some women were doing this job for their family, and for food. Women were projected as destroyer of the society. Society creates these

kinds of women. Here women becomes as a sexual object. In some place we have male prostitution. Male prostitution for male clients this type of gay sexual prostitution is violence for human being life. Society is the reason for all this kinds of works. In many countries encourage the prostitution. They get tax from prostitution work. Women were forced to do this job. Prostitution is seen as a sinful one in radical feminism.

#### V. PORNOGRAPHY

Pornography is another type of violence for both of them. In this type both of them were treated as animals. The actors were misled the society. Both men and women they do not enjoy this kind of work but they do this kind of job for their own life. We live in an internet world. We get accessed to information through our fingertip. Some use internet for work but other don't. So women are portrayed badly. Radical feminism rejects the pornography. They are the projects of the patriarchal society.

#### VI. LOVE

The word love is the major block for women emancipation. Many novels, movies, dramas, poetry, and in real life also we have this kind of block. It dominates the men and women. Radical feminism rejects this concept. The concept is the reason for women violence. Men and women are equal but this word controls them. This concept is an interdependent one. Interdependent never allow to encourage others development. It also enhances the ego. Radical feminism is support for equality in society. It rejects inequality in society.

#### VII. WHY RADICAL FEMINISM IS IMPORTANT

1. It views the feminism in other way
2. It talks about the equality for both gender
3. It questions the society norms
4. It fights for women empowerment
5. It talks about the women emancipation
6. It questions the patriarchal society
7. It rejects the traditional life style
8. It encourage the modern life style
9. It encounters the women rules
10. It rejects the idea of good women

#### VIII. RADICAL FEMINISM AND INDIAN LITERATURE

Indian literature is one of the important literatures in literature field. It talks about the historical incidence and traditional values and fictional Stories. Indian literature is about literary movements and ideology in India. Most of the Indian literatures are male oriented literature. They never give importance to women characters. Some of them reject the women values in literature. High class women only encouraged in literature. Women were projected as evil spirits and devils. Many women writer were emerged after the 20<sup>th</sup> century. Indian feminism talks about the women problems and psychological problem in family life and society. Radical feminism also talks about these kinds of women problems. Indian feminism and radical feminism are talking about the theme. Radical feminism encourages the women working and education. So the theories talk about the women empowerment and emancipation.

#### IX. CONCLUSION

This paper discusses the radical feminism movements and its theories principles. The researcher discusses the radical feminist root and ideology. The researcher also talks about the women empowerment problems. This paper talks about the importance of radical feminism and differences also. This theory helps to identify the feminism problem in society.

#### WORKS SITED

- [1] Jaggar, Alison, M. (1992). Contemporary Western Feminist Perspectives on Prostitution, "Asian Journal of Women's Studies", 3.2:8-29.
- [2] Khan, J.H." Radical Feminism in Kamala Das's Poetry." The Common Wealth Review 21.1: 96-134
- [3] Teasley Deborah. Radical Feminism: Definition, Theory & Criticism. Retrieved from
- [4] <http://study.com/academy/lesson/radical-feminism-definition-theory-criticism.html>
- [5] Vandana Shiva. Different types of Feminist Theories. Retrieved from <http://www.caragillis.com/LBCC/Different%20types%20of%20fe mini.html>



# Promoting Language Skills using Dictogloss

Kalaimathi.S

**Abstract---** *Learning the skills of the language follows various techniques to acquire proficiency over the new language. Dictogloss is one of the famous methods in the promotion of the language skill. Students are involved in the study of the content as well the language simultaneously. The four basic skills such as listening, speaking, reading and writing are promoted through this technique. This study will discuss the promotion of the language skills using Dictogloss. It will explain the way of using Dictogloss, theories of Content Based Instruction and promotion of the language skills.*

**Keywords---** *Dictogloss, language skills, knowledge of the content, directed listening, notes taking, peer learning, reproduction.*

## I. BACKGROUND OF THE STUDY

Language learning with expertise in skills is the need of the learners. Learners are trained in skills in many ways. New approaches and methods are being followed for the welfare of the learners. Students in schools are trained in a way to score more which help them in choosing their field in higher education. This method forces the students to focus only on the subjects and not the language part. This kind of instruction put them in trouble when they face the outside world. Their knowledge in subject goes waste with their ignorance on language skills. Training should be given equally in subject as well language so that students can exhibit their subject knowledge clearly through their language skills. Dictogloss helps them in learning subject and language simultaneously.

## II. AIM OF THE STUDY

The study on the method of Dictogloss is made to explain the way of executing it. It aims to focus on the development of the language skills; listening, speaking, reading and writing. The study concentrates on combining language and subject together in the learning process. This study plans to drive away the fear of students in using the target language as it involves peer learning. This helps students to get trained easily as language learning takes place in the process of subject learning and not as an individual discipline. It discusses the principles of Content Based Instruction which frames the basis of the method of Dictogloss.

## III. REVIEW OF LITERATURE

The interest of the students on the content they are learning forms the base of the liveliness of the class. In addition to the content students' involvement in the class is important to the students to learn the subject being taught. CBI is one of the process based methodologies which involves interesting content and involvement of them through various methods. Leaver and Stryker (1989) claim that CBI is an instructional approach in which "language proficiency is achieved by shifting the focus of the course from learning of language per se to the learning of subject matter". CBI tries to develop both students' language and their content knowledge through providing them with authentic, meaningful academic contexts. Custodio and Sutton (1998) through their research shown that CBI often uses authentic tasks centered around authentic materials, so it can help language minority students increase their motivation, and provide more opportunities for them to explore prior knowledge. Therefore, Dictogloss is such a task which helps in providing both language and content knowledge for the students.

## IV. HYPOTHESIS

The study for this paper is made with the assumption to show how language learning happens as a process accompanied with content learning and the development of the language skills in students using the method of Dictogloss.

## V. RESEARCH QUESTIONS

The present is made with the following research questions:

1. How to practice the method of Dictogloss?
2. How Dictogloss combines language and content?
3. How are the skills effectively developed using Dictogloss?

## VI. DISCUSSIONS

Students are in need to acquire fluency in the target language. But their education system intends them to focus on the subject more than the language skills. Limitedness in time and competition to score marks makes them learn language for the sake of scoring marks and not for the purpose of attaining knowledge in it. CBI is the solution brought to solve this problem. It helps in saving time in learning as it teaches language and content of the subject simultaneously. This saves students' time

and reduces their efforts to learn. Dictogloss, a method of CBI combines these two aspects which will reduce the workload of the teachers as well as the learners.

Basing language teaching on content is not a new idea. It started as long as second languages have been taught material developers choose and give interesting content to engage students' interest. However, the approach known as CBI was first used in the mid-1980s in the book of Bernard Mohan called *Language and Content*. Mohan's (1986) idea in this book is "learning of language and subject matter can be accomplished". The communicative environment of workers is the work place. In the same way communicative environment of students is the school where they communicate the content subjects. So there exists a close connection between language and content classes. Mohan (1986) views, "we must view language and learning across the curriculum: language and learning in the content class as well as language and learning in the language class".

Language and content when integrated motivates the learners because it gives them double benefit. Dictogloss is one of the way of using the language and content integrated material in a class. "In a Dictogloss, (Wajnryb 1990) students listen twice to a short talk or a reading on appropriate content. The first time, students listen for the main idea, and then the second time they listen for details. Next, students write down what they have remembered from the talk or reading. Some teachers have their students take notes while listening. The students then reformulate what has been read. Students get practiced in note-taking this way. Next, they work with the partner or in a small group to construct together the best version of what they have heard. What they write is shared with the whole class for a peer-editing session. Through these processes, students become familiar with the organization of variety of texts within a content area" (as cited by Larsen and Anderson (2016) (pg.142) in *Techniques & Principles in Language Teaching*).

Dictogloss involves materials of the content to be learnt. The method involves repeated reading and listening which help students to get familiar with the subject. As students listen they are asked to note down the important words first, this help them to note down the key words on the theme taken for discussion. This helps them to learn the jargons easily with the context. When explained they can easily understand the theme and study it simultaneously. Dictogloss also involves students' interaction in pairs and groups. This provides them the scope for peer learning where they are able to clear their doubts and learn new things including grammar easily as they learn from their peers. Thus the rules of grammar which frighten the students get into them unknowingly. Therefore in this way Dictogloss integrates language and content.

Dictogloss is one of the many ways of implementing CBI. The special benefit of using Dictogloss is because it develops all the four skills. Listening, speaking, reading and writing are developed simultaneously. Most of the students are learning English as the second language. But in the aspect of mastering the language most students fail. Students who are good at listening lack expertise in other three. In the same way students who are expert in speaking are not able to write well. This applies the same for all the skills. Therefore Dictogloss is one of the best ways to train students in all the four skills.

The basic skill of language learning is listening. Because it is the root for all the other skills as speaking involves listening to make a communication. As English is the foreign language we go for the native like pronunciation to pronounce the words, so reading needs listening to pronounce the words rightly. And writing also involves listening as one can write what they listened. Listening plays a vital role in Dictogloss. Students are made to listen and follow what the teacher reads. They are made to take notes which make them to listen attentively. Then in the process of peer group activities they listen to their friends. This practice therefore helps them to listen and helps to enable them to become active listeners.

The next skill, speaking is the prime skill for communication. Only through speaking the communicable ability of a person is evaluated in the very beginning of a conversation. Dictogloss involves peer learning where the students are asked to share what they had written with others. Then they correct one another. Everyone strives to get their version right therefore they discuss eagerly and keenly with others. In this way Dictogloss allows all the students to speak.

Then, come reading and writing, the professional skills. Dictogloss trains reading and writing in a mixed classroom easily. Students read what they had written again and again to attain accuracy. More than their own writing they read others' too. As they read for the purpose of correcting it they read carefully and clearly. This aspect is absent in a normal reading practice. This helps the students to become active readers.

Following all this come the skill of writing, is also a part of Dictogloss. Students are asked to write what they listened to. In this process students write the passage read by the teacher again and again. Through peer learning the learn grammar to make their sentences right. Intentional focus to make it right allows them to learn grammar and make right sentences and paragraph easily. Thus, Dictogloss improves the writing skill effectively.

Dictogloss in a simple method and so it can be followed in all situations like mixed level classrooms, large classrooms etc. where everyone gets involved and learn for their betterment.

## VII. SUMMATION

Language learning follows various methods to provide knowledge of using it effectively. Dictogloss is one of the important ways as it tends to improve vocabulary learning, and the skills like listening, speaking, reading and writing effectively. Other ways to improve skills work specifically for that purpose which makes the students get bored but, Dictogloss makes improvement in students in the process of learning the content. This saves the time of the students. It works as a subject class and simultaneously it develops the language part of the students. Therefore the interest of students in attaining proficiency in the target language happens without any extra effort thrown to it.

## REFERENCES

- [1] Brinton, D. M. and P. Master (eds.) (1997). New ways in Content Based Instruction. Alexandria, VA: (TESOL).
- [2] Custodio, B. and Sutton, M.J. (1998). Literature –based ESL for secondary school students. TESOL Journal.
- [3] Larsen, D.F. (2011). Techniques and Principles in Language Teaching. New York: Oxford University Press.
- [4] Leaver, B. L. and S. B. Stryker. (1989). Content Based Instruction for foreign language classroom. Foreign Language Annals.
- [5] Mohan, B. (1986). Language and Content. Reading, M.A.: Addison-Wesley.

# Developing Scenario in Communicative English

Prabhavathy.P and Dr.S.N. Mahalakshmi

“I’m not a fan of Technology  
I’m a fan of pedagogy, of understanding  
how people learn and the most effective  
Learning methods .But Technology  
enables some exciting changes.  
-Donald A.Norman  
(Yazigi Teachers Development Spot)

The main objective of the Communicational English course is to develop students’ communication skills and send them for campus placement or recruitment. It would help not only for the rural and regional medium background students but also English medium students to improve their communication skills.

The five principles of Professional Development are based on the fundamental belief that all the teachers would bring strengths to the profession and want their students to achieve and feel successful and for the purpose the teachers frame the new ways of teaching in the classroom when they are convinced that their students will benefit, accordingly.

*A. Principle 1: Build on basic skills, knowledge and expertise:*

Professional Development will link new knowledge and activities with what the practitioners already know and are able to do, and will extend their creativity.(gathered from the work of several authors including Fullon, 2005 Guskey, 2000 et al., 2010.)

*B. Principle 2: Consider Participants as learners:*

Professional Development should provide opportunity to the learners to apply new skills and the knowledge. In addition, practitioners need time to try out new methods in a eco-friendly environment before either moving to another topic or attempting the method in the classroom.

*C. Principle 3: Provide Personnel Opportunities, feedback and follow up:*

Professional Development should offer educational strategies; techniques etc, to practice the new skills, and

also it should provide feedback on performance as well as it should ensure to follow up the activities.

*D. Principle 4: Seek out the changes in teacher knowledge and skills:*

The evaluation of a participant’s/learner’s knowledge and skills is essential to the effectiveness of the professional development program. Assuming that the participants are teachers and then the teaching work to performance of the teaching work and performance of the teacher should be collected for the evidence.

*E. Principle 5: Seek out the changes in Students’ Performance:*

Professional Development should find out the student’s performance, behaviour and achievement. This principle states that a link must be established as evidence that professional development contribute to significant improvement in the quality of educational programs or student achievement. Finally, a period of classroom application followed by formal observation and feedback should be used to reinforce the development of new skills.

*F. Principle 6: Coaching and Mentoring in Practice:*

Prospective mentors participate in structured experiences become aware of needs, teach with targeted strategies, monitor activities, reflect on outcomes, adapt strategies and harness personal strengths, etc., “The strength of peer coaching lies in its potential to promote a culture of collaboration and professionalism among teachers. It is also designed to improve the level of implementation of new instructional technique and curriculum” (Wong & Nicotera, 2003) (1)

Wallace, M (1993), have been suggested the three main various model of teacher or professional learning. Firstly, the ‘Craft model’ in which the trainer is the master teacher, providing an example to be followed. Secondly, The ‘applied science’ model also give the trainer an authoritative role, as the source of theory which the teacher is to interpret in practice and, Thirdly, The conventional ‘reflective model’ in contrast, casts the trainer in the role of ‘facilitator ‘or ‘developer’ giving little information (3).

Teacher should be associated with the stages like Planning and Preparation, Presentation and Production, Utilization and Evaluation while teaching language skills. Teachers, as mentioned above, generally agree that they learned most from their own experience and reflection while in professional practice (3).

Prabhavathy.P , Research Scholar (PhD), Bharathiar University, Coimbatore

Dr.S.N.Mahalakshmi, Research Supervisor, Assistant Professor&Head, Department of English, Anna University of Technology, Regional Centre, Coimbatore

Motivation “as the process of arousing, sustaining and regulating activity.”

GOOD, C.W. (1973)

Extrinsic or external and intrinsic or internal are the two types of motivation

- a) External motivation is based on the use of rewards and punishments and
- b) Intrinsic motivation is that which is aroused in the learning process itself (2).

The teacher must know when to use which technique. In other words, the judgement of a teacher should be fine-tuned to the needs of that particular class/group of learners. It is important to remember that the techniques we use in a classroom should not stop at skill-getting activities but must extend to skill-using activities too. Listening and Speaking are two sides of the same coin-both are closely interrelated as Reading and writing.

Teachers use the syllabus varies very widely between different countries and institutions and depends on financial resources as well as on teaching approach and also the purchase of a wide variety of teaching materials teachers may find it most effective to work mainly from the syllabus as the basis of their programme.

Syllabus is of **Grammatical-lexical**: In this type of syllabus both structures and lexis are specified either together or in two separate lists.

**Situational**: These Syllabuses would be headed by names of situations or locations such as ‘In the road’, ‘Drinking a Coffee’ etc.,

**Notional**: ‘Notions are concepts that language can express. General notions may include ‘number’, ‘time’, ‘colour’. Whereas specific notion include vocabulary items such as ‘man’, ‘afternoon’, etc.,

**Functional-notional**: It is to be noted that purely functional syllabuses are rare, usually both functions and notions are combined. For examples- ‘identifying’, ‘promising’.

**Topic-based**: these kind of syllabuses indicate a fairly clear set of vocabulary items like ‘food’, or ‘The Group’, which may be specified.

**Procedural**: these syllabuses specify the learning tasks to be done rather than the language itself or even its meanings. for example: story-writing, map reading.,

**Multi-strand /mixed**: these syllabuses actually combine different aspects in order to help the teachers as well as the learners in this modern syllabus topics, tasks, functions, grammar, vocabulary as well as notions are differentiated. Whereas a lesson plan is based on:

1. The operational philosophy of the teacher
2. Teacher’s understanding of his pupils
3. Teacher’s knowledge of the material to be taught
4. Teacher’s knowledge of the methods of teaching and on the other hand,

A lesson plan may be envisaged as - A blue print, A guide-map for action, A comprehensive chart of classroom teaching-learning activities, an elastic but systematic approach for the teaching of concepts, skills and attitudes etc. Effective teaching and effective testing are two sides of the same coin.

Tests can be direct or indirect :

- A direct or performance-based test measures one’s communicative competence in almost real life situations.
- An indirect test does it in an indirect way like testing one’s reading or speaking ability. Direct tests are difficult to administer; that is why, indirect tests are generally used.

Evaluation is a systematic gathering of information for purposes of making decisions and it is defined as ‘an attempt to understand what is going on to judge its worth and make decisions about it’. Evaluation is the process of determining the skills of teaching and learning:

1. The extent to which an objective is achieved,
2. The effectiveness of the learning experiences provided in the classroom and
3. How well the goals of teaching have been accomplished.

Evaluation may lead to changes in teaching technology and also in learning technology. A question paper may contain different type of tests. (2).

Teachers of English have a responsibility to help the students in overcoming their fears about communicating and to assist students in developing more positive perceptions of communication activities.

1. Try to know about your communication nervousness
2. Accept your mistakes and if you have fear and nervousness when you are asked to speak in front of an audience
3. Keep the point in your mind that speech anxiety is a natural emotion
4. Write your mistakes and find out all these where you are committing errors
5. Take steps to develop your confidence level
6. Share your communication problems with your teacher
7. Have an outline plan of your presentation
8. Take steps to improve your English and your pronunciation

9. Utilize the lab for your communication improvement
10. Try to participate in all kinds of topics actively so that you can acquire language
11. The teacher should identify the areas in which students have communication problems and training should be.

In the globalized context, students of Engineering and Technology need a specific set of language skills for their success in education and career. In the process of educating future engineers special emphasis on 'Technical English-I &II' and 'A course in communication skills' becomes necessary. To get a job in companies for engineering students, they should have communication skills in English.

The student's communication skills are noticeable in an interview by the panel of judges (4). The English language teacher is not just a teacher of grammar and sentence structure; he/she is expected to play an active role as a diagnostician, counselor, communication specialist, soft skills trainer.

#### REFERENCES:

- [1] Guidelines for PD, An overview Judith wilde –national clearing house for English Language acquisition. [http://www.ncela.gwu.edu/files/uploads/3/pd\\_in\\_action.pdf](http://www.ncela.gwu.edu/files/uploads/3/pd_in_action.pdf)
- [2] Aggarwal J.C, 'Principles, Methods and techniques of Teaching', Vikas Publishing House Private Limited.
- [3] Wallace (1993) Training Foreign Language Teachers: A Reflective Approach, Cambridge: Cambridge University press.
- [4] #59, Article: English Language Communication Skills Laboratory for Engineering
- [5] Students: Syllabus, Objectives, Advantages and the Role of Teaching Teacher, by A. RAMESH BABU

# Teachers' Empowerment through SSA: An Exploration

A. Sherlin Raja

**Abstract---** *In the post-globalization era, English is the most useful, international language in the world. The UN-sponsored Sarva Shiksha Abhiyan (SSA) is an effort to universalize elementary education through community-ownership of the school system. It is a response to the demand for basic quality English education all over India. The Scheme is also an attempt to provide opportunities for improving teachers' competencies. It aims at promoting student-centred approach to all the children through provision of community owned quality education in a mission mode. Educators through Cluster and Block Resource Centres organize in-service training programmes for teachers of English at periodical intervals. This paper intends to highlight how teachers develop their practical English language skills through SSA and how students benefit in turn.*

## I. BACKGROUND OF THE STUDY

IN India, the primary and upper level education plays a vital role in every corner of the country. The aim of the Scheme SSA is "Education for all" and the term 'all' refers to people those who are living in the remote areas are lack facilities. Elementary education being a basic human need raises the standards of life, helps to attain employment, removes regional backwardness and ensures overall development of the country. In school education, English has inevitably increased the demand for teachers. A quality education provides students with capabilities to economically productive and develops teachers' professional skills. To provide quality education, teachers are called to exercise their professionalism. Continuous professional development is necessary for ensuring professionalism in teaching profession. It enables teachers to continuously acquire, expand and extend their knowledge to develop skills and abilities with the aim of improving the quality of both teaching and learning. It also goes a long way in ensuring the achievements of all students. Particularly, in Tamil Nadu government spends money and pays attention to Primary and upper level English teachers and implements teachers professional development in English language teaching. In the present scenario, the Scheme SSA introduces SABL and ALM

methods to teach students effectively and promote student-centered learning. Teachers act as a basic role to implement these methods in the classroom transactions. In-service teachers are specially trained by educators through Cluster and Block resource Centre meeting. Through trainees, teachers improve their teaching, curriculum, research-based knowledge; pedagogical understanding of the subject matters, teaching methodology and the latest development in the teaching profession.

## II. RESEARCH QUESTIONS

The following research questions were framed for investigation:

1. What is the Concepts of Sarva Shiksha Abhiyan?
2. What are the impacts of SSA in School education?
3. Why is CPD important in primary and upper level education?
4. What is the role of SSA in Continuous Professional Development for English teachers?

## III. DISCUSSION

Education is the systematic training of the young children in schools; it is the inherent right of children early in their lives. Education is all forms of human learning; more specifically it is the process performed in specialized institutions called schools. It has often been thought, that people from different national, social, ethnic, religious and linguistic background can be encouraged to adopt a common outlook on life through a common schooling experience. Education in general is expected to make people understand the values of life so that they can promote equality and social justice in a democracy. Education means both the acquisition of skills, habits and attitudes, which help a person to lead a full and worthwhile life in this world II. The work of education is to make the child become aware of its inner powers. Education is the basic condition for the development of the whole man and vital instrument for accelerating the well-being and prosperity of all in every direction in the education field. Mahatma Gandhi says, "Education draws out the best in the child and man, body, mind and spirit". Individual education helps in the building of the personality through his physical, intellectual and moral development. Education instills in the child a sense of maturity and responsibility by bringing in him the desired

A. Sherlin Raja, M.Phil Research Scholar, Research Department of English, The American College, Madurai, Tamil Nadu, India. Email: rajasherlin44@gmail.com

changes according to his needs and demands of ever changing society of which he is an integral part. Education is a powerful and pervasive agent of change. It is the key that unlocks the door to development and modernization.

Many projects and programmes at both the micro and macro level have been undertaken to ensure education for all. As a result of all the past interventions, there has been considerable progress in ensuring access to all children to primary education. There has been an increase in enrolment and retention, improvement in school attendance and generation of strong demand for education especially for girls. However, the achievement levels of pupils have been generally low and there are wide inter-state and inter-district differences in the attendance and achievement of pupils. Sarva Shiksha Abhiyan (SSA) is an attempt to improve the capabilities of all children through provision of community owned quality education in a mission mode. This programme is a timely effort for the universalization of primary education with the collaboration of the people and communities. It can also say that it is a cooperative mission of the state and central governments as a response to the demand for quality primary education all over the country. The programmes shows its commitment by deciding the time limit of the coming year 2017, all children between the age group of 6 to 14 will be provided quality primary education without any kind of discrimination. Like this way the Sarva Shiksha Abhiyan Mission (SSA) is an expression of political will for universal elementary education across the country and an opportunity for the states to promote the social justice and to develop their own vision of elementary education.

According to **Knight (2002)** continuing professional development is needed because initial teacher education cannot contain all the propositional knowledge in the procedural, which the knowledge grows in practice. Due to the Scheme SSA the syllabus totally changed and the cards system was introduced at the primary and upper level education. Teachers should develop certain skills and empower students without any difficulty. **Fullan (1993)** connects the value of CPD to change and reform agenda that are externally driven. There is a need for innovative and creative means for addressing issues claiming the key to success lies in the creative of making new activity and methodology and therefore professional development must serve as a vehicle for reform in the teaching profession. **Dadds (1997)** strengthens CPD as a fundamental principle of teachers' works when they claim that teachers require planned, flexible and adaptive forms of professional development, which cater for the complexity of their responses. Therefore, CPD is a transformative tool that improves responsiveness and change in practice.

Sarva Shiksha Abhiyan provides pedagogical and financial support from the Central and State governments to train in-service teachers through BRT Educators. Educators have long valued professional development throughout the year the process called in-service teachers, continuing education and teacher development. The professional competence of teacher-educators helps to provide pedagogical inputs in teacher education programmes and transact the intended objectives with quality. To improve quality and teacher development, the scheme SSA provides an ample opportunity for teachers to enhance their professional required skills through Cluster and Block resource centers. The Centers have a rich academic resource with ample references materials for the teachers. SSA proactively is implementing several methods like SABL and ALM for students' efficacy and become autonomous learner. The BRC and CRC level training specially focus on the development of the teachers and innovative methods to students through experts of the particular field. The impact of the training is to analyze the teachers' competencies with the implementation of the methods. Training for learner-centred language teaching occurs only after the completion of formal training (**Altman, 1983:25**).

Language teaching methods always change due to the methods and approaches. There is a need for in-service courses for teachers of English to promote a multi faceted competence and to provide new needs, situation and greater flexibility (**Mackey and Bosquet, 1977: 66**). In-service teacher development turns out be occasion for upgrading teaching skills or introducing teachers to the latest fashion (**Britten, 1985: 234**). English is the most standard language and the medium of instruction for all students in the primary level itself. The Resource Centre aims to develop skills and knowledge of the English teachers to use appropriate interactive and child centered teaching methodology on the basis of the level of competency of the students to teach English. The Scheme SSA mainly focuses on English language to enhance LSRW skills and educators teach them in a different method like SABL and ALM methodology. Teachers are introduced to new ideas, methods and methodology according to SSA Trimester syllabus.

#### IV. CONCLUSIONS

Sarva Shiksha Abhiyan (SSA) Scheme is of much importance to assess the primary and upper level education and it contributes to professional and personal development for teachers and improvement in teaching and learning. English language teachers must continue their language skills throughout their career. In-service training can be useful to equip teachers with the knowledge and skills of presenting a lesson, using cards for efficacy and student-centred learning. It develops



teachers' intellectual, experiential, and attitudinal growth in teaching profession.

#### REFERENCES

- [1] Dadds, M. (1997) Continuing Professional Development: nurturing the expert within. *British Journal of In-service Education*, 23 (1) pp 31-38.
- [2] Fullan, M. (1993) *Change forces: Probing the depths of educational reform* London: Falmer Press
- [3] Knight, P. (2002) A systemic approach to professional development: learning as practice teaching and teacher education, 18 (3) pp 229-241.

proof

# Learning English Grammar through Mobile phone Apps

Stanley Devaraj.S

**Abstract---** *For second language learners, the value of the explicit teaching of English grammar has never been questioned. The teaching of grammar with its emphasis on rules, drilling and learning by rote, was seen as traditionalist. Due to the strong impact of technology in Education it brought many platforms for learning. One such master gadget is 'Smart Phones' essentially low powered hand-held computers which replaced computers, books and many electronic gadgets. Applications in the smart phone which offer a new way of studying English grammar on the go as most of the apps can be used without the internet connection. This paper focuses on some major research questions like why English grammar is necessary for speaking and writing. How English grammar helps in language proficiency, how a second language learner can utilize mobile phone apps for learning English grammar.*

**Keywords---** Grammar, Smart phones, Applications.

## I. AIM OF THE STUDY:

The research paper aims at learning English grammar through smart phone apps.

## II. RESEARCH QUESTIONS

- Why English grammar is necessary for speaking and writing?
- How English grammar helps in language proficiency?
- How a second language learner can utilize mobile phone apps for learning English grammar?

## III. WHAT IS GRAMMAR?

What do people mean by grammar when they insist that it be in the curriculum? The word grammar has to mean "the set of organizing principles which native speakers intuitively follow". In this sense grammar is the unconscious knowledge which we learned when we were very young during language acquisition. No one taught us, yet obviously speakers of the language share a language share a complex, high structured system, the abstract structure of

the language itself- the grammar. To distinguish this sense of the word from others to come, we call it grammar-I

## IV. WHY TEACH GRAMMAR?

Grammar should be taught in our schools and colleges. By grammar I mean the system of language, the ways words are formed and positioned in English to make meanings. Why do I want to teach grammar explicitly?

One reason is intelligent one, the study of grammar, well taught, will give students an understanding of how language works. Grammar is a body of information, as a content it is a discipline subject that matters. For instance biology teachers do not argue about teaching anatomy; yet, the knowledge of anatomy does not make people healthier. Biology teachers rightfully assume that an intelligent person should understand how the body works. Likewise English teachers acknowledge that grammar has an important place in the English classroom and get on with the business

A second reason for teaching grammar is a practical one. Such teaching involves the vocabulary relevant to the discipline. Students in shop communicate about a differential gear, in math about pi, in gym about a quarterback sack. These terms are vocabulary common to the subject matter. The terms make communication easier. The English teacher should be able to say noun, verb, subject, predicate, phrase, and clause with the assurance that students know what these words mean.

A third reason is political. Many educators, parents and employers want English teachers to teach grammar. If these expectations were flat-out wrong, I would not honor it. But since I do not believe it is wrong headed, I honor it and by so doing maintain credibility with people who matter to me. Moreover, I do not load bullets into the guns of my critics.

## V. HOW ENGLISH GRAMMAR HELPS IN LANGUAGE PROFICIENCY:

Grammar is a system which is a key to learn a language without knowing the rules of the grammar. If a second language learner wants to improve his language he should study grammar of his target language unlike first language people who acquire the language rather studying.

## VI. LEARNING ENGLISH GRAMMAR THROUGH MOBILE PHONE APPS

Smart phone plays a vital role in present generation without a smart phone it must be odd to live in this technological world. Smart phones are not only made for entertainment purpose but also for studying. If we really want to utilize our smart phone we should rely on study apps which will be very much useful for us. There are many platforms in which apps are being designed; some popular platforms are Android, IOS and windows. There are lot of apps in which we can improve our English knowledge one such basic app is English grammar app. There are many such apps available in those platforms which I mentioned earlier. Many of the second language learners like us are not aware of those apps. By downloading those apps from app store one can learn English grammar on the go and those apps comes with exercises would be very much useful in evaluating our language proficiency. These kinds of apps will satisfy your learning more than a face to face teaching. The doubts which we get during the study from apps may clear within the app of next update because you can write a feedback to the app provider so that they can fix the methodology of writing way in order to attract the learners. This is the most elegant way to study English grammar through technology.

### REFERENCES:

- [1] Tabbert, Russell (11 March 2016). " Parsing the Question "Why teach Grammar?""
- [2] Retrieved from [http://www.jstor.org/stable/817566?seq=1&cid=pdf-reference#references\\_tab\\_contents](http://www.jstor.org/stable/817566?seq=1&cid=pdf-reference#references_tab_contents)
- [3] Bradford, Arthur. Teaching English to speakers of English. New York: Harcourt, 1973
- [4] Goba, Ronald J and Brown Polly Ann(09 march 2016) " Grammar should be taught and learned in our schools"Retrieved from <http://www.jstor.org/stable/817013>

# Learning Idioms: A Key to Enrich English Proficiency

S.A.S. Joseph

**Abstract---** *In recent years, there has been heightened awareness of the critical role of vocabulary in second language learning and teaching. English is a language that has rich idiomatic expressions. Idioms make a language more and more colorful. Idioms are figurative expressions that do not mean what they literally state. Idioms are an essential aspect of learning a second language. It is one of the components that language learners are lacking in order to attain high levels of proficiency. The emphasis on mastery of grammar allows little time for the other aspect of language, such as the ability to understand idiomatic phrases. Idioms are often skipped by EFL teachers in an attempt to simplify things for their students. As idiom learning is a lifelong process, the learner should have self-interest in learning them. If not, even though he is fluent in English he won't be able to understand a native speaker. Because the way native speakers use English in the real world is highly idiomatic and it assumes that a fluent non-native speaker should similarly idiomatic. One can learn idioms from reading newspapers, novels, and magazines, watching good English movies and listening to cricket commentary. This paper aims at making the learning of idioms easier for the ESL learners through some new suggestive ways.*

**Key Words---** *Vocabulary, idiomatic expressions, proficiency, mastery, grammar, and language.*

## I. INTRODUCTION

ENGLISH is the language of communication in today's world. Students have no other choice than English. English is a language that has rich idiomatic expressions. If an ESL Learner learns everything in English and omits learning idioms, his English won't be completed. Learning idioms has always been very difficult for second-language learners, because of the fact that most materials for teaching idioms are inadequate. Another reason is that the students are unaware of the importance of learning idioms and so they don't show any interest in learning idioms. But the use of idioms will have a great influence in the teaching and learning of the English language, because it could be one of the ways to

give students better scope to improve communicative skill in the day-to-day conversation.

## II. REVIEW OF LITERATURE

The researcher have read Irujo Suzanne's article *A Piece of Cake* which says that idioms also can be taught effectively and easily to ESL learners. In her another article *Don't put your leg in your mouth: Transfer in the acquisition of idioms in a second language* Irujo Suzanne investigated whether second language learners use knowledge of their first language to comprehend and produce idioms in the second language. The result is that students use both inter- and intralingual strategies to produce idioms that they don't know.

## III. STATEMENT OF PURPOSE

This paper aims at insisting the importance of learning idioms in English. It proposes some ways to learn idioms with own interest.

## IV. HYPOTHESES

The present study started with the following assumptions in mind.

1. Teaching and learning of Idioms are seen as tough task.
2. Learning of idioms will help the students to have a command over the language especially in communication and writing
3. Idioms also can be taught and learnt easily if certain easy and interactive activities are introduced.

## V. RESEARCH QUESTIONS

The following research questions were framed for investigation,

1. What is an idiom?
2. What are the needs of learning English idioms?
3. Why do the ESL learners feel learning idioms a tough task?
4. Whether the teaching of the idiom has been a success or a failure?
5. How can idioms be taught and learnt effectively and easily?

S.A.S. Joseph, M. Phil Research Scholar, Research Department of English, The American College, Madurai. Email: Joshychan007@gmail.com

## VI. DISCUSSION

An idiom is an expression whose meaning cannot be understood based on the definition of its constitutional elements. It is an expression that has a meaning apart from the meanings of its individual words. For example: *It's raining cats and dogs*. Its literal meaning suggests that cats and dogs are falling from the sky. We interpret it to mean that it is raining hard. Conventionality, inflexibility, figuration, proverbiality, informality and affect are the properties of idiom.

Students may go to foreign countries to work. They may be able to do the job well there but not the communication so effectively even though they are good at speaking English fluently. This is because the native speakers use lot and lots of idioms in their daily conversation. While conversing, the non-native speaker of English will feel ashamed if they don't understand what the native speaker is asking for. Acquisition of idioms will help the students to be better speakers of English language. To speak as native speakers one should acquire a strong knowledge of idioms. The high number of idioms and their frequency is an important aspect of vocabulary. The learning of idioms must therefore be considered an integral part of vocabulary learning.

Idioms make a language more and more colorful. Idioms carry the cultural heritage and social experiences of a society. It has specific meaning other than literal meaning. So they may not be meaningful if it is translated directly into another language. This is why the second language learner always feels learning idioms a tough task.

An idiom is defined as 'an expression whose meaning cannot be derived from its constituent parts' (Stein and Su 1980:444). For example, the idiomatic meaning of *he spilled the beans* has nothing to do with beans or with spilling in its literal sense. Most idioms also have literal counterparts, which makes them even harder to learn. A native speaker will quickly realize which meaning is intended, while the second-language learner is left trying to figure out where the beans came from and how they were spilled.

Even when learners do master the meanings of some English idioms, it is still very difficult to learn to use them correctly. Idioms vary in formality from slang (you *got it*) and colloquialisms (*he kicked the bucket*) to those which can be used in formal situations. In addition to situational appropriateness, many idioms have grammatical constraints. One can tell his/her friends that you 'didn't sleep a wink' last night, but can't tell them that you 'slept a wink'. If learners try to rely on their first language to help them use idioms in their second, they will be successful in only a very few instances. In most

cases, this strategy will produce an incorrect and often comical form.

There are a variety of idiom dictionaries for those who wish to learn more about idioms. Newspapers and magazines, radio programs, television shows and films also sources of idioms. Roleplaying, writing and interactive activities such as matching the parts of idioms are some activities that can help L2 expand their knowledge and use of idioms. Although idioms are indeed more common in informal discourse, there are hundreds of idioms used in academic settings as well. For example, Simpson and Mendis (2003) conducted a corpus search of academic spoken English and found numerous idioms such as *on the right track*, *come into play*, and *down the line*. In fact, research shows that idioms have more specific and complex meanings than their literal paraphrases (Gibbs, 1992).

Not all idioms will be equally difficult for learners to master. The degree of similarity between a given idiom in the L2 and its equivalent in the learner's native language is an important variable. Idioms that are identical in both languages will be easiest to learn. Nevertheless, frequency is not the only factor to consider when choosing which idioms to teach. Context of use will also determine how useful a particular idiom is for the target audience. For example, the idiom "call it a day" is a low-frequency item according to Liu's corpus analysis, but is routinely used to mark the end of a class or meeting.

This is a primary consideration since we want our students to learn those idioms that will allow them to participate more fully in interactions with native speakers. Since there are thousands of idioms in any language (for example, some English idiom dictionaries contain up to 7,000 idioms), we want to devote attention to the most useful ones. Generally "most useful" overlaps with "most frequent." Fortunately, corpus research has greatly contributed to knowledge in this area; The ESL teachers may consult the work by Liu (2003) on the most frequently used spoken idioms in American English as well as the comparison of American and British English done by Grant (2007). Another potential resource is the *Longman grammar of spoken and written English* (Biber et al., 1999), which includes a small section on frequently used idioms.

If the teachers have decided to devote attention to idioms in class, he may consider creating separate lessons in order to teach "useful" idioms. A first step would be to raise students' awareness of idioms so that they develop a habit of noticing them in everyday situations, including reading and listening. Students can be asked to keep an idiom notebook; they can later share their examples in class and ask questions about appropriate usage. Teachers can draw attention to new idioms by embedding them into regular vocabulary and/or reading activities. For that

teachers should take advantage of natural language source passages (e.g., TV, newspapers, or even a corpus search).

There is no pedagogy exclusive to idioms; most research suggests using a wide range of techniques. For example, students can draw pictures to represent the literal meaning; this can be particularly effective for lower-proficiency learners or for idioms that have image-evoking potential. Alternatively, the teacher can provide an image associated with the idiom. Note that images/pictures are more than mere entertainment for the students; research suggests that forming a mental image of an idiom is a powerful tool for learning and further retention.

After presenting idioms in context and helping students infer their meaning, teachers should force retrieval of the idioms that have been studied. This can be done in numerous ways, including typical vocabulary exercises like matching idioms to their meanings, filling in blanks with the appropriate idiom, replacing underlined expressions with an idiom, etc. Finally, to promote output and creative language use, students can write dialogues using the idioms or tell stories based on pictures. For additional teaching ideas, I recommend the articles by Cooper (1998) and Irujo (1986) and chapter nine of Liu (2008).

Incorporating idioms into the curriculum may seem like a daunting task because of the sheer number of idioms that exist in any language. It is unlikely (and unrealistic) to expect an ESL student to master the 5,000 idioms in the *Cambridge dictionary of American idioms* (Heacock, 2003). The teachers have to decide which idioms to teach, since it is impossible to teach all of them and the students should show some personal interest in learning idioms. To approach the task, teachers and students should remember that L2 idiom learning is a lifelong process.

#### WORKS CITED

- [1] Biber, D., Johansson, S., Leech, G., Conrad, S., & Finnegan, E. 1999. Longman grammar of spoken and written English. Harlow, England: Pearson Education.
- [2] Cooper. 1998. Teaching idioms. *Foreign Language Annals* 31(2).255-266.
- [3] Grant, L.E. 2007. In a manner of speaking: Assessing frequent spoken figurative idioms to assist ESL/EFL teachers. *System*, 35(2), 169-181.
- [4] Gibbs, R. 1992. What do idioms really mean? *Journal of Memory and Language*, 31, 485-506.
- [5] Liu, D.(2008). *Idioms: Description, comprehension, acquisition, and pedagogy*. New York: Routledge.
- [6] Heacock, P. (Ed.). 2003. *Cambridge dictionary of American idioms*. Cambridge: Cambridge University Press.
- [7] Irujo, S. 1986. A piece of cake: learning and teaching idioms in a second language. *ELT Journal*, Vol.40 (3). 236-242 .Oxford: Oxford University Press.
- [8] Irujo, S. 1986. Don't put your leg in your mouth: Transfer in the acquisition of idioms in a second language. *TESOL Quarterly*, Vol. 20 (2).287-304.
- [9] Liu, D. (2003). The most frequently used spoken American English idioms: A corpus analysis and its implications. *TESOL Quarterly*, 37(4), 671-700.
- [10] Stein, J., and P. Y. Su (eds.) 1980. *The Random House Dictionary*. New York: Ballantine.
- [11] Simpson, R., and Mendis, D. 2003. A corpus-based study of idioms in academic speech. *TESOL Quarterly*, 37(3), 419-441.

# e-English In Social Media

K. Kavitha Raj and M.G.Shruthi

**Abstract---** *The influence of social media on individuals has become highly inevitable and vast due to the technological advancement and communication development in the current scenario. As English being spoken by the second largest population in the world, the language of computer and also the language in which more number of newspapers and magazines are published, it proves to play a vital role in the social network that prevails popular amidst youngsters and also which is widely used in the commercial world. Hence a lots of new words are emerging in our generation. Due to the ultimate raise of social media new words are being formed day by day. From unfriend to selfie social media is definitely having an impact in language. Now a days these social media words surround us more than the usual words we use. These days, other than typing the full words people prefer to type only the short forms or the acronyms. This change is due to mass audience towards the social media. There are lots of surveys conducted in different states, in which more than ninety percent of the parents never understand what their children type in texts. Thus Social media has fractured English to this extent. This paper highlights the transformation of English language used in various media of art to English used in social networks.*

## I. INTRODUCTION

THE social media IS the relationship between a set of people and social network. In the past few decades the social media has changed drastically the lifestyle of the people and had started influencing the lives to the extent unimaginable. Now a days to survive even for a minute without using the social networking sites have become impossible as youngsters regularly check for their LIKES, STATUS UPDATES, NEW POSTS, etc.. Initially social media started to change the way people communicate, from mails and telephone to instant messages and video calls. Then social media eventually started to take the entire media into its hands, i.e., people started to believe what social medias began to telecast instead of news channels. Also people instead of expressing their feelings to people, they started to post it on the social medias. Thus people began to spend less time with their loved ones and as time passed people has no time to spend with their loved ones at all as they only

had time for their status updates and other social media influenced works. Thus those social medias have brought an unexpected and drastic change in the lives of individuals.

The social medias started to take over English by introducing new words to the world in order to attract people. First these words were only used in social medias but these words gradually became the commonly used words in today's generation. The more people began to indulge themselves in the social medias, the more, new words began to evolve in the English language. This evolution of new words has made a vast change in the way people speak English. The old literal English and the present day English have vast differences, but after the growth of social medias the link between the literal English and today's English have become minimal. Hence the paper highlights the influence of social media in English language which in terms known as e-English.

## II. IMPACT OF SOCIAL MEDIA IN ENGLISH:

From unfriend to selfie, social media has an impact in English language generating number of new words. Due to these impact on English, NEOLOGISMS (coining of new words) have grown to the maximum extent. In earlier days, words like WALL, POST, STATUS, PAGE, PROFILE had different meanings and were not used much. But now a days these words are the most prevailing ones in daily usage. Also the influence of social media has made English, the language acronyms (LOL, ASAP...) and abbreviations (TTYL, GTG, OMG...). Twitter allows us only to tweet 140 characters, thus usage of acronyms has reached the roof. New words are being coined and put into usage. As even a simple HASTAG has its own meaning in today's social media world. These social medias have prompted a subtle revolution the way people use English. As a whole there is no need to publish through traditional avenues to bring a word into existence as using it on a social media is more than enough.

## III. THE INFLUENCE OF NEOLOGISTIC WORDS IN DAILY LIFE:

In the past, it took years or even decades for word usage to warrant inclusion in the dictionary. Radio and TV shortened the amount of time it took for new terms to gain traction, but the real revolution has occurred over the past several years by the social medias. In these days social media is the only origin for coining of new words,

---

K. Kavitha RAJ, Asst. professor, SKCT.,  
M.G.Shruthi, B.E.-CSE, SKCT.

which have been evolved and put into common usage like BLOGOSPHERE(collection of personal websites called blog),troll(someone who starts online conflicts by upsetting people)etc. Another significant aspect is the REAPPROPRIATION of words. It is a cultural process by which a group claims words that were previously used in a way and gives them a new meaning. People who engage them in social medias are the ones who carry out this process of reappropriation. There are also phrases being replaced excluding words like, google is the most famous amidst the people, but the we use the phrase “google it” instead of “search it” and we use “tweet it” instead of “share it”. The impact of the social media in the language is really not reachable to our imagination. “shorter is better – if u could do it well” the online writers tell us. Because they think it takes a skill for writing short. Due to this the older generation fails to understand the new words of this generation. In a survey conducted in London parents said that half the time they couldn’t understand what their children are typing.

These are the top words parents could not understand which their children were typing (from the survey)(REF:telegraph.co.uk):

TEXT	MEANINGS
SPEAK	
TTYL	TALK TO YOU LATER
TBT	THROWBACK THURSDAY
LMK	LET ME KNOW
BAE	A TERM OF AFFECTION
TXT	TEXT
THIRSTY	LOOKIN FOR ATTENTION
GR8	GREAT
BRB	BE RIGHT BACK
GTG	GOT TO GO
ROFL	ROLL ON FLOOR LAUGHING

#### IV. THE DRAWBACKS OF THESE IMPACT MADE:

There are few writers who say that these social medias are fracturing the language and make it loose its essence and aesthetic sense. With the increasing usage of social medias, the language that speak and write have undergone an unbelievable and drastic change which affects the standard forms in the long run. There is also an website called “slangmeans.com” to know the meanings of certain slang words. These social medias have more advanced impact on the language. For instance, in a survey conducted out of 102 students, 57% students say that social medias have made them less productive that they are not even able to concentrate on their homeworks

and they use the words, which they use in social medias i.e. the acronyms and abbreviations in their exam papers.

#### V. CONCLUSION

Just imagine if ten years ago, someone asked you to “be their friend” or “instagram your photo of your lunch” you would have been confused that if the person asking you was alright. Many of the neologisms have evolved only due to social media. The results point to the seismic generation gap of how today’s generation understand and speak the language. Sometimes these impacts are also for the good cause because in this ultra speed technological world, the newly coined word reduce our time and help us to manage with this fast moving world. Carefully listen to the discussions in the social media because you may find many new words, in some period of time you may also coin a word.

#### REFERENCE

- [1] Danah M. Boyd & Nicole B. Ellison, “Social Network Sites: Definition, History, and Scholarship”, In Journal Of Computer-Mediated Communication, Vol. 13, Issue 1, October 2007.
- [2] S. Kuppuswamy, P. B. Shankar Narayan, “The Impact of Social Networking Websites on the Education of Youth”, In International Journal of Virtual Communities and Social Networking, Vol. 2, Issue 1, page 67-79, January-March 2010. [4] J. Cain, “Online



# Impact of Social Media on English Language

K. Mahaalakshmi

## I. INTRODUCTION

**M**EDIA has always played a major role in influencing language from the very first manuscript to the use of internet language in the modern era. In fact, globalization and development in modern technology have enhanced the learning process. As globalization has made the world smaller. The media relates to all modes of transmission from internet, radio, television, video, audio and any other sources that has the ability to transmit information. Diversity of media is now used as a fundamental teaching aid, not only in the rudiments of English within the National Curriculum, but as an essential requirement to meet the challenges of the global market. Nobody can ignore the importance of this global language which provides the basis for survival these days.

Nowadays, social network is very popular especially to teenagers. It makes communication faster and more convenient. Examples for social networks are Facebook, twitter, MSN, Xanga and so on. People communicate through languages, and there are good and bad impacts on language English that caused by social networks. Teenagers tend to have more chance to communicate in English through using social networks. It is because typing or texting in English is much easier and faster than in other Languages. Therefore, teenagers prefer to type in English and that will definitely improve their writing and reading skill when they get more chance to communicate in English. Students perceived the benefits of chatting and writing online, through which they gained more practice with the language. They were using the language to negotiate in an authentic way, which according to Savignon is an important means when developing communicative competence in a foreign language (English). Teaching and Learning through Social Networks Learning to speak English Language can be one of the most exciting and rewarding challenges that a person can undertake—whether it is for personal enrichment, business or both. And when one is learning a language, having a friendly support group can be a huge benefit. With social learning techniques, however, learning tasks becomes easier— without excessive time or travel cost. By combining new webcasting technologies with social networking, organizations can create virtual environments that leverage webcasting to help students learn and test language skills in a social, online

environment that facilitates global connections for language learning and social media. With social learning webcasts, trainers serve a greater number of students by providing localized content and extra on-demand resources, including video, chat and social media sharing—students can share their learning experience with others via Twitter, Facebook or LinkedIn. The scope of media, specially internet is indeed very high. Today one can GOOGLE out anything and everything he desires. Innumerable social networking sites are popping – up every day. Orkut, Linked in, Zorpia, Hi-5, Facebook and Twitter are only to name a few. The vital role of media in the learning process of English language has been observed very well by a critic who states: “Learning from media and technology is often referred to in terms such as instructional television, computer based instruction or integrated learning system.”

Thus ever since media came into existence, it has played a pivotal role in moulding and forming the thought process and lingua franca of all who came under its spell. Social media has spawned new words and morphed old ones. English newspapers are quite popular in India, both in terms of the number of periodicals and the numbers of copies printed. Most of the major national newspapers are published in English and are popular in cities and towns. Further as news medium radio remains a state monopoly in India from time to time, assertions are made that FM radio is poised for an exponential growth in India. There are around 250 FM radio stations broadcasting now and in the next phase, 1100 more are expected to be licensed, most of them are private.

These channels broadcast many programmes in English and regional languages. Sport commentaries, which have large audience, are delivered in English, Hindi, and in some regional languages. News casters, especially on AIR and Doordarshan, try to maintain an accent close to British Received Pronunciation. Until about a decade ago, the diction of the newscasters on AIR was regarded as a model for pronunciation.

Similarly CNN, BBC and some other international channels have proved to be very popular with urban audiences. Watching Television is an all time favorite hobby of children, youngsters as well as the elderly people. It affects the life style and behavior of people to a great extent. Now a days, these T.V. people are supporting a new language which is known as Hinglish. It is a mixture of Hindi and English.

---

K. Mahaalakshmi, I M.A. English Literature, Nirmala College for women, Coimbatore. Email- mailtomahalakshmi612@gmail.com

English teaching nowadays is using a variety of techniques. A number of media technologies are used as a tool to encourage students to learn English for effective communication. English teaching and learning must not limit only in classroom but teachers have to support students' learning with a good teaching system and create environment that allows students to practice their language skills upon their levels. In order to achieve effective language teaching, students must have an opportunity to practice the language skills as much as possible, both in and outside classroom; the teaching process must be consistent with the nature and characteristics of the language; learning and teaching activities should be varied and comprised of various activities for enhancing language skill practice, training students about how to study language on their own to create self-reliant learners (learner independence) and contributing to a lifelong learning by using foreign language as a tool for further education and occupational purpose, which is a key component of a learning reform. Learning English via the internet network is one way to increase effectiveness of English learning of students. Students can practice language by choosing topics and levels of lessons from a wide variety of activities based on their interests and skill levels. Language learning from electronic media on the internet is the utilization of materials and resources available online as a medium to gain knowledge for effective teaching and development of learners. Electronic lessons usually have selective contents, learning activities, exercises, and tests and allow students to revise them at any time. Students will also be encouraged to respond to the contents of the lessons. Also, electronic lessons can link to many other learning resources of the related subjects. This learning technique provides students with interesting lessons that make study more fun, and thus help to develop the students' knowledge and skills efficiently

## II. CONCLUSION

To conclude Media has profound impact on education. It is the power of media that one headline either in praise or against a particular thing can change the entire scenario in just one stroke. Therefore if we relate this powerful tool with the education of today, we will find that it works as a great tool in inspecting and grading in school as well as in universities. Moreover in the present scenario students and their parents feel the convenience of mass Media. Nine-in-ten family homes with children use internet and keep on searching all the aspects of learning using it. Thus media helps them to save their time as well as provide them all the information at their disposal. In short, the impact of media on people, language and education is very much in the positive and progressive direction.

## REFERENCES

- [1] Crouch, Giles. "The Impact of Social Media on English". <http://www.mediabadger.com/2011/01/the-impact-of-social-media-on-english-language>
- [2] Graddol David (1997). The future of English. The British Council.
- [3] Ajjan, H., & Hartshorne, R. (2008). "Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests". Internet & Higher Education,

# Acquiring English Language – The Easier Phase and the Quicker Results

B. Arokia Lawrence Vijay

**Abstract---** *The word English has become a nightmare to many people in India. Reasons can be a very big list that can run into pages. Ages since people in countries like India, Pakistan, Bangladesh etc strive hard to meet the challenges to master the language just to get opportunities for better living. Acquiring and mastering the language though simple but the learners find in real challenge to meet the required results. This paper aims to make the challenges of the needy to achieve their dreams to acquire the language. A study was made on beginner level learners and the desired results have been arrived to sound strong that learning English is very easy and the need is the right ingredients with the right proportion and the minimum required time. A detailed study was made on twenty five students of the same capacity on giving the right ingredients and the right proportionate to acquire the language. The study proved that 80 hours of direct learning and 80 hours of roundabout learning made students develop better command over the language.*

**Keywords---** *Acquiring, Challenges, Opportunity, Learning, Ingredients and Proportion*

## I. INTRODUCTION

ACQUIRING ENGLISH language in countries like India is not a big deal. Due to colonization English language has become a part and parcel of life. A person who has never gone even for standard one can utter a minimum of 500 English words. The basic essential for acquiring any language is words; in this case English is the strength of people in India. They are familiar with English words rather than the words in their mother tongue. Therefore this study made the learners feel easy to acquire and also the execution. A total of 160 hours is utilized for the research. All the four basic skills listening, reading, speaking and writing are motivated and inculcated in the learners to achieve the desired outcome. The methodology involved in achieving the result is what the study is. Forty alternative days of each two hours a day is the time for the direct learning. In the mentioned time, learners are given input and given practice on the inputs given.

## II. IDENTIFYING STUDENTS

Twenty five students of same calibre in language was identified and listed for the study. These learners are identified by taking a basic written test on English language and grammar, listening skill and with simple spoken test. Basic English language and grammar test includes essential grammar, reading comprehension, paragraph writing and dialogue writing. Listening test was done by reading a small paragraph by a teacher of English and also the same audio was played in the audio system and followed by that, ten objective questions are given. Spoken skill is tested by asking general questions and asking students to ask few questions to the examiner and also general topics like pen, computer, world, watch are given and asked to speak on it for a minute. Almost the identified students scored an average of 30% to 35 % of marks in all the skills.

## III. DIRECT LEARNING

### A. Time bound and Grammar requirements

Time is required for any effective research. Approximately a dedicated hour spent for learning English yields only 0.01% of development in the learners' language skill. This means it takes number of months and years to master the language. Learners are first made to accept this time bound frame and continuous and dedicated involvement with love towards the language will accomplish for the success. Followed by the acceptance from the learners, effective ground work is laid by the application of grammar when it comes to effective communication in English. Many learners of English tend to write the spelling of grammar as grammer. This learning, knowing and using the spelling is also grammar. Generally a bad reputation has been created amongst the learners of English in the non native speaking countries that grammar is boring and one of the toughest learning parts.

Grammar is an application similar to mathematics formula. For example, the sentence "My shirt's colour is white." is wrong just because of the application of grammar rules. Learners usually stop learning Noun with its definition "naming word or name of a person, place, animal or a thing". Noun should not be stopped learning with the definition alone. It has to be elaborated in detail with Noun number, Noun kinds, Noun gender and Noun

B. Arokia Lawrence Vijay, AP (SRG)/ English, Kumaraguru College of Technology. Email: arokialawrencevijay.b.sci@kct.ac.in

case. The above mentioned sentence is wrong because of the application of the rule in noun case. Though the structure of the sentence is correct but the grammar rules say that is wrong. This is because possessive case can be used only with living things. Nonliving things never take possessive case. Therefore the correct form of the sentence is "The colour of my shirt is white".

All the direct learning sessions are begun with the essential grammar. This part is conveyed with the reason of learning and the application in day to day life. The given essential grammar for the direct learning sessions includes, Noun (noun number, noun kinds, noun gender and noun case), Verb (Five forms of the verb – base form (dance/eat), third person singular form (dances/eats), Progressive form (dancing/eating), past form (danced/ate) and the participle form (danced/eaten), adjective, adverb, preposition, phrasal verbs etc.

#### IV. PRONUNCIATION

Pronunciation is an important key factor in the delivery of the language to the perfect medium. Though it is one of the key factors, people in India tend to go wrong with it. One of the major reasons for going wrong with the Pronunciation is the Mother Tongue influence (MTI).

For example people whose mother tongue is Tamil naturally go wrong with pronouncing words like fast, friend etc. This is because the Tamil language has a sound 'pa' whereas it does not have equivalent for 'fa' /f/. Therefore instead of the sound /f/ people who talk Tamil substitute /p/ for /f/. As a result the word 'friend' becomes 'priend' and the word 'fast' becomes 'past'. This is one example where speakers of Tamil go wrong with English Pronunciation. Overcoming the problem with pronunciation is quite easy but needs interest and commitment.

The selected students too had similar problems. To overcome this, two platforms are identified. One is the pronunciation tutorial from the [www.bbc.co.uk](http://www.bbc.co.uk) website. All the forty four sounds are given clear explanation by the instructor in the video. The methodology to pronounce a sound and the words associated with it are explained clearly and simpler without dealing with any technicalities of the sounds of the language. After giving detailed picture of the sounds and words, the instructor asks to repeat it.

This video is played to all the identified learners every day. Per day video of only one sound is given for learning, but the video is played multiple times till they get familiarised. This drill is given to all the identified learners to be more comfortable with the sounds and with the pronunciation.

The second platform is offline dictionary in their smart phone. Learners are given five to ten new words per

day and they are asked to listen to the pronunciation of given word and to repeat them until they are familiar to them.

All the identified learners are monitored carefully and also motivated continuously. The learners too are committed and much involved to carry out the two drills. Better results are arrived with the given drills and the exercises

#### V. LSRW (LISTENING, SPEAKING, READING AND WRITING)

##### A. *Listening*

For effective communication, listening is the basic and the key skill, without the ability to listen effectively, messages are easily misunderstood. The first skill for learning a language is listening. Without proper listening, acquiring or mastering a language is not at all possible. Also, the most important factor is the beginners of the language should be given proper and the right listening tutors and tutorials. Listening to the incorrect pronunciation will lead to commit more errors and also inherit the language as they learn.

The learners are given audio clips from the authorised Received Pronunciation website. For example audio clips from <http://learnenglishteens.britishcouncil.org/> are selected and played in a good audio system and they are asked to listen to it multiples times. Followed by the listening, they are given a worksheet to answer the questions based on the audio. Around fifteen to twenty minutes is the time allotted for this skill.

##### B. *Reading*

Reading, the next skill is given equal concentration. First of all, learners are highly motivated to understand the importance of reading in developing the language. It is ensured that a minimum of 30 minutes is spared for this skill. Educational researchers have also found a strong correlation between reading and vocabulary knowledge. In other words, people who have a large vocabulary are usually good readers. The continuously fact is that reading improves understanding, where this leads to comprehend better.

With our research, choosing the text and materials are the greatest challenge that is encountered for this skill. Asking the learners to read English news papers does not sound good as they are beginners. This is because many leading English news papers use big words and the second fact is that the subject may not be interesting. As a result simple books of the matriculation school are selected for the reading, for example history and geography, science and English books are selected. These books suit our module well because all the learners can read and understand the concept easily and also they like at least any one of the subjects. As mentioned, at least

minimum of 30 minutes are used for this skill. Exercise on what they read and understand is expressed in the speaking section.

### C. *Speaking*

It is easy to convenience the learners that speaking skill is important. All of them are very clear and the focus on this skill is high comparing all the other three. Challenges remain constant, irrespective of skill. Though it is clear amongst the learners, when it is said that the session is on speaking, silence is the result. All the skills and the learning tools require motivation but speaking needs more. The learners are continuously motivated on the importance and the outcome. Though challenging, it is made clear to the learners and they are ready.

Initially simple questions are asked to them. They are to answer in a word or two. This is the first stage of speaking skill development. Next they are asked to answer the question in a complete sense as they are taught the essential grammar. They are given the words required. Step by step the difficulty level of speaking is increased and what they have understood in the reading section is asked to speak. This worked out well, as days passed by better outcome and results are witnessed.

Some of the key ingredients in speaking are contractions, communicative functions (How to greet others, how to say thanks and sorry and how to respond to it, parting and leave taking, complementing etc)

### D. *Writing*

Writing is the easiest skill among the four skills for the learners, as they are quite familiar with it. Based on the learning for the day, tasks on writing are assigned. On the day of speaking on the given topic, learners are asked to write what they have spoken. Also the reading section activities are asked to write. Apart from these, learners are asked to write short messages, describing objects and places, narrating the day's activity, letters, paragraph writing, essay writing etc. In this section also the level of difficult is increased.

On the whole, all the four skills are given equal importance and inputs.

### E. *Roundabout Learning*

Apart from the direct method of learning, all the learners are instructed to spend at least two hours a day. All the learners are given individual attention and instructions to be carried out in the non-direct scheduled sessions. These sessions are left at the convenience of the learners. They can work at their comfortable working hours. All they have to spend the minimum suggested hours.

Learners are instructed to identify a minimum of five new words and find the pronunciation and frame

sentences on the words identified. Exercises on the grammar session are given and learners are also asked to frame exercises for the fellow learners. Followed by this, simple topics are chosen for spoken practice. The spoken content is recorded in their smart phone or any other supporting device and they are evaluated the following day. They are also supposed to write short messages to the instructor and letters to their friends on general ideas. Apart from theses mentioned items, learners are watched comic stories (Eg: Akbar Birbal stories) with subtitles. And they have to rewrite the story without watching it again. Learners are more loyal in executing all the given tasks and assignment.

## VI. CONCLUSION

Both the Direct Learning and Roundabout Learning have given the desired results. By the end of the session learners are asses on all the four skills. The results in the assessment clearly say that there is a massive change in the language that they use. Learners felt more comfortable in the learning methodology. Initially they too had quite difficulty in the system and the methodology to go with as days passed by, they were able to get accustomed and worked very hard to achieve the desired result. On the whole, the mentioned methodology has given the desired results and also has shown a better path for the learners. To conclude a minimum of 180 hours with the right ingredients with the right proportion will make beginners of English language to sound strong.

## REFERENCE

- [1] Namhee Lee; Lisa Mikesell; Anna Dina L. Joaquin; Andrea W. Mates; John H. Schumann,
- [2] The Interactional Instinct: The Evolution and Acquisition of Language, Oxford University Press, 2009.
- [3] Cohen, A and Brooks-Carson, A.2001.Research on direct versus translated communicating: Students 'Strategies and their results. The Modern Language Journal, 85,169-188.
- [4] Bere, A. (2013). Using mobile instant messaging to leverage learner participation and transform pedagogy at a South African University of Technology. British Journal of Educational Technology, 44(4), 544-561.

# Enhance Communication Skill through Task Based Approach: A Study

J. Jeano

**Abstract---** *Task based learning is one of the most effective ways of learning English for effective communication. While effective communication is a learned skill, it is more effective when it is spontaneous rather than formulaic. The main aim of learning English is to communicate in it with others so that learners become employable in life and to move forward for higher studies. It is undoubtedly true that the teaching of English in India is still teacher-fronted examination-oriented instead of learner-centric and skills-oriented. Consequently, the vernacular medium students suffer a lot in spite of several years of study of English as a subject and not as a skill. They remain crippled being unable to use English for communication both at work and in higher educational institutions. TBL has come as a great boon for them since it helps them learn English by involving them in meaningful tasks. It instills confidence and enhances capability to successfully use English. The paper proposes TBL as an alternative approach to learning English and discusses problems in its use in the Indian context from learners' point of view.*

skill starts from teaching process, eventually it affects the learning process. Lochana & Deb (2006) state that most EFL teachers teach language by lecturing and focusing on grammatical rules instead of language use. It is much more effective to teach language from context and meaning (Ellis, 2003). Teachers often give opportunities for learners to participate in classroom discussion, so that the situation become worse not allowing to learn the communication skill.

According to Ruso (2007), learners do not like teachers who spend most of class time lecturing. Teachers lecturing mode makes the learners dull and demotivates them from the learning process. Consequently, learners have limited input to the learning process.

Learners confront different extra troubles in learning English. Numerous EFL learners can't adequately utilize English in discussion or correspondence with others. According to Xiao (2009), EFL learners avoid employing target language and cannot apply it in genuine communication. Hashim (2006) shows that learning a language flourishes most when learners are in a positive environment and are given opportunities to communicate in authentic situations. Accordingly, it has been suggested that teachers abandon the traditional teaching approach and replace it with communicative language teaching (Lochana and Deb, 2006).

Enormous research shows that the task based learning accepted as an alternative approach to solve the crisis of teaching and learning English. Oxford (2006) says that task-based teaching and learning is an exciting field that offers great riches if explored by teachers in their dual roles as instructors and action researchers. Muller (2006) states that after using task-based

## I. BACKGROUND OF THE STUDY:

**C**OMMUNICATION skill is necessary, and the skill helps an individual to survive in the current global business world. Communication which doesn't include only speech, it involves all the four basic skills. With knowing those skills are comes under communication, English has been placed in the curriculum from primary to higher education. So the problems of learning the communication

---

J. Jeano., M.A., Mphil., Assistant Professor, Department of English, The American College, Madurai, TN. Email: jeanojs@gmail.com

learning, teachers can be confident that they are meeting institutional requirements and facilitating the development of genuine communication skills among learners.

Task-based learning provides many advantages in teaching and learning English as a Foreign Language (TEFL) because it offers language experience in the classroom. Task-based learning focuses on learners using language naturally in pairs or group work, allowing them to share ideas (Nunan, 2004: 12). It encourages them to be actively involved in the learning process. This paper shows that the task based approach will help students to learn and make them fluent in communication skills.

## II. RESEARCH QUESTION:

The following research questions were framed to focus on the attention of the topic during investigating:

1. Do communication skill only include speech?
2. What is the importance of Task Based approach?
3. What are the problems faced by students in Indian context from learners' point of view?
4. On what way TBL helps students to improve communication skill?

## III. DISCUSSION:

Communication is a part and parcel of day to day life. The absence of communication may lead to misunderstanding. In order to exclude these problems, one must need effective communication skills. The purpose of communication to express ones goal and to achieve by making some development. Communication can be divided into two parts which is verbal and nonverbal. Verbal communication involves spoken words or sounds at the same time nonverbal communication involves sign language. So the communication part has been divided into two types.

1. Written communication
2. Oral communication

Written communication involves a sort of written words to express a message from one to

another. The skill which must help for business people. Because it helps them to maintain records in an effective way. And it helps to showcase one's own product effectively. Written documents can serve as an evidence in any critical situation. Because written words are believable than spoken. We can manipulate the spoken, but the same thing that we can't do that in written.

Oral communication holds great importance in interacting properly with people. The communication process which is carried out by means of spoken words is referred to as oral communication. For a good oral presentation the quality of text being prepared and the way it is presented are equally important.

Facilitators generally whine regarding people don't talk inside the classroom. They may feel debilitate or shy; yet the certainty is, few from claiming them really dare. Task-Based Learning (TBL) serves scholars will bring a serious knowledge with those dialect and also provide for them setting and the outcome is inspiration. TBL is an educating support methodology which concentrates on the student by asking to do meaningful activities or task. These errand might a chance to be every day routines similar to purchasing a container about coffee, gathering a check, setting off of the doctor, around others. TBL which helps learners as well as facilitators to improve their skill of communication, because the focus of attention will chance form teaching to learning process.

The aim of TBL is to integrate all four skills and to move from familiarity to precision in addition to familiarity. When it is executed, the whole class will concentrate on learning process. They have to take care of any issue or circumstance (errand) that the instructor gives them. They can utilize the dialect any way they need; as long it's reasonable (exactness is not that vital). Teacher will give the task to the students and then have to capture the activity. It will create a vibrant atmosphere with students

and teachers. This will create an opportunity to involve every single student.

English is in India today a sign of people's goal for excellence in learning and a complete contribution in national and international life. The attitude of the people towards English increases the demand of English education in the country. English is the lingua franca of both arts and science. Fluency in English is must in the competitive world and it is essential to jobseekers because most of companies are owned or run by foreign entities. The talent to write and speak well in English is generally one of the most vital criteria set by firms.

Literacy in India, has reached a significant height, since independence. This was the country in which students used to come from all over the world to acquire the knowledge and education. English is now taught as the 'second language' in schools in nearly every country in the world. English was introduced in India by the British with the introduction of the East India Company in 1600. The Christian missionaries further popularized the use of English. Teaching is like that holy job of God because God made man but education make them civilized.

The standard of English has not come up to a great extent as expected. Teaching and learning of English was facing some challenges includes meager attitude of students, influence of vernacular and overloading with many lessons. However, due to the prevailing challenges it has not progressed as expected.

In India, many people commit themselves to study English. While many reach fluency and written ability within short period of time, students encounter problems and challenges along the way. Regional errors in learning English challenge students, but they naturally acquire from their errors and progress. English-language learners may enter a class in a state of fear and it may last only a few days or up to a few weeks. Some students receive and absorb

language quickly but are often incapable to express or transcribe it.

TBL helps students to learn many things rather listening to lectures. In this digital world, one who is interested in studies, before listening to lecture of a subject, he/she can access to wide range of material and can prepare themselves for classes. These process can happen at any time and at any place. There is no space bound. Once they got interested on any subject they can access to the world of knowledge. Those days library is the only place to access the material. But now those materials were uploaded in to cloud storage. So any one can access at any time.

Those process is not only mentioned for material search. These process indirectly helps students to learn any language or to improve communication skill. In future, no students like lecture mode classroom, instead they need a task to know what it is. So through task we can guide them and show them this is what the subject says instead lecture. TBL increases self-motivation and makes student active. Self-motivation is the thing which now students lacking themselves nowadays. Because they were bound with technology. They can access through material they need. But they were shy to participate with class room activities. So TBL helps students to participate to communicate within a group that the students' like. There is no need of any rules. They can communicate randomly with teachers and as well as students. The task must be related to technology, which will be successful to carry out the classroom. Youngsters nowadays making communication only through online more than eye to eye communication. So educators can start their TBL process on the ground of technology.

#### IV. CONCLUSION:

The use of Task-based Approach can increase the students' learning communication skill accuracy. This approach is much needed in English language teaching and learning



especially in speaking. Task-based Approach can improve the students' speaking fluency in which the improvement is dealing with self-confidence. They are excited to the given topics because the topics deals with the real-life conversation, so it's easy for them to make conversations and present them in front of the classroom with their own group. Task-based Approach motivates the students in teaching and learning process. The English facilitators are suggested that the use of Task-based Approach as one of the alternative ways to improve students' communication skill to improve their potential or their skill as educators in giving guidance or information to the students in learning and teaching speaking process so that the students are able to understand materials easily. And also, English facilitators are expected to create many ways or some teaching method and strategy in English learning and teaching process for the sake of education qualities improvement.

#### REFERENCE:

- [1] Ellis, R. 2003. Task-based Language Teaching and Learning. Oxford: Oxford University Press.
- [2] Hashim, F. 2006. Language Immersion for Low Proficiency ESL Learners: The ALEMAC Project. The Reading Matrix. Vol. 6.
- [3] Muller, T. 2006. Researching the Influence of Target Language on Learner Task Performance. Proceedings from the Asian EFL Journal International Conference, 8(3).
- [4] Nunan, D. 2004. Task-Based Teaching. Cambridge: Cambridge University Press.
- [5] Lochana, M. and Deb, G. 2006. Task Based Teaching: Learning English without Tears. Retrieved February 14, 2009 from [http://www.asian-efljournal.com/Sept\\_06\\_ml&gd.php](http://www.asian-efljournal.com/Sept_06_ml&gd.php).
- [6] Oxford, R. 2006. Task-Based Language Teaching and Learning: An Overview. Asian EFL Journal.
- [7] Ruso, Nazenin. 2007. The Influence of Task Based Learning on EFL Classrooms. [http://www.asianefljournal.com/profession\\_teaching\\_articles.php](http://www.asianefljournal.com/profession_teaching_articles.php).
- [8] Xiao, L. X. 2009. A new paradigm of teaching English in China: An Eclectic Model. The Asian EFL Journal, 8(4).

# Strategies of acquiring English Language and Assessment on Student Learning

V. Arunadevi

**Abstract---** *The enhancement of English language is stupendous especially as a second language and it has earned its elegant position as a top-notch universal language among versatile languages. Language learning is of paramount importance that it faces many stages meeting out several dimensions as it is learnt by different learners with various cultures with linguistic background. Hence universal guidelines and strategies can be chalked out to rear the language in a conducive atmosphere so that learners will be at ease. This paper focuses on learning the strategies of language acquisition and the assessment of learned knowledge since learning adopts continuous assessment as the important tool to check the level of language acquisition.*

## I. INTRODUCTION

A Globe with unique language is a myth since it is emerged in a multicultural dynasty with volume of various languages and inhabitants. But universe has evolved an identified sole language which is used widely and made its footprint in the annals of world as an international standard language, English. It has encroached almost two-third of global countries as a second language and poses a threat to many learners since it is a complete novel language. The entry of foreign language and its compulsion to learn is a great international phenomenon that instigates people to thrive hard for English language acquisition with utmost concentration. But many people confronted with difficulties to acquire even the basic requirements to earn language competency as it is the transition of experience.

Second and foreign language learning strategies can be understood as “any set of operations, steps, plans, routines used by the learner to facilitate the obtaining, storage, retrieval, and use of information” (Wenden & Rubin, 1987, p. 19). They are intentional (Cohen & Macaro, 2007) and (at least to some degree) conscious procedures by which a learner reaches his or her learning goal.

## II. LANGUAGE ACQUISITION

English, the legendary communicative tool, falls under the broad spectrum of prominent languages venerated by the celebrities of the days gone by due to its versatility and elegance. This language has adapted different dimensions when it is entered into different countries and engulfed versatile modifications with regard to pronunciation, spelling and vocabulary usage. Likewise it is enforced into Indian curriculum as a second language and its acquisition draws a fervent attention as it is an ever-increasing pipeline to have multi disciplinary tasks to be transacted among countries.

Acquisition of language starts from learning vocabulary and its meaning as a routine work and these words should be stored in a memory for further retrieval during the conversation. Learning words is the fundamental task which enlivens the art of speaking. So learners can then energize their learning with the accumulation of possible basic words for day to day conversation using pictures that provide learners an ideal chance to correlate the meaning of words easily. Moreover learning proper pronunciation and its practice takes strenuous task because the originality of the language should not stand at stake.

## III. STRATEGIES OF LANGUAGE ACQUISITION

To acquire English language, many strategies and techniques can be adopted with sheer focus. Language acquisition largely relies on apt utilization of four major components with equal balance that depends upon its functional usage. Learners can gain required English language skills and attitudes through proper guidance which will be the perfect aid to communicate successfully in various global contexts and build intercultural understanding.

Linguistic competency can be procured via four major skills; Listening, Reading, Speaking, and Writing (LSRW) that are all an integral part of typical language proficiency and use. Listening and Reading are branded as the receptive skills or comprehension skills; while speaking and writing are termed as the productive skills. Imparting these skills involve an incessant process that learners should initially pay their heed to the vast pool of recorded or live conversations, dialogues etc., and they can attempt to reciprocate the received content on their

V. Arunadevi, Assistant Professor & Coordinator, Department of English, Dr.Mahalingam College of Engineering and Technology, Pollachi

own words ; this method can steer them to concentrate more on listening which is the soul of all languages. Of all skills, listening and speaking are the prominent skills to be learnt in order to earn the fundamental understanding of the language possessing lion's share. Whereas reading and writing can be imbibed later with minimal focus as it demands the representation of symbols to read and write.

The target of acquiring these skills is focused and inculcated through daily activities. In class room teachers can provide learners with opportunities to enhance each skill: students can **listen** to variety of audio or live interviews, conversations, debates, discussions etc., **speak** using pronunciation practice, greetings, dialogue creation, role plays, **read** using newspaper articles, stories, novels, written grammar drills, cards for playing games, flashcards and **write** about mundane deeds, describing oneself or others, a journal articles and letters. These tasks can be carried out in order to fulfill the required cognitive demand by participating in a task individually, in pairs or in small cooperative groups.

To illustrate, in class room I provide the learners with simple activities like self-introduction that yields the answers to a series of personal questions (name, age, grade level, members of family, favourite sports, subjects, etc.) and sequences them into a self-introduction. Students are given large visuals to trigger each component of the self-introduction. The teacher can point to each picture while modelling a self-introduction (students are listening) and then invite learners to introduce themselves (speaking) to one or two if they are peers. Some of the visuals can then be changed and the students can be invited to introduce themselves to others in the class to whom they have never spoken.

This activity can be adapted to become a regular (daily, weekly) warm-up activity to get learners talking in the target language. Having covered listening and speaking in the oral self introduction, a scenario can then be created wherein learners must write a self-introduction to a potential home stay host. The picture cues provide learners support without giving them a text to memorize. This is a sample task focused on the regular practice of four skills in a single day.

Strategies of learning a language can be further compartmentalized according to whether they are cognitive, metacognitive, affective, or social (Chamot 1987, Oxford 1990). Cognitive strategies usually involve the identification, retention, storage, or retrieval of words, phrases, and other elements of the second language. Metacognitive strategies deal with pre-assessment and pre-planning, on-line planning and evaluation, and post-evaluation of language learning activities, and language use events. Such strategies allow learners to control their own cognition by coordinating the planning, organizing,

and evaluating of the learning process. Affective strategies serve to regulate emotions, motivation, and attitudes (e.g., strategies for reduction of anxiety and for self encouragement). Social strategies include the actions which learners choose to take in order to interact with other learners and with native speakers (e.g., asking questions for clarification and cooperating with others). Language acquisition can be happened from learning in adjacent with assessment that is instrumental for analyzing the gray matter of learners.

#### IV. ASSESSMENT ON LANGUAGE LEARNING

"Practice makes man perfect" This statement illustrates vividly the main component of teaching learning process and its stern effort in bringing out the ultimate assessment on the valued comprehension.

The process of learning starts with identification of the central idea in the acquisition of gray matter in the cognitive level and persistently continues with inculcation of subject matter along with practical expertise that can stimulate the simple thought into meta cognitive level of learning. Prolonged learning should compulsorily derive a pause considering certain aspects of learning in order to check the level of understanding. Assessment is the perfect tool to elucidate and validate the intermittent learning that thrashes light on the progressed level of students through the proper guidance and the facilitation of teachers. Assessment is a logical process of congregating information. It is an integral part of instruction that enhances, empowers, and celebrates student learning. Using a variety of assessment techniques, teachers gather information about what students know and are able to do, and provide positive, supportive feedback to students. They also use this information to diagnose individual needs and to improve their instructional programs, which in turn helps students learn more effectively.

It is a continuous activity, not something to be dealt with only at the end of a unit of study. Students should be made aware of the expected outcomes of the course and the procedures to be used in assessing performance relative to the outcomes. Students can gradually become more actively involved in the assessment process in order to develop lifelong learning skills.

As a facilitator he/she should impart education choosing multiple channels in order to enhance and cultivate the intellectual level of students aligned with the curriculum. Multiple paths can unlock a variety of means to achieve the result under proper assessment that is the penultimate source of education. Furthermore the ultimate point of education is the implementation of continuous acquisition of knowledge in real life crossing various levels in a day today life.

## V. ASSESSMENT PARAMETERS

Intellectual stamina of an individual student in group and in individual can be checked using various strategies in different areas. Hence the assessment parameters are organised by the facilitator to measure the understanding level of the students aligned with the global benchmark in all four domain areas. While assessing the speaking and writing skills, relevant content, grammatical accuracy, range of language, register and non-verbal cues and pronunciation (Speaking only) are evaluated. During the listening process, the students should pay their heed to the audio/live and infer the meaning and then take notes followed by the questions regarding the content. In Reading skill, they are evaluated based on the pronunciation, proficiency in skimming and scanning and his ability in note making.

Class room activities can further be provided based on the required area involving multiple methods, for example, oral questions during the lecturing, paper based written examinations, listening tests, Online Tests, providing questionnaire, group projects, speaking tests like self introduction, Introducing others, Oral and Power point presentations, Group Discussion, JAM talk, Small talk, Extempore, Role play, Skit, Seminar etc., When implemented effectively, assessment can provide evidence of student learning and progression, and prioritize recommendations for continuous improvement. Through these deeds the students are assessed based on their effective communication skills, leadership quality, team building skill, motivational skill, time management, polite nonverbal skills etc.,

## VI. CONCLUSION

These are the excellent springboards for the students to enrich their competency through various activities integrating the four skills in order to step up their mastery in language that leads to the upliftment of mental calibre. So Language curriculum should be derived and prepared based on the level of students and it should stress the balanced development of listening, speaking, reading and writing by measuring competency in each skill and then focusing on the development of the weakest skill. Furthermore a vivid and effective communicative class is supposed to be the integration of the four language skills training, in which the teacher needs to establish a positive atmosphere, plan appropriate activities, encourage learners and deal with problems sensitively.

Then based on the requirement the students are provided with situation based activities that allow for well-rounded development of the individual and progress in all areas of language learning. This approach concretizes the integration of not only the four skills but also language, culture, experience and learning strategies.

## REFERENCES CITED

- [1] Cohen, A. D., & Macaro, E. (Eds.). (2007). *Language Learner Strategies: Thirty Years of Research and Practice*. Oxford: Oxford University Press.
- [2] Wenden, A., & Rubin, J. (1987). *Learner Strategies in Language Learning*. New Jersey: Prentice Hall.
- [3] Chamot, A. U. (1987). The learning strategies of ESL students. In A. Wenden & J. Rubin (Eds.), *Learner Strategies in Language Learning*. Englewood Cliffs, NJ: Prentice-Hall.
- [4] Oxford, R. L. (1990). *Language Learning Strategies: What every teacher should know*. New York: Newbury House/Harper Collins.

# Techno –Teaching

R.Vidyavathi

**Abstract---** *The recent rapid development of technology and the use of cell phones and different multimedia devices have opened endless possibilities for teachers to teach English and access information. The Internet, YouTube, Web.2.0, e-books, and various websites have changed how we prepare our lessons and instruct our students. Now, with ready-made materials at the touch of a keyboard button, it is a lot easier to bring real-life issues to the classroom and have a meaningful discussion. Appropriate integration of technology in the classroom encourages students to use language in many different ways. Furthermore, learners from different parts of the world can get connected and exchange ideas via the Internet and other media devices. Students may know more than their teachers about how to use technology, and yet they need proper guidance from the teachers on how to select, analyze, and utilize the right information to achieve their learning goals*

**Keyterms---** *multimedia devices, technology, learning goals*

## I. INTRODUCTION

**T**ECHNOLOGY is playing a major role in inspiring, innovating and motivating students in a large scale. Now a days, teachers can find students merged with mobile phones playing various games like mini militia and other car games. Orienting them on academics has become a herculean task for teachers. Here are some popular teaching techniques that can be used to enhance teaching through technology

## II. FLIPPED CLASSROOM :

This method involves and encourages students to prepare for the lesson before the class. The task is that students should be informed about the topic prior. The class becomes a dynamic ambience, when students elaborate various examples along with instances on what they studied. Thus the class becomes highly agile and interactive. These typing of teaching helps the student to research beyond their normal boundaries and explore out of their curiosity. There is a separate flipped model class room available in online. Students can access on those models to get a preview about the subjects.

## III. DESIGN METHOD OR CASE METHOD:

In this method, teachers act as a facilitator in giving the main theme on a topic. Students has to create a real life cases through group discussion, brainstorming and sharing creative ideas. Usually these classes will be very effective for science and experimental subjects. Furthermore, this case method is mostly subdued with business schools to analyze real case experience.

## IV. SELF-LEARNING :

**Curiosity is the main driver of learning.** As a basic principle of learning, it makes little sense to force students to memorize large reams of text that they will either begrudgingly recall or instantly forget. The key is to let students focus on exploring an area which interests them and learn about it for themselves.

A common technique for exploring self-learning is the use of Mind Maps. Teachers can create a central node on a Mind Map and **allow students the freedom to expand and develop ideas**. For example, if the focus is the Human Body, some students may create Mind Maps on the organs, Bones or Diseases that affect the human body. Later the students would be evaluated according to the Mind Maps they have created and could collaborate with each other to improve each others Mind Maps and come to a more comprehensive understanding of the Human Body.

## V. GAMIFICATION

Learning through the use of games is a method that has already been explored by some teachers, especially in elementary and preschool education. By using games, students learn without even realizing. Therefore, **learning through play** or ‘*Gamification*’ is a learning technique that can be very effective at any age. It is also a very useful technique to keep students motivated.

The teacher should design projects that are appropriate for their students, taking into account their age and knowledge, while making them attractive enough to provide extra motivation. One idea may be to encourage students to create quizzes online on a certain topic. Students can challenge their peers to test themselves and see who gets a higher score. In this way, students can enjoy the competition with peers while also having fun and learning.

## VI. SOCIAL MEDIA :

Students today are always connected to their social network like FB, Whats App and other nexing arenas and information sharing along with pictures has become very easy. Various groups can be created in par with the field of interest and the students can share knowledge transcending beyond the territories

Moreover, class room teaching can be made interesting by the application of PPTs, presentations, and seminars. Recent days E-learning provision is available everywhere. Virtual classrooms is on the path to places as a student, sitting in a place can orient with world class professors with the help technology aids. To conclude, education is best imbibed through self – exploration and technology is really a boon to everyone considering all facets. Students can make use of these aids to make their learning effective and efficient.

proof

# Use of Grotesque in the Selected Novels of Toni Morrison

A. Anitha and Dr.V. Arthy

**Abstract---** Morrison used the grotesque elements to provoke and arouse the feeling of the readers through the violence, nastiness, supernatural events and cruelty people. Besides, the grotesque elements are the powerful tools to use to tell the racial difference and slavery story to the readers. The writer wants to awake the society to look at these issues. In essence, she tells the tales that many have not, and in the process, presents alternate ways of thinking about knowledge and the presence and influence of blackness in America. This paper focuses on the use of the grotesque in Toni Morrison's novels

## I. INTRODUCTION

**T**ONI MORRISON is a black woman, scholar, writer and a senior editor at Random House. One of the most prolific and powerful writers of contemporary fiction is Toni Morrison. The 1993 Nobel Prize winner's works continue to be heavily debated, explicated, and theorized as she continues to write more novels. Due to Morrison's multi-layered, non-linear and dialectic approaches to her writing, Morrison's works evoke endless discussion. In each of Morrison's novels a tremendous capacity is displayed for capturing the essence of black folk traditions- the speech, the naming practices, the humor, the oral history and lore, the beliefs and superstitions. But also present in her work are aspects of the grotesque and of decadence which, incubated in a larger milieu of social, spiritual and moral malaise, seemingly infect the lives of her characters, leaving them with few possibilities for survival. This paper focuses on the use of the grotesque in Toni Morrison's novels

The term "grotesque" means strangely distorted so as to arouse fear or laughter, fantastic, bizarre or ugly (Oxford English Dictionary, 2006). The characteristic of grotesque writing style always arouse the emotion, imagination of the readers. Grotesque's meaning is the same as the word "gothic". Phillip Thomson, author of

*The Grotesque*, reports that the concept not only extended to literature during this time period, but also to other non-artistic things such as body parts. Rieland thus describes the grotesque as something which evokes several contradictory feelings. This idea of several simultaneous contradictory or paradoxical feelings is typically known as co-presence. Thus, when someone sees a grotesque painting or reads about a situation or character that is grotesque, he or she experiences co-presence of feelings, usually one being a sense of horror or disgust and the other one of amusement or laughter.

Morrison began to write fiction and revised a short story that she had written when she was a student at Howard University. This story is *Bluest Eye* (1970), and it is her first novel. It is the novel of Pecola, the African American girl who was destroyed by the white beauty standard. The second novel is *Sula* (1973) presents the friendship between Sula and Nel and opposition between good and bad. *Song of Solomon* (1977), the story of Milkman searches for his identity. *Tar Baby* (1981) states the conflicts of race, class and sex. *Beloved* (1987) reveals the history of slavery in the United States which is based on true story. *Jazz* (1992) is a story of violence and passion in New York City's Harlem. *Paradise* (1998) is portrait of a black utopian community in Oklahoma. Her novel *Love* (2003), the family story that reveals facets of love. She wrote *A Mercy* (2008), *Home* (2012) and her latest novel *God Help the Child* (2015)

Morrison used the grotesque elements to provoke and arouse the feeling of the readers through the violence, nastiness, supernatural events and cruelty people. Besides, the grotesque elements are the powerful tools to use to tell the racial difference and slavery story to the readers. The writer wants to awake the society to look at these issues. In essence, she tells the tales that many have not, and in the process, presents alternate ways of thinking about knowledge and the presence and influence of blackness in America. To accomplish her goals for writing, Morrison uses the grotesque as part of her narrative strategy. By means of the grotesque, the irrational and supernatural can be introduced (for example, the character of Beloved, the myth of the flying African). By means of the grotesque, readers are provided images that burn in their minds, causing them to pause and think (for example, Sethe's chokecherry tree). Through the grotesque markings on bodies, readers are able to understand the historic degradation of blacks in America, particularly

A. Anitha, Assistant Professor in English, Department of Humanities, Coimbatore Institute of Technology Coimbatore Institute of Technology, Coimbatore – 641 014. Email: anitha.ba1990@gmail.com

Dr.V. Arthy, Assistant Professor in English, Department of Humanities, Coimbatore Institute of Technology Coimbatore Institute of Technology, Coimbatore – 641 014. Email: arthyvj@gmail.com

women (for example, Sethe's tree, Paul D's iron collar, Nan's missing arm, Baby Suggs' hip). By means of the grotesque, readers understand the repercussions of war (for example, Shadrach's hands and National Suicide Day). By means of the grotesque, readers receive a glimpse of characters' psychoses, created by insecurities that arise from a lack of cultural awareness (for example, Pauline and Pecola Breedlove). Through the author's use of the grotesque, she is able to "force" readers to comprehend actions and images often neglected or desensitized through other means of presentation. And in the process of comprehending characters' struggles and situations, which are, in many cases representative of African American struggles, readers are able to have a better understanding of institutional racism and sexism against, in particular, black women

Morrison first shows the grotesque elements in "*Sula*", which is a story of a woman who shows the devil like character. Morrison embodies goodness and badness in one character. The story also presented violence and madness through many characters apart from Sula Peace, the protagonist character. These characters are Shadrack who is a shell-shock veteran from World War I, and Eva Peace who ends the life of her drug addicted son. This story is full of blood and unpleasant scenes. Most characters in this story are strange in their behaviors. The first is Shadrack. He is a mentally abnormal veteran. He faces violence from the war and the capture of police on the way back to Medallion. He is fascinated with death so, he generated the National Suicide Day. This day is promoted to people's interest in committing suicide or killing the others. Shadrack's madness and the idea to create the National Suicide Day are presented in the following:

...He knew the smell of death and was terrified of it, for he could not anticipate it. It was not death or dying that frightened him, but the expectedness of both. In sorting it all out, he hit on the notion that if one day a year were devote to it, everybody could get it out of the way and the rest of the year would be safe and free. In this manner he instituted National Suicide Day. On the third day of the new year, he walked through the Bottom down Carpenter's Road with a cowbell and a hangman's rope calling the people together. Telling them that this was their only chance to kill themselves or each other. (p.14)

From the quoted paragraphs, Morrison presented grotesque through Shadrack's character. He was strange from normal people as we can see that he can smell death. There is only evil that satisfy of death and can smell it. Death is familiar to him but it is unfamiliar to normal people. Death is very normal for him. Everybody cannot enjoy this situation. On the other hand, his idea is very interesting and good for our world. He intended to set this day which is only one day in the year for killing. For the

rest of the year, people should stay in peace. This implies that violence, crime and even death will be joyful if they occur only in one day a year. But in real life people all over the world has trouble with crime, violence and death every day, especially in the war time the armed forces never leave out from death even one time. But if the National Suicide Day was agreed by all people especially the Head of the countries, the armed forces would be happy with only one day war. The suffering would never occur in this world. Toni Morrison emphasizes the importance of narrative form and how it indirectly reveals ethics in fiction. For example, the scene where Eva kills Plum is over two and one half pages, yet there is practically no narrative devoted to describing the twenty eight years that Eva spends in nursing homes.

Her novel "*The Bluest Eye*" studies the process of a young black girl's retreat into insanity, the only place of refuge against a world that continually reinforces the destructive belief that blue-eyed blond beauty is the only beauty there is. Pecola, the main character, along with her friend Claudia, the narrator, and the rest of the community are victims of this cold, loveless and artificial world. Because the only other alternative open to Pecola is acceptance of such a devastating idea, she chooses the security of permanent insanity, while the community, unaware of its own victimization, looks on. This act of "becoming" is a major storyline in *The Bluest Eye*. Changes to the adolescents' bodies are continuously inspected, chattered about, and documented, particularly by the adolescents themselves

In "The Grotesque: First Principles," Geoffrey Harpham says that "One of the most frequent ways for an artist to use the grotesque...is through the creation of grotesque characters" and that "Victims of obsession particularly lend themselves to grotesque characterization". Morrison makes use of the technique of creating grotesque characters who are obsessed with their lovers. In *Song of Solomon*, Morrison refers to obsessive love as "anaconda love," because these snake-like lovers smother their partners. Usually, the obsessive behaviors end with tragic circumstances. Hagar is obsessed with her cousin/lover Milkman; in *Love Heed* Johnson and Christine Cosey are obsessed with Bill Cosey, particularly his money; and in *Jazz*, Violet and Joe Trace are both obsessed with Dorcas Manfred.

Thomson believes that the goal of the grotesque is one of "sudden shock" versus the goal of irony being intellectual in the sense that readers will likely take great satisfaction in detecting it and its functions. As expected though, Hagar does come to Guitar's apartment to try to kill Milkman, and the attempted murder scene that ensues is quite grotesque. While Hagar sneaks into Guitar's window, Milkman patiently awaits in Guitar's bed because he has resigned himself to either living on his



own terms or dying. No time is wasted before Hagar attempts to murder Milkman. In her hand, Hagar carries a butcher knife, her “comfortably portable weapon,” which she tries to drive into Milkman’s neck, but ends up hitting his collarbone instead. Little damage is done; a small wound bleeds lightly. Hagar then tries to strike him again, but she can not bring herself to hurt him: “Try as she might, the ball joint in her shoulders would not move” (130). Thus, because of Milkman’s stubbornness and Hagar’s love for Milkman, they become “The paralyzed woman and the frozen man”

The grotesque elements are significantly employed by Morrison to provoke the horror, mystery, supernatural, satire, comedy and tragedy at the same time to make the readers understand the devastating impacts of slavery. Grotesque elements are various but they are related with the definitions provided. Moreover grotesque fiction is not a supernatural story. On the subsurface it is like a ghost story, but underneath is a serious message. The readers have to read the underlying meanings more carefully to find out. Since grotesque are powerful tools for to provoke the readers’ awareness of some specific problems and makes changes.

#### REFERENCES:

- [1] *The Bluest Eye*. New York: Knopf, 1970. New York: Plume-Penguin, 1994
- [2] *Song of Solomon*. New York: Knopf, 1977. New York: Plume-Penguin, 1987.
- [3] *Sula*. New York: Knopf, 1973. New York: Plume-Penguin, 1982.
- [4] Millichap, Joseph R. “Distorted Matter and Disjunctive Forms: The Grotesque As Modernist Genre.” *Arizona Quarterly* 33 (1977): 339-347.
- [5] O’Connor, William Van. “The Grotesque in Modern American Fiction.” *College English* 20 (1959): 342-346.
- [6] Powell, Tony B. (2000). *Toni Morrison: The Struggle to Depict the Black Figure on the White Page*. *Toni Morrison’s Fiction: Contemporary Criticism*
- [7] Jones, Carolyn M. (1993). ‘Sula’ and ‘Beloved’: image of cain in the novels of Toni Morrison.

# Strategies of Acquiring English

P. Subathra

**Abstract---** *English language learners need lots of opportunities to engage in social interactions with others, but they also need support from adults as they develop the language skills they need to negotiate those interactions. To acquire English language, we can use the following strategies to foster social interaction. For group activities, pair English language learners with children who have strong English language skills, and make sure that all the children who speak the same home language are not grouped together. match both their interests and their language abilities. Encourage child talk by providing prompts when children need help in expressing. Encourage parents to talk and read to their children in their home language as a way of strengthening children's language skills. Incorporate children's home language in the classroom when possible. Songs and videos can be used effectively for this purpose if teachers do not speak their students' language.*

## I. INTRODUCTION

ENGLISH LANGUAGE learners frequently have not acquired through exposure to text the breadth and depth of vocabulary needed to comprehend their English and content area texts or to participate in classroom discussions of texts. This Strategy Guide introduces strategies teachers can use for vocabulary instruction in their English and content area classrooms, enabling the students to acquire English language in a manner similar to the way they learned their native language, naturally and through regular interaction with others who already know the language. In the natural process of language acquisition, students first develop basic communication skills in English. The focus is on fluency and learning to speak English in a social context with native speakers is so important to the Natural Approach. Rather than getting caught up in grammar and the mechanics of language, non-native speakers learn by interacting with English-only models. This approach is most successful when there are two conditions:

1. Comprehensible input is provided, which means messages are made understandable and meaningful to the learner through a variety of techniques.
2. There is a low-affective filter, which means students are made to feel comfortable and there is little pressure to learn "it all" right now.

Here are some ways you can create a classroom environment that supports natural acquisition:

- Use visuals that reinforce spoken or written words.
- Employ gestures for added emphasis
- Adjust your speech: Speak slowly; enunciate; use longer natural pauses; repeat words or phrases; include shorter sentences, fewer pronouns, and simpler syntax.
- Exaggerate intonations at times.
- Stress high-frequency vocabulary words.
- Use fewer idioms and clarify the meaning of words or phrases in context.
- Stress participatory learning.
- Maintain a low anxiety level and be enthusiastic.
- With these conditions in place, students can't help but learn the language!

There are five proficiency levels: Beginning, early intermediate, intermediate, early advanced and advanced. The four domains are: Listening, speaking, reading, and writing. Students need to be instructed at their proficiency level for the different domains. It is crucial to understand that students progress through the levels of proficiency at different level.

1. **Function:** Functions are the purposes of communication. This includes social conversations, jokes, and inquiry.
2. **Form:** This refers to the structure of the English language such as grammar, sentence structure, and syntax. These are used as building blocks.
3. **Fluency:** Fluency is the ease in speaking the language. English language learners need ample amount of time just practicing speaking English in order to become fluent.
4. **Vocabulary:** The development of a wide and varied vocabulary is essential. Research shows that English language learners should be taught key vocabulary, or brick words, prior to a lesson in order to assist them in their language development. For example, whatever concept you are teaching, it is recommended that you include vocabulary words that will make the content more comprehensible to the learner.

Children stretch their language in order to communicate when they lack the adult words. With object categories they often overextend terms to inappropriate instances. They may do so with certain terms in production but not in comprehension. With spatial

relations they may opt for one general purpose locative term to talk about many different configurations, and with actions they often rely on general purpose verbs. What children mean on any one occasion, therefore, is bound up with their strategies for communicating.

## II. BARRIERS TO ACQUIRE ENGLISH

The listening process is often described from an information processing perspective as "an active process in which listeners select and interpret information that comes from auditory and visual clues in order to define what is going on and what the speakers are trying to express". Considering various aspects of listening comprehension, the major listening problems as follows:

1. lack of control over the speed at which speakers speak ,
2. not being able to get things repeated,
3. the listener's limited vocabulary,
4. failure to recognize the "signals,"
5. problems of interpretation,
6. inability to concentrate, and
7. established learning habits.
8. Barrier category 1: Affective barriers
9. Some affective influence might distract learners from learning the target strategies. The affective factors that play a negative role in strategy acquisition include anxiety, distress, frustration, and resistance.
10. Barrier category 2: Habitual barriers
11. Some learners report that they were more inclined to resort to their old "survival kit," i.e., their former listening habits, than to try the listening strategies introduced in the training. Although not all of the former listening habits disadvantaged comprehension, some did draw learners away from activating the potential strategies in the comprehension process.
12. Barrier category 3: Information processing barriers
13. Type 1: obstacles pertaining to spoken-word recognition
14. Learners report that the obstacles in strategy use that was complicated by spoken-word recognition problems. Some learners were having trouble with the matching task between the pronunciation of the spoken words and the words they already knew. Others, like learner were unable to recall the meanings of the spoken words. And, there were also learners such as who experienced both obstacles.

Similarly, learners couldn't employ the key word strategy due to the barriers in perceiving or differentiating sounds that seemed to sound alike to the learner: Under the condition, it's a little difficult to obtain the right key words.

Design instruction that focuses on all of the foundational literacy skills.

Activities that promote early literacy skills in preschool include:

- Interactive storybook reading
- "Pretend" reading and writing
- Games and other activities to help children identify the letters of the alphabet

Interactive experiences with language and print through poems, nursery rhymes and songs

The emphasis should be on code-based instruction, or instruction that helps children understand the relationship between spoken language and print. Recognize that many literacy skills can transfer across languages.

A child who has developed early literacy skills in his or her first language will find it easier to develop those same skills in English. Parents who are not proficient in English should be encouraged to help prepare their children for learning to read by using the home language to:

- Teach rhymes and songs
- Play word games
- Share storybooks

Teachers can support parent-child reading by sending home books in the child's home language. This makes available to parents, and it lets them know that the teacher considers reading to children in the home language to be important.

## III. PREPARING FOR THE FUTURE

Much attention has been given to the persistent achievement gap between English language learners and their English-speaking peers.

The good news, however, is that recent research has shown that high-quality early childhood education programs can have a significant impact on children's later academic achievement. Programs that provide research-based, age-appropriate instruction in early language and literacy skills can ensure that English language learners enter school equipped with the tools they need to be successful learners in kindergarten and beyond .

## IV. HOW TO ACQUIRE SOCIAL AND ACADEMIC LANGUAGE

Some of the most pressing and frequent questions administrators, board members, and classroom teachers ask are "How long should it take a newcomer to learn English?" we explore the answers to these questions, analyze the essential theories in second-language

acquisition, and examine the differences between social and academic English.

As you read the statements below, decide whether you think they are true or false.

- English language learners need one to three years to master social language in the classroom.
- Students don't always acquire social language naturally in informal contexts. They may need to be taught how to communicate appropriately in social situations.
- Although English language learners may speak English on the playground, this does not mean they have mastered the academic and cognitive language of the classroom.
- Learning academic subjects in their native language helps ELLs learn English.
- Parents of English language learners should be encouraged to speak their primary language at home.
- Students who have strong literacy skills in their native language will learn English faster.

#### V. THE ENGLISH LANGUAGE LEARNER

English language learners who are in the beginning stages are able to handle the following tasks:

- Produce survival vocabulary such as the words for water or bathroom.
- Follow simple directions that are accompanied by gestures such as "Point to the door" or "Walk to the chair."
- Engage in one-to-one social conversation using gestures.
- Answer low-level questions such as "Is an elephant large or small?" or "What color is the chair?"
- Participate effectively in hands-on classes such as art and physical education.
- Play uncomplicated games, particularly games that they play well in their native language, such as checkers, chess, or backgammon.
- Produce simple drawings, charts, and graphs.
- Listening to and understanding a simple story.
- Responding to and writing answers for short informational questions. For example, for a history unit on the Pilgrims, a teacher can test literal comprehension by asking, "What was name of the Pilgrims' ship?"

- Executing answers to questions about a chart or map, such as "Find Mexico on the map and label it."
- Understanding and communicating knowledge about math facts. At this stage, however, students will not be ready to learn difficult math concepts.
- Interacting socially with classmates. English language learners should be able to ask for help with their schoolwork or understand a teacher's instructions for a game.
- Newcomers will be able to participate in context-reduced activities during their

#### VI. LEARNING STRATEGIES

Learning strategies are steps taken by students to enhance their own learning. Strategies are especially important for language learning because they are tools for active, self-directed involvement, which is essential for developing communicative competence. Strategy use is the foundation of second language learning. For example, good learners know that practice in authentic situations and risk-taking enhances language learning. They also practise discrete strategies such as predicting meaning in context before consulting reference tools, analysing text for clues to meaning. Good language learners know how to improve their command of the language and intentionally apply strategies to do this. Content and language are developed together through a focus on and application of learning strategies. The strategies are relevant to all students, native and non-native English speakers. The authors recommend that the approach be used in mainstream classrooms.

When students take control of their own learning, the teacher's role changes from supplier of information to facilitator of learning. In this way, learning becomes student centered and students exit support equipped to take advantage of the many language learning opportunity. Learning strategies are steps taken by students to enhance their own learning. Strategies are especially important for language learning because they are tools for active, self-directed involvement, which is essential for developing communicative competence. Strategy use is the foundation of second language learning. For example, good learners know that practice in authentic situations and risk-taking enhance language learning. They also practice discrete strategies such as predicting meaning in context before consulting reference tools, analyzing text for clues to meaning. Good language learners know how to improve their command of the language and intentionally apply strategies.

Content and language are developed together through a focus on and application of learning strategies. The strategies are relevant to all students, native and non-native English speakers. Students should also take initiative in recycling vocabulary. Vocabulary is also learned through explicit focus on words and attempts to apply those words or expressions in authentic contexts. At the beginning stages learning, a teacher can guide the vocabulary development but as the learner's English becomes more advanced the student should take responsibility for his/her own vocabulary acquisition, identifying and focusing on unfamiliar words as they arise in authentic texts. Interest and curiosity about words is a path to continued vocabulary building. Strategies that focus on and recycle words in meaningful and engaging contexts are more likely to have a lasting effect.

## VII. CONCLUSION

Vocabulary is best learned when it is recycled in meaningful contexts. Teachers should make every effort to facilitate this as students learn and apply their knowledge to the different strands of language: reading, writing listening and speaking. Students should also take initiative in recycling vocabulary.

- Students need to read aloud to a partner, and to use appropriate pacing and expression.
- Students should use a glossary and index to search for information and complete a quick quiz.
- Students need to find key words in bold and define them in their own words for a partner, using context or referring to a glossary.
- Students should read, demonstrating comprehension of complex sentences to acquire English.

## REFERENCES

- [1] Fernandez-Toro, M. & Jones, F. R. (2001). DIY techniques for language learners. London: Centre for Information on Language Teaching and Research.
- [2] Gibbons, P. (1991). Learning to Learn in a Second Language. Newtown, NSW: Primary English Teaching Association.
- [3] Gibbons, P. (2002). Scaffolding Language, Scaffolding Learning: Teaching Second Language Learners in the Mainstream Classroom. Portsmouth, NH: Heinemann.
- [4] Nation, I. S. P. (2001). Learning Vocabulary in Another Language. Cambridge: Cambridge University Press.
- [5] Franken, M. (1987). Self-questioning scales for improving academic writing. Guidelines 9, 1:1-8.
- [6] Johns, T. & Davies, F. (1983). Text as a vehicle for information: the classroom use of written texts in teaching reading in a foreign language. Reading in a Foreign Language 1, 1:1-19.
- [7] Long, M. H. & Porter, P. A. (1985). Group work, interlanguage talk, and second language acquisition. TESOL Quarterly 19, 2:207-228.

# How to Enrich Your English

B. Sudha

## I. INTRODUCTION

**L**ANGUAGE Vocabulary Read this article to learn how you can enrich your English vocabulary in just a month! Enriching Your Vocabulary Love words. You have to really want to learn new vocabulary if you're going to succeed. Look up words you don't know whenever you encounter them. After encountering and looking up a word several times, you should eventually be able to remember its definition. Try them in your regular conversation so you will be sure when and where to use them. Use a Thesaurus. A thesaurus is a great resource which enables you to know the more advanced equivalent of Basic English words.

There are many computer programs and websites that have ways of giving you a short "Word of the Day" list with new words every day. Try going to [www.dictionary.com](http://www.dictionary.com). Scroll down and click on "Get the Word of the Day e-mail". If you enter all of the required information, you will get a new e-mail every day with a word, its definition, and an example usage sentence. Get a personalized Google homepage and click on "Add Content". Search for "word of the day" in the search box, and pick some of the content choices that you'd like to have on your homepage. We recommend Merriam-Webster ([www.m-w.com](http://www.m-w.com)), Dictionary.com, and Wordsmith.org. When you log on to your homepage, there will be a list of new words every day. Read. Read all genres of books. When you come across a word you don't know, read the sentences around the word and try to figure out what it means from the context. Check your guess with a dictionary.

This doesn't mean you should start reading medical textbooks or other books with lots of new words on every page. Set aside time each day to sit down with your book. Enjoy yourself! Play word games with friends. Try Boggle, Scrabble, or Catch-Phrase. There are so many great games out there to teach you new words. If a friend comes up with a word that you don't know, ask them what it means. Use the words you learn when you're talking to people or writing letters or e-mail. Using your new vocabulary is not only fun, but a great way to remember all these new words. Try to use at least three new words a day when communicating with anyone. Learn roots, prefixes, and suffixes. Many words in the English

language come from Latin or Greek words. When you combine these Latin or Greek words, you get new words in English.

For example:

Astro ("astron" meaning "star") + logy (logos meaning "speech") = astrology (meaning "telling of the stars"). Buy an etymological dictionary (meaning "a dictionary of word origins"). If you learn any romance language (eg: French, Spanish, Italian), or Latin or Ancient Greek, these will help you immensely with improving your vocabulary, especially the two ancient languages here because so many complicated English words are derived from words that are simple and commonly used in them.

Find a friend who speaks English. It's good to practice using your new words. With a web connection, your conversation partner does not need to live near you. You can email, chat, and even phone each other using your computers. A friend who understands that you are learning can help you practice, use new words in your conversations, and offer you advice. Since talking to a friend is fun, it won't feel like work! If your friend wants to learn your language, too, it will be easier for both of you to understand each other's mistakes. Listen to the radio, watch television, or find a podcast that you like in English, and practice.

The Importance of Vocabulary is central to English language teaching because without sufficient vocabulary students cannot understand others or express their own ideas. Wilkins (1972) wrote that "...while without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (pp.111-112). This point reflects my experience with different languages; even without grammar, with some useful words and expressions, I can often manage to communicate. Lewis (1993) went further to argue, "Lexis is the core or heart of language" (p.89).

Particularly as students develop greater fluency and expression in English; it is significant for them to acquire more productive vocabulary knowledge and to develop their own personal vocabulary learning strategies.

Students instinctively recognize the importance of vocabulary to their language learning. As Schmitt (2010) noted, "learners carry around dictionaries and not grammar books" (p.4). Teaching vocabulary helps students recognize and communicate with others in English. Voltaire purportedly said, "Language is very difficult to put into words." I believe English language

---

B. Sudha M.A (B.Ed), Assistant professor, Department of English, Annai Khadeeja arts and science, College for Women, Kandianivayal. Email: [sudhakalachitra@gmail.com](mailto:sudhakalachitra@gmail.com)

students generally would concur, yet learning vocabulary also helps students master English for their purposes. A person's vocabulary is the set of words within a language that are familiar to that person. A vocabulary usually develops with age, and serves as a useful and fundamental tool for communication and acquiring knowledge. Acquiring an extensive vocabulary is one of the largest challenges in learning a second language. Vocabulary is commonly defined as "all the words known and used by a particular person". Knowing a word, however, is not as simple as merely being able to recognize or use it. The way to build vocabulary. Understand the explanation before you start practicing will definitely increase your understanding the language.

proof

# Social Aspects in Samskara By U.R. Ananthamurthy

Dr.P. Santhi and A. Santha Devi

**Abstract---** *U.R. Ananthamurthy's Samskara has already achieved the status of a classic. It is one of the most important post-independent novels written in India which studies both metaphysical and social aspects of Hinduism.*

## I. INTRODUCTION

**S**AMSKARA presents before us a community of persons who are interlocked with each other through various complex relationships- caste, economy, gender, societal hierarchy, religious questions and taboos ferment a complex web of relationships, against the backdrop of which the story line has been sketched. Superficially the novel deals with the dilemma of performing the last rites of Naranappa, a rebellious Brahmin who could not be excommunicated from his community by the rest of the Brahmins: yet at another level it also judges the quality of an entire way of life through two major characters, Praneshacharya and Naranappa, who are presented as foil and counterfoil to each other. Religion and caste are probably the two most important aspects of Indian social and cultural life. So many critiques of religion and caste have been attempted and time and again casteism has been attributed to Hinduism and the researches have been done to prove that. The paper explores how U.R. Ananthamurthy takes a different stance in Samskara

The first theme that is taken up by the novel is about life after death. One of the greatest metaphysical aspects of the religions is that they offer glorious life after death in paradise to their selected followers. They have also laid different criteria to judge the eligibility of the pious candidates who vow for it. This criterion generally includes: following a set of rules, leading an honest, faithful and pious life. The Hindus yearn for even a step further and want to achieve moksha, a kind of supra-existence which means freedom from the cycle of birth and death. But what is the best way of achieving that supra-existence is the question that has been contemplated by the human beings since the rise of religion.

Another important issue that has been taken up in the novel is that of caste. Chandri, a low-caste woman who is lesser than wife of the dead man, Naranappa. She symbolizes all women of her caste and class. She is the most discussed character after Naranappa in the novel and also more critical. Since, she is from the class of prostitutes, thus categorizing her as the member of lower caste. Everyone feels shame on her. She is not only untouchable to Brahmins but even invisible. A look of her will pollute the Brahmins. Everyone in the Agrahara looks down on her but behind the veil everyone is mad for her beauty and wants to possess her. Because she belongs to the lower caste, her understanding is permanently under question as if she is an immature. This is just a wrong belief because in the whole course of the novel she is the one who presents herself with more mature vision than anyone in the whole Agrahara, even than the authority, Acharya.

Another woman in the novel is the wife of Putta who represents inter-caste theory in the novel; though this is not much different from untouchable even they are from Caste Hindu sect. According to *Manu Smriti* this inter caste relationship will naturally put the offenders in untouchable sect. Putta is the product of an inter-caste marriage, naturally an untouchable. He is part Brahmin, and part lower caste. He mentions occasionally that he is having problems with his wife, and that the solution to this is just to beat her. The only problem with him is that his wife just wants to visit her parents because she loves them and her husband Putta does not want to bear the expenses of her journey. This shows that after marriage a woman cannot visit or love her parents. She has to lose every relationship and make herself only related to husband. He will decide her feelings and desires even though they are just and respectable. In Putta's wife the domination is only exerted by physical force but she rebels in the psycho-hierarchy form in her consciousness and this rebellion pushes Putta to beat her again and again.

Lakshidevamma was a child widow. The passage describing her ill fate "married at eight, widowed at ten. She lost her father-in-law and mother-in-law at fifteen. The agrahara had sneered at her. She lives alone, and became "all venom" when Garuda took everything from her. Lakshidevamma is insignificant in the larger scheme of things. She is ignored and bypassed by all the

---

Dr.P.Santhi, Head of the Department, Coimbatore Institute of Technology, Coimbatore 641 014 . E-mail: Psanthi.cit@gmail.com  
A.Santha Devi, Assistant Professor, Coimbatore Institute of Technology, Coimbatore 641 014  
Email: santhadeviam@gmail.com



Learned Brahmins and yet it is she who comes out with the sanest advice for the entire lot. She abuses profusely, specially Garuda for having stolen“ a poor old shaven widow’s money” ( Samskara 54) and as she belches she utters just the right words by way of counsel and indictment.

She is suppressed oppressed because she is a woman living alone, or both.

## II. CONCLUSION:

This paper has sought to clarify the social aspects in U.R. Anantha Murthy’s Samskara. , the writer remarkably proves that caste system has no sanction in the religion and at the same time proves that orthodoxy too is an alien concept for Hinduism which is dynamic and mobile and always ready to accept changes. This novel becomes even more authentic social document when we come to know that it is not entirely fictional and is based on the childhood experiences of the writer.

## REFERENCES

- [1] Ananthmurthy, U.R.1999. Samskara. Trans. A.K. Ramanujan. New Delhi: Oxford University Press.6. All the subsequent references all from the same edition of the text.
- [2] Ananthmurthy, U.R. 2005 “ I, a Brahmin.” New Internationalist. July.
- [3] Manu Chakravarthy. U.R. Ananthamurthy Omnibus. Gurgaon: Arvind Kumar Publishers. 2007:305.
- [4] Rigveda. 2 indya. Web.
- [5] The Bhagvad Gita. Trans. Shri Purohit Swami. the bigview. Web.12.
- [6] Nadkarni. M.V. 2003“Is Caste System Intrinsic to Hinduism?
- [7] Demolishing a Myth.” Economic & Political Weekly.Vol. 38, No. 45(Nov.8-14) pp. 4783-4793.
- [8] Ananthmurthy. U.R. “Tradition and Creativity.”
- [9] Ed. N. Manu Chakravarthy. U.R. Ananthamurthy Omnibus. Gurgaon: Arvind
- [10] Claude, Levi- Strauss. “Incest and Myth,” David Lodge, 546. n.d. de Beauvoir, Simone.
- [11] The Second Sex, trans. H.M. Parshley, London: Vintage, 1997. 131. Dumont, Louis.
- [12] Hierarchy, Status and Power: The Caste System and It’s Implications Social Stratification Ed.
- [13] Dipankar Gupta Published by Oxford University Press, New Delhi Nineteenth Impression 2010. 483.
- [14] Web Sources: www.inflibnet.ac.in > Home > Vol 3, No 5&6 (2011



























































#### A. Influence of growth condition on the production of Enterocin

The enterocin was secreted into the growth medium, and production was started from late log phase itself and maximum was obtained in the early stationary growth phase at 18<sup>th</sup> hours of the culture. Growth beyond the stationary phase result in a decrease in bacteriocin production. Incubation temperature and pH played important role in cell growth as well as bacteriocin production. Further more were production recorded at 35 °C and lower level were recorded at 45 °C. Regarding pH, maximum bacteriocin level was observed at pH 6.5 and minimum bacteriocin production level was observed at pH of 4.5.

#### B. Molecular weight determination in Tricine SDS

Molecular weight of the bacteriocin was determined by SDS-PAGE gel electrophoresis. Single protein band was observed when stained with Comassie blue and it clearly indicated the purity of the protein. The molecular weight was estimated as approximately 5kDa (Fig 2).

### V. DISCUSSION

Enterococci are known to be widespread in nature. For most enterococcal species, the predominant habitat is the gastrointestinal tract of animals and humans where they can be found in numbers as high as 108 cfu/g of feces [18]. Enterococci were found in foods of animal origin (milk, cheese, and fermented sausages), vegetables and plant materials [20]. Additionally to these natural habitats, they are implicated in nosocomial infections [34]. Many enterococci were reported to produce bacteriocins called enterocins, which are various, having great diversity in their structure, and active against numerous microorganisms, especially foodborne pathogens and against microorganisms of environmental and medical interests [1, 7, 11, 21].

Many enterocin and other members of the pediocin like family of bacteriocin exhibit a broad inhibitory spectrum that includes most of the gram positive bacteria [2, 4, 5, 6, 25]. Our enterocin strongly inhibited gram negative. Even though gram positive bacteria are usually considered to be resistant to the many of bacteriocins from *Enterococcus* stains, we observed some Gram negative stains were sensitive to our bacteriocins. Some reports have state to support our findings that certain lactic acid bacteriocins, especially the class bacteriocin pediocin, can inhibit limited number of Gram positive bacteria.

Bacteriocin production can be influenced by pH, temperature, incubation time, and other environmental factors [3, 13, 28]. According to the result obtain in this study, and those reported in the literature [10, 22, 33]. The optimal production of *Enterococcus*

*faecalis*. Bacteriocins occurs during the early logarithmic growth phase, usually at a pH 6.5. The decrease in antimicrobial activity observed after a longer incubation time. The majority enterocins have been characterized so far class 2, with molecular weight under 10kDa [121]

The present study was described the production of enterocins from home waste Vegetables stain *Enterococcus faecalis* protein (enterocin) was partial purified with traditional ammonium sulphate method subsequently the molecular weight as determined by the standard method. Based on the results it reveals the further study needed for the molecular characterization. As per our best knowledge, it is the first study on bacteriocin producing strains isolated from home waste Vegetables. Also the capacity to inhibit both gram negative as well as positive strains *Enterococcus faecalis*. It can be used in drug development.

### REFERENCE

- [1] A. Galvez, E. Valdivia, M. Martinez, and M. Maqueda, "Bactericidal action of peptide antibiotic AS-48 against *Escherichia coli* K-12," Canadian Journal of Microbiology, vol. 35, no. 2, pp. 1989, 318–321.
- [2] Aymerich T, Holo H, Havarstein LS, Hugas M, Garriga M, Nes IF. Biochemical and genetic characterization of enterocin A from *Enterococcus faecium*, a new antilisterial bacteriocin in the pediocin family of bacteriocins. Appl. Environ. Microbiol. 1996;62: 1676-1682.
- [3] Biswas SR, Ray P, Johnson MC, Ray B. Influence of growth conditions on the production of a bacteriocin, pediocin AcH, by *Pediococcus acidilactici* AcH. Appl. Environ. Microbiol. 1991; 57: 1265- 1267.
- [4] Booth MC, Bogie CP, Sahl HG, Siezen RJ, Hatter KL, Gilmore MS. Structural analysis and proteolytic activation of *Enterococcus faecalis* scytolysin, a novel lantibiotic. Mol. Microbiol. 1996; 21: 1175-1184.
- [5] Casaus P, Nilsen T, Cintas LM, Nes IF, Hernandez PE, Holo H. Enterocin B, a new bacteriocin from *Enterococcus faecium* T136 which can act synergistically with enterocin A. Microbiology. 1997; 143: 2287-2294.
- [6] Cintas LM, Casaus P, Havarstein LV, Hernandez PE, Nes IF. Biochemical and genetic characterization of enterocin P, a novel seedependent bacteriocin from *Enterococcus faecium* P13 with a broad antimicrobial spectrum. Appl. Environ. Microbiol. 1997; 63: 4321- 4330.
- [7] C. M. A. P. Franz, M. J. Van Belkum, W. H. Holzapfel, H. Abriouel, and A. Galvez, "Diversity of enterococcal bacteriocins and their grouping in a new classification scheme," FEMS Microbiology Reviews, vol. 31, no. 3, pp. 2007, 293–310.
- [8] De Vuyst L., Vandamme, E.J. Antimicrobial potential of lactic acid bacteria. In: De Vandamme, E.J. (Eds). Bacteriocins of lactic acid bacteria: Microbiology, Genetic and Applications. Blackie Academic & professional. London. United Kingdom. Pp. 1994, 91-142.
- [9] De vuyst, L., Avonts, L., Makras, E. probiotics, prebiotics and gut health (Chap. 17). Remacle, C., Ruesens, B. (Eds), Functional foods, Ageing and Degenerative Disease. Woodhead Publishing Ltd., Cambridge, United Kingdom, pp. 2004, 416-482.
- [10] Daeschel MA, McKenney MC, McDonald LC. Bacteriocidal activity of *Lactobacillus plantarum* C11. Food Microbiol. 1990;7: 91-98.
- [11] E. A. Svetoch, B. V. Eruslanov, V. V. Perelygin. "Diverse antimicrobial killing by *Listeria monocytogenes*" 50-52

- bacteriocin," Journal of Agricultural and Food Chemistry, vol. 56, no. 6, pp. 2008, 1942–1948.
- [12] Eijssink V, Axelsson L, Diep DB, Havarstein L S, Holo H, Nes, I F. Production of class II bacteriocins by lactic acid bacteria; an example of biological warfare and communication. *Antonie van Leeuwenhoek*. 2002, 81: 639-654.
- [13] Eijssink VGH, Brurberg MB, Middelhoven PH, Nes IF. Induction of bacteriocin production in *Lactobacillus sake* by a secreted peptide. *J. Bacteriol*. 1996, 178: 2232-2237.
- [14] Franz, C.M.A.P., Holzapfel, W.H., Stiles, M.E. Enterococci at the crossroads of food safety? *International Journal of food Microbiology*. 1996a, 47, 1-24.
- [15] Franz, C.M.A.P., Stiles, M.E., Schleifer, K.H., Holzapfel, W.H. Enterococci in foods-a conundrum for food safety. *International Journal of Food Microbiology*. 2003, 88, 105-122.
- [16] Gutierrez, J., R. Larsen, L. M. Cintas, J. Kok, and P. E. Hernández. High-level heterologous production and functional expression of the sec-dependent enterocin P from *Enterococcus faecium* P13 in *Lactococcus lactis*. *Appl. Microbiol. Biotechnol*. 2006, 72: 41–51.
- [18] Holt, J.G., N.R. Krig, J.T. Staley and S.T. Williams. Gram positive Cocci. *Bergey's Manual of Determinative Bacteriology*, 9th Edn., Prentice-Hall, Baltimore, Maryland 21202 USA, pp. 1994, 528-540.
- [19] I.K. Uhn, A. Iversen, M. Finn. "Occurrence and relatedness of vancomycin-resistant enterococci in animals, humans, and the environment in different European regions," *Applied and Environmental Microbiology*, vol. 71, no. 9, pp. 2005, 5383–5390.
- [20] Ivanova I, Miteva V, Stefanova TS, Pantev A, Budakov I, Danova S, Montcheva P, Nikolova I, Dousset X, Boyaval P. Characterization of a bacteriocin produced by *Streptococcus thermophilus* 81. *Int. J. Food Microbiol*. 1998, 42: 147-158.
- [21] J. C. Giard, J. M. Laplace, A. Rince. "The stress proteome of *Enterococcus faecalis*," *Electrophoresis*, vol. 22, no. 14, pp. 2001, 2947–2954.
- [22] J. E. Line, E. A. Svetoch, B. V. Eruslanov. "Isolation and purification of enterocin E-760 with broad antimicrobial activity against Gram-positive and Gram-negative bacteria," *Antimicrobial Agents and Chemotherapy*, vol. 52, no. 3, pp. 2008, 1094–1100.
- [23] Jimenez-Diaz R, Rios-Sanchez RM, Desmazeaud M, Ruiz-Barra JL, Piard JC. Plantaricin S and T, two new bacteriocins produced by *Lactobacillus plantarum* LPCO10 isolated from a green olive fermentation. *Appl. Environ. Microbiol*. 1993, 59: 1416-1424.
- [24] Kang JH, Lee MS. Characterization of bacteriocin produced by *Enterococcus faecium* GM-1 isolation from infant. *J. Appl. Microbiol*. 2005, 98: 1169-1176.
- [25] Klaenhammer, T.R. Genetics of bacteriocins produced by lactic acid bacteria. *FEMS Microbiology Review*. 1993, 12, 39-86.
- [26] Kwon DY, Koo M S, Ryoo CR, Kang CH, Min KH, Kim WJ. Bacteriocin produced by *Pediococcus* sp. in kimchi and its characteristics. *J. Microbiol. Biotechnol*. 2002, 12: 96-105.
- [27] Lilly, D.H., Stillwell, R.H. Probiotics: growth promoting factors produced by microorganisms. *Science*. 1965, 147, 747-748.
- [28] Lowry, O.H., N.J. Rosebrough, A.L. Farr and R.J. Randall. Protein measurement with the folin-phenol reagent. *J. Biol. Chem*. 1951, 193: 265-275.
- [29] Mørtvedt-Abildgaard CI, Nissen-Meyer J, Jelle B, Grenov B, Skaugen M, Nes IF. Production and pH-dependent bactericidal activity of lactocin S, a lantibiotic from *Lactobacillus sake* L45. *Appl. Environ. Microbiol*. 1995, 61: 175-179.
- [30] Saavedra, L. Clinical application of probiotic agents. *American Journal of Clinical Nutrition*. 2001, 73, 1147S-1151S.
- [31] Salminen, S., Isolauri, E., Salminen, E. Clinical uses of probiotics for stabilising gut mucosal barrier: successful strains and future challenges. *Antonie Van Leeuwenhoek*. 1996, 70, 347-358.
- [32] Schagger, H., and Von Jagow, G. Tricine sodium dodecyl sulphate polyacrylamide gel electrophoresis for the separation of proteins in the range from 1 to 100 kDa. *Anal. Biochem*. 1987, 166 368-379.
- [33] Svec, P., Derivese, L.A., Sedlacek, I., Baele, M., Vancanneyt, M., Haesebrouck, F., Swings, J., Dossar, J. *Enterococcus haemoperoxidus* sp. nov. and *Enterococcus moraviensis* sp. nov., isolation from water. *International journal of Systematic and Evolutionary Microbiology*. 2001, 51, 1567-1574.
- [34] Todorov S, Gotcheva B, Dousset X, Onno B, Ivanova I. Influence of growth medium on bacteriocin production in *Lactobacillus plantarum* ST31. *Biotechnol. Biotechnol. Eq*. 2000, 14: 50-55.
- [35] W. Witte, C. Cuny, I. Klare, U. Nübel, B. Strommenger, and G. Werner, "Emergence and spread of antibiotic-resistant Gram-positive bacterial pathogens," *International Journal of Medical Microbiology*, vol. 298, no. 5-6, pp. 2000, 365–377.

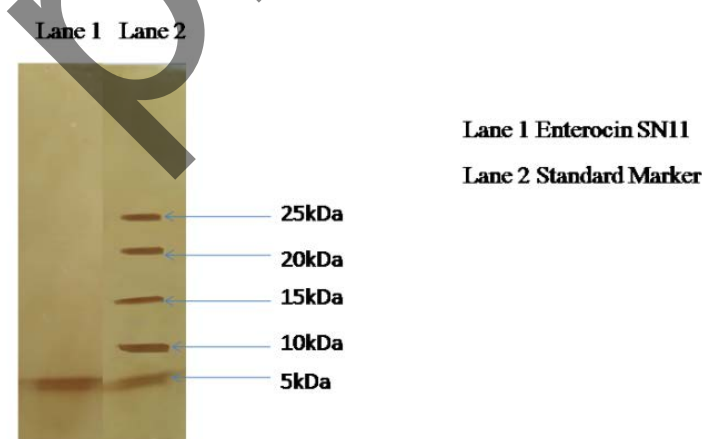


Fig. 2. Tricine SDS-page analysis of purified enterocin SN11.

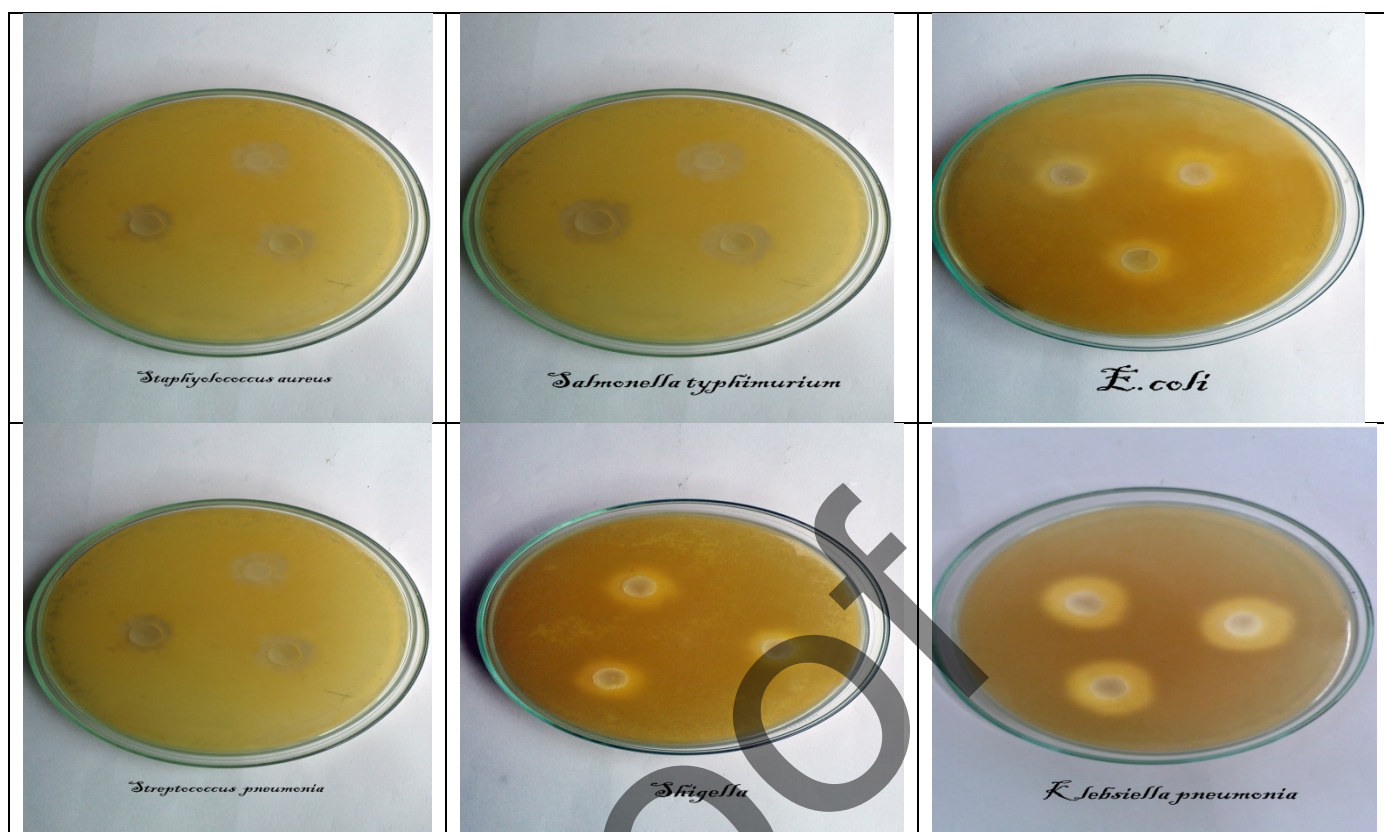


Fig 1 Antagonistic activity of enterocin SN11 against pathogenic microorganisms.



# Growth and Characterization of KLTC Crystal

S. Vasuki

**Abstract----** *The synthesis and growth of KLTC single crystals have been successfully carried out by slow evaporation technique at room temperature. The grown crystal characterized by Single crystal XRD, FTIR, UV-Vis, Density & SHG studies. Single crystal XRD has confirmed that the grown crystal belongs to monoclinic sturcture. The presence of functional group has been confirmed by Fourier Transform Infrared spectrum. The transmittance spectrum has been recorded by UV-Vis Spectrometer. From absorption spectrum it is observed that the crystal have the transmittance of 98%. The density of the grown crystal determined by Flotation technique. SHG efficiency was identified from Kurtz Powder technique.*

**Keywords---** *KLTC, slow evaporation, XRD, FTIR, Optical studies.*

## I. INTRODUCTION

THERE is an increase in research activities to identify suitable materials and crystals which display the excellent non linear properties. Due to unique properties, the non linear optical single crystals have promising applications in the area of photonics such as high speed information processing, frequency conversion, optical communication, high optical disk data storage etc.,[1] Compared to organic crystals, the inorganic crystals have good physiochemical stabilities and large second order nonlinearities. Because of these reasons the inorganic crystals are gaining popularity in the field of nonlinear optics. Bimetallic thiocyanate complexes of type  $AB(SCN)_4$  and their derivatives are much potentially useful among the inorganic systems because all of them contain  $-S=C=N-$  bridges, which connect A and B atom, forming infinite two dimensional or three dimensional networks. The infinite networks produce relatively large polarization which induces large macroscopic nonlinearities in the materials [2, 3].

In the present work an attempt has been made to synthesis single crystals of Pottasium Lithium Thiocyanate (KLTC) from slow evaporation technique. The physiochemical properties of grown KLTC crystals are studied by using various characterization techniques such as XRD, FTIR, Density measurement and optical studies.

## II. EXPERIMENTAL DETAILS

The KLTC single crystals were obtained by crystallization from an aqueous solution of  $K_2SO_4$ ,  $LiSO_4 \cdot H_2O$ ,  $NH_4(SCN)$  in a proper stiochiometric ratio by slow evaporation method at room temperature. The material was synthesized from commercially available Potassium Sulphate, Lithium Sulphate monohydrate and Ammonium thiocyanate (AR grade). The synthesized salt was dissolved in double distilled water. The solution was filtered twice to remove any insoluble impurities. The saturated solution was maintained in the undisturbed condition and the beaker was covered by filter paper. Few holes are made on the filter paper for slow evaporation. Seed crystals were formed due to spontaneous nucleation within a week. After the period of one month transparent and colorless crystals were harvested. The photograph of the grown crystal is shown in Fig 1.



Fig 1 Photograph of KLTC crystal

## III. RESULTS AND DISCUSSION

### 3.1 Single crystal XRD

The grown crystals were subjected to single crystal XRD to confirm the crystallinity and also to estimate the lattice parameters by employing Bruker Nonuis CAD-4 single crystal X-Ray diffractometer. Then, the obtained cell values of the grown crystals were compared with their parent substances [3-7] which confirms whether the grown crystals are complex or not.

S. Vasuki, Assistant Professor – Physics, P.A.College Of Engineering And Technology, Pollachi-642002.

Table 1 XRD Data

Cell Values	Li <sub>2</sub> SO <sub>4</sub> .H <sub>2</sub> O	K <sub>2</sub> SO <sub>4</sub>	NH <sub>4</sub> (SCN)	KLTC
a(Å)	5.449	5.476	4.3	5.139
b(Å)	4.953	10.033	7.2	5.232
c(Å)	8.473	7.433	13.0	8.606
$\alpha$	90°	90°	90°	90°
$\beta$	105°	90°	114°	115°
$\gamma$	90°	90°	90°	90°

From the single crystal X-ray diffraction data, it is observed that the KLTC crystallizes under monoclinic structure. The lattice parameters were from single crystal XRD data reveals that the changes in the lattice parameter values were due to complex formation. Further it confirms that the grown crystals were novel one.

### 3.2 Density measurement

Using Flotation technique, the densities were measured for the complex crystals. The density of the complex crystal found to be 2.180 g/cm<sup>3</sup> and it is compared with their densities of parent materials

TABLE 2 Density Measurement

Name of the material	Density in g/cm <sup>3</sup>
K <sub>2</sub> SO <sub>4</sub>	2.66
Li <sub>2</sub> SO <sub>4</sub> .H <sub>2</sub> O	2.06
NH <sub>4</sub> (SCN)	1.305
KLTC	2.180

From the density measurement the density values of the complexes were lies between the densities of parent substances. Hence it can be concluded that the grown crystals were complex.

### 3.3 Optical absorption study

For studying optical transparency of grown crystal in the UV-vis-NIR an optical absorption spectrum is recorded in the range of 200-500 nm.

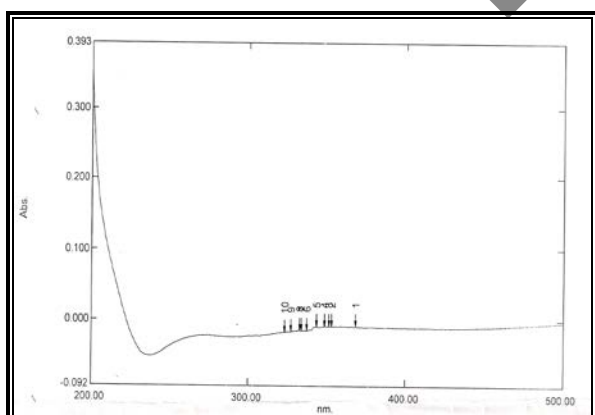


Fig 1 UV-Absorption spectrum

From the absorption spectrum (Fig 1) it is noticed that there is no significant absorption in 200-500 nm, which resembles that grown crystals were highly transparent in the entire visible region. Then it is evident that the grown crystals having low cut off wavelength around 250 nm which an essential property for a NLO material.

### 3.4 FTIR studies

The Fourier Transform Infrared (FTIR) spectral analysis is a technique in which almost all functional groups in a molecule absorb characteristic frequencies. The absorption of IR radiation causes bending and stretching vibrations. The most important range being 400 – 4000 cm<sup>-1</sup>. FTIR spectrum was recorded using SHIMADZU 8400S using KBr pellet technique.

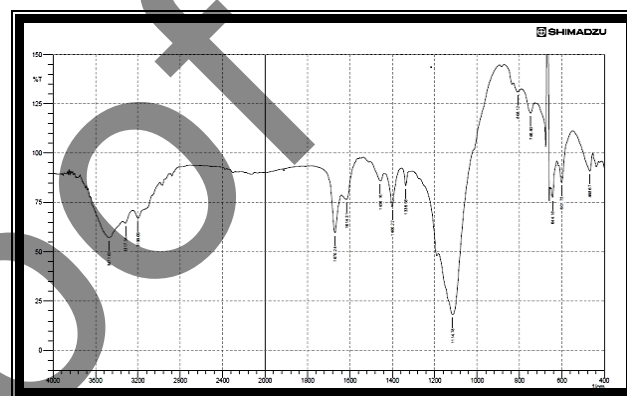


Fig 2 FTIR Spectrum of KLTC

The peaks at 3313, 3199 cm<sup>-1</sup> were attributed to H<sub>2</sub>O stretching. Cyanides and thiocyanates having vibrational bands at 2200-2000 cm<sup>-1</sup> and C-S stretching appear as a weak band in the 800-600 cm<sup>-1</sup> region [8-12]. The peaks at 2075 cm<sup>-1</sup> were ascribed to C-N stretching. The peak at 810 cm<sup>-1</sup> corresponds to CN stretching. The SCN bending vibrations of KLTC appears at 464 cm<sup>-1</sup>. The C-S, C-N and SCN frequencies of complex crystals were well agreement with the available literature [3,8-12].

This confirms the metal-nitrogen and metal-sulfur coordination in their structures. It resembles that the complex crystals were bonded through S and N. The C-S, C-N and SCN frequencies of complex crystals were well agreement with the available literature [3,8-12].



### 3.5 Second Harmonic Generation test

The most widely used technique for confirming SHG from prospective second order NLO materials is the Kurtz-Perry powder technique [13]. The second harmonic generation conversion efficiency test has been carried out using modified setup of Kurtz and Perry [14] at Indian Institute of Science, Bangalore. A Q-switched Nd: YAG laser beam of wavelength 1064 nm, with an input power of 4.7 mJ/pulse, and pulse width of 8 ns with a repetition rate of 10 Hz was used. The grown crystals were crushed into a fine powder and then packed in a micro-capillary of uniform bore and exposed to laser radiations. The 532 nm radiation was collected by a monochromator after separating the 1064 nm pump beam with an infra-red blocking filter. The second harmonic radiation generated by the randomly oriented micro-crystals was focused by a lens and detected by a photomultiplier tube. The emission of green light confirms the second harmonic generation. It is observed that the measured SHG efficiency of KLTC crystal was same as that of KDP. Hence the grown crystal has NLO property. It can be used for optical applications.

## IV. CONCLUSION

KLTC crystal has been successfully synthesized and the grown crystals have been grown by slow evaporation method at room temperature. The crystallographic data indicates that the KLTC crystallize under monoclinic structure. Density measurement confirms the complex formation. The vibrational frequencies were reveals that the common mode of SCN behavior; bridging two metal ions by coordination through both N and S atoms with some metal characters. The absence of absorption in the visible region and the lower cutoff wavelengths of grown crystals highlights its prospectus of application in optoelectronics. The non linear optical behavior of the KLTC crystal was confirmed from Kurtz Perry powder test by the emission of green radiation. Hence KLTC crystal can be a potential material good for optical applications.

## REFERENCES

- [1] X. Q. Wang et al., Materials Research Bulletin 36 ,879-887 (2001).
- [2] X.Q. Wang ,et al., Journal of crystal growth, 224,284-293(2001).
- [3] B.Vijayabhaskaran, et al., Journal of Minerals and Materials Characterization and Engineering, 11,691-694,(2012).
- [4] J.K. Saha and J. Podder Journal of Bangladesh Academy of Sciences, 35(2), 203-210(2011).
- [5] R. Kanagadurai et.al.,E-Journal of Chemistry, 6(3), 871-879 (2009).
- [6] E.Vanderzee, F.J.Westrum, J.Chem. Thermodynamics, 2, 417-429 (1970).
- [7] G.E. Ziegler , The Crystal Structure of Lithium Sulphate Mono-Hydrate, Li<sub>2</sub>SO<sub>4</sub>.H<sub>2</sub>O, 456-462 (1934).
- [8] N.B. Colthuph, L. H. Daly, S.H. Wilberley, Introduction to Infrared and Raman Spectroscopy Academic press, Newyork, (1964).
- [9] M.S.Yadav, Spectroscopy (Second Edition, Anmal Publications Pvt. Ltd, New Delhi, 2004).
- [10] Jag Mohan, Organic Spectroscopy, (Narosa publishing House, 2001).
- [11] S. Gunasekaran, S. Ponnusamy, Cryst. Res. Technol. 41, No.2, 130 – 137 (2006).
- [12] B. Vijayabhaskaran, et.al, Indian Journal of Pure & Applied Physics, Vol. 49, 340-343 (2011).
- [13] Robert W. Boyd, Non linear Optics Second Edition, Academic Press, London, (2006).
- [14] S. K. Kurtz, and T. T. Perry, J. Appl. Phys, 39, 3798-3813(1968).

# Antibacterial Properties of Indium Titanium Oxide Nanoparticles

Ranjithkumar. R. S. Sathish, R. Sengodan,  
C. K. Senthil Kumaran and B. Chandar Shekar

**Abstract---** Novel InTiO nanoparticles were prepared by wet chemical method. The fourier transform infrared spectroscopy confirmed the presence of metal-oxide (In-O and Ti-O) vibrations. The X-ray diffraction pattern indicated that the InTiO NPs have mixed phase of rutile-TiO<sub>2</sub> and cubic-In<sub>2</sub>O<sub>3</sub> structure. Scanning electron microscopy image showed a regular spherical shape with uniform in sizes. The spherical shape of the PVA assisted InTiO CNPs was also confirmed by transmission electron microscopy. The size of the NPs was about 28.35 nm - 34.76 nm. Antibacterial activity of InTiO nanoparticles showed convincing level of zone of inhibition against human pathogens.

**Keywords---** Composite materials, Structure, SEM, TEM and Antibacterial Activity.

## I. INTRODUCTION

THE nanoscience tools that are currently well understood and those that will be developed in future are likely to have an enormous impact on biology, biotechnology and medicine. The comparable size scale of nanomaterials and biological materials, such as antibodies and proteins, facilitates their use in biological and medical applications. The biomedical community has recently discovered that the distinctive physical characteristics of nanomaterials, such as their extraordinarily high surface area to volume ratio, tuneable optical emission, unique electrical and magnetic behaviour, and other novel properties can be exploited in a wide spectrum of biomedical utilities ranging from drug delivery to biosensors [1]. The current advantages in the field of nanotechnology particularly the ability to prepare metal oxide nanoparticles of specific size and shape are likely to

lead to the development of new biomedical materials [2]. Human beings are often infected by microorganisms such as bacteria, molds, yeasts, and viruses present in their living environments. Because of the emergence and increase in the number of multiple antibiotic-resistant microorganisms and the continuing emphasis on health-care costs, many scientists have researched methods to develop new effective antimicrobial agents that overcome the resistances of these microorganisms and are also cost-effective.

NPs into the environment may be harmful to the efficacy of beneficial microbes that function in element cycling, pollutant degradation and plant growth [3]. TiO<sub>2</sub> has been used extensively for killing different groups of microorganisms including bacteria, fungi and viruses [4]. Nanoparticles have a high specific surface area and utilize nanobased-system for various biomedical applications. The finding of novel antimicrobial agents with novel mechanisms of action is important and extensively pursued in antibacterial drug discovery [5]. Other hand, Titanium dioxide (TiO<sub>2</sub>) is extensively utilized as a self-cleaning and self-disinfecting surface coating materials [6]. Photo induced super-hydrophobicity and antifogging effect of titanium dioxide has a more helpful role in environmental purification such as removing bacteria from water and air [7]. Owing to this increasing trend of Titanium oxide nanoparticles in environmental and medical application, the present study was aimed to synthesis novel InTiO NPs and investigated the antibacterial activity against *Escherichia coli* (Gram-negative) and *Streptococcus faecalis* (Gram-positive).

## II. EXPERIMENTAL PROCEDURE

### A. Preparation of INTIO

50 ml PVA solution was prepared by adding 0.5 g of Poly Vinyl Alcohol (PVA) in 50 ml of distilled water and then the solution was magnetically stirred at 80°C for 5h. An equimolar ratio of In<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> powders were mixed with the prepared PVA solution with continuous stirring process. During the stirring process, the precipitation and gelation occurred to form a continuous network structure throughout the whole volume of the mixed indium and titanium based oxide solution. Then the gel-precipitation was ultrasonically churned in a water bath for 10 mins. During the ultrasonication, the metal oxides collided to form a bond of continuous network and

Ranjithkumar. Department of Biotechnology, Dr.N.G.P. Arts and Science College, Coimbatore-641 048, Tamil Nadu, India.

R. S. Sathish, Advanced Communication Engineering Centre, School of Computer and Communication Engineering, Universiti Malaysia Perlis, Kangar 01000, Perlis, Malaysia.

R. Sengodan, Department of Physics, Kumaraguru College of Technology, Coimbatore -641 049, Tamil Nadu, India

C. K. Senthil Kumaran, Department of Physics, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

B. Chandar Shekar, Assistant Professor, Department of Physics, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India. E-mail: chandar.bellan@gmail.com

followed by centrifugal washing at a frequency of 6000 rpm for 10 mins. Finally, the continuous ultrasonication and centrifugal washing process was repeated for 5 times to get well dispersed hybrid precursor solution. The final hybrid precursor solution was dried overnight at 200 °C to get a batch of porous fluffy mass with elimination of PVA. Finally, the dried gel was grinded and kept at 900 °C to get InTiO NPs.

### B. Characterization of INTIO-CNPS

The functional groups present in the InTiO NPs were identified by Thermo Nicolet, Avatar 370 fourier transform infrared spectroscopy (FTIR) with a spectral range of 800-400  $\text{cm}^{-1}$  and resolution of 4  $\text{cm}^{-1}$ . The structural properties were characterized by X-ray diffraction (XRD) using Bruker AXS D8 advance diffractometer with  $\text{CuK}\alpha$  radiation ( $\lambda = 1.5406 \text{ \AA}$ ) with operating voltage 40 kV and a current of 30 mA. The surface morphology of the NPs was imaged using JEOL Model JSM - 6390LV scanning electron microscope (SEM). The morphology, size and elemental compositions were identified with the help of JEOL JEM 2100 high resolution transmission electron microscope (HRTEM) with energy dispersive X-ray spectrometer (EDS).

### C. Antibacterial Activity

The INTIO NPS synthesized by wet chemical method was tested for antimicrobial activity by disc diffusion method against *E. coli*. Control experiments were also carried out in the presence of known standard antibiotics (Tetracycline). Sterilized Muller Hinton agar was poured in petriplate, after solidification the bacterial strain was swabbed uniformly onto the individual plates using sterile cotton swabs. INTIO NPS sample were prepared with different concentration, 0.5, 1.0, 1.5, and 2.0 mg/ml in sterile water. Filter paper discs (4 mm in diameter) were soaked in 50  $\mu\text{L}$  of the sample in each concentration. The discs were placed on the inoculated plates and allowed to dry for 10 min, then incubated at 37°C for 24h and the diameters of the inhibition zones were measured in millimeters.

## III. RESULTS AND DISCUSSION

The FTIR spectrum of virgin InTiO NPs and PVA assisted InTiO is shown in the Figure 1. The observed several absorption peaks between 800 and 400  $\text{cm}^{-1}$  region of the FTIR spectrum may be attributed to the characterization of metal-oxide (M-O) vibrations correspond to Ti-O and In-O stretching mode [8]. From the FTIR spectra it is seen that some of the peaks shifted and some disappeared with respect to the pure  $\text{In}_2\text{O}_3$  and  $\text{TiO}_2$  compounds [9,10].

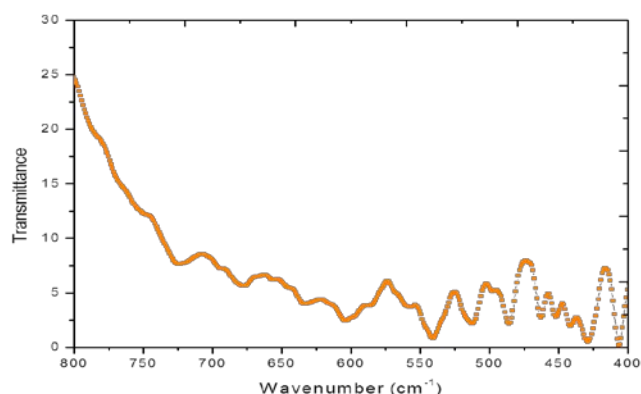


Figure 1: FTIR spectrum of InTiO

Figure 2 shows the XRD pattern of InTiO NPs. The observed Bragg's angles of 30.5, 35, 50, 54 and 60.5° corresponds to the (222), (400), (440), (600) and (622) planes of cubic structure (JCPDS 06-0416) of  $\text{In}_2\text{O}_3$ . The additional peaks observed for the diffraction angle of 27° indicates the rutile phase of  $\text{TiO}_2$  (JCPDS- 21-1276). The Bragg's angle of 27, 36, 39, 41, 44, 54, 56, 62 and 64° corresponding to (110), (101), (200), (111), (210), (211), (220), (002) and (310) planes indicates the rutile phase of  $\text{TiO}_2$  [11]. There is no anatase phase in the prepared sample. This shows that part of the anatase phase has transformed to rutile phase for samples calcined above 500 °C [12]. This confirms that the anatase phase is less thermally stable than rutile phase. Rutile phase has some advantages over anatase phase due to their high refractive index, higher dielectric constant, higher electrical resistance and chemical stability [13]. The calcinations temperature is an important factor affecting the phase transformation, which clearly indicated that the anatase to rutile transformation is accompanied by a crystallographic re- arrangement in  $\text{TiO}_2$  lattice [14]. The strong and sharp reflection peaks suggested that the prepared NPs are well crystallized. The XRD patterns suggested that the InTiO NPs showed better crystallinity. The obtained main diffraction peaks indicated the presence of mixed phase of rutile  $\text{TiO}_2$  and cubic  $\text{In}_2\text{O}_3$ . The crystallite size (D) was calculated from the full width at half maximum (FWHM) by using the Scherer's formula  $D = k\lambda/\beta\cos\theta$ , Where constant k is the shape factor=0.94,  $\lambda$  is the wavelength of the x-rays ( $\lambda = 1.5406 \text{ \AA}$  for  $\text{CuK}\alpha$ ),  $\theta$  is the Bragg's angle and  $\beta$  is the FWHM. The calculated crystallite size is 24.13 nm.

The SEM micrograph of InTiO NPs is shown in the Figure 3. The particles are assembled into close aggregates. Aggregation of InTiO NPs is obtained due to calcinations temperature. SEM image showed that the InTiO NPs were spherical in shape with uniform in sizes [15]. The ultrasonication and capping molecule or binder like polyvinyl alcohol (PVA) have probably influenced and leads to the uniform grain sizes of the product during

synthesis. The role of PVA on the morphology is obvious from the SEM images [16].

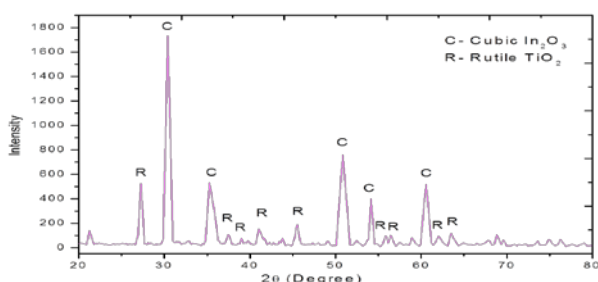


Figure 2: XRD spectrum of InTiO

The PVA assisted InTiO NPs showed uniform particle sizes less than 100nm with spherical shapes. The sizes of the particles are found to be 28.35 nm to 34.76 nm (Fig. 4a). From the TEM images it is concluded that the wet chemical method can produce uniform spherical shape InTiO NPs with uniform sizes and also revealed that spherical shape with uniform core-shell structured NPs obtained. The observed structure is good in agreement with early reported work on core-shell material [17].

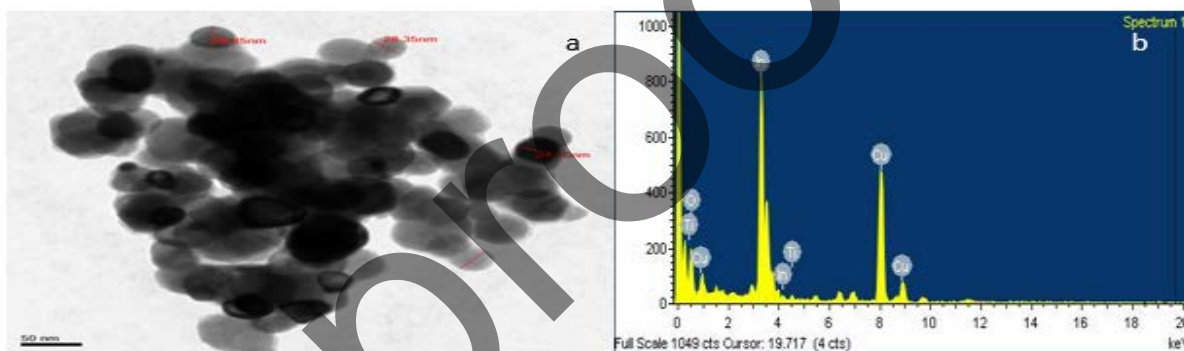


Figure 4: a) TEM image of InTiO NPs and b) EDX Spectrum of InTiO NPs

#### D. Antimicrobial activities of InTiO NPS

The antimicrobial activity of InTiO NPS along with standard antibiotic was investigated against both *E. coli* and *S. faecalis*. The INTIO-NPS nanoparticles synthesized by wet chemical method exerted a fairly significant antibacterial properties against two pathogens investigated when compared to control.

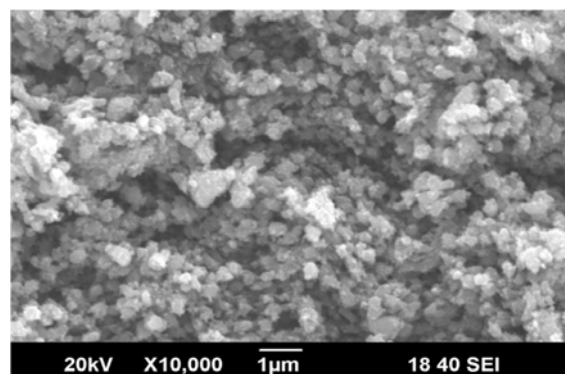


Figure 3: Novel InTiO NPs SEM Image

An effect of the addition of second oxide on the titania particle size, which is observed from TEM indicating the decrease in particle size was seen in the mixed-oxide samples compared to  $\text{TiO}_2$  sample [18]. To determine the elements present in InTiO CNPs by TEM-EDS analysis was carried out it is seen that InTiO NPs (Fig.4b) contain elements of In, Ti and O. It also indicated the absence of any impurity in the prepared NPs.

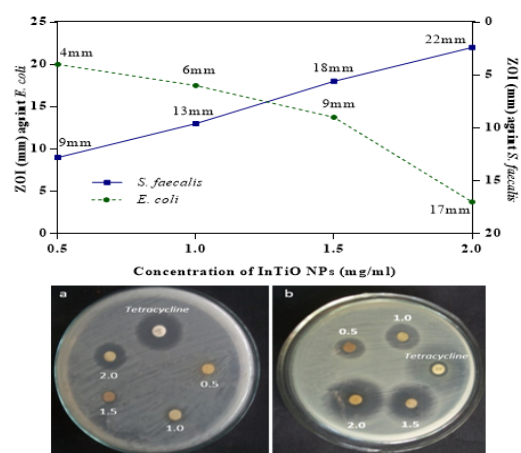


Fig. 5: Antibacterial activity of InTiO NPs against human Pathogens

The diameter of inhibition zones increased for the test pathogen it has been observed that antibacterial effect was dose dependent manner. Gupta et al. (2013) study reported that the TiO<sub>2</sub> and Ag-doped TiO<sub>2</sub> nanoparticles showed significant antibacterial activity against both gram positive and gram negative bacterial. Surface modified and HPMC treated TiO<sub>2</sub> NPs coated films exhibited good antibacterial activity against *E.coli* as well as *S. aureus* [19, 20]. Similarly our study shows the maximum 22, 17 mm Zone of Inhibition (ZOI) against test pathogen such as *E.coli*, *S. faecalis* at 2.0 mg/ml concentration of INTIO-CNPS by disc diffusion method (Fig 5). Novel InTiO NPs exhibited possess potent bactericidal activity against gram positive organisms.

#### IV. CONCLUSION

Novel InTiO nanoparticles were prepared by wet chemical method. The X-ray diffraction pattern indicated that the InTiO NPs have mixed phase of rutile-TiO<sub>2</sub> and cubic-In<sub>2</sub>O<sub>3</sub> structure. Scanning electron microscopy image showed a regular spherical shape with uniform in sizes. The spherical shape of the PVA assisted InTiO CNPs was also confirmed by transmission electron microscopy. The size of the NPs was about 28.35 nm - 34.76 nm. Antibacterial activity of InTiO nanoparticles showed convincing level of zone of inhibition against human pathogens.

#### REFERENCE

- [1] D. Bagchi, D. M. Bagchi, H. Moriyama, F. Shahidi, S.K. Singh, P.P. Kulkarni and D. Dash, (2013) DOI: 10.1002/9781118451915.ch1.
- [2] A. Azam, A.S. Ahmed, M. Oves, M.S. Khan, S.S. Habib, and A. Memic, International Journal of Nano medicine, 7 (2012) 6003-6009.
- [3] P. Gajjar, B. Pettee, D.W. Britt, W. Huang, W. P. Johnson and A. J. Anderson, Journal of Biological Engineering, 3 (2009) 1-13.
- [4] K. Gupta1, R.P. Singh, A. Pandey and A. Pandey, Beilstein Journal of Nanotechnology, 4 (2013) 345–351.
- [5] A. Coates, Y. Hu, R. Bax, and C. Page, "The future challenges facing the development of new antimicrobial drugs" Nat. Rev. Drug Discov., Vol. 1, pp. 895-901, 2002
- [6] A. Fujishima, and K. Honda, "TiO<sub>2</sub> photoelectrochemistry and photocatalysis," Nature, Vol. 238, pp. 37, 1972.
- [7] S. Tojo, T. Tachikawa, M. Fujitsuka, and T. Majima, The Photo-Absorption and Surface Feature of Nano-Structured TiO<sub>2</sub> Coatings," Journal of Physical Chemistry C, Vol. 112, pp.14948, 2008.
- [8] A. Mitsionis, T. Vaimakis, C. Trapalis, N. Todorova, D. Bahnemann, R. Dillert, Appl. Catal.B: Environ. 106, 398 (2011).
- [9] J. Vasquez, H. Lozano, V. Lavayen, M. L. Cantu, P. G. Romero, M.A.S. Ana, E. Benavente and G. Gonzalez, J. Nanosci. Nanotechnol. 9, 1103 (2009).
- [10] L. G. Teoh, Y. C. Lee, Y. S. Chang, T. H. Fang and H. M. Chen, Curr. Nanosci. 6, 1 (2010).
- [11] S. Kumar, N. K. Verma and M. L. Singla, Dig. J. Nanomater. Bios. 7, 607 (2012).
- [12] M. K. Moghaddam and F.F. I. Sola, J. Phys. Theor. Chem. 7, 245 (2011).
- [13] P. S. Liu, W. P. Cai, L. X. Wan, M. D. Shi, X. D. Luo, W. P. Jing. Trans. Nonferrous Met. Soc. China. 19, s743 (2009).
- [14] S. Riyas, G. Krishnan and P. N. Mohandas, Adv. Appl. Ceram. 106, 255 (2007).
- [15] M. Hema, A. Yelil, P. Tamilselvi and R. Anbarasan, Chem. Sci. Trans. 2, 239 (2013).
- [16] A. Azadeh, A. M. Amin and M. Ali, Iran. J. Chem. Chem. Eng. 30, 75 (2011).
- [17] G.G. Rusu, M. Rusu and N. Apetroaei, Thin Solid Films, 515 (2007) 8699-8704. Y.L. Zhao,
- [18] L. Yang, X. He and F. He, Materials Letters, 62 (2008) 4539-4591
- [19] K. Gupta1, R.P. Singh, A. Pandey and A. Pandey, Beilstein Journal of Nanotechnology, 4 (2013) 345–351.
- [20] N. Saraschandaraa, M. Pavithrab and A. Sivakumara, Antimicrobial applications of TiO<sub>2</sub> coated modified polyethylene (HDPE) films. Archives of Applied Science Research, 2013, 5 (1):189-194.

# Antibiofilm Action of Silver Nanoparticles Coated Intravascular Catheter (AgNPs- IVC) Against Clinically Isolated Human Pathogens

R. Ranjithkumar, K. Selvam, R. P. Senthil Kumar, J. Manikantan, C. K. Senthil Kumaran and B. Chandar Shekar

**Abstract---** Bacterial biofilms are widely distributed and play important roles in many environments. Biofilms are bacterial communities in which cells are embedded in a matrix of extracellular polymeric compounds attached to a surface. Silver nanoparticles (AgNPs) are multifunctional nanoparticles with effective antibacterial activity. In this present study, the synthesized AgNPs by reduction of silver nitrate during exposure to betel nut aqueous extract was confirmed by UV-Vis spectrum, the SPR peak observed at 414 nm. The characterization of AgNPs was carried out using X-ray diffraction, Dynamic Light Scattering, Scanning Electron Microscope and Energy-Dispersive Spectroscopy. XRD analysis revealed that the particles were crystalline in nature with face-centered cubic geometry. The distribution of the AgNPs observed that the particles obtained are polydisperse mixtures in the size range from 81 to 89 nm by using DLS analysis. SEM image of AgNPs shown that relatively spherical in shape and uniform with high agglomeration were noted. BN-AgNPs coated IVC have shown the greatest antibacterial activity against biofilm producing human pathogens.

**Keywords---** Betel Nut, AgNPs, SEM, XRD, IVC, pathogens.

## I. INTRODUCTION

**B**ACTERIAL BIOFILMS are widely distributed and play important roles in many environments.

Generally, biofilms are bacterial communities in which cells are embedded in a matrix of extracellular polymeric compounds attached to a surface [1]. Bacterial surface components and extracellular compounds in combination with environmental and quorum-sensing signals are crucial for autoaggregation and biofilm development in most bacterial species [2, 3]. Many urinary tract infections and bloodstream infection are associated with indwelling medical devices and biofilm associated. The most strategy for treating these infections may be deletion and removal of the biofilm contaminated device. Urinary tract infections and bloodstream infection are associated with indwelling medical devices and biofilm associated. The most strategy for treating these infections may be deletion and removal of the biofilm contaminated device. Urinary catheter biofilms may initially be composed of single species, but longer exposures inevitably lead to multispecies biofilms [4]. Intravascular catheters (IVC) are used for the administration of medications, parenteral nutrition, fluids and blood products to monitor hemodynamic status and to provide hemodialysis [5]. Use of IVC for patient care may be associated with increased risk of central line associated bloodstream infection. Mermel (2000) study reported around 80,000 central line associated bloodstream infection occur among patients in US intensive care units each year. Anaissie and co-worker reported that the biofilms may form within three days after catheter insertion [6, 7].

Nanotechnology is novel approaches to research phenomena at atomic, molecular and macromolecular scales, where properties differ significantly from those at a larger scale [8]. Nanomaterials have nanoscale dimensions about between 1-100 nm and frequently exhibit new and significantly chemical, physical and biological changed proprieties [9] and nanoparticles have excellent catalysts, sensor and adsorbents due to their large specific surface area and high reactivity [10]. The novel method for synthesizing nanoparticles utilizing biological resource and such a methodology is called as “green chemistry” [11]. Shanmugavadivu and co-workers revealed that green synthesis approaches of producing silver nanoparticles using pomegranate peel extract have benefits over the conventional techniques and they own

R. Ranjithkumar, Department of Biotechnology, Dr.N.G.P. Arts and Science College, Coimbatore-641 048, Tamil Nadu, India.

K. Selvam, Associate Professor, Department of Botany, Periyar University, Salem, Tamilnadu- 636011, India. E-mail: selsarat@yahoo.com and biotechnranjith@gmail.com

R. P. Senthil Kumar, Department of Biotechnology, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

J. Manikantan, Department of Physics, Sri Ranganathar Institute of Engineering and Technology, Coimbatore, Tamilnadu, India.

C. K. Senthil Kumaran, Department of Physics, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

B. Chandar Shekar, Department of Physics, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

potential antibacterial activity against human pathogens [12]. Antimicrobial activities of nanoparticles are well-known, particularly, silver nanoparticles have been described as the one with the highest level of toxicity for microorganisms and lowest toxicity for animal cells [13]. Hence, the present study was designed to enhance our knowledge of betel nut mediated green synthesized silver nanoparticles impregnated intravascular catheters tried against biofilm producing bacteria such as *Pseudomonas aeruginosa*, *Staphylococcus epidermidis* and *Klebsiella pneumoniae*.

## II. MATERIALS AND METHODS

### A. Biosynthesis of AgNPs from betel nut

About 5ml of betel nut aqueous extract was slowly added to 100 ml of aqueous solution of 1mM concentration  $\text{AgNO}_3$  while stirring. The formation of dark brown colour was observed after 8h incubation. Then the silver nanoparticles solution was purified by repeated centrifugation at 10,000 rpm for 20 min to isolate Ag nanoparticles free from other bioorganic compounds present in the solution. The obtained particles were washed with distilled water for 2 to 3 min and kept it in Hot air oven for drying at 60°C for 2 hours. The effectiveness and accuracy in results without any contamination, each and every steps of the experiment were maintained under sterility conditions.

### B. Characterization of AgNPs

The formation of dark brown colour was observed after 6 h incubation at room temperature and  $\lambda_{\text{max}}$  was taken using UV-Visible spectroscopy (UV-2600 series shimadzu UV-vis spectrophotometer from 200-800 nm at a resolution of 1nm). X-ray diffractometer (SHIMADZU Lab X XRD-6000 series) with a  $\text{Cu K}\alpha$  radiation monochromatic filter in the range 10-80°. Debye-Scherrer's equation was used to determine the particle size of the silver nanoparticles from the 2 $\theta$  values of the X-ray diffraction peaks. Debye-Scherrer's equation  $D = k\lambda / \beta \cos\theta$ , Where, k - constant,  $\lambda$  - wavelength of the X-ray,  $\beta$  - full width half maximum of the XRD peak (radians),  $\theta$ -Bragg's angle of the XRD peak. The particles size were arrived based on measuring the time dependent fluctuation of scattering of laser light by the nanoparticles using Dynamic Light Scattering (DLS). The obtained data were analyzed using zetasizer software. The morphological characterizations of the bioinspired synthesized silver nanoparticle samples were done using Scanning Electron Microscope (SEM) JEOL model 6390 and Energy-Dispersive Spectroscopy (EDS) used for the elemental analysis or chemical characterization of a sample were performed on Hitachi S-3400 NSEM instrument equipped with a Thermo EDS attachments.

### C. Preparation of AgNPs coated IVC

AgNPs releasing intravascular catheters were made using slurry-dipping technique. The technique started with the preparation of stable slurry with 0.5 g of bioinspired AgNPs in the molten polyethylene glycol (PEG) and appropriate slurry temperature (37°C) was determined by an optimization process based on a trial-and-error approach to achieve optimum coating thickness, uniformity and stability of composite coating as well as adequate infiltration of AgNPs particles into coating structure. 2g of PEG with a predefined molecular weight was mixed with AgNPs (0.5g) in a glass vial. The mixture was heated at the range of 60-70°C in a water bath to obtain homogeneous slurry. The resulting slurry was homogenized in a magnetic stirrer for 5 to 10 min. Each piece of catheter (length 6 mm) was dip-coated twice with intermittent drying (suspension coating method). The dip-coating procedure was carried out in sterile glass beakers on a shaker at 120 rpm for 30 min, with a drying period of about 15 min between the two coating procedures, followed by drying at room temperature. All coating steps were carried out under strict aseptic conditions. All samples were coated by a thickness of about 3-10% of catheters outer diameters and the catheter samples were stored at 4°C for upto 15 min. In order to increase AgNPs loading and prevent excessive increase in catheter thickness, the coating process was repeated four times for each sample. Subsequently, in order to slow down the release rate of AgNPs from PEG coating and mitigate the friction effect between catheter surface and mucosa, second coating layer was formed on the catheter surface. PVA was dissolved in DMSO to acquire a 10 w/w % solution. PEG-coated samples were submerged into PVA solution three times for 1 min each. Thereafter, these samples were stored at 4°C or in a deep freezer to implement one freeze-thaw cycle and physically crosslink the samples. The coated intravascular catheters were left to dry on a clean bench for one week at room temperature to remove residual DMSO.

### D. Antibacterial activity of AgNPs coated IVC

The antibacterial activity of catheter materials after dip-coating with AgNPs was performed against biofilm producing bacteria. In this qualitative method the pre-measured size length 6mm of catheter materials were placed on the surface of Mueller-Hinton agar plate which had previously been seeded with an overnight broth culture of the test organisms. The plates were incubated at 37°C for 24 to 48 h. The experiment was carried out in triplicate. Antibacterial activity was expressed as the diameter of the zone of inhibition.

## III. RESULTS AND DISCUSSION

Biodiversity of plants and their potential secondary constituents, plants and plant parts have gained attention



in recent years as medium for nanoparticles synthesis [14]. In the present study, the aqueous extract of betel nut was used as reducing agent for the synthesis of AgNPs using 1mM concentration of  $\text{AgNO}_3$ . The crude aqueous extract was light brown colour however after addition of

$\text{AgNO}_3$  the colour of the reaction mixture turned dark brown colour which indicated the formation of AgNPs after incubation period  $\lambda$  max shown around 414 nm (Fig .1).

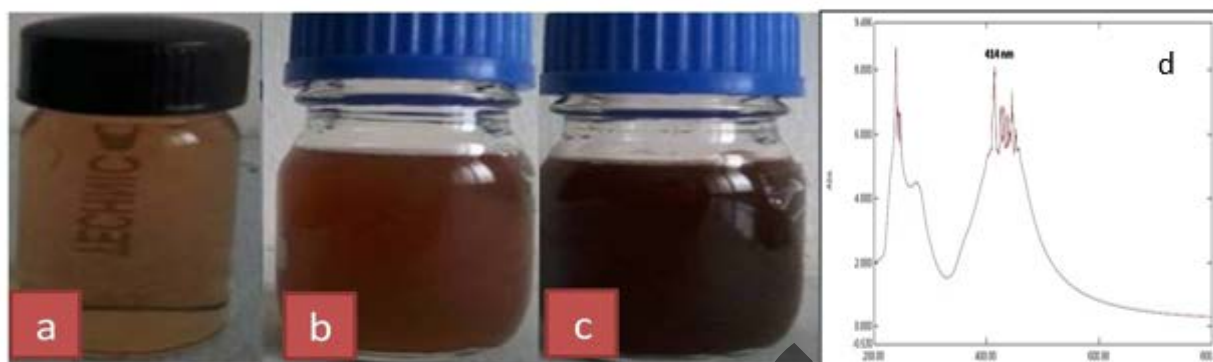


Fig. 1: Colour change of betel nut extract containing AgNPs before and after synthesis a) Betel nut extract b) before synthesis and c) after synthesis d) UV-spectrum of AgNPs

Analysis through X-ray diffraction was carried out to confirm the crystalline nature of the silver nanoparticles [15]. The bioinspired silver nanostructure by employing betel nut extract was further confirmed by the characteristic peaks observed in the XRD image (Fig. 2a). XRD pattern of silver nanoparticles showed numbers of Bragg reflections that may be indexed on the basis of the face-centered cubic structure of silver. A comparison of obtained XRD spectrum with the standard confirmed that the silver particles formed in present experiments were in the form of nanocrystals, as evidenced by the

peaks at  $2\theta$  values of 38.01, 44.20, 64.37 and 77.34 corresponding to (111), (200), (220), and (311) Bragg reflections, respectively, which may be indexed based on the face-centered cubic structure of silver (JCPDS file nos. 04-0783). X-ray diffraction results clearly show that the silver nanoparticles formed by the reduction of  $\text{Ag}^+$  ions by the betel nut extract are crystalline in nature. It was found that the average size from XRD data and using the Debye-Scherrer equation was approximately 29.42 nm.

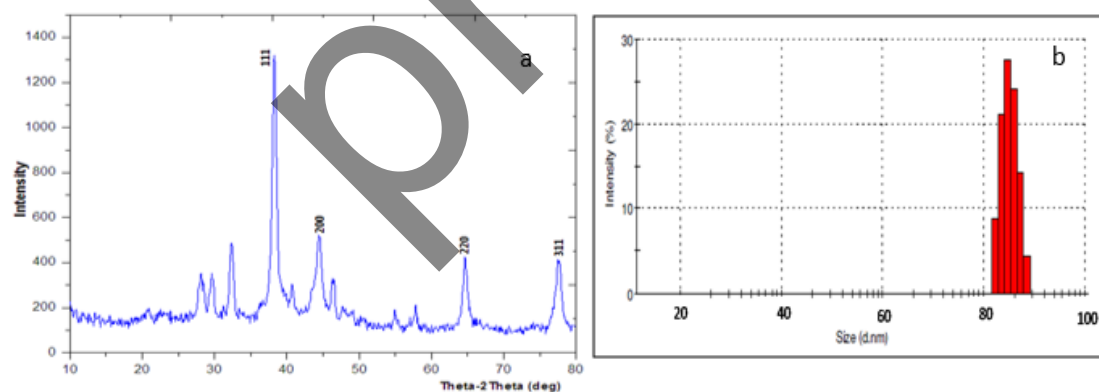


Fig.2: a) XRD analysis of BN-AgNPs b) DLS analysis of BN-AgNPs

The average particle size of silver nanoparticles synthesized by the present green method can be calculated using the Debye-Scherrer equation [16]. The size distribution of the betel nut extract mediated synthesized AgNPs is depicted in figure 2b. The distribution of the silver nanoparticles observed that the particles obtained are polydisperse mixtures in the size range from 81 to 89 nm. The average size of the synthesized silver nanoparticles is around 85 nm. SEM

analysis shows high-density silver nanoparticles synthesized by betel nut extract. The particles shape distributions of the silver nanoparticles was observed at different magnifications (Fig. 3a). Figure 3b shows the EDS photographs of silver nanoparticles, all the peaks of Ag are observed and assigned. Some impurity peaks were detected below 1 keV, corresponds to oxygen, Cl, Na and Ca, which were probably related to the presence of crystalline biomolecules in the extract [17].



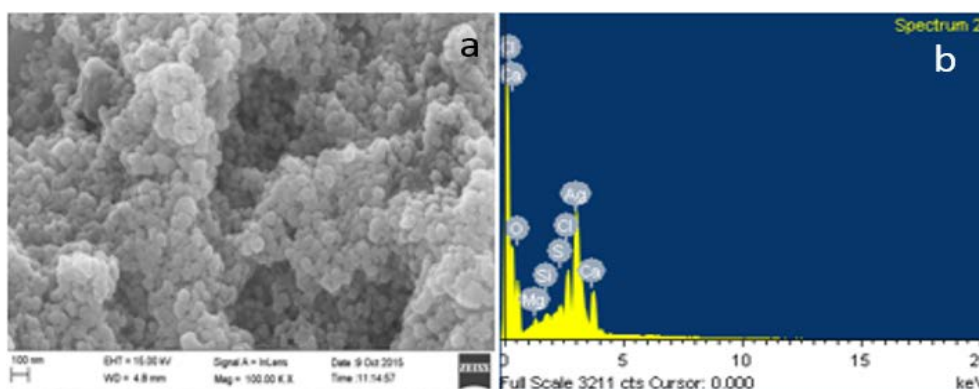


Fig.3: a) SEM image of BN-AgNPs and b) EDS analysis of BN-AgNPs

#### E. Antibacterial Activity of BN-AgNPs coated IVC

Antibacterial activity of after dip-coating with bioinspired synthesis AgNPs catheter materials shows good antibacterial activity against test pathogen. In this study antibacterial activity of AgNPs coated IVC was evaluated by using standard Zone of Inhibition (ZOI)

microbiology assay. In the current study, BN-AgNPs coated IVC samples achieved maximum ZOI was found to be 42 mm and 36 mm for *S. epidermidis* and *K. pneumoniae* and significant antibacterial activity received against the *P. aeruginosa* (Fig. 4).

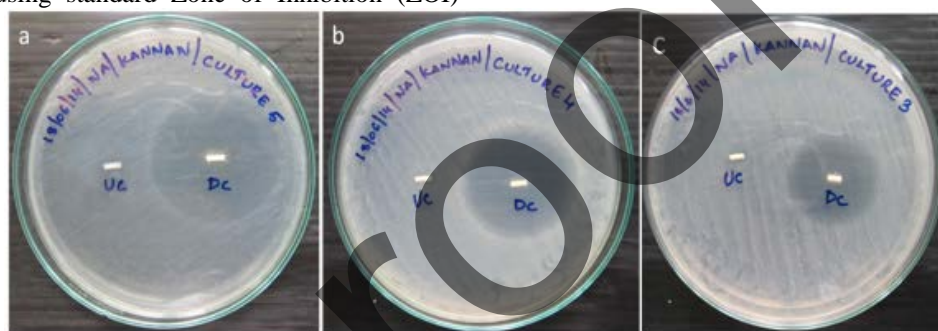


Fig. 4: Antibacterial activity BN-AgNPs coated IVC against human pathogens

Conversely no inhibition found in non-coated biomaterial. The AgNPs coated biomaterial showed inhibition zone against all studied bacteria and we found the BN-AgNPs coated biomaterial have superior antibacterial action against *S. epidermidis* and *K. pneumoniae*.

#### IV. CONCLUSION

Silver nanoparticles are multifunctional nanoparticles with effective antibacterial activity. In this present study, the green route synthesize BN-AgNPs by reduction of silver nitrate during exposure to betel nut aqueous extract was confirmed by UV-Vis spectrum, the SPR peak observed at 414 nm. XRD analysis revealed that the particles were crystalline in nature with face-centered cubic geometry. The distribution of the AgNPs observed that the particles obtained are polydisperse mixtures in the size range from 81 to 89 nm by using DLS analysis. SEM image of AgNPs shown that relatively spherical in shape and uniform with high agglomeration were noted. BN-

AgNPs coated IVC have shown the greatest antibacterial activity against biofilm producing human pathogens.

#### REFERENCES

- [1] S.S Branda, S. Vik, L. Friedman, and R. Kolter, Trends Microbiol., 13, 20 (2005).
- [2] Schembri, G. Christianesen, and P. Klemm, Mol. Microbiol., 41, 1419 (2001).
- [3] J. W. Costerton, Z. Lewandowski, D. E. Caldwell, D. R. Korber, and H. M. Lappin-Scott, Annu. Rev. Microbiol., 49, 711 (1995).
- [4] D. J. Stickler, Biofouling, 94, 293 (1996).
- [5] L. A. Mermel, B. M. Farr, R. J. Sherertz, I. I. Raad, N. O'Grady and J. S. Harris, Clin. Infect. Dis., 32, 1249 (2001).
- [6] L. A. Mermel, Ann. Int. Med., 132, 391 (2000).
- [7] Anaissie, G. Samonis, and D. Kontoyiannis, Eur. J. Clin. Microbio. Infect. Dis., 14, 135 (1995).
- [8] R. Ranjithkumar, K. Selvam, and M. Shanmugavadivu, J. Green Sci. Technol., 1, 102, (2013).
- [9] J. Theron, J. A. Walker, and T. E. Cloete, Crit. Rev. Microbiol., 34, 43 (2008).
- [10] Q. Li, S. Mahendra, D. Y. Lyon, L. Brunet, M. V. Liga, D. Li, and P. J. J. Alvarez, Water Res., 42, 4591 (2008).
- [11] D. Inbakandan, C. Kumar, L. Stanley Abraham, R. Kirubakaran, R. Venkatesan, and S. Ajmal Khan, Colloids and Surface B, 11, 636 (2013).

- [12] M. Shanmugavadivu, K. Selvam, and R. Ranjithkumar, *Am. J. Adv. Drug Deliv.*, 2, 174, (2014).
- [13] J. P. Guggenbichler, M. Boswald, S. Lugauer, and T. Krall, *Infection*. 27, S16 (1999).
- [14] Madhumitha, and R. M. Selvaraj, *J. Nanomater.*, 951858, 1 (2013).
- [15] N. Ahmad, S. Sharma, M. K. Alam, V. N. Singh, S. F. Shamsi, B. R. Mehta, and A. Fatma, *Colloids Surfaces B.*, 81, 81 (2010).
- [16] Nabikhan, K. Kandasamy, A. Raj, and N. M. Alikunhi, *Colloids Surfaces B.*, 79, 488 (2010).
- [17] M. Ropisah, M. W. Samsudin, L. B. Din, A. Ahmad, N. Ibrahim, S. Noor Adnalizawat and Adnan, *Int. J. Nanomed*, 9, 121(2014).

proof

# Green Synthesized Silver Nanoparticles Coated Fabric: Antibacterial Textile Finishing

R. Ranjithkumar, K. Selvam, R. P. Senthil Kumar, J. Manikantan, C. K. Senthil Kumaran and B. Chandar Shekar

**Abstract----** Nano technology is one of the most important and active area of research and development of new biomedical products. Several new products are using silver nanoparticles to generate antimicrobial action due to a large surface area. In this present study we demonstrated antibacterial activity of betel leaf reduced green synthesis of silver nanoparticles (BL-AgNPs) coated onto textile cotton fabric was tested according to EN ISO 20645 against human pathogens such as *Escherichia coli*, *Staphylococcus aureus*, and *Staphylococcus epidermidis* in agar plates. Among the three tested bacteria, BL-AgNPs coated textile cotton fabric displayed excellent antibacterial activity against *S. epidermidis*. This BL-AgNPs coated cotton fabric will lead to new generation antimicrobial agents to prevent and reduce microbial infection.

**Keywords---** Betel Leaf, Textile cotton fabric, Antibacterial, Pathogens.

therapeutics, food packaging and synthetic textiles [2]. Nanocoating the surface of clothing, textiles and textiles for footwear is one approach to the production of high active surface to have UV-blocking and antimicrobial properties [3]. A new generation of dressing incorporating agents such as silver to prevent or reduced infection from human pathogens [4]. A current development in textile coating and finishing is the addition of nanoparticles to achieve novel materials properties and application. The most significant research on the functionalization of textile materials with silver nanoparticles is focused on cotton fibers [5]. Although the steady substitution of natural fibers with synthetic fibers in medical and healthcare division. Cotton fibers are still used to a great extent in manufacturing of non-implantable medical textile materials such as bandages, plasters, gauze dressing, wadding, etc and also in healthcare products [6]. Hence, in this present work aim to investigate of betel leaf (BL) mediated green synthesized silver nanoparticles coated cotton fabric was evaluate antibacterial activity against human pathogens.

## I. INTRODUCTION

NANOTECHNOLOGY is one of the most important and active area of research and development of new biomedical products. Several new products are using silver nanoparticle to generate antimicrobial action due to a large surface area [1]. Silver nanoparticles and silver based compound have been reported to have good antimicrobial activity against an extensive range of microorganisms. In current research, the progress in the field of nanotechnology and nanoscience has brought to fore the nanosized organic and inorganic nanoparticles which are finding increasing applications in medicine,

## II. MATERIAL AND METHODS

### A. Biosynthesis of AgNPs

The aqueous solution of 1mM concentration silver nitrate ( $\text{AgNO}_3$ ) was prepared to synthesize silver nanoparticles from betel leaves. For the experiment briefly, 5ml of betel leaves aqueous extract was slowly added to 100 ml of aqueous solution of 1mM concentration  $\text{AgNO}_3$  while stirring, for reduction into Ag ions. Then the solution was purified by repeated centrifugation at 10,000 rpm for 20 min to isolate Ag nanoparticles free from other bioorganic compounds present in the solution. After centrifugation the obtained particles were washed with distilled water for 2 to 3 min and kept it in Hot air oven for drying at 60°C for 2 h. The effectiveness and accuracy in results without any contamination, each and every steps of the experiment were maintained under sterility conditions.

### B. Characterization of AgNPs

X-ray diffraction (XRD) measurement of the biosynthesized silver nanoparticles was carried out using X'Pert Pro X-ray diffractometer (PAN analytical BV, The Netherlands) equipped with Cu/K $\alpha$  radiation source using Ni as filter at a setting of 30kV/30mA. All X-ray

R. Ranjithkumar, Department of Biotechnology, Dr.N.G.P. Arts and Science College, Coimbatore-641 048, Tamil Nadu, India.

K. Selvam, Associate Professor, Department of Botany, Periyar University, Salem, Tamilnadu- 636011, India. E-mail: selsarat@yahoo.com and biotechnranjith@gmail.com

R. P. Senthil Kumar, Department of Biotechnology, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

J. Manikantan, Department of Physics, Sri Ranganathar Institute of Engineering and Technology, Coimbatore, Tamilnadu, India.

C. K. Senthil Kumaran, Department of Physics, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

B. Chandar Shekar, Department of Physics, Kongunadu Arts and Science College, G-N Mills, Coimbatore - 641 029, Tamil Nadu, India.

diffraction data were collected under the standard experimental conditions in the regular angular range. The crystalline silver nanoparticle was calculated from the width of the XRD peaks, using a Debye-Scherrer formula,  $D = 0.94\lambda / \beta \cos\theta$ . Where  $D$  is the average crystallite domain size perpendicular to the reflecting planes,  $\lambda$  is the X ray wave length,  $\beta$  is the full width at half maximum and  $\theta$  is the diffraction angle. The particles size were arrived based on measuring the time dependent fluctuation of scattering of laser light by the nanoparticles using Dynamic Light Scattering (DLS). The obtained data were analyzed using zetasizer software. The images of green route silver nanoparticles were obtained in a scanning electron microscope (Fb-Quanta 200 SEM machine) at different magnification level. The details regarding applied voltage, magnification used and size of the contents of the images were implanted on the images itself. Energy-Dispersive Spectroscopy (EDS) used for the elemental analysis or chemical characterization of a sample were performed on Hitachi S-3400 NSEM instrument equipped with a Thermo EDS attachments.

### C. Antibacterial activity of AgNPs

100% cotton (40s) fabric samples were commercially procured and textile swatches were cut circularly with a diameter of 2cm. The BL-AgNPs (2mg/ml) was treated onto the textile swatches by using a standard dip-dry method. The treated samples were further processed to access its antibacterial activity against standard bacterial test cultures. Antibacterial activity of the treated fabrics was determined by using standard EN ISO 20645 test method. The antibacterial capacity of the finished fabric was tested against Gram positive and Gram negative pathogens such as *Escherichia coli*, *Staphylococcus aureus* and *Staphylococcus epidermidis*. Nutrient agar plates were prepared by pouring 15 ml of media into

sterile Petri dishes. The plates were allowed to solidify for 5 min and 0.1% inoculum was swabbed uniformly and allowed to dry for 5 min. The finished fabric with the diameter of  $2.0 \pm 0.1$  cm was placed on the surface of medium and the plates were kept for incubation at 37°C for 24 h. At the end of incubation, the zone of inhibition formed around the fabric was measured in millimeters and recorded.

## III. RESULTS AND DISCUSSION

The XRD pattern of betel leaf mediated bioinspired synthesized silver nanoparticles showed numbers of Bragg reflections that may be indexed on the basis of the face-centered cubic structure of silver (Fig 1a). A comparison of obtained XRD spectrum with the standard confirmed that the silver particles formed in present experiments were in the form of nanocrystals, as evidenced by the peaks at  $2\theta$  values of 38.01, 44.20, 64.37 and 77.34 corresponding to (111), (200), (220) and (311) Bragg reflections, respectively, which may be indexed based on the face-centered cubic structure of silver (JCPDS file nos. 04-0783). X-ray diffraction results clearly show that the silver nanoparticles formed by the reduction of  $\text{Ag}^+$  ions by the betel leaf extract are crystalline in nature. It was found that the average size from XRD data and using the Debye-Scherrer equation was approximately 15.36 nm. The average particle size of silver nanoparticles synthesized by the present green method can be calculated using the Debye-Scherrer equation [7]. The distribution of the betel leaf mediated synthesized silver nanoparticles observed that the particles obtained are polydisperse mixtures in the size range from 70 to 80 nm. The average size of the synthesized silver nanoparticles is around 74 nm (Fig.1b).

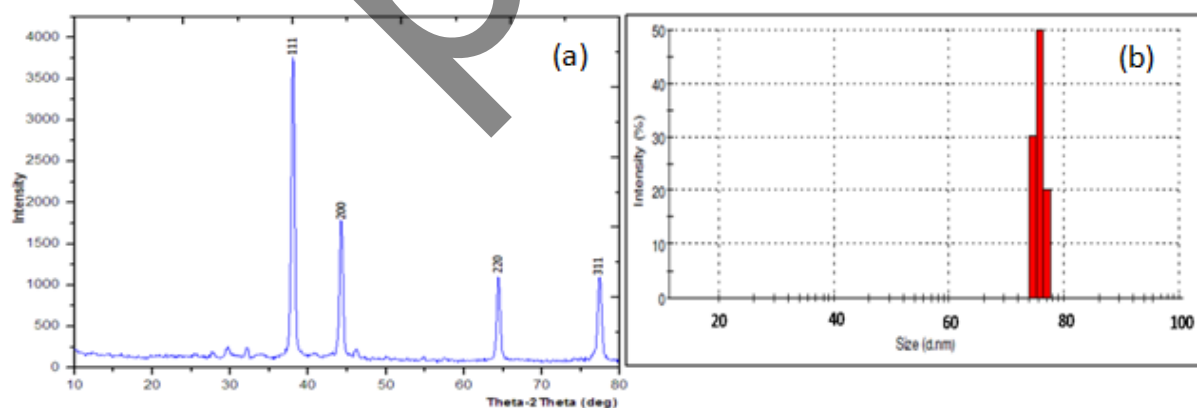


Fig. 1: (a) XRD analysis of BL-AgNPs (b) DLS analysis of BL-AgNPs

Scanning Electron Microscopy analysis shows uniformly distributed silver nanoparticles with high agglomeration on the surface of the cell (Fig. 2a). The betel leaf extract reduced silver nanoparticles were around

spherical with high agglomeration was noted. The large silver particles may be due to the aggregation of the smaller ones, due to the SEM measurements. Figure 2b shows the EDS photographs of betel leaf extract

bioinspired silver nanoparticles. All the peaks of Ag are observed and assigned. Some impurity peaks were detected below 1 keV, corresponds to O, Mg, Cl, K and

Cawhich were probably related to the presence of crystalline biomolecules in the extract.

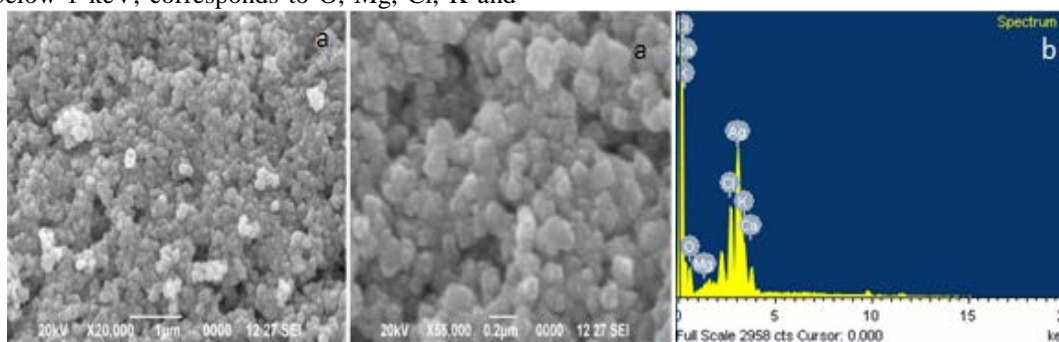


Fig. 2: (a) SEM image of BL-AgNPs (b) EDS analysis of BL-AgNPs

#### D. Antibacterial activity of BL-AgNPs

The antimicrobial properties of the nanosilver and nanosilver coated materials have been exploited for a long time in the biomedical field [8,9]. In this present study we demonstrated antibacterial activity of green silver nanoparticles coated textile cotton fabric was tested according to EN ISO 20645 against human pathogens *E. coli*, *S. aureus* and *S. epidermidis* in nutrient agar plates.

The comparison between the silver nanoparticles treated and untreated textile cotton fabric samples the silver nanoparticles coated fabric cotton exhibit good antibacterial activity against test pathogens. BL-AgNPs coated cotton fabric showed maximum zone of inhibition was found to be 45 mm for *S. epidermidis* (Fig. 3).



Fig.3: Antibacterial activity BL-AgNPs against *S. epidermidis*

Whereas other three test pathogens of *S. aureus* and *E. coli* reach reasonable zone of inhibition of 36 and 31 mm respectively (Fig. 4). Previous study demonstrated the eco-friendly synthesized silver nanoparticles coated cotton fabric and leather samples exhibited excellent antibacterial activity against *Brevibacterium linens* [10].

Hence, the present investigation achieved BL-AgNPs coated textile cotton fabric displayed admirable antibacterial activity against tested pathogens.

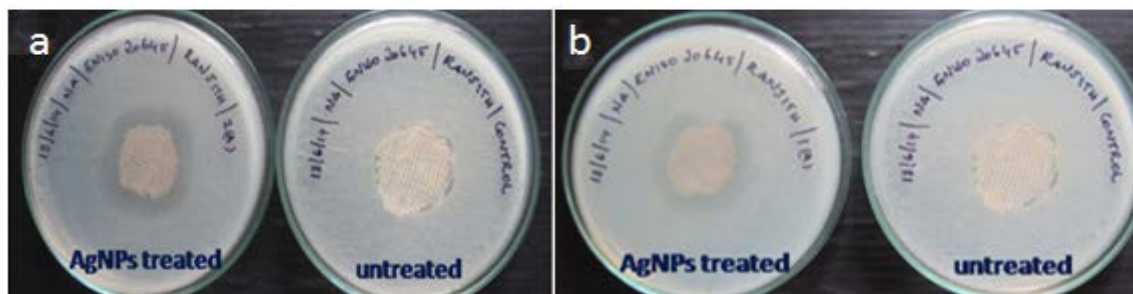


Fig.4: Antibacterial activity BL-AgNPs against (a) *E. coli* and (b) *S. aureus*

#### IV. CONCLUSION

Bioinspired synthesized silver nanoparticles coated textile cotton fabric samples exhibit very good antibacterial activity against tested human pathogens. Coating cotton fabrics with silver nanoparticles has a significant effect against *S. epidermidis*. In addition, BL-AgNPs coated cotton fabric showed reasonable activity against other test pathogens. This nanosilver coated cotton fabric will lead to new generation antibacterial agents to reduce and prevent pathogenic infection such as wound dressing material, surgical masks, etc.

#### REFERENCES

- [1] Rai, M., A. Yadav and A. Gade. *Biotechnol. Adv.*, 27(1), (2009), 76-83.
- [2] Prabhu, S. and E. K. Poullose. *Int. Nano Let.*, **2:32** (2012), doi: 10.1186/2228-5326-2-32
- [3] Gupta, P., M. Bajpai and S. K. Bajpai. *The J. Cotton Sci.*, 12: (2008), 280-286.
- [4] Yin, H. Q., R. Langford and R. E. Burrell. *J. Burn Care Rehabil.*, 20(3), (1999), 195-200.
- [5] Radetic, M., *J. Mater. Sci.*, 48, (2013), 95-107.
- [6] Czajka, R. *Fiber Text. East Eur.*, 13(1), (2005), 13-16.
- [7] Ranjithkumar Rajamani, Selvam kuppasamy and M. Shanmugavadivu. *J. Green Sci. Technol.* 1(2), (2013), 103-106.
- [8] Gholamreza, A., J. Varshosaz and N. Shahbazi., *Nanomed. J.*, 1(2), (2014), 94-99.
- [9] Ranjithkumar Rajamani, Selvam kuppasamy and M. Shanmugavadivu. *J. Green Sci. Technol.* 1(2), (2013), 111-113.
- [10] Velmurugan, P. S. M. Lee, M. Cho, J. H. Park, S. K. Seo, H. Myung, K. S. Bang and B. T. Oh. *Appl. Microbiol. Biotechnol.*, 19, (2014), 8179-8189.



# Relative study of Lithium and Magnesium salts in Polymer Electrolyte Batteries

R. Manjuladevi and Dr.M. Thamilselvan

**Abstract---** Solid Polymer electrolyte have been a lot of interest on research and development in recent years due to their potential applications in rechargeable batteries, fuel cells, sensors, electronic display devices, smart windows and other applications. Recently Lithium and Magnesium salt polymer electrolytes are abundantly used in batteries due to their stability, flexibility, conductivity, availability and safety in handling. In this paper we compare the mechanical and electrical properties of the Lithium and Magnesium salts in polymer electrolytes combined with polymer composites.

**Keywords---** Lithium and Magnesium salts, Polymer electrolyte, Composite.

## I. INTRODUCTION

ION conducting polymer electrolytes are of a major global interest to physicist, chemists and engineers as they offer a better substitute to liquid electrolytes because of their potential application in various electrochemical devices particularly in batteries and super capacitors[1-2]. It has been accepted that polymer electrolytes possess some distinct advantages over liquid electrolytes, such as reduced reactivity, reduced leakage, improved safety and better shape flexibility. The world wide attention has focused on the high performance and environment-friendly nature of the energy storage devices. Lithium ion and Magnesium ion are incorporated in most of the commercially available batteries for their fabrication due to its high specific capacity and excellent cyclic stability [3-4].

Poly (vinyl alcohol) (PVA) is one of the most important polymeric materials as it has many applications in industry and is of relatively low cost [2,3]. PVA is a potential material having a very high dielectric strength, good charge storage capacity, and dopant-dependent electrical and optical properties. The electrical conductivity of the PVA blend with inorganic acids and water has been already reported by R. A. Vargas and co-workers. It is reported that the water content in the PVA-

based electrolyte enhanced the conductivity while preserving the dimensional stability of the electrolyte [4].

In recent years lithium is one of the most important power sources because of its higher energy density, shape and design flexibility, lower self discharge rate, no memory loss and longer life span compare to other secondary battery. Magnesium is an attractive electrode material. It is employed as the negative electrode in primary batteries, which are based on aqueous electrolytes. Several methods, such as copolymerization, plasticization, blending and addition of salts have been used to enhance the conductivity of the polymer electrolytes. Among these addition of salt is a useful tool to develop new polymeric material with improved mechanical stability. In the present work, Poly vinyl alcohol (PVA) was mixed with salt lithium nitrate and magnesium acetate to form two separate systems in which Li ion and Mg ion will act as conducting species.

The purpose of this work is to compare the structural and conductivity analysis among lithium and magnesium based electrolyte. The polymer electrolytes were subjected to XRD, FTIR and AC impedance analysis to optimize the composition.

## II. EXPERIMENTAL PROCEDURE

### 2.1. Materials

Poly (vinyl alcohol) (PVA) with an average molecular weight of 1,25,000 were purchased from CDH, India. Lithium nitrate ( $\text{LiNO}_3$ ) (CDH, India) and Magnesium acetate.

#### 2.1.1. Solution casting technique

Poly (vinyl alcohol) (PVA) with an average molecular weight of 1,25,000 were purchased from CDH, India. Lithium nitrate ( $\text{LiNO}_3$ ) (CDH, India) was dried at 40°C for 24 h before using it. Polymer electrolytes were prepared using the solution casting technique. Stoichiometric quantities of PVA and  $\text{LiNO}_3$  [1] are dissolved in distilled water and then stirred until homogeneous solution is obtained and the final solution is poured into polypropylene dishes and dried in an oven at 70°C for 6 days to ensure removal of solvent traces. The smooth, uniform thin films which are transparent to visible light with good mechanical properties have been obtained. The obtained films are kept in a desiccators for further drying and then used for different experimental

R. Manjuladevi, Department of Physics, SriGuru Institute of Technology, Coimbatore, Tamil Nadu

Dr.M. Thamilselvan, Department of Physics, Thanthai Periyar Government Institute of Technology, Vellore, Tamil Nadu

studies. The thickness of the samples has been found to be in the range of 0.15 – 0.41 mm. The XRD, FTIR pattern of polymer Electrolytes has been observed. Impedance analysis has also been carried out for the samples.

Similarly for the same PVA the salt Magnesium acetate is used as raw material. Double distilled water has been used as solvent. Solid polymer electrolytes are prepared by the solution casting method. Appropriate quantity of PVA was dissolved in high purity distilled water with rigorous stirring for about 4-5 h. the required quantity of salt was dissolved in minimum quantity of distilled water and these two solutions were mixed and stirred gently. The solutions were continuously stirred for about 10-12 h. The resulting homogeneous solution were poured on cleaned Petri dish and allowed to evaporate at room temperature under vacuum. The dried samples were transferred in to a desiccator for further drying before test. The prepared samples were free standing and thickness of the samples varied from 80-110  $\mu\text{m}$  [2]. The Polymer electrolyte films were subjected to X-ray diffraction studies to investigate the nature of crystallinity using icmeasurements were carried out with the help of stainless steel blocking electrodes by using a computer controlled micro Auto lab type III Potentiostat/Galvanostat of frequency range 50 Hz-100 KHz.

### III. 3.RESULTS AND DISCUSSION

#### 3.1.XRD (Lithium nitrate)

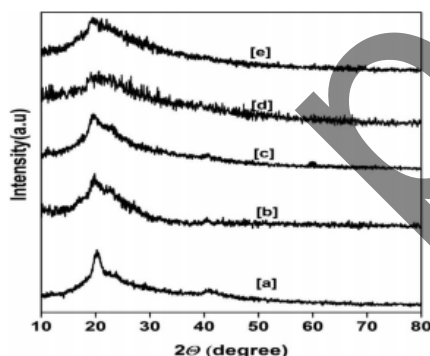
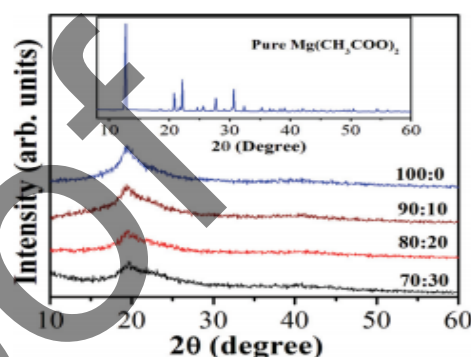


Figure 1. show that the X-ray diffraction pattern of pure PVA and with different Mwt% of  $\text{LiNO}_3$ . The figure shows peak intensity at  $2\theta = 20^\circ$  for pure PVA. The above peak gets decreased with increasing concentration of  $\text{LiNO}_3$  which implies decrease of crystallization and increase of amorphous nature. None of the diffraction peak pertaining to  $\text{LiNO}_3$  is observed indicating that the salt is completely dissociated. The highest amorphous nature is observed for the sample 70PVA + 30 $\text{LiNO}_3$ .

#### 3.2.FTIR

The IR spectra of pure PVA and with different Mwt% of  $\text{LiNO}_3$  are shown in the picture. From the picture the observed band around  $3070\text{ cm}^{-1}$  has been attributed to C-H stretching of pure PVA; the above peak gets shifted when the salt concentration has been increased. The band corresponding to C-N stretching observed at  $2174\text{ cm}^{-1}$  for pure PVA has been shifted  $2188\text{--}2174\text{ cm}^{-1}$  for 70% PVA. The shift in stretching modes of the carbonyl bonds due to pyrrolidone rings are seen from peaks in the picture. The vibrational bands corresponding to C-H of PVA has been shifted. The observed shifts and variation in intensities of FTIR spectrum suggest the complete complexation of salt with polymer.

#### 3.3.XRD (Magnesium acetate)



The X-ray diffraction patterns of pure PVA, PVA complexed with  $\text{Mg}(\text{CH}_3\text{COO})_2$  salt, and pure  $\text{Mg}(\text{CH}_3\text{COO})_2$  salt are shown in Figure 3. A broad peak around  $19.7^\circ$  ascribed to the pure PVA was found to decrease in intensity and an increase of full width half maximum has been observed for salt-doped polymer. The above changes reveal the increase in the amorphous nature of the complexed system which has established a correlation between the height of the peak and the degree of crystallinity. In the present study, 80 PVA:20 $\text{Mg}(\text{CH}_3\text{COO})_2$  [8] polymer electrolyte has high amorphous nature as compared to other electrolytes. This is in good agreement with conductivity results. Peaks corresponding to pure  $\text{Mg}(\text{CH}_3\text{COO})_2$  have been found to be absent in the complex, indicating a complete dissociation of salt in the polymer matrix.

#### 3.4.Conductivity analysis ( $\text{LiNO}_3$ )

The conductivity values of PVP with different concentration of  $\text{LiNO}_3$  and  $\text{Mg}(\text{CH}_3\text{COO})_2$  in  $\text{Scm}^{-1}$  at room temperature



Composition	Lithium Nitrate	Magnesium Acetate
100:0	$6.266 \times 10^{-7}$	$0.059 \times 10^{-7}$
90:10	$1.443 \times 10^{-6}$	$0.384 \times 10^{-7}$
80:20	$9.225 \times 10^{-5}$	$1.34 \times 10^{-7}$
70:30	$6.828 \times 10^{-4}$	$0.707 \times 10^{-7}$

- [8] Chen Liaoa, Xiao-Guang Suna,” Crosslinked gel polymer electrolytes based on polyethylene glycol methacrylate and ionic liquid for lithium ion battery applications”

From the above table the conductivity values for all the compositions of PVA and  $\text{LiNO}_3$  polymer electrolytes at room temperature have been studied [3]. The highest room temperature conductivity values is found to be  $6.828 \times 10^{-4} \text{ Scm}^{-1}$  for the composition of 70 PVA : 30%  $\text{LiNO}_3$ . The low glass transition temperature has been observed for the high conductivity composition. For Magnesium Acetate the highest conductivity is found to be  $1.34 \times 10^{-7}$  for the composition of 80 PVA : 20%  $\text{Mg}(\text{CH}_3\text{COO})_2$

#### IV. CONCLUSIONS

Two different salts has been blended with PVA polymer to prepare electrolyte for batteries. From the conductivity analysis it is found that the PVA polymer is more efficient with Lithium nitrate than that with Magnesium acetate. So I further decided to proceed my work with Lithium nitrate along with some fillers to improve its efficiency.

#### V. ACKNOWLEDGEMENT

The Authors thank to the Management and Principal of SriGuru Institute of Technology to carry out the work successfully.

#### REFERENCES

- [1] Kingslin Mary Genova Francis, Selvasekarapandian Subramanian, “Lithium Ion-conducting Blend Polymer Electrolyte Based on PVA–PAN Doped with Lithium Nitrate”
- [2] Anji reddy polu and Ranveer kumar, “ionic conductivity and discharge Characteristic Studies of PVA-Mg(CH<sub>3</sub>COO)<sub>2</sub> Solid Polymer Electrolytes”
- [3] Anji Reddy Polu1, Ranveer Kumar2 and K Vijaya Kumar1, “Ionic conductivity and electrochemical cell studies of new Mg<sup>2+</sup> ion conducting PVA/PEG based polymer blend electrolytes”
- [4] D.Ravindran , P.Vickraman ,” Mg<sup>2+</sup> -Ionic Conductivity Behavior of Mixed Salt System in PVA-PEG Blend Matrix”
- [5] R. Leones, F. Sentanin, L. C. Rodrigues,” Investigation of polymer electrolytes based on agar and ionic Liquids”
- [6] Pramod K Singh, Kang-Wook Kim, “Preparation, characterization and application of ionic liquid doped solid polymer electrolyte membranes”
- [7] Shital N. Bhad, V.S.Sangawar, “Study Of Proton Conducting PVA Based Gel Electrolyte”

# Influence of Cr Doping on Structural, Surface and Optical Properties of ZnS Prepared by Chemical Precipitation Method

N. Manivannan, B. Chandar Shekar, C.K. Senthil Kumaran  
and S. Sugapriya

**Abstract---** Chromium doped Zinc sulphide ( $\text{Cr}^{2+}\text{ZnS}$ ) nanoparticles were synthesized by chemical precipitation and studied their structural, surface and optical properties. Predominant peak shifting towards higher angle with dopant concentration corresponds to the structural deformation in the presence of  $\text{Cr}^{2+}$  as evident from XRD spectra. Nanoparticles size decreases with the doping concentration. SEM image for different dopant concentration showed large difference in morphology. Chemical compositions were recorded by EDS. HRTEM confirms the presence of nanocrystalline materials. The results from selected area electron diffraction (SAED) confirm the XRD results. Band gap energy ( $E_g$ ) of about 3.72-3.93eV is obtained from Diffused reflectance spectra (DRS) using UV-Vis-NIR spectrophotometer.  $E_g$  increases with dopant concentration showed strong quantum confinement.

As grown and rare earth metal doped ZnS NPs are notable candidate having remarkable optical properties [5]. Doping of different transition metal ions favours the property changes in ZnS. Mn doped ZnS [6], Cu doped ZnS [7], Co doped ZnS [8] and Ni doped ZnS [9] have been extensively investigated but theoretical and experimental results on Cr doped ZnS are till limited. Number of synthesis methods available for the preparation of ultrafine nanoparticles such as sol-gel, hydrothermal, microwave, solid state techniques and spray pyrolysis methods etc. Among these, chemical precipitation method is most popular one to monitor the shape and size of particles without requiring the expensive and sophisticated equipment's [11]. The present work aims to synthesis the pure and  $\text{Cr}^{2+}$  doped ZnS QDs by precipitation method and to study the effect of  $\text{Cr}^{2+}$  doping on structural, surface and optical properties of ZnS QDs.

## I. INTRODUCTION

NANOPARTICLES of II-VI group inorganic semiconductors are having wide range of applications in opto-electronic devices mainly due to large optical band gap. Small particle size of semiconductors may arise due to quantum confinement, i.e. (i) blue shift in optical absorption spectra and (ii) increases in excitonic peak [1]. The particle size below which the blue shift occurs is referred as Bohr radius of exciton. Bohr radius of exciton of ZnS is very small (1.1 nm) [2]. The optical properties of nanometer-scale semiconductors have been extensively investigated during the last two decades [3,4]. It can be tailored by band gap engineering.

## II. EXPERIMENTAL DETAILS

Zinc nitrate [ $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ ] (from Sigma-Aldrich, India), Sodium sulphide ( $\text{Na}_2\text{S}$ ) and Chromium nitrate [ $\text{Cr}(\text{NO}_3)_3$ ] were used to prepare Cr:ZnS Nps. The Cr:ZnS Nps were prepared by the precipitation method as follows. Initially, desired mole concentrations of  $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  and Chromium nitrate were dissolved in 45  $\text{cm}^3$  de-ionized water and then stirred for 30 min at room temperature to achieve complete dissolution, thus 0.1 mole concentration solutions were obtained. Sodium sulphide also dissolved in de-ionized water separately as per mole concentration. Further, sodium sulphide solution was added drop by drop to the prepared solution and maintained at constant stirring for 5 hours at room temperature using magnetic stirrer. The precipitated solution were centrifuged at 5000 rpm for 30 min to separate undesired agglomerates, and washed with de-ionized water and ethanol. The samples were dried for one hour at 150  $^\circ\text{C}$  to eliminate residual gas, water impurities and to obtain fine powders of Cr doped ZnS NPs of different dopant concentrations (0.025, 0.05 and 0.075) were obtained. All the reactions were carried out at room temperature under ambient condition using de-ionized water as a solvent for its inherent advantages of being simple and eco-friendly.

N. Manivannan, Nanotechnology Research Lab, Department of Physics, Kongunadu Arts and Science College,

G.N. Mills, Coimbatore, India. E-mail: annmv1978@gmail.com

B. Chandar Shekar, Nanotechnology Research Lab, Department of Physics, Kongunadu Arts and Science College, G.N. Mills, Coimbatore, India.

C.K. Senthil Kumaran, Nanotechnology Research Lab, Department of Physics, Kongunadu Arts and Science College, G.N. Mills, Coimbatore, India.

S. Sugapriya, Department of Chemistry, Coimbatore Institute of Technology (CIT), Coimbatore, India.

### III. CHARACTERIZATIONS

XRD analysis have been carried out using PANalytical X-ray diffractometer, Surface morphology of the samples have been studied using SEM (JEOL JSMS 800-V). Compositional analysis of the samples has been studied using energy dispersive analysis of X-rays (JEOL Model JED-2300). HRTEM images of the prepared nanopowders have been recorded using a Philips TECNAI-F20 microscope. Diffused reflectance spectra (DRS) of these sample were measured using JASCO V-780 UV-Visible/NIR Spectrophotometer

#### A. Results and discussion :X-Ray Diffraction (XRD)

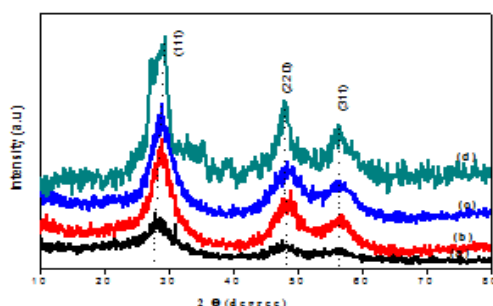


Figure-1: XRD pattern of pure and Cr-doped ZnS nanoparticles : (a) pure ZnS, (b) 0.025 mole concentration of Cr-doped ZnS, (c) 0.050 mole concentration of Cr-doped ZnS, (d) 0.075 mole concentration of Cr-doped ZnS

XRD patterns of Cr-doped ZnS nanocrystals are shown in Fig 1 and revealed the three diffraction peaks at  $2\theta$  values 29.15, 48.28 and 56.64. The diffraction peaks corresponds to (111), (220) and (311) planes are in good agreement with the standard diffraction peaks (JCPDS 05-0566) of cubic structure and also indicates that the  $\text{Cr}^{2+}$  ions substituted into  $\text{Zn}^{2+}$  site has no effect on the crystal structure, thus confirming the zinc blende crystal structure. we can clearly find that the Cr-doped ZnS nanopowder shows considerable broadening in the X-ray pattern, due to the very small size of the nanocrystals [12]. Other impurity phase was not detected. In the present investigation the diffraction peaks is also shifted to higher angle when Cr-doped ZnS in comparison to pure ZnS samples. Due to that the chromium ions replace the zinc ions. To calculate the nanoparticle diameter from the width of the line in the XRD spectrum, the Debye-

$$D = \frac{K\lambda}{\beta \cos \theta}$$

Scherrer's formula was used. Where  $D$  is the mean particle size,  $\lambda$  is the wavelength of incident X-ray (1.5406 Å),  $\theta$  is the degree of the diffraction peak, and  $\beta$  is the full width at half maximum (FWHM) of the XRD peak appearing at the diffraction angle  $\theta$ . According to the calculation, the size of all samples is almost the same, which is about 4 nm ( $\pm 0.1$  nm) [13]

#### B. Scanning Electron Microscopy (SEM)

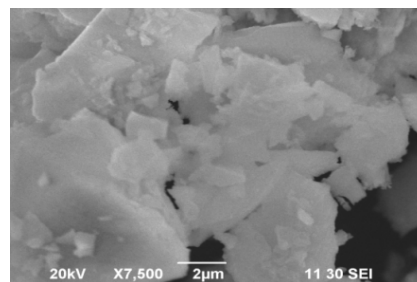


Fig.2: Surface Morphology of 0.075 Mole Concentration of Cr-doped ZnS

Scanning electron microscope is a suitable technique to study the surface microstructure of the sample. Figure-2 shows the SEM micrographs of 0.075 mole concentration of Cr-doped ZnS NPs. SEM images showed very different morphology. The distributions of grains are irregular in shape and also found agglomerated with nearer grains. It infers that formation of bigger grains with increase in dopant concentration leads to the higher grain size [14].

#### C. Energy Dispersive X-Ray Spectroscopy (EDX)

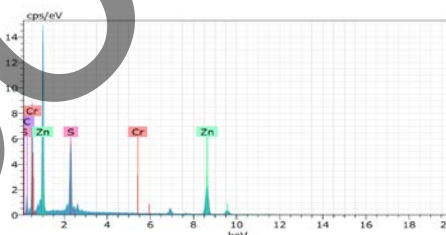


Fig.3 EDX Spectra of 0.075 mole Concentration of Cr-Doped ZnS Sample

EDX spectra of 0.075 mole concentration of Cr-doped ZnS sample is shown in Fig.3. Composition spectra revealed that the elements such as Zn, O, S, C and Cr only exist in Cr-doped ZnS nanoparticles. No trace of other elements in the spectra confirms the purity of the samples [15].

#### D. High Resolution Transmission Electron Microscopy (HRTEM)

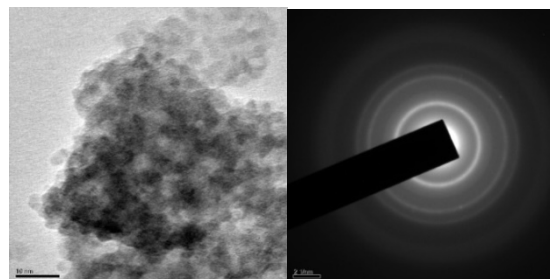
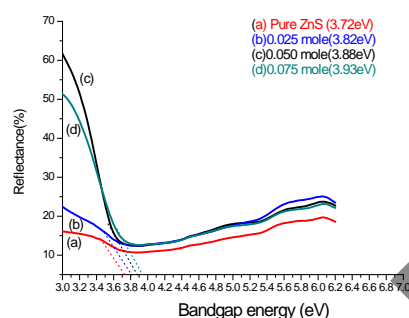


Fig:4 HRTEM and SAED Image of the 0.075 Mole Concentration of Cr-Doped ZnS

The obtained HRTEM and SAED patterns were shown in Figure 4. HRTEM and SAED gives information about the shape and particle size of individual nanostructure.

The image shows a cluster of agglomerated nanoparticles. The result shows that the pure and Cr doped ZnS NPs were in narrow size. The image shows the finger print appearance and corresponding to miller indices of ZnS, confirmed that the particles were in quantum size. The SAED pattern corresponds to reflections from three crystal planes (111), (220) and (311). The increases in mole concentration of dopants showed strong quantum confinement due to the small size of the particles, which approaches the exciton Bohr radius (1-10 nm). The average particle size was found to 2-4 nm, which is in good agreement with the average particle size obtained by XRD results. Both XRD and HRTEM results attributed that the most of the  $\text{Cr}^{2+}$  ions have been placed into the ZnS lattice sites [16].

#### E. Diffused Reflectance Spectra (DRS)



#### F. Diffused Reflectance Spectra of 0.075 Mole Concentration of Cr doped ZnS

Fig. 5 shows the DRS spectra of the pure and Cr doped ZnS NPs. The estimated band gap energy of pure and Cr doped ZnS (0.025, 0.05, 0.075) is found to be 3.72 eV, 3.82 eV, 3.88 eV and 3.93 eV respectively. The band gap energy of pure and also doped ZnS samples have found to increases with increases in dopant concentration (blue shift), it may be due to quantum confinement effects. It is reported that the bulk ZnS have bang gap energy of 3.6 eV [17]. The estimated band gap of the prepared samples are having higher band gap than the bulk ZnS due to quantum confinement. When the pure and doped Cr doped ZnS samples sizes approached to the Bohr excitonic radius, a quantum confinement effect is expected from these QDs.

### IV. CONCLUSION

Pure and Cr doped ZnS (0.025, 0.05 and 0.75) were synthesized by the chemical precipitation method. It is clear that the lattice constant of the Cr doped ZnS nanoparticles slightly decreases with the increase of the

$\text{Cr}^{2+}$  ions concentration and confirming the zinc blende crystal structure as evident from XRD spectra. The average particle size in the range of 2 to 4nm. Diffuse reflectance spectra shows the increases in the band gap with  $\text{Cr}^{2+}$  concentration may be owing to quantum confinement effect. SEM images showed different surface morphology and exhibited that grains were agglomerated with random shape. Presences of Cr, Zn and S without impurity were confirmed using EDX. The HRTEM indicated that Cr doped ZnS were in narrow size distribution, the images resembled the finger print appearance, which corresponds to miller indices plane of ZnS, confirmed formation of nanoparticles. The SAED Pattern corresponds to reflections from three crystal planes, indicating (111), (220) and (311). The increases in mole concentration of dopants showed strong quantum confinement due to the small size of the particles which approaches the exciton Bohr radius (1-10nm). These results strongly suggest that doping  $\text{Cr}^{2+}$  on ZnS lattice strong influence on its structure, surface morphology and optical properties.

#### REFERENCE

- [1] Klimov, "Nanocrystal quantum dots", Los Alamos Sci. 23(2003) 214-220
- [2] Jamieson T, Bakhshi R, Petrova D, Pocock R, Imani M, Seifalian AM "Biological applications of quantum dots", Biomaterials 28 (2007) 4717-4732
- [3] Nanda J, Sapra S, Sarma, "Size-selected zinc sulphide nanocrystallites: Synthesis, structure and optical studies", Chem. Mater 12(2000) 1018-1024
- [4] William WY, Emmanuel C, Rebekah D, Vicki LC, "Water-soluble quantum dots for biomedical applications", Biochem. Biophys. Res. Commun 348(2006) 781-786
- [5] Jamil K. Salem, Talaat M. Hammad, S. Kuhn, Mohammed Abu Draaz, Naser K. Hejazy, R. Hempelmann, "Structural and optical properties of Co-doped ZnS nanoparticles synthesized by a capping agent", Journal of Materials Science: Materials in Electronics 25 (2014) 2177-2182
- [6] R. Sarkar, C. S. Tiwary, P. Kumbhakar, S. Basu, A. K. Mitra, "Yellow-orange light emission from  $\text{Mn}^{2+}$ -doped ZnS nanoparticles", Physica E 40 (2008) 3115.
- [7] H. Zhang, Z. Wang, L. Zhang, Y. Li, J. Yuan, S. Yan, "Thermal Desorption Behavior and Binding Properties of DNA Bases and Nucleosides on Gold" J. Mater. Sci. Lett. 21 (2002) 1472-1474
- [8] R. Sarkar, C. S. Tiwary, P. Kumbhakar, A. K. Mitra, "Yellow-orange light emission from  $\text{Mn}^{2+}$ -doped ZnS nanoparticles", Physica B 404 (2009) 3855.
- [9] P. Yang, M. Lu, D. Xu, D. Yuan, J. Chang, G. Zhou, M. Pan, "Strong green luminescence of  $\text{Ni}^{2+}$ -doped ZnS nanocrystals" Appl. Phys. A 74 (2002) 257-262.
- [10] S.M. Liu, Z. Xu, F. Q. Liu, X. R. Xu, J. Chin, "Synthesis and properties of transition metals and rare-earth metals doped ZnS nanoparticles", Rare-earth Soc. 19(2001) 566-572
- [11] He Hu, Weihua Zhang, "Synthesis and properties of transition metals and rare-earth metals doped ZnS nanoparticles", Optical materials 28(2006) 536-550
- [12] P. D. Cozzoli, M. L. Curri, A. Agostiano, G. Leo, M. Lomasola, J. Phys. Chem. B 107 (2003) 4756
- [13] J. Goldstein, D.E. Newbury, D.C. Joy, C.E. Lyman, P. Echlin, E. Lifshin, L. Sawyer, J.R. Michael, Scanning Electron Microscopy and X-ray Microanalysis, Springer, 2003

- [14] D. Sukanya, P. Sagayaraj, "Facile Synthesis and Characterization of MPA capped CdSe and CdSe/ZnS Nanocrystals", Coden (USA) 7 (2014) 1421-1425
- [15] Kiriakidis, G., M. Bender, E. Gagaoudakis, V. Cimalla, "InO thin films: candidates for novel chemical and optoelectronic applications", Mater. Phys. Mech. 1 (2000) 83-97
- [16] R. Sarkar, C.S. Tiwary, P. Kumbhakar, A.K. Mitra, "Enhanced visible light emission from Co<sup>2+</sup> doped ZnS nanoparticles", Physica B 404(2009) 3855-3858
- [17] C. Kittel, "Introduction to Solid State Physics", Wiley, New York, 6th Edition (1986) 185-197.

proof

# Docking and Topological Analysis of Disulfiram Drug Molecule via Theoretical Charge Density Analysis

G. Rajalakshmi and C. Kalaiarasi

**Abstract---** A charge density analysis of Disulfiram drug molecule in gas phase (form I) and in the active site of cytochrome P450 (form II) were performed using DFT method with 6-311G\*\* basis set. The charge density analysis reveals the difference in conformational modification, charge distribution and the electrostatic properties between the isolated molecule (I) and the molecule present in the active site (II). The bond charges of C-S bond and S-S bonds are highly depleted after it entering the active site. The dipole moment of the molecule (I) is  $\sim 0.98D$  whereas for molecule to (II) it is increased to  $5.36D$ . The difference in dipole moment is  $\sim 4.4D$ . This large dipole moment enhancement is due to the intermolecular interaction that exist between the disulfiram molecule and the aminoacid residues present in the active site of cytochrome P450. A reactivity hole is seen on the surface of the electronegative region of (I) but it disappears in the form (II). Positive region represents the electrophilic sites of the molecule. Sulphur acts as the nucleophilic region.

## I. INTRODUCTION

ALCOHOLISM, also known as alcohol use disorder (AUD) and alcohol dependence syndrome, is a term used for drinking of alcohol [1]. Alcohol affects all parts of the body; it particularly affects the brain, heart, liver and pancreas. It results in mental illness and it increases the risk of cancer [2]. Medically alcoholism is considered as both physical and mental illness [3, 4]. The World Health Organization estimates that of 2010 there were 208 million were alcoholics [5, 6]. About 3.3 million people, 5.9% are died due to alcoholism [7]. People often use insulting words to denote the person those who are affected by alcoholism like tippler, drunkard, dipsomaniac and souse [8]. Medications such as acamprosate, disulfiram or naltrexone may be used to prevent drinking [9].

Disulfiram is a drug discovered in 1920's [10]. It is sold under the trade name of Antabuse and Antabus. It is used in the treatment of chronic alcoholism. Disulfiram works by inhibiting the enzyme acetaldehyde dehydrogenase. In the body, alcohol is converted to acetaldehyde, which in turn broken down by acetaldehyde dehydrogenase, if acetaldehyde dehydrogenase is inhibited, acetaldehyde builds up and cause unpleasant effects. Disulfiram is used to inhibit the acetaldehyde dehydrogenase. It also has antiprotozoal activity [11,12]. Several researches are going on disulfiram for the treatment of cancer and HIV [13].

Cytochrome P450 enzymes metabolize thousands of endogenous and exogenous chemicals. It metabolize many of the drugs. CYPs are the enzymes involved in drug metabolism about 75% of the total metabolism [14]. CYPs deactivated or bioactivated the drug molecules. The changes in CYPs enzyme activity may affect the metabolism and clearance of various drugs. Hence it is necessary to know about the interaction of drug with the CYP enzymes. As disulfiram inhibits the CYP3A4 in this work docking study was performed between CYP3A4 enzyme with disulfiram. The intermolecular interactions and charge density analysis of disulfiram was carried out. The comparison of the structural and charge density parameters of disulfiram in the active site with the corresponding parameters in gas phase study paves the way to identify the changes in conformation, molecular flexibility, charge density distribution and the electrostatic properties of disulfiram in the active site. The charge density analysis of disulfiram in gas phase (I) was performed using HF [15] and DFT [16,17] level with 6-311G\*\* basis set; whereas, a single point energy calculation was carried out for the docked molecule using DFT method [16,17] with 6-311G\*\* basis set to explore the charge density distribution and the electrostatic properties in the active site. The electrostatic potential surfaces of disulfiram have been used to identify the strong electronegative and electropositive regions of the molecule, which provides vital information about the reactivity [18] of the drug with the receptor. Fig.1 Shows the chemical diagram of 1",1"-[disulfanediy]bis(carbonothioylnitrilo)] tetraethane.

G. Rajalakshmi, Department of Physics, Periyar University, Salem - 11. E-mail: rajimeetsu@gmail.com

C. Kalaiarasi, Department of Physics, Sri Vijay Vidyalaya College of Arts and Science, Dharmapuri- 636 701, Tamil Nadu, India Author2, Designation, Department, Organization/University, City, Country. E-mail:author2@yahoo.com

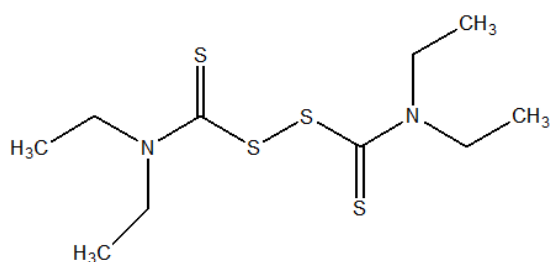


Figure 1: Chemical Diagram of 1'',1'''-[disulfanediy]bis(carbonothioylnitrilo)] tetraethane.

## II. COMPUTATIONAL DETAILS

The receptor cytochrome P450 [CYP3A4] with pdb code 1TQN [19] was obtained from Brookhaven Protein Data bank. The ligand was drawn using chemdraw software. The molecular docking analysis has been performed using AUTODOCK program [20]. After docking analysis 10 lowest energy conformers were obtained. Among them, the lowest energy conformer was used to determine the intermolecular interactions and charge density analysis. The PyMOL [21] software was used to view the intermolecular interactions that exist between the receptor and the ligand. An *ab initio* [22] and DFT single point energy calculations were performed for the molecule lifted from the active site using B3LYP [16,17] and 6-311G\*\* basis set with the Gaussian03

program package [23]. The geometry optimization of (I) was converged at the threshold limits of 0.00025 and 0.00050 au were applied for the maximum force and displacement respectively. The topological analysis was carried out from the wave functions obtained from DFT theory. The bond topological properties such as electron density  $\rho_{\text{bcp}}(r)$ , Laplacian of electron density  $\nabla^2\rho_{\text{bcp}}(r)$ , eigen values ( $\lambda_1, \lambda_2, \lambda_3$ ) and ellipticity  $\tau$  were calculated from Bader's theory of Atoms in molecules (AIM) [24], which are implemented in AIMPAC program suite [25]. The deformation density of the molecule was plotted by *wfn2plots* and XDGRAPH [26]. The 3Dplot software [27] was used for the generation of ESP map of the molecule using the potential cube file of Gaussian03.

## III. RESULTS AND DISCUSSION

### 3.1 Molecular docking

The lowest docked energy of 10 different conformers is presented in table 1. The lowest docked energy is given by -6.35kcal/mol. The nearest neighbours, shortest intermolecular contacts obtained from docking analysis are given in table 2. Figure 2a & 2b shows, intermolecular contact exist between disulfiram and the the cytochrome P450 enzyme.

Table 1: The lowest docked energies (kcal/mol) of 10 different conformers of disulfiram.

Conformation	Lowest docked energy (kcal/mol)
1	-6.35
2	-6.29
3	-6.06
4	-5.82
5	-5.74
6	-5.22
7	-5.32
8	-5.30
9	-5.09
10	-4.96

The molecule goes and binds in the exact active site of CYP3A4. The active site aminoacid residues are Arg 212, Hem 508, Ala 305, Ser 119, Phe 108, Phe 213, Phe 241, Phe 304. The carbon atoms C(2) and C(4) forms hydrophobic interaction with carbon atom of Phe 108 at 3.5 and 3.1 Å. The C(4) atom of disulfiram interacts with carbon atoms of Phe 213, Phe 241 and Phe 304 at 3.4, 3.1 and 3.4 Å respectively. There is an electrostatic interaction with the oxygen atom of Ser 119 at a distance of 3.0 Å. The sulphur S(2) atom also interact with the

carbon and oxygen atom of Ser 119. The S(3) atom forms an interaction with the hydrogen atom of amide group of Arg 212 at 3.1 Å. The S(4) atom forms hydrophobic interaction with the Hem 508 and Ser 119 at 3.5 Å. The nitrogen atom forms van der Waals interaction with the hydrogen atom of Arg 212 at 3.5 and 3.4 Å. The C(9) atom makes an electrostatic interactions with the Fe atom of Hem 508 at a distance of 3.1 Å.



Table 2: Nearest neighbours and short contact distances (Å) of disulfiram with amino acid residues of cytochrome P450 active site.

Disulfiram...cytochromeP450	Distance	Disulfiram...cytochromeP450	Distance
C(1)...No neighbours found		C(10)...Hem 508/NB	3.5
C(2)...Phe 108/CE2	3.5	Hem 508/FE	3.4
C(3)...No neighbours found		Ala 305/O	3.4
C(4)...Phe 108/CZ	3.1	N(1)...No neighbours found	
Phe 213/CE1	3.4	N(2)...Arg 212/NH1	3.5
Phe 241/CZ	3.1	Arg 212/NH2	3.4
Phe 304/CE2	3.4	S(1)...Ser 119/O	3.0
C(5)...No neighbours found		S(2)...Ser 119/CB	3.3
C(6)...No neighbours found		Ser 119/OG	3.5
C(7)...No neighbours found		S(3)...Arg 212/NH2	3.1
C(8)...No neighbours found		S(4)...Hem 508/C2D	3.5
C(9)...Ala 305/CB	3.4	Ser 119/CB	3.5
Hem 508/ND	3.2		
Hem 508/NA	3.4		
Hem 508/FE	3.1		

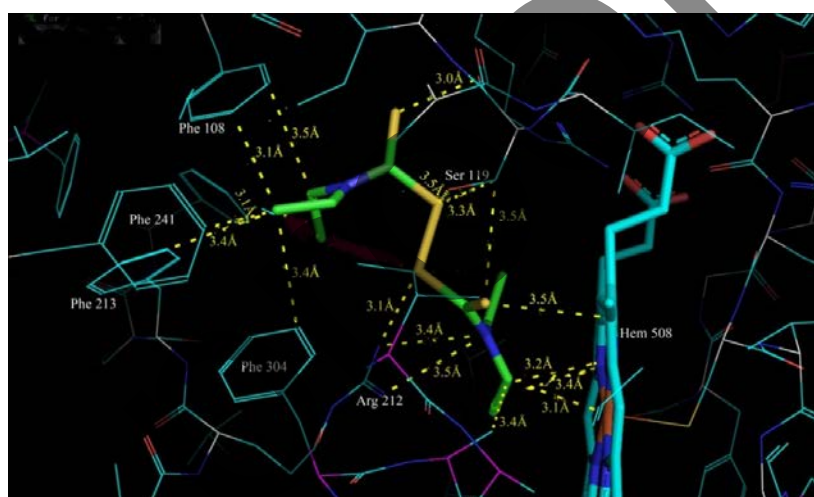
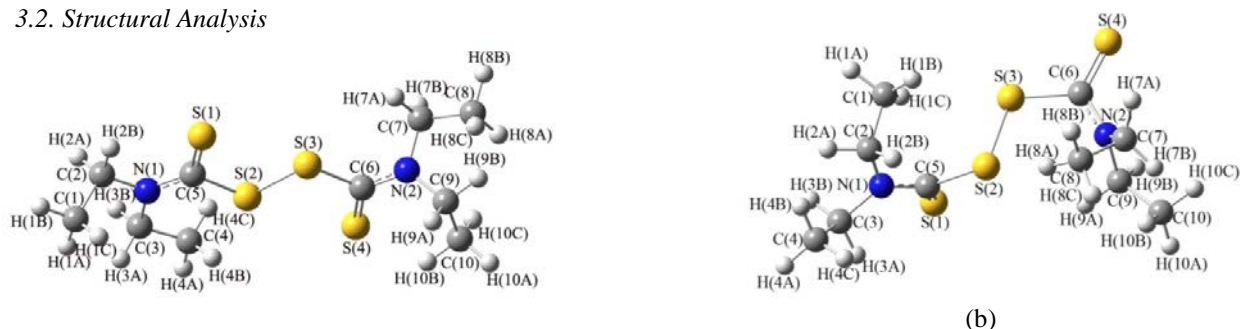


Figure 2: Disulfiram-cytochrome P450 complex showing some important intermolecular interactions in the active site of cytochrome P450.

(a)

### 3.2. Structural Analysis



(b)

Figure 3: The geometry of disulfiram molecule in (a) gas phase (I) B3LYP/6-311G\*\* and (b) in the active site of cytochrome P450 (II) (from docking).



Figure 3 (a) and (b) shows the ball and stick model of the (I) and (II) forms of disulfiram molecule. The conformation of the molecule was altered due to the intermolecular interactions that exist between the amino acid residues and the disulfiram molecule after it entering into the active site of cytochrome P450 (CYP3A4). The conformational modification of two forms was determined from its geometrical parameters [Table SP1]. The conformational modification due to intermolecular interaction can be easily understood from the difference of the torsion angles between the two forms of molecule (I) and (II). In gas phase disulfiram is a linear molecule, after entering into the active site, its structure get changed into a more folded conformation. The bond length of C(5)–N(1) of molecule (II) is decreased from 1.347 Å to 1.330 Å than molecule (I), whereas, the C(5)–S(1) bond length is increased from 1.659 to 1.669 Å. Similarly, the C(6)–N(2) bond length of molecule is decreased by ~0.022 Å. The C(6)–S(4) bond length of molecule (II) get increased by ~0.014 Å than molecule (I). The S–S bond length of molecule (II) is slightly increased from 2.045 Å to 2.096 Å.

The conformation of bonds C(3)–N(1)–C(5)–S(2), C(2)–N(1)–C(5)–S(1), C(7)–N(2)–C(6)–S(3) and C(9)–N(2)–C(6)–S(4) has been changed from *trans* to *cis* when they enter into the active site of cytochrome P450 this can be well understood from their torsion angles [178.8° to -0.6; 178.7° to 0.1°; 170.6° to 0.2° and 169.0° to -0.4°]. The conformation of C(3)–N(1)–C(5)–S(1), C(2)–N(1)–C(5)–S(2) and C(7)–N(2)–C(6)–S(4) bonds changed from *cis* to *trans* [table SP1].

### 3.3. Charge Density Analysis

The charge density analysis of both the forms of molecule (I) [gas phase] and the molecule lifted from the active site (II) was carried out. A critical point search has been performed. Invariably, it gave (3, -1) which indicates that all bonds are covalent in nature. Figure 4 shows the deformation density of molecule (I) and (II). It clearly depicts the bonding and lone pair regions of the disulfiram molecule. The electron density of C–C bonds of gas phase molecule (I) ranges from 1.630 to 1.635 eÅ<sup>-3</sup>. The electron density of active site molecule (II) is slightly increased and the value ranges from 1.656 to 1.671 eÅ<sup>-3</sup>. Among all the bonds, the C(5)–N(1) and C(6)–N(2) bonds are having high electron density and the value is ~2.192 eÅ<sup>-3</sup>. The  $\rho_{\text{bcp}}(\mathbf{r})$  value of C(5)–N(1) and C(6)–N(2) whose carbon atoms are attached with the sulphur atoms of molecule (II) is slightly decreased while all other C–N bonds of molecule (II) are slightly increased. The C–S bonds of molecule (I) and (II) are having less electron density values on comparing with

other bonds such as C–C, C–N and C–H. The S–S bond is having less charge concentration and its value is 0.990 eÅ<sup>-3</sup>. The electron density of S–S bond of molecule (II) [1.021 eÅ<sup>-3</sup>] is not much altered than molecule (I). The polar C–H bonds have high charge concentration which can be infer from its  $\rho_{\text{bcp}}(\mathbf{r})$  of molecule and its value is also increased after it entering the active site [-1.967 eÅ<sup>-3</sup>].

The charge density analysis of both the forms of molecule (I) [gas phase] and the molecule lifted from the active site (II) was carried out. A critical point search has been performed. Invariably, it gave (3, -1) which indicates that all bonds are covalent in nature. Figure 4 shows the deformation density of molecule (I) and (II). It clearly depicts the bonding and lone pair regions of the disulfiram molecule. The electron density of C–C bonds of gas phase molecule (I) ranges from 1.630 to 1.635 eÅ<sup>-3</sup>. The electron density of active site molecule (II) is slightly increased and the value ranges from 1.656 to 1.671 eÅ<sup>-3</sup>. Among all the bonds, the C(5)–N(1) and C(6)–N(2) bonds are having high electron density and the value is ~2.192 eÅ<sup>-3</sup>. The  $\rho_{\text{bcp}}(\mathbf{r})$  value of C(5)–N(1) and C(6)–N(2) whose carbon atoms are attached with the sulphur atoms of molecule (II) is slightly decreased while all other C–N bonds of molecule (II) are slightly increased. The C–S bonds of molecule (I) and (II) are having less electron density values on comparing with other bonds such as C–C, C–N and C–H. The S–S bond is having less charge concentration and its value is 0.990 eÅ<sup>-3</sup>. The electron density of S–S bond of molecule (II) [1.021 eÅ<sup>-3</sup>] is not much altered than molecule (I). The polar C–H bonds have high charge concentration which can be infer from its  $\rho_{\text{bcp}}(\mathbf{r})$  of molecule [-1.879 eÅ<sup>-3</sup>] and its value is also increased after it entering the active site [-1.967 eÅ<sup>-3</sup>].

The Laplacian of electron density  $\nabla^2 \rho_{\text{bcp}}(\mathbf{r})$  gives the chemical significance of the bond topological theory of molecular structure. The Laplacian of electron density of  $\nabla^2 \rho_{\text{bcp}}(\mathbf{r})$  of C–C bonds of molecule (I) is -13.2 eÅ<sup>-5</sup> and the value is not much altered for the molecule (II). The bond charges of C–N bonds attached with the sulphur atom are much concentrated than other C–N bonds present in the molecule for both forms of (I) & (II). The bond charges of C–S bonds are highly depleted for gas phase (I) [-3.2 eÅ<sup>-5</sup>] as well as for active site molecule (II) [-0.3 eÅ<sup>-5</sup>]. When the molecule enters into the active site the charges of C–S bonds are further depleted. The  $\nabla^2 \rho_{\text{bcp}}(\mathbf{r})$  value of S–S bond is -2.6 eÅ<sup>-5</sup> this indicates that the charges of sulphur bond is highly depleted on comparing with all other bonds. Similar to electron density, Laplacian of C–H bonds are high than all other bonds present in the molecule.

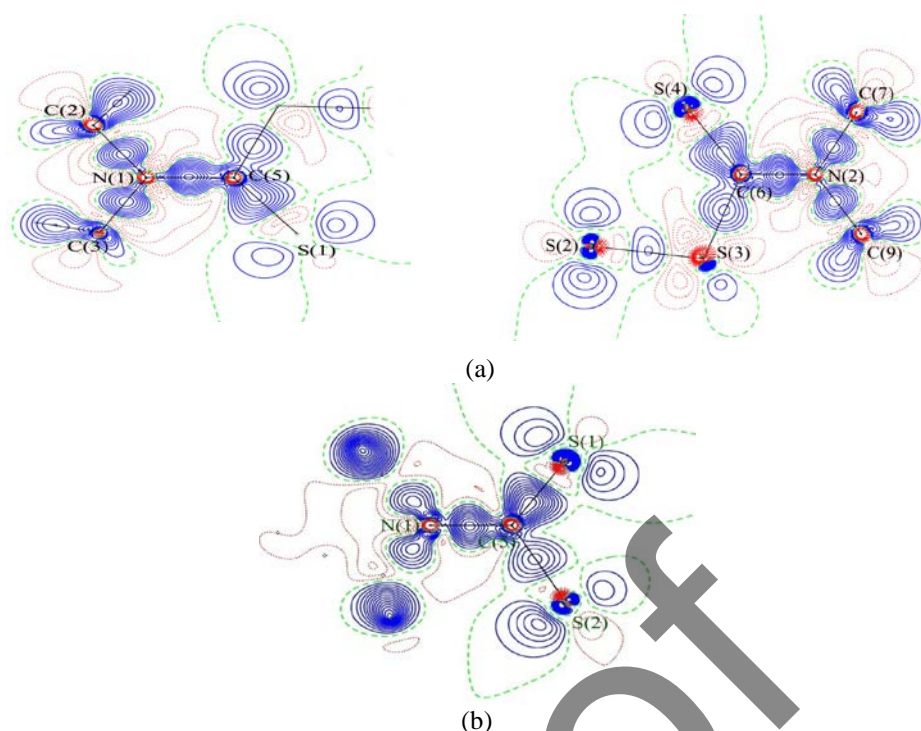


Figure 4: Deformation density maps of (a) (I) and (b) (II) forms of disulfiram molecule. Solid lines indicate positive contours, dotted lines are negative and dashed lines are zero contours. The contour interval is  $\pm 0.05 \text{ e}\text{\AA}^{-3}$ . [Since the molecule is highly twisted the electron density maps was drawn].

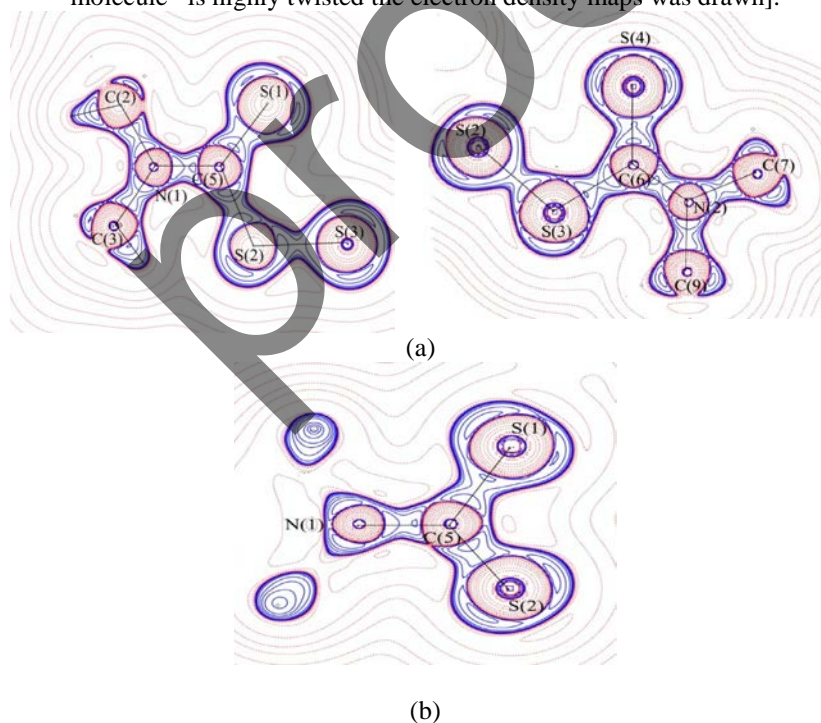


Figure 5: Negative Laplacian of electron density of disulfiram molecule of (I) (a) and (II) (b). Contours are drawn in logarithmic scale,  $3.0 \times 2^N \text{ e}\text{\AA}^{-5}$  where  $N=2,4$  and  $8 \times 10^n$ ,  $n=-2,-1,0,1,2$ . Solid blue lines and dotted red lines represent positive and negative contours respectively [As the molecule is highly twisted maps are drawn in different plane.

Table 2.4: Topological properties of electron density of (I) and (II) forms of disulfiram calculated from HF and DFT methods. [First line indicates HF, second line indicates DFT and third line indicates DFT(SP)].

Bonds	$\rho_{\text{bcp}}(\mathbf{r})^a$	$\nabla^2\rho_{\text{bcp}}(\mathbf{r})^b$	$\lambda_1^b$	$\lambda_2^b$	$\lambda_3^b$	$\omega$	$d_1^c$	$d_2^c$	$D^c$	$\nabla d\%$
C(1)–C(2)	1.731	-16.8	-13.5	-11.6	6.9	0.034	1.526	0.741	0.785	1.44
	1.630	-13.1	-12.4	-10.7	8.6	0.032	1.531	0.780	0.751	0.95
	1.662	-13.6	-12.7	-11.0	8.7	0.026	1.524	0.751	0.773	0.72
C(4)–C(3)	1.727	-16.7	-13.5	-11.6	6.9	0.035	1.527	0.740	0.787	1.54
	1.635	-13.2	-12.5	-10.7	8.6	0.032	1.529	0.749	0.780	1.01
	1.666	-13.8	-12.8	-11.1	8.7	0.019	1.523	0.746	0.777	1.02
C(8)–C(7)	1.730	-16.7	-13.5	-11.6	6.9	0.035	1.527	0.740	0.787	1.54
	1.632	-13.2	-12.4	-10.7	8.6	0.031	1.530	0.749	0.780	1.01
	1.656	-13.6	-12.6	-11.0	8.6	0.023	1.524	0.756	0.769	0.43
C(9)–C(10)	1.736	-16.8	-13.6	-11.7	6.9	0.036	1.525	0.783	0.741	1.38
	1.631	-13.2	-12.4	-10.7	8.6	0.033	1.531	0.778	0.754	0.78
	1.671	-13.8	-12.9	-11.1	8.8	0.032	1.523	0.762	0.761	0.03
C(2)–N(1)	1.670	-11.3	-11.3	-9.7	8.4	0.030	1.473	0.488	0.985	16.87
	1.689	-15.0	-12.6	-10.9	7.1	0.030	1.475	0.899	0.576	10.95
	1.759	-15.8	-13.1	-11.1	7.0	0.048	1.450	0.549	0.901	12.14
C(3)–N(1)	1.695	-12.9	-11.6	-10.2	7.7	0.008	1.472	0.493	0.979	16.51
	1.675	-14.7	-12.3	-10.6	6.9	0.033	1.476	0.569	0.907	11.45
	1.662	-13.6	-12.7	-11.0	8.7	0.026	1.524	0.751	0.773	0.72
C(5)–N(1)	2.319	-20.7	-21.0	-17.5	15.5	0.066	1.331	0.456	0.875	15.74
	2.195	-21.2	-18.7	-14.4	9.9	0.157	1.347	0.498	0.849	13.03
	2.106	-20.6	-17.8	-13.4	8.6	0.187	1.369	0.520	0.849	12.02
C(6)–N(2)	2.324	-20.2	-21.0	-17.6	16.1	0.066	1.328	0.874	0.454	15.81
	2.188	-21.2	-18.7	-14.3	9.7	0.159	1.350	0.849	0.501	12.89
	2.150	-22.9	-18.8	-14.7	8.4	0.138	1.370	0.825	0.545	10.22
C(7)–N(2)	1.704	-12.9	-11.7	-10.3	7.8	0.007	1.469	0.492	0.978	16.54
	1.665	-14.5	-12.3	-10.5	7.0	0.040	1.479	0.573	0.906	11.26
	1.758	-15.9	-13.5	-11.1	7.2	0.078	1.450	0.568	0.883	10.86
C(9)–N(2)	1.682	-11.3	-11.4	-9.9	8.7	0.021	1.470	0.487	0.984	16.91
	1.670	-14.6	-12.3	-10.7	7.0	0.023	1.478	0.903	0.575	11.10
	1.751	-15.5	-12.9	-11.0	7.0	0.037	1.449	0.559	0.891	11.46
C(5)–S(1)	1.424	6.2	-5.5	-4.5	15.6	0.100	1.670	1.045	0.624	12.61
	1.466	-2.3	-5.6	-4.8	7.4	0.038	1.659	0.655	1.004	10.52
	1.683	5.8	-7.3	-6.2	18.5	0.052	1.577	0.612	0.965	11.19
C(6)–S(3)	1.365	-10.3	-9.2	-6.6	4.4	0.242	1.787	0.886	0.902	0.45
	1.133	-5.0	-7.2	-5.4	6.9	0.176	1.856	0.880	0.977	2.61
	1.197	-5.4	-7.7	-5.6	7.1	0.234	1.817	0.843	0.974	3.60
C(6)–S(4)	1.421	6.2	-5.5	-4.4	15.5	0.100	1.671	1.046	0.625	12.60
	1.472	-2.1	-5.6	-4.8	7.6	0.039	1.657	0.654	1.003	10.53
	1.685	4.5	-7.4	-6.0	17.1	0.089	1.578	0.615	0.963	11.03
S(3)–S(2)	0.962	-3.6	-5.4	-3.9	5.2	0.225	2.098	1.049	1.049	0.00
	0.990	-2.6	-4.9	-4.2	6.0	0.020	2.046	1.022	1.024	0.05
	1.021	-3.0	-5.5	-4.2	6.1	0.164	2.024	1.006	1.019	0.32
C(1)–H(1A)	1.909	-24.5	-19.2	-16.9	9.5	0.010	1.071	0.678	0.392	13.35
	1.852	-21.9	-19.1	-16.9	11.9	0.010	1.079	0.693	0.386	14.23
	1.937	-23.9	-20.3	-18.0	12.1	0.007	1.056	0.676	0.380	14.02

C(1)–H(1B)	1.949	-25.4	-20.2	-17.8	10.3	0.009	1.066	0.380	0.685	14.31
	1.867	-22.3	-19.5	-17.2	12.3	0.009	1.077	0.381	0.696	14.62
	1.942	-24.0	-20.4	-18.0	12.1	0.007	1.056	0.676	0.380	14.02
C(1)–H(1C)	1.921	-24.8	-19.3	-17.0	9.4	0.011	1.069	0.674	0.395	13.05
	1.867	-22.3	-19.5	-17.2	12.3	0.009	1.077	0.696	0.381	14.62
	1.956	-24.1	-20.4	-18.1	12.1	0.005	1.056	0.674	0.381	13.87
C(2)–H(2A)	2.025	-27.3	-22.1	-19.1	11.4	0.031	1.062	0.696	0.366	15.54
	1.912	-23.4	-20.7	-17.9	12.9	0.027	1.077	0.703	0.374	15.27
	2.000	-25.6	-22.2	-19.3	13.4	0.022	1.055	0.690	0.365	15.40
C(2)–H(2B)	1.985	-26.4	-20.9	-17.9	10.1	0.040	1.067	0.681	0.386	13.82
	1.912	-23.4	-20.7	-17.9	12.9	0.027	1.077	0.703	0.374	15.27
	2.000	-25.6	-22.2	-19.3	13.4	0.022	1.055	0.690	0.365	15.40
C(3)–H (3A)	2.003	-26.8	-21.4	-18.4	10.6	0.035	1.065	0.687	0.377	14.55
	1.932	-23.9	-21.3	-18.5	13.5	0.024	1.074	0.708	0.366	15.92
	1.990	-25.2	-21.8	-18.9	13.1	0.025	1.056	0.685	0.370	14.91
C(3)–H(3B)	1.992	-26.5	-21.2	-18.2	10.5	0.037	1.066	0.685	0.381	14.26
	1.894	-22.9	-19.7	-17.4	12.5	0.009	1.076	0.698	0.378	14.87
	2.004	-25.5	-21.8	-19.0	12.9	0.024	1.056	0.682	0.373	14.63
C(4)–H(4A)	1.914	-24.6	-19.4	-17.1	9.6	0.009	1.070	0.680	0.390	13.55
	1.843	-21.7	-19.0	-16.7	11.9	0.009	1.080	0.694	0.386	14.26
	1.949	-24.0	-20.5	-18.1	12.3	0.011	1.056	0.677	0.378	14.16
C(4)–H(4B)	1.928	-25.0	-19.5	-17.2	9.6	0.011	1.068	0.676	0.391	13.34
	1.847	-21.8	-19.0	-16.7	11.8	0.010	1.080	0.692	0.388	14.07
	1.941	-24.0	-20.4	-17.9	12.1	0.011	1.056	0.674	0.382	13.83
C(4)–H(4C)	1.938	-25.2	-19.9	-17.5	10.0	0.009	1.067	0.683	0.384	14.01
	1.873	-22.4	-19.7	-17.4	12.5	0.008	1.076	0.699	0.378	14.92
	1.948	-24.1	-20.6	-18.1	12.3	0.011	1.056	0.678	0.378	14.21
C(7)–H (7A)	2.003	-26.8	-21.4	-18.4	10.7	0.034	1.064	0.688	0.377	14.62
	1.923	-23.6	-21.1	-18.3	13.5	0.026	1.076	0.368	0.708	15.80
	1.990	-25.3	-21.8	-18.9	13.0	0.026	1.055	0.683	0.372	14.74
C(7)–H (7B)	1.989	-26.5	-21.1	-18.1	10.4	0.036	1.067	0.382	0.685	14.20
	1.902	-23.1	-20.4	-17.5	12.5	0.032	1.078	0.697	0.381	14.66
	1.998	-25.4	-21.9	-19.0	13.1	0.027	1.056	0.684	0.372	14.77
C(8)–H(8A)	1.914	-24.6	-19.4	-17.1	9.6	0.009	1.070	0.680	0.390	13.55
	1.843	-21.7	-19.0	-16.7	11.9	0.010	1.080	0.693	0.386	14.21
	1.941	-24.1	-20.4	-18.1	12.2	0.003	1.056	0.676	0.380	14.02
C(8)–H(8B)	1.920	-24.8	-19.4	-17.1	9.6	0.010	1.069	0.678	0.392	13.38
	1.874	-22.4	-19.7	-17.4	12.5	0.009	1.076	0.698	0.378	14.87
	1.955	-24.3	-20.4	-18.2	12.1	0.002	1.056	0.675	0.381	13.92

C(8)–H(8C)	1.939	-25.2	-19.9	-17.5	10.0	0.009	1.067	0.683	0.384	14.01
	1.853	-21.9	-19.1	-16.8	11.9	0.011	1.078	0.691	0.387	14.10
	1.960	-24.3	-20.4	-18.1	11.9	0.002	1.056	0.672	0.384	13.64
C(9)–H(9A)	2.032	-27.5	-22.3	-19.2	11.5	0.029	1.060	0.696	0.365	15.61
	1.929	-23.8	-21.1	-18.3	13.3	0.027	1.075	0.706	0.369	15.67
	2.033	-25.9	-22.5	-19.6	13.7	0.023	1.055	0.690	0.365	15.40
C(9)–H(9B)	1.980	-26.3	-20.8	-17.8	10.1	0.039	1.068	0.681	0.387	13.76
	1.899	-23.0	-20.4	-17.6	12.7	0.032	1.079	0.700	0.379	14.88
	1.986	-25.1	-21.6	-18.8	12.9	0.026	1.056	0.682	0.374	14.58
C(10)–H(10A)	1.910	-24.6	-19.3	-17.0	9.5	0.009	1.070	0.679	0.392	13.41
	1.845	-21.8	-19.1	-16.8	12.0	0.008	1.080	0.695	0.385	14.35
	1.953	-24.0	-20.7	-18.2	12.7	0.009	1.056	0.681	0.374	14.54
C(10)–H(10B)	1.911	-24.6	-19.2	-16.9	9.4	0.010	1.071	0.676	0.395	13.12
	1.856	-22.0	-19.2	-16.9	11.9	0.010	1.078	0.692	0.386	14.19
	1.926	-23.5	-19.9	-17.5	11.7	0.009	1.056	0.670	0.386	13.45
C(10)–H(10C)	1.945	-25.3	-20.1	-17.7	10.2	0.008	1.066	0.685	0.381	14.26
	1.860	-22.1	-19.3	-17.0	12.1	0.009	1.078	0.695	0.383	14.47
	1.932	-23.7	-20.1	-17.7	11.9	0.008	1.056	0.673	0.383	13.73

#### 2.3.4 Atomic charges and Electrostatic potential

The atomic charges of gas phase molecule (**I**) and the active site form (**II**) of disulfiram were calculated by

Mulliken population analysis (MPA) [28] and Natural population analysis (NPA) [29]. The MPA and NPA charges of both (**I** & **II**) of disulfiram molecule are presented in table 5.

Table 5: Atomic charges (e) of (**I**) and (**II**) forms of disulfiram molecule

ATOM	MPA			NPA		
	HF	DFT	SP	HF	DFT	SP
C(1)	-0.21	-0.25	-0.02	-0.50	-0.58	0.07
C(2)	-0.05	-0.17	-0.20	-0.09	-0.18	-0.50
C(3)	-0.09	-0.14	-0.05	-0.10	-0.17	-0.09
C(4)	-0.20	-0.26	-0.09	-0.50	-0.58	-0.10
C(5)	-0.02	-0.11	-0.21	0.07	-0.06	-0.50
C(6)	-0.02	-0.11	-0.02	0.07	-0.06	0.07
C(7)	-0.10	-0.13	-0.10	-0.10	-0.17	-0.10
C(8)	-0.19	-0.26	-0.19	-0.50	-0.58	-0.50
C(9)	-0.06	-0.17	-0.06	-0.09	-0.17	-0.09
C(10)	-0.20	-0.26	-0.20	-0.50	-0.58	-0.50
N(1)	-0.49	-0.30	-0.49	-0.55	-0.46	-0.55
N(2)	-0.48	-0.31	-0.48	-0.55	-0.46	-0.55
S(1)	-0.30	-0.18	0.20	-0.27	-0.16	0.18
S(2)	0.20	0.11	0.20	0.18	0.14	0.18
S(3)	0.20	0.10	-0.30	0.18	0.14	-0.28
S(4)	-0.30	-0.17	-0.30	-0.28	-0.15	-0.27
H(1A)	0.09	0.12	0.10	0.17	0.20	0.18
H(1B)	0.13	0.11	0.09	0.19	0.20	0.17
H(1C)	0.08	0.13	0.12	0.16	0.21	0.18
H(2A)	0.17	0.16	0.14	0.20	0.21	0.18

H(2B)	0.10	0.13	0.12	0.16	0.20	0.17
H(3A)	0.14	0.18	0.09	0.18	0.22	0.17
H(3B)	0.12	0.12	0.13	0.17	0.18	0.19
H(4A)	0.10	0.11	0.08	0.18	0.20	0.16
H(4B)	0.09	0.10	0.17	0.17	0.19	0.20
H(4C)	0.12	0.15	0.10	0.18	0.22	0.16
H(7A)	0.14	0.18	0.14	0.18	0.22	0.18
H(7B)	0.12	0.11	0.12	0.17	0.19	0.17
H(8A)	0.10	0.10	0.10	0.18	0.20	0.18
H(8B)	0.09	0.11	0.09	0.17	0.21	0.17
H(8C)	0.12	0.14	0.12	0.18	0.19	0.18
H(9A)	0.17	0.18	0.17	0.20	0.22	0.20
H(9B)	0.10	0.13	0.10	0.16	0.19	0.16
H(10A)	0.09	0.12	0.09	0.18	0.20	0.18
H(10B)	0.08	0.11	0.08	0.16	0.19	0.16
H(10C)	0.13	0.13	0.13	0.19	0.20	0.19

The nitrogen atoms N(1) and N(2) are having high negative charge than all other atoms in the molecule and the MPA charge is  $-0.30e$  and  $-0.31e$  respectively. The charges of the atom are increased when it present in the active site and the value is increased by  $-0.15e$ . The S(1) [ $-0.18e$ ] and S(4) [ $-0.17e$ ] atom are having negative charge, whereas, the S(2) and S(3) atoms possess positive charge  $0.11e$  and  $0.10e$  respectively. Due to the charge redistribution and intermolecular interaction the charges are altered. When enters into the active site the sulphur atom S(2), S(3) and S(4) becomes  $0.20e$ ,  $-0.30e$  and  $-0.30e$  respectively. The charge of S(1) atom becomes positive [ $0.20e$ ]. Thus, the sulphur atom forms more number of interactions with the amino acid residues of cytochrome P450.

The dipole moment of the gas phase form of disulfiram (**I**) is  $0.98\text{ D}$ , whereas this value has been found to be increased to  $5.36\text{ D}$  when the molecule present in the active site. The difference in dipole moment between the two forms (**I** & **II**) is  $\sim 4.4\text{ D}$ ; this large dipole moment enhancement is mainly due to the strong and weak intermolecular interactions that exist between the amino acid residues present in the active site of

cytochrome P450 and the disulfiram. Figure 6 displays the superposed form of dipole moment vectors of disulfiram in gas phase and in the active site.

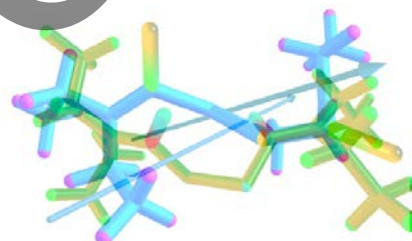


Figure 6: The superposed form of dipole moment vectors of disulfiram in gas phase and in the active site.

Electrostatic potential provides information about the reactivity of the molecule. The electronegative region is around the sulphur atoms in both the forms of molecule (**I**) and (**II**). As sulphur atom is the most reactive atom a reactivity hole is seen on the surface of the electronegative region of (**I**) but it disappears in the form (**II**). Positive region represents the electrophilic sites of the molecule. Sulphur acts as the nucleophilic region.

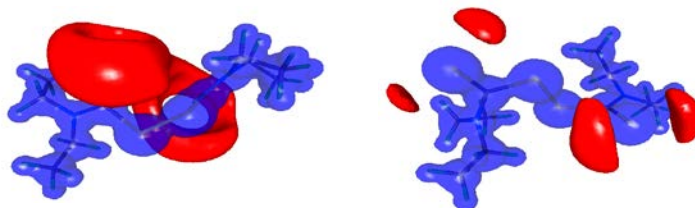


Figure 7: Isosurface representation of molecular electrostatic potential of (a) (**I**) and (b) (**II**) forms of disulfiram [B3LYP/6-311G\*\*]. Blue: positive potential ( $+0.5\text{ e}/\text{\AA}^{-1}$ ) and Red: negative potential ( $-0.05\text{ e}/\text{\AA}^{-1}$ ).

#### IV. SUMMARY AND CONCLUSION

Alcoholism is one of the worst societal problems faced by the people all over the world. Alcoholism affects the health both physically and mentally. So it is very much essential to prevent drinking the alcohol. Medications such as disulfiram, naltrexone may be used to prevent drinking. The Docking analysis was carried out for the drug disulfiram and the cytochrome P450 molecule. The obtained lowest docked energy is -6.35kcal/mol. In gas phase disulfiram is a linear molecule, after entering into the active site, its structure get changed into a more folded conformation. The active site aminoacid residues are Arg 212, Hem 508, Ala 305, Ser 119, Phe 108, Phe 213, Phe 241, Phe 304. The sulphur atom forms more number of interactions with the active site aminoacid residues. The S-S bond length of molecule (**II**) is slightly increased. The S-S bond is having less charge concentration and its value is  $0.990 \text{ e}\text{\AA}^{-3}$ . The bond charges of C-S bonds are highly depleted for gas phase (**I**). When the molecule enters into the active site the charges of C-S bonds are further depleted. The  $\rho_{\text{bcp}}(r)$  value of S-S bond is  $-2.6 \text{ e}\text{\AA}^{-5}$  this indicates that the charges of sulphur bond is highly depleted on comparing with all other bonds. The C-N bond is much concentrated. The nitrogen atoms N(1) and N(2) are having high negative charge than all other atoms. The dipole moment of the gas phase form of disulfiram (**I**) is 0.98 D, whereas this value has been found to be increased to 5.36 D when the molecule present in the active site. The difference in dipole moment between the two forms (**I** & **II**) is  $\sim 4.4 \text{ D}$ ; this large dipole moment enhancement is mainly due to the strong and weak intermolecular interactions that exist between the amino acid residues present in the active site of cytochrome P450 and the disulfiram. A reactivity hole is seen on the surface of the electronegative region of (**I**) but it disappears in the form (**II**). Positive region represents the electrophilic sites of the molecule. Sulphur acts as the nucleophilic region.

#### REFERENCES

- [1] Jill Littrell (2014). Hoboken: Taylor and Francis. p. 55. The World Health Organization defines alcoholism as any drinking which results in problems.
- [2] Alcohol's Effects on the Body, Retrieved (2015).
- [3] D. J. Mersy. Recognition of alcohol and substance abuse, American family physician. (2003), 67, 1529
- [4] Health and ethics policies of the ama house of delegates. (2008), p. 33.
- [5] Global status report on alcohol and health, World Health Organization. (2014).
- [6] Global Population Estimates by Age, 1950–2050, Retrieved (2015).
- [7] Alcohol Facts and Statistics, Retrieved (2015).
- [8] Chambers English Thesaurus. Allied Publishers.
- [9] G. Testino, S. Leone, P. Borro, (2014), Minerva Medica, 105, 447.
- [10] Method of Manufacturing Tetra-alkylated Thiuramdisulphides.
- [11] T. Nash, W. G. Rice, (1998). Efficacies of zinc-finger-active drugs against *Giardia lamblia*. Antimicrob. Agents. Chemother, 42, 1488.
- [12] M. J. Bouma, D. Snowdon, A. H. Fairlamb, J. P. Ackers, (1998). J. Antimicrob. Chemother, 42, 817.
- [13] Doyon, Geneviève, Zerbato, Jennifer, Mellors, W. John, Sluis-Cremer, Nicolas. Disulfiram reactivates latent HIV-1 expression through depletion of the phosphatase and tensin homolog. (2013), AI 27, 7
- [14] F. P. Guengerich. Chem. Res. Toxicol. (2008), 21
- [15] J. K. Labanowski and J.W. Andzelm. Density Functional Methods in Chemistry, Springer, New York. (1991).
- [16] R. G. Parr and W. Yang. Density Functional Theory of Atoms and Molecules, Oxford, New York. (1989).
- [17] A. R. Leech. Molecular Modelling Principles and Applications, (1996).
- [18] D. Stalke, Chem. Eur. J., (2011), 17, 9264.
- [19] J. K. Yano, M. R. Wester, G. A. Schoch, K. J. Griffin, C. D. Stout E. F. Johnson. J. Biol. Chem. (2004), 279, 38091
- [20] G. M. Morris, D. S. Goodshell, R. S. Halliday, R. Huey, W. E. Hart, R. K. Belew and A. J. Olson. J. Comput. Chem. (1998), 19, 1639.
- [21] W. L. DeLano. PyMol Molecular Graphics System, DeLano Scientific, San Carlos, CA, USA. (2002).
- [22] J. K. Labanowski and J.W. Andzelm. Density Functional Methods in Chemistry, Springer, New York. (1991).
- [23] M. J. Frisch, G. W. Trucks, H. B. Schlegel, G. E. Scuseria, M. A. Robb, J. R. Cheeseman, J. A. Montgomery, T. Vreven, K. N. Kudin, J. C. Burant, J. M. Millam, S. S. Iyengar, J. Tomasi, V. Barone, B. Mennucci, M. Cossi, G. Scalmani, N. Rega, G. A. Petersson, H. Nakatsuji, M. Hada, M. Ehara, K. Toyota, R. Fukuda, J. Hasegawa, M. Ishida, T. Nakajima, Y. Honda, O. Kitao, H. Nakai, M. Klene, X. Li, J. E. Knox, H. P. Hratchian, J. B. Cross, C. Adamo, J. Jaramillo, R. Gomperts, R. E. Stratmann, O. Yazyev, J. Austin, R. Cammi, C. Pomelli, J. W. Ochterski, P. Y. Ayala, K. Morokuma, G. A. Voth, P. Salvador, J. J. Dannenberg, V. G. Zakrzewski, S. Dapprich, A. D. Daniels, M. C. Strain, O. Farkas, D. K. Malick, A. D. Rabuck, K. Raghavachari, J. B. Foresman, J. V. Ortiz, Q. Cui, A. G. Baboul, S. Clifford, J. Cioslowski, B. B. Stefanov, G. Liu, A. Liashenko, P. Piskorz, I. Komaromi, R. L. Martin, D. J. Fox, T. Keith, M. A. Al-Laham, C. Y. Peng, A. Nanayakkara, M. Challacombe, P. M. W. Gill, B. Johnson, W. Chen, M. W. Wong, C. Gonzalez and J. A. Pople, Gaussian03, Revision D.1; Gaussian, Inc., Wallingford, CT, (2005).
- [24] R. F. W. Bader, Atoms in Molecules – A Quantum Theory, Oxford University Press, Oxford, (1990).
- [25] J. Cheeseman, T. A. Keith and R. F. W. Bader, AIM-PAC Program Package, McMaster University Hamilton, Ontario. (1992)
- [26] T. Koritsanszky, P. Macchi, C. Gatti, L. J. Farrugia, P. R. Mallinson, A. Volkov and T. Richter, XD-2006. A Computer Program Package for Multipole Refinement and Topological Analysis of Charge Densities and Evaluation of Intermolecular Energies from Experimental or Theoretical Structure Factors, Version (2007), 5, 33.
- [27] A. I. Stash, V. G. Tsirelson, J. Appl. Cryst. (2002), 35, 371.
- [28] R. S. Mulliken, J. Chem. Phys. (1955), 23, 1833.
- [29] A. E. Reed, R. B. Weinstock and F. A. Weinhold, J. Chem. Phys., (1985).

# Effect of Thickness on Optical and Photoconduction Properties of ZnTe Thin Films

R. Amutha, A. Subbarayan, and R. Sathyamoorthy

**Abstract---** *The present paper reports the studies of optical and photoconductivity of vacuum deposited Zinc Telluride (ZnTe) thin films as a function of thickness. The thickness of the film was measured by multiple beam interferometer (MBI) technique. The optical transmittance spectra were obtained by using spectrophotometer. The transmittance and the optical bandgap energy were found to decrease with increase in film thickness. The optical transition in these films is found to be direct and allowed. Photoconductivity measurements have been carried out at room temperature as a function of applied voltage and wavelength of light sources.*

**Keywords---** ZnTe, Optical properties, Band gap, Photoconduction

## I. INTRODUCTION

POLYCRYSTALLINE thin films of II-VI compound semiconductors have reasonable importance in electronic and optoelectronic devices fabrication due to their high absorption coefficients and low fabrication costs. Among them, ZnTe, with a direct gap of 2.26 eV at 300 K (Acharya et al 2007; Aqili et al 2012), is attractive materials for the development of various modern solid state devices such as purely green light emitting diodes, solar cells, waveguides and modulators. Thus, a wide range of possible applications makes ZnTe a material especially worth investigating. The optical properties of ZnTe may reveal valuable information in this direction. The optical band gap energy was found to be thickness dependent. Hence this paper reports the effect of thickness on optical and photoconduction properties of vacuum evaporated ZnTe thin films.

## II. 2 EXPERIMENTAL DETAILS

Pure Zinc Telluride powder (99.99% Aldrich chemicals company, USA) was evaporated from a molybdenum boat under a vacuum of  $10^{-5}$  m.bar by thermal evaporation using the conventional 12A4 Hind

Hivac coating unit. The ZnTe film was formed onto well-cleaned glass substrates kept at room temperature. A constant rate of evaporation, 1 Å/sec was maintained to grow films of good quality and rotary drive was also employed to sustain uniform thickness through out the samples prepared. Thickness of the films was measured through quartz crystal monitor and verified by multiple beam interferometer (MBI) technique by forming Fizeau fringes (Tolansky 1948). The optical transmittance and absorption measurements for the films were recorded using double beam UV-VIS-NIR spectrophotometer (Jasco Corp, V-570) in the range 200 – 2500 nm with 1 nm resolution at room temperature. The photocurrent has been measured using a multifunctional optical power meter (ORIEL - Model 70310 USA). The spectral response of films was recorded in the wavelength region 400 to 800nm. Electrical conductivity was measured by taking silver paste as a contact electrode at 1cm separation applied on the film surface. The samples were kept in the measurement chamber. An ELH lamp was used for white light and a series of oriel VIS-NIR interference filters were used for monochromatic light. The incident light intensity was measured in  $\text{mW}/\text{cm}^2$  by placing a suryampi at the position of the sample.

## III. RESULTS AND DISCUSSION

### 3.1 Optical Property

The transmittance spectra of the vacuum evaporated ZnTe films of various thicknesses in the visible region are presented in figure 1. As seen, the transmittance decreases with the increase in the film thickness, which leads to a decrease in light scattering losses (Jeong et al 2003). High transmittance in the higher wavelength region and a sharp absorption edge were observed in the films (Chattopadhyay et al 1991). Thicker films tend to possess multiple internal reflections that occur inside films and as a consequence, it reduces the overall transmittance, which leads to a decrease in light scattering losses. The average transmission value for the ZnTe film is over 65%. The transmittance falls steeply with decreasing wavelength. It can be positively concluded that the material is of highly absorbing nature in the visible region. This is in good agreement with the earlier investigations (Prasada Rao et al 1995; 1996).

R. Amutha, Department of Physics, Nirmala College for Women, Coimbatore-18, Tamilnadu, India. E-Mail: amutha\_selvi@yahoo.com

A. Subbarayan, PG and Research Department of Physics, Kongunadu Arts & Science College, Coimbatore-29, Tamilnadu, India

R. Sathyamoorthy, PG and Research Department of Physics, Kongunadu Arts & Science College, Coimbatore-29, Tamilnadu, India



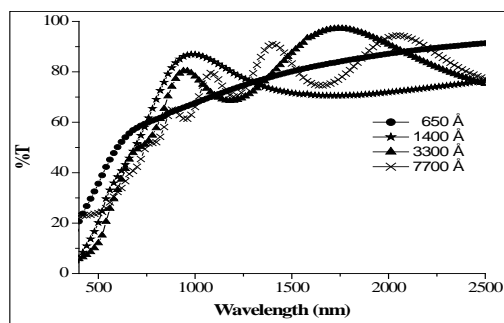


Figure 1. Transmittance Spectra of ZnTe films for various Thicknesses

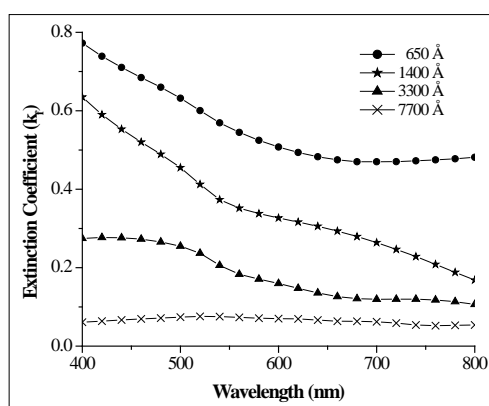


Figure 2. Dependence of Extinction Coefficient ( $k_f$ ) on Wavelength for ZnTe Films of Different Thicknesses

The total absorption coefficient was calculated from transmittance measurements with the aid of the expression (Zelaya et al 1998)

$$\alpha = \left( \frac{4\pi k_f}{\lambda} \right)$$

The extinction co-efficient ( $k_f$ ) can be calculated

$$\text{from the relation } k_f = \frac{2.303\lambda \log\left(\frac{1}{T_0}\right)}{4\pi t}$$

Where ' $T_0$ ' is the transmittance and ' $t$ ' the thickness of the film.

Figure 2 shows the variation of  $k_f$  with wavelength for ZnTe films of different thicknesses. The value of extinction coefficient decreases with increase in film thickness, which may be due to the improvement in the crystallinity with the increase in film thickness leading to the minimum imperfections (Prathap et al 2006; Pal et al 1993).

The electronic transition between valence and the conduction bands, is given by (Goswami 1996)

$$\alpha h\nu = A(h\nu - E_g)^p$$

Where the magnitude of the exponent ' $p$ ' characterizes the type of transition and takes the values 1/2, 3/2, 2 and 3 for direct allowed, direct forbidden, indirect allowed and indirect forbidden transitions respectively. In the above equation ' $A$ ' is a constant, ' $E_g$ ' the optical band gap and ' $h\nu$ ' the energy of photon.

The  $(\alpha h\nu)^2$  is plotted against the photon energy ( $h\nu$ ) for ZnTe films of various thicknesses and the energy gap for these films are obtained by extrapolating the linear straight line portion of the curve to the energy axis. All the plots show straight-line portions supporting the interpretation of direct band gap for all the films. From the plot, it is concluded that the optical transition in these films is direct and allowed. The variation of  $(\alpha h\nu)^2$  versus photon energy for ZnTe thin film of different thicknesses are shown in figure 3.

It is observed that the band gap ( $E_g$ ) decreases with increase in film thickness as shown in table 1. The decrease in band gap with increase in film thickness can be explained on the basis of island structure (Neugebauer et al 1962). The decrease in optical band gap energy with increase in film thickness is due to the increased grain size of the higher thickness of the film. Hence, the variations of band gap in the films are supposed to be due to the changes in the lattice constants, which may arise because of the change in microstrain (Pal et al 1989).

### 3.2 Photoconduction

In the present study photoconductivity measurements have been carried out at room temperature as a function of applied voltage and wavelength of light source.

#### 3.2.1 Photoconductivity as a function of light intensity

The figure 4(a) shows the variation of photocurrent with applied voltage for different light intensities. The observed photocurrent increases with increase in applied voltage as well as light intensity. The observed current after illumination is always higher than that of the dark current. After illumination, there is an increase in the number of mobile charge carriers, resulting in an increase in the electrical conductivity of the film. This is due to increase in concentration of majority charge carriers. The increase in photocurrent with light intensity may also be mainly due to the reduction in barrier height ( $E_b$ ) rather than the increase in the majority carriers.

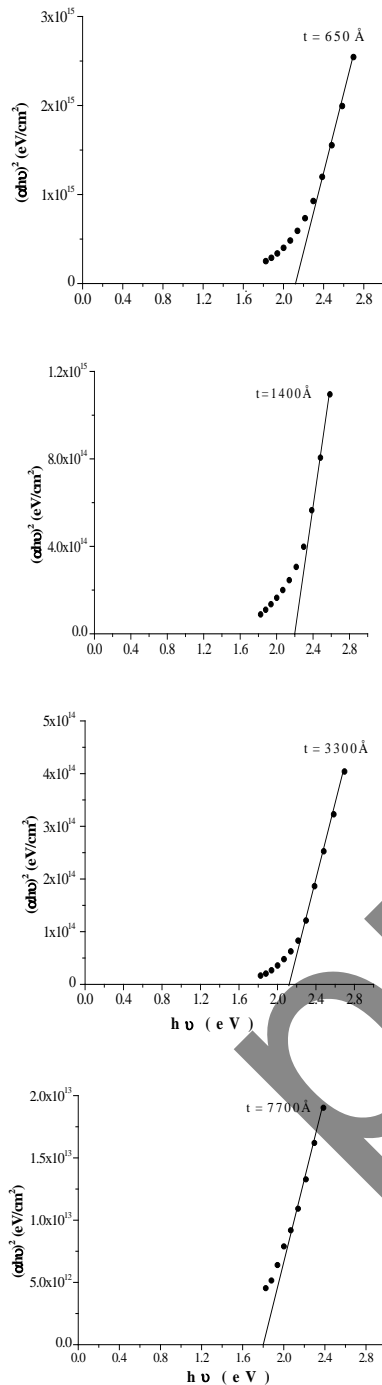


Figure 3. Dependence of  $(\alpha h\nu)^2$  on Photon Energy ( $h\nu$ ) for ZnTe films of the Various Thicknesses

Table 1. The band gap for different thicknesses of ZnTe thin films

Thickness [ $\text{\AA}$ ]	Band gap [eV]
650	2.31
1400	2.17
3300	2.12
7700	1.80

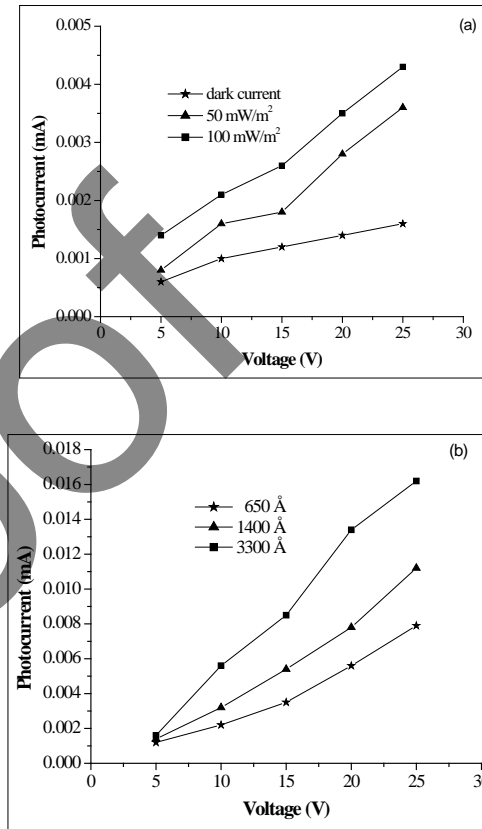


Figure 4. Variation of Photocurrent with Applied Voltage for (a) Different Illuminations (b) Various Thicknesses

The variation of photocurrent with applied voltage for various thicknesses is shown in figure 4(b). The photocurrent increases with increase in applied voltage as well as the film thickness (Gill et al 1970; Lindquist et al 1972; Soeya et al 1977; Hou et al 1970; Sorokin et al 1966). The observed linear dependence of photocurrent with applied voltage (Shay et al 1975), which supports that, the deposited films are free from traps.

### 3.3.2 Photoconductivity as a function of wavelength

The spectral response of ZnTe thin films of different thickness is shown in figure 5. The photocurrent increases with increase in wavelength of the incident light and reaches a maximum for a particular wavelength beyond

this the photocurrent decreases. The maximum in the spectral response curve corresponds to the absorption edge, which is related to the energy band gap. The maximum photoconductivity centred on 550 nm, which corresponds to the band gap of ZnTe films. At higher wavelengths the radiation is partially absorbed giving rise to less photocurrent than the maximum. The presence of defect centers extends the spectral response to longer wavelengths due to direct excitation of carriers from defect levels. In the short wavelength region only the surface regions are excited, where defect states give shorter life times and hence drop in photosensitivity is resulted. The sharpness of the peak is found to be thickness dependent. If the photoconductor is very thin, no maximum is observed in the response curve as all the photo-excited carriers recombine by surface recombination kinetics.

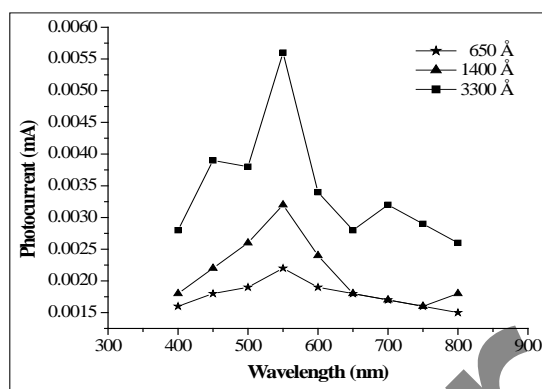


Figure 5. Variation of Photocurrent with Wavelength for various Thicknesses

#### IV. CONCLUSIONS

ZnTe thin films were deposited onto well-cleaned glass substrates by vacuum evaporation. From the transmission spectra, the transmittance is found to decrease with increase of film thickness. The optical constants exhibit a high sensitivity on thickness. The observed optical transition in ZnTe films is of direct and allowed type. The optical band gap energy shows an inverse dependence on thickness. The photoconductive studies show that the photocurrent increases with both applied voltage and intensity of incident light. The spectral response curve of ZnTe thin films exhibit a maximum corresponding to the absorption edge about 550 nm, which corresponds to the band gap energy of the material under investigation. The band gap has been determined from the spectral response curve as 2.25 eV.

#### REFERENCES

- [1] Acharya K P, Erlacher A and Ullrich B 2007 Thin Solid Films 515, 4066

- [2] Aqili A K S, Saleh A J, Ali Z and Al-Omari S 2012 Journal of Alloys and Compounds 520, 83
- [3] Chattopadhyay K K, Sarkar A, Chaudhuri S and Pal A K 1991 Vacuum 42(17), 1113
- [4] Gill W D, and Bube R H 1970 J. Appl. Phys. 41 (9), 3731
- [5] Goswami A, 1996 Thin Film Fundamentals (New Age International Publishers, New Delhi) p. 342.
- [6] Hou S L and Marley J A 1970 J. Appl. Phys. Lett. 16, 467
- [7] Jeong S H, Kho S, Jung D, Lee S B and Boo J H 2003 Surface and Coatings Technology 174-175, 187
- [8] Lindquist P F and Bube R H 1972 J. Appl. Phys. 43 (6), 2839
- [9] Neugebauer C A and Webb M B, J. Appl. Phys. 33, 74 (1962).
- [10] Pal U, Saha S, Chaudhuri A K, Rao V V and Banerjee H D 1989 J. Phys. D: Appl. Phys. 22, 965
- [11] Pal U, Samanta S, Ghorai S and Chaudri A K 1993 J. Appl. Phys. 74, 6368
- [12] Prasada Rao K, Hussain O Md, Reddy H T R, Reddy P S, Uthanna S, Naidu B S and Jayarama Reddy P 1995 Journal of Alloys and Compounds 218, 86
- [13] Prasada Rao K, Hussain O Md, Reddy H T R, Reddy P S, Uthanna S, Naidu B S and Jayarama Reddy P 1996 Optical Materials 5, 63
- [14] Prathap P, Subbaiah Y P V, Devika M and Ramakrishna Reddy K T 2006 Mater. Chem. Phys. 100 (2-3), 375
- [15] Shay J L and Wernick J H 1975 Ternary Chalcopyrite Semiconductors: Growth, Electronic properties and Applications, Pergamon, New York
- [16] Soeya T, Morimoto J and Naruge Y 1977 Jpn. J. Appl. Phys. 16, 1883
- [17] Sorokin G P, Papshev Yu M, and Oush P T 1966 Soviet Physics Solid State 7(7), 1810
- [18] Tolansky S 1948 Multiple beam interferometry of surfaces and films (Oxford University Press, New Jersey)
- [19] Zelaya O, Sanchez-Sinencio F, Mendoza-Alvarez J G, Farias M H, Cota-Araiza L and Hirata-Flores G 1998 J. Appl. Phys. 63(2), 410

# Characteristic Studies of ZnO Coated on Plasma Treated Fabric

S. Inbakumar and P. M. Andavan

**Abstract---** *Zno nano particle was prepared by sol-gel method. Untreated and plasma treated fabric were treated with ZnO solution and these samples were studied by UV and PL for ultra violet radiation protection analysis. Crystallinity studies were performed using XRD Microstructural characterization at high magnifications was carried out using transmission electron microscope (HRTEM) and the elemental compositions were obtained by energy dispersive X-ray spectrophotometer (EDS).*

## I. INTRODUCTION

RECENTLY, much attention has been paid to new technologies, called “added-value technologies”, permitting the production of functionalised and so-called “intelligent textiles”. The dynamic development of functionalised textile products is directly related to progress in chemistry and polymer processing, and in particular to nanotechnology. The functionalisation of textile products by the introduction of chemical nanomolecules into them or on the surface of their fibres has recently become the main direction of the development of textile product engineering, permitting the obtaining of products which show properties unachievable with the use of conventional technology.

Research work on the functionalisation of textile products has focused on the endowment of new properties or combinations of properties, e.g. antibacterial, self-cleaning, absorbing UV radiation or deodorising. Extremely promising agents for functionalisation are nanoparticles of metal oxides, in particular titanium dioxide and zinc oxide [1]. Zinc oxide, showing high absorption of UV radiation [2, 3] and antibacterial properties [4], is a very interesting modifier used in the textile industry [5] due to its prospective use for the production of safety garments (health service) and all kinds of fabrics for the construction industry [6]. Zinc oxide can occur in a variety of structures, including one-dimensional (e.g. nanowires, nanorods, nanorings or nanohelices) or two-dimensional ones (nanoplates,

nanosheets), and can have a rich gamut of applications [7].

Literature gives many methods for obtaining zinc oxide with particles of different sizes and structures: the sol-gel process [8, 9], precipitation [10 - 12], the emulsion route [13, 14], the hydrothermal process [15, 16], the organometallic method [17], the thermal decomposition of a precursor [18, 19] and many others. The sol-gel, solvothermal or hydrothermal methods have some considerable limitations with respect to e.g. the scale of production and economical aspects. The most promising solution from the point of view of the functionality of the product is the modification of conventional precipitation methods.

This paper is concerned with the analysis of the process of ZnO synthesis by solgel method. And these solutions are then added with fabrics and studied it can be successfully used as UV barrier

## II. EXPERIMENTAL SETUP

ZnO solid solutions were prepared by sol – gel method. The precursor sols were prepared from zinc acetate dihydrate ( $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ , E-Merck, India) was dissolved in 1:1 mixture of ethanol and doubly distilled water. The ‘sol’ mixture was stirred for 6h at a temperature of 50°C. The resultant product was dried and calcined at 500°C for an hour to get a pure nano ZnO.

The crystallographic studies were performed using XRD (Shimadzu 6000 X-ray diffractometer) with  $\text{CuK}\alpha$  wavelength and scanning in the  $2\theta$  range from 20 to 80°. Microstructural characterization at high magnifications was carried out using transmission electron microscope (HRTEM, JEOL JSM 200), high resolution scanning electron microscope (HRSEM, FEI Quanta FEG 200) and the elemental compositions were obtained by energy dispersive X-ray spectrophotometer (EDS). The photoluminescence spectra were obtained by Flurolog spectro fluorometer with the excitation of 380nm.

## III. RESULTS AND DISCUSSION

Fig.1.shows the optical absorption spectrum of ZnO nanopowder prepared under aqueous conditions. The UV visible spectra for ZnO nanoparticles synthesized in aqueous media displayed excitonic absorption peak at 378 nm which implies lower particle size of ZnO. The bandgap calculated from the UV cut-off is found to be

S. Inbakumar , Research & Development Centre, Bharathiar University, Physics Division, Kumaraguru College of Technology-Coimbatore -641049- India. Email: s.inbakumar@gmail.com

P. M. Andavan, Department of Physics – Government Arts College – Coimbatore – 641029 – Tamilnadu – India

3.41 eV ZnO nanoparticle. These band gap values blue shifted relative to the bulk zinc oxide of 3.37 eV (Huang et al 2001).

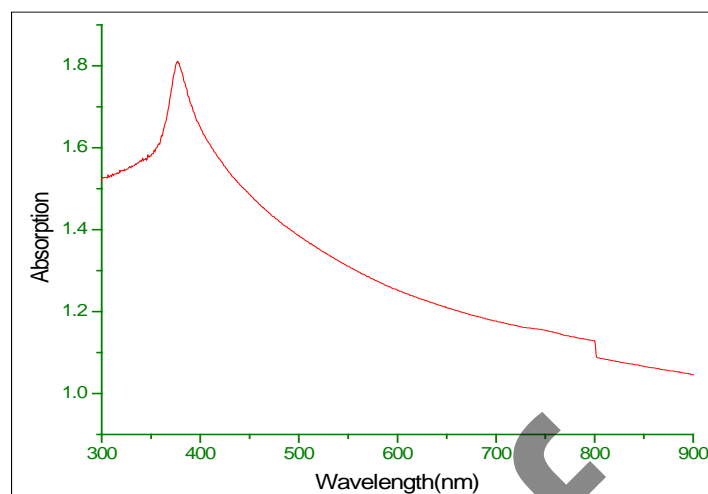


Fig: 1.UV Spectrum of ZnO

Fig.2 depicted the photoluminescence spectrum of nanosize ZnO synthesized in aqueous medium. Strong emission peak centred at 402 nm was observed in ZnO. The ZnO sample exhibits only UV bandgap luminescence but no oxygen defects luminescence was observed. (In general, it is observed around 530 nm, i.e. green–yellow emission). Generally, a green–yellow emission is

observed in PL spectra, due to recombination of photo generated holes with singly ionized charge state of specific defect (Hsieh et al 2003). However, absence of the green yellow emission in our samples indicates the potential of our synthetic strategy to produce a low concentration of oxygen defects and high optical quality of single crystal ZnO (Zu et al 1997; Gao et al 2005).

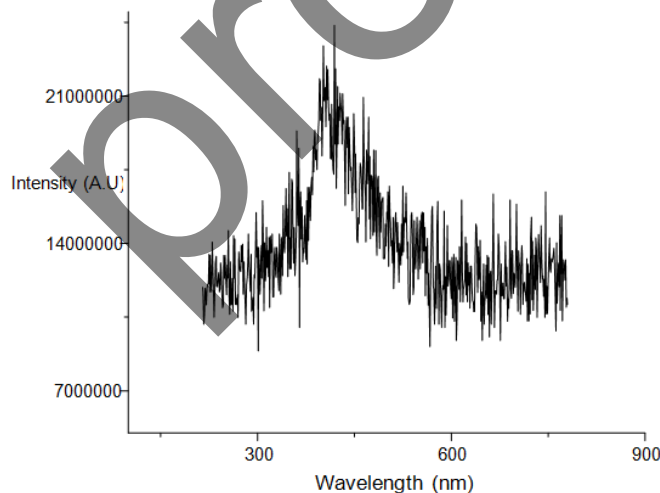


Fig.2: PL spectrum of ZnO

#### IV. X-RAY DIFFRACTION ANALYSIS

The crystal structure and orientation of ZnO nanoparticles have been investigated by X-ray diffraction (XRD) method. The sharp and intense peaks from Fig.3 indicate that the samples are highly crystalline of ZnO and ZnO nanoparticles have polycrystalline structure [5].

The XRD peaks for (100), (002) and (101) planes indicates the formation of phase pure wurtzite structure of ZnO. The ZnO nanoparticles have a preferred growth orientation along 101 direction. No peaks were observed due to impurities, indicating high purity of the ZnO nanopowders obtained by sol-gel method. The values of  $a$  and  $c$  for ZnO calculated using the formula,

$$\frac{1}{d^2} = \frac{4}{3} \left\{ \frac{h^2 + hk + k^2}{a^2} \right\} + \frac{l^2}{c^2}$$

was found to be  $a = 3.232 \text{ \AA}$  and  $c = 5.177 \text{ \AA}$ . The lattice constants for hexagonal ZnO nanoparticles reported in Joint Committee on Powder Diffraction Standards (JCPDS) matches with the calculated one [6]. The crystalline size of ZnO can be calculated using Scherrer's formula,

$$D = \frac{K\lambda}{\beta \cos \theta}$$

where

The constant K is the shape factor = 0.94

' $\lambda$ ' the wavelength of X-rays (1.5406 for  $\text{CuK}_\alpha$ )

$\theta$  is the Bragg's angle

$\beta$  is the full width at half maximum

The average crystalline size is found to be 27 nm. Table 1 shows the XRD parameters of ZnO nanopowders. Fig.3 shows the EDX spectrum of ZnO nanopowders and Table 2 shows the ratio of ZnO elemental composition. EDX spectrum shows four peaks which are identified as zinc and oxygen. Hence, it can be seen that pure ZnO

nano powders can be prepared using sol-gel method. Formation of a dominant rod like crystal. The interplanar spacing values  $d$  were also calculated by using the formula,

$$d = n\lambda / 2 \sin \theta$$

Table: 1. Particle size estimated from the diffraction spectrum

2 $\theta$ (degree)			Interplanar distance(d) ( $\text{\AA}$ )		FWHM	Crystalline (size) nm
hk	observed	JCPDS	observed	JCPDS		
100	31.92	31.77	2.80	2.81	0.42	27.58
002	34.56	34.42	2.59	2.60	0.37	30.00
101	36.40	36.23	2.46	2.48	0.39	26.80
102	47.65	47.53	1.90	1.91	0.39	26.85
110	63.05	66.60	1.62	1.62	0.40	26.80

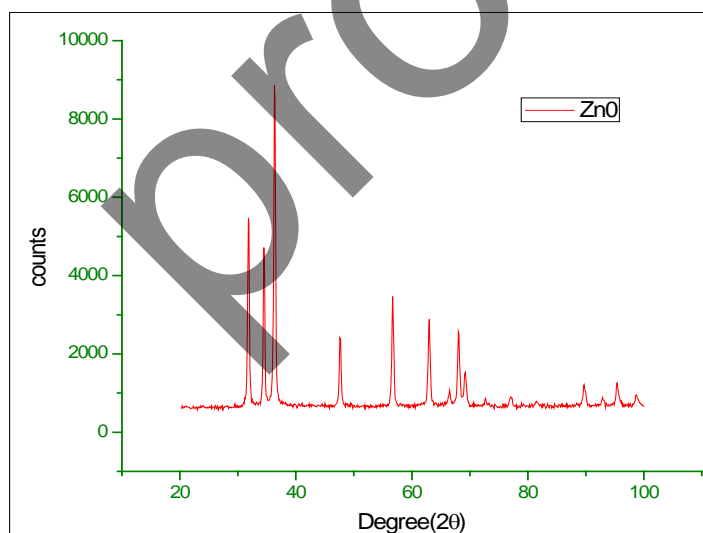


FIG:3. XRD PATTERN OF ZnO

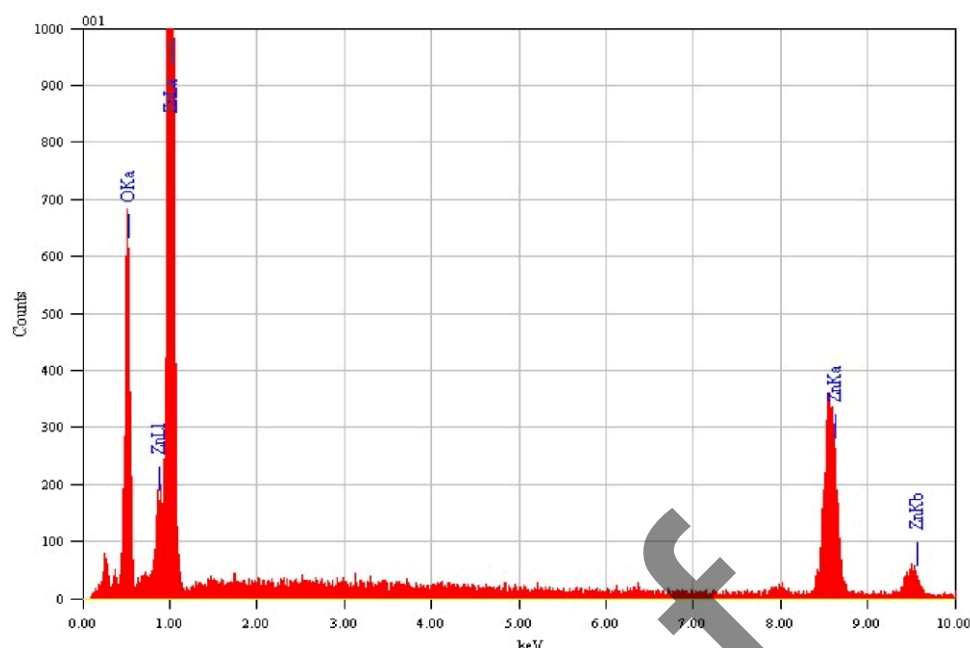


Fig:4. EDX spectrum of ZnO

Table: 2 Elements composition of ZnO

Elements	Experimental Results (Atomic %)
Zn	23.14
O	76.86

#### V. SURFACE MORPHOLOGY ANALYSIS

Fig.5a&b shows the Scanning electron microscopy image of ZnO nano particle prepared by sol-gel method. The small range of rod shaped morphology is observed in the micrograph as shown in figure 5b. The SEM pictures show distinguished rod shape morphology with a self-aligned prismatic nanoparticles. The transmission electron micrograph of the ZnO sample is given in Fig.6. The figure clearly indicates the morphology of the particles to be roughly hexagonal and homogeneous. Some of the particles are agglomerates. The distribution of particles obtained from the TEM image is given in Fig.6.

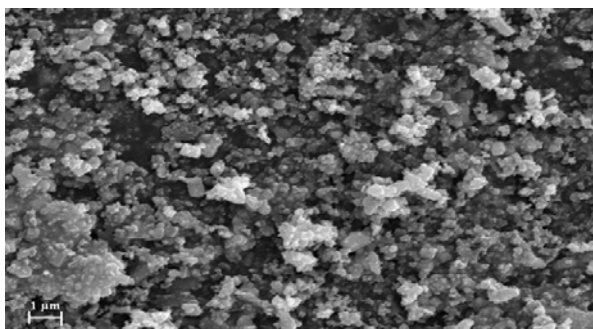


Fig:5a. SEM image of ZnO

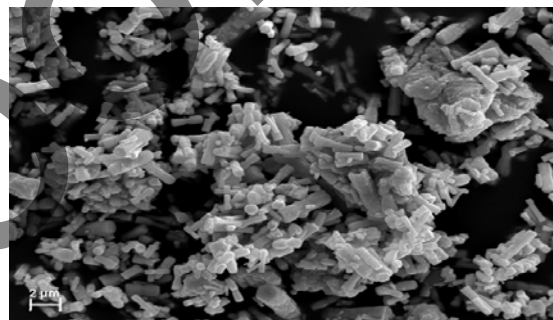


Fig:5b. SEM image of asynthesis ZnO

#### VI. HRTEM OF ZNO

TEM images of the ZnO nanoparticles are shown in Fig.6. Nanoparticles are nearly hexagonal and quite monodisperse. However, there are some larger aggregates in the sample obtained from synthesis, because of the high surface energy of ZnO nanoparticles that results in aggregation, especially when the synthesis is carried out in an aqueous medium. The mean diameter of the particles in the dry powder was measured by averaging the size of a large number of particles (400) from the analysis of TEM micrographs. The particles diameter ranges between 12 and 38 nm for the material obtained according to synthesis. The particles size calculated on the basis of Scherrer's equation agrees quite well with the value obtained through TEM micrographs (Table 1).

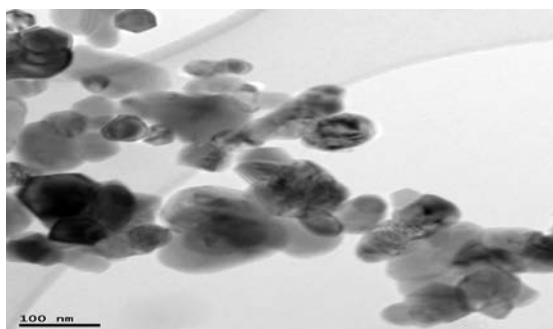
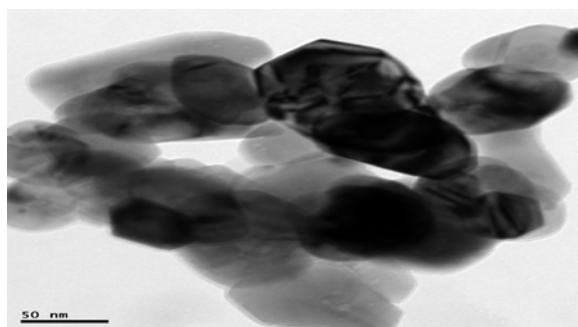


Fig.6:HRTEM of ZnO

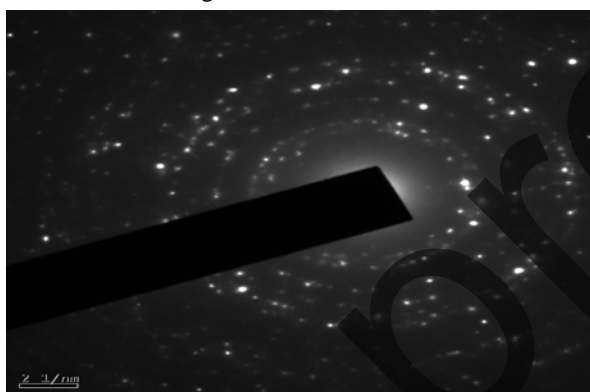
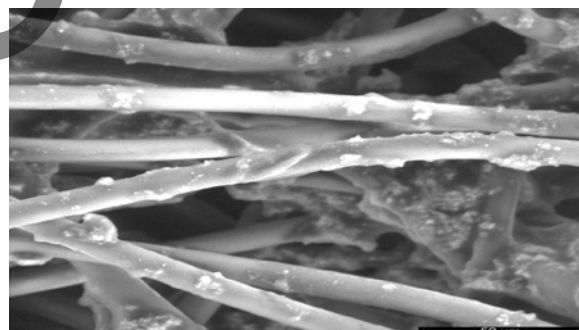
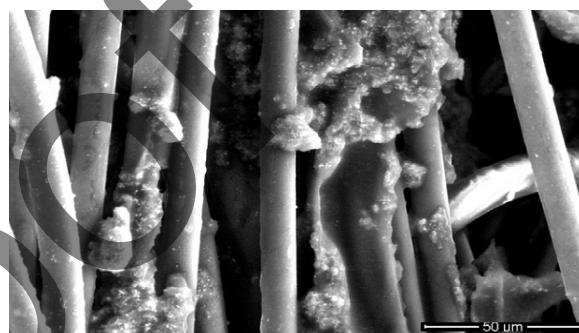
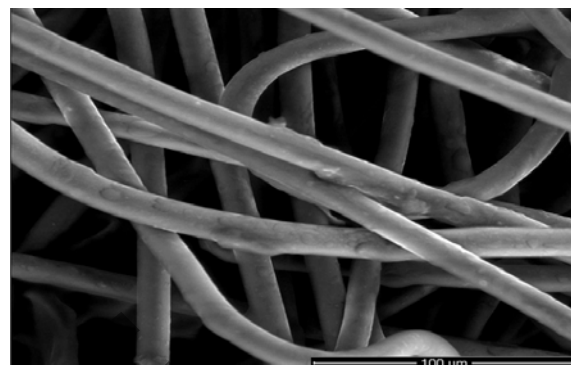


Fig: 6c. SAED pattern of ZnO particle

## VII. ELECTRON MICROSCOPY

SEM microphotographs of fabric coated with ZnO with and without preliminary treatment with plasma are shown in **Figure 7**. The surface of unmodified fabric is smooth, sees **Figure 7a**, but has small particles in some places, probably impurities. In Fig. 7b&c, SEM micrographs show the nanoscaled ZnO particles on untreated and on plasma treated samples respectively. The nanoparticles are well dispersed on the fiber surface in both cases, although some aggregated nanoparticles are still visible. The surface roughness plays a primary role in determining their adhesion to the fibers: it is reasonable to expect that the particle agglomerates will be easily removed from the smooth fiber surface, while the particles will penetrate deeper and adhere strongly into

the rough surface of the fabric matrix. Activation with low-temperature plasma increases the amount of carboxylic groups on the surface of fibres, resulting in the improvement of adhesive properties and, hence, in the attachment of a greater amount of ZnO particles to the fabric surface.

Fig:7 SEM image of (a) Untreated fabric  
(b) Fabric+ZnO (c) Plasma treated fabric+ZnO

## VIII. CONCLUSIONS

As follows from the results obtained, (SEM and EDS analyses) the preliminary treatment of nonwoven fabric with low-temperature plasma resulted in the attachment of a considerably greater amount of micronised zinc oxide particles to the fabric. Products from fabric preliminary treated with cold plasma and coated with paste containing ZnO can be classified as protecting against UV radiation.



## REFERENCES

- [1] Wang R., Xin J.H., Tao X.M., Daoud W.A.; Chem. Phys. Lett., Vol. 398, 2005, pp. 250-255.
- [2] Özgür Ü., Alivov Ya.I., Liu C., Teke A., Reshchikov M.A., Doğan S., Avrutin V., Cho S.-J. and Morkoç H.; J. Appl. Phys., Vol. 98, 2005, pp. 1-103.
- [3] Yadav A., Prasad V., Kathe A.A., Raj S., Yadav D., Sundaramoorthy C., Vigneshwaran N.; Mater B.. Sci., Vol. 29, 2006, pp. 641-645.
- [4] Zhang L., Jiang Y., Ding Y., Povey M., York D.; J. Nanopart. Res., Vol. 9, 2007, pp. 479-489.
- [5] Sójka-Ledakowicz J., Lewartowska J., Kudzin M., Jesionowski T., Siwińska-Stefańska K., Krysztafiewicz A.; Fibres Text. East. Eur., Vol. 16, 2008, pp. 116-116.
- [6] Qian L., Hinestroza J.P.; JTATM, Vol. 4, 2004, pp. 12-18.
- [7] Kim H.W., Kebede M.A., Kim H.S., Srinivasa B., Kim D.Y., Park J.Y., Kim S.S.; Curr. Appl. Phys., Vol. 10, 2010, pp. 52-56.
- [8] Kamalasanan M.N., Chandra S.; Thin Solid Film., Vol. 15, 1996, pp. 112-115.
- [9] Suwanboon S.; Sci. Asia, Vol. 34, 2008, pp. 31-34.
- [10] Mayo M.J.; Int. Mater. Rev., Vol. 41, 1998, pp. 85-115.
- [11] Jitianu M., Goia D.V.; J. Colloid Interface Sci., Vol. 309, 2007, pp. 78-85.
- [12] Sun D., Wong M., Sun L., Li Y., Miyatake N., Sue H-J.; J. Sol-Gel Sci. Technol. Vol.43, 2007, pp. 237-243.
- [13] Lopez-Quintela M.A., Rias J.; J. Colloid Interface Sci., Vol. 158, 1993, pp. 446-451.
- [14] Voroboyova S.A., Lesnikovich A.I., Mushinskii V.V.; Mater. Lett., Vol. 58, 2004, pp. 863- 866.
- [15] Chen D., Jiao X. and Cheng G., 2000. Hydrothermal synthesis of zinc oxide powders with different morphologies, Solid State Communication, Vol.113, pp. 363-366.
- [16] Lu Ch.H., Yeh Ch.H; Ceram. Int., Vol. 26, 2005, pp. 363-366.
- [17] Kahn M.L., Monge M., Colliere V., Senocq F., Maisonnat A., Chaudret B.; Adv. Funct.Mater., Vol. 15, 2005, pp. 458-468.

# Structural, Optical and Electrical properties of ZnO Nanoparticles and PANI/ZnO Nanocomposite by Microwave Assisted Hydrothermal method

C. Thenmozhi, V. Manivannan, E. Kumar and  
S. VeeraRethinaMurugan

**Abstract---** Zinc Oxide nanoparticles were synthesized by microwave assisted hydrothermal method using Zinc Nitrate Hexahydrate ( $\text{ZnNO}_3 \cdot 6\text{H}_2\text{O}$ ) as a starting material. Polyaniline / Zinc Oxide (PANI / ZnO) nanocomposite material was prepared by an in-situ polymerization of aniline in the presence of ZnO nanoparticles. The structure, morphology and functional group of the synthesized Zinc Oxide nanoparticles and PANI / ZnO nanocomposites were characterized by X-ray diffraction (XRD), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR). The sharp peaks in the X-ray diffraction pattern indicate that the obtained powder was ZnO and was crystalline in nature. The crystallite size of the sample were calculated from the full width at half maximum of X-Ray diffraction peaks by using Debye-Scherrer formula and were found to be around 45nm. FTIR studies showed that there was a strong interaction between polyaniline and Zinc Oxide nanoparticles. The band gap of the sample were calculated from the UV-Visible spectroscopic studies. Dielectric studies of ZnO nanoparticles show the frequency dependent dielectric behaviour of ZnO nanoparticles. Results reveals that the dielectric constant decrease with the increasing frequency whereas the a.c conductivity of the sample increases with the increase in frequency.

**Keywords---** Microwave assisted synthesis, Hydrothermal method, ZnO nanoparticles, XRD, FT-IR, UV-visible, SEM, TEM and Dielectric properties.

## I. INTRODUCTION

ZnO is a semiconducting oxide material having wide band gap of 3.37eV at room temperature, which exhibits excellent optical and electrical properties. Due to its physical & chemical properties, zinc oxide is used in

various applications such as photo catalysis, UV protection, solar cell and gas sensor applications. It has been widely used for its catalytic, electrical, optoelectronic and photochemical properties [1-4]. So many techniques are available for the synthesis of ZnO nanoparticles, namely, hydrothermal synthesis [5], physical vapour deposition [6], electrochemical deposition [7], chemical vapour deposition [8], pulsed laser deposition [9], microwave assisted synthesis [10] and thermal evaporation [11]. Since, microwave assisted synthesis is a rapid technique and also cost effective compared to other methods, this method is chosen for producing ZnO nanoparticles. Zinc oxide (ZnO) is a common material that is readily used in semiconductor fabrication especially in solar cells and gas sensors due to its special properties. Zinc oxide, a versatile semiconductor material has been attracting attention because of the commercial demand for optoelectronic devices operating at blue and ultraviolet regions [12].

## II. EXPERIMENTAL

### 2.1 Materials and Characterization Techniques

All the chemicals involved in this microwave assisted method were used as received from the chemical suppliers without any further purification and processing. Aniline (99.5%), Zinc Nitrate Hexahydrate ( $\text{ZnNO}_3 \cdot 6\text{H}_2\text{O}$ ), Sodium Hydroxide (NaOH) and Ethylene Glycol were procured from E. Merck and Ammonium persulfate (98%) was purchased from Hi-media and used as received. All the chemicals were of analytical grade and solutions were prepared with double distilled water. Aniline monomer was distilled using cubic condenser for purification.

The prepared ZnO nanoparticles were characterized by X-Ray Diffraction technique (XRD) and Scanning Electron Microscope (SEM) to find the structure and morphology. Crystallographic studies were carried out using a X-Ray diffractometer (Bruker D8 with Nickel filtered Cu -  $K\alpha$  radiation), in the scanning range of  $2\theta$  from  $10^\circ$  -  $80^\circ$  using Cu -  $K\alpha$  radiations of wavelength  $1.5406\text{\AA}$ . SEM images of the sample were recorded using the model HITACHI SEM, to study the morphology of the samples. HRTEM micrographs of the prepared

C. Thenmozhi, Research Scholar, PRIST University, Thanjavur

V. Manivannan, Director, R&D (Retd), PRIST University, Thanjavur

E. Kumar, Asst.Prof, Dept of Physics, Tamil Nadu Open University, Chennai

S. VeeraRethinaMurugan, Asst.Prof, Dept of Physics, R.S.Govt. College, Thanjavur

samples were taken using the Model JEOL – J2000.FT-IR spectra of the sample were recorded in the range of 400 – 4000 $\text{cm}^{-1}$  using Shimadzu 8400S FT-IR Spectrometer.

## 2.2 Synthesis of ZnO Nanoparticles – Microwave Assisted synthesis

Zinc Nitrate Hexahydrate ( $\text{ZnNO}_3 \cdot 6\text{H}_2\text{O}$ ) and Sodium hydroxide (NaOH) were taken in 1:4 molar ratio and dissolved completely in de-ionized water separately. Then the dissolved  $\text{ZnNO}_3 \cdot 6\text{H}_2\text{O}$  was added with Ethylene Glycol. Further, NaOH solution was added drop wise into the above mixture under vigorous stirring. Then the prepared mixture solution was kept in the microwave oven (900 W, 2450 MHz) for about 30 minutes. Finally, the as-prepared sample was centrifuged several times in double distilled water, ethanol and dried at 150 °C for 24 hours, resulting in the formation of ZnO nanoparticles.

## 2.3 Synthesis of PANI / ZnO Nanocomposites

To prepare Polyaniline / ZnO nanocomposite, Aniline was injected into 2M HCL containing different wt% of ZnO nanoparticles under ultrasonic action to reduce the aggregation of ZnO nanoparticles. After 12hrs, Ammonium Persulphate as an oxidant (APS), was dropped into the solution with constant stirring for 10 min. The polymerization was allowed to proceed for 3hrs at 30° C. Reaction mixture was filtered and washed with 2M HCL and de- ionized water and then dried at 90° C for 12hrs in vacuum. PANI / ZnO nanocomposite with fine tint green colour was obtained.

# III. RESULTS AND DISCUSSION

## 3.1 X-ray Diffraction technique (XRD)

The XRD pattern of ZnO nanoparticles and PANI/ZnO nanocomposite are shown in Figure 1. The XRD result shows that the sharp and the well defined diffraction peaks formed at 33° and 58.7° confirmed the formation of ZnO nanoparticles and also indicate the good crystallinity of synthesized material. The characteristic peaks of ZnO formed at 33°, 45.6°, 58.7°, 69° and 73° corresponds to the miller indices (0 0 2), (1 0 2), (1 1 0), (2 0 1) and (0 0 4) respectively, which can be indexed with hexagonal phase (JCPDS Card No. 80-0075) [13]. The crystalline size of ZnO nanoparticles was calculated using the value of FWHM from the most intense XRD peaks as around 45 nm by using Scherrer formula (1) [14].

$$D = \frac{K\lambda}{\beta \cos \theta} \quad (\text{nm}) \quad \dots\dots\dots (1)$$

where D is the crystallite size, K is the shape factor (0.94),  $\lambda$  is the wavelength of X-rays ( $\lambda = 1.54059 \text{ \AA}$ ),  $\beta$  is the full width at half maximum (FWHM) of the diffraction peaks and  $\theta$  is the angle of diffraction. The XRD pattern of PANI / ZnO nanocomposite has a peak at  $2\theta = 25^\circ$  belongs to PANI,

representing the amorphous structure with low crystallinity. The XRD pattern of PANI/ZnO nanocomposite include the characteristic peaks of ZnO with the crystalline structure of hexagonal wurtzite, which confirms the formation of nanocomposite with lower crystallinity [15, 16a, b, c].

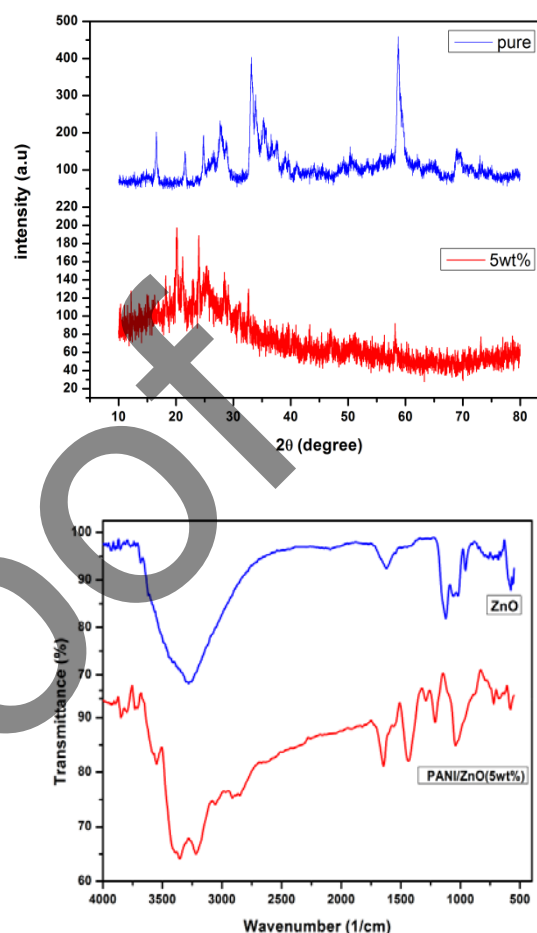


Figure 1. XRD pattern of ZnO & PANI / ZnO Figure 2. FT-IR spectra of ZnO & PANI / ZnO

## 3.2 FT-IR Spectroscopy

The FT-IR spectra of ZnO nanoparticles and PANI / ZnO nanocomposite synthesized by microwave assisted hydrothermal method are shown in Figure 2. The FT-IR spectra of ZnO nanoparticles shows that the peak at low wave number region of 576  $\text{cm}^{-1}$  is assigned to ZnO group [17, 18]. The sharp peak at 1123  $\text{cm}^{-1}$  is due to C-H plane bending vibration [19]. The band appears at 1619  $\text{cm}^{-1}$  may be attributed to C=C stretching mode of quinoid ring [20]. The peak at 3278  $\text{cm}^{-1}$  is due to the absorption of water during the preparation of IR pellet [21]. In PANI/ZnO nanocomposite, the peak at 582  $\text{cm}^{-1}$  is due to C=C stretching mode of quinoid rings [22]. The band at

$1040\text{cm}^{-1}$  was due to  $\text{SO}_3^-$  vibrations [17]. The peak at  $1434\text{cm}^{-1}$  was attributed to C–C stretch in benzoid ring and C–H mixed vibrations[18]. The peak at  $1644\text{cm}^{-1}$  was due to benzoid ring stretching[23]. The broad band at  $3355\text{cm}^{-1}$  and  $3219\text{cm}^{-1}$  was due to N–H band stretching vibration[18] and hydrogen bonded NH bond[20], respectively.

### 3.3 UV-Visible Spectroscopy

The UV–Visible absorption spectrum and Tauc plot of ZnO are shown in Figures 3a & 3b. ZnO has the characterization absorption peak at 237nm. For PANI/ZnO nanocomposite, there was a strong absorption peak at 234nm, which is blue shifted compared with the absorption peak of pure ZnO. It may be due to the interaction between PANI and ZnO nanoparticles which could cause charge transfer from PANI to ZnO through hydrogen bonding [24]. The band gap of ZnO and PANI / ZnO nanocomposite were calculated from Tauc plot and the values are 3.26eV and 3.18eV. On adding PANI with ZnO, the band gap decreases. The decrease of band gap of the nanocomposite has been attributed to the quantum confinement effect of nanoparticles.

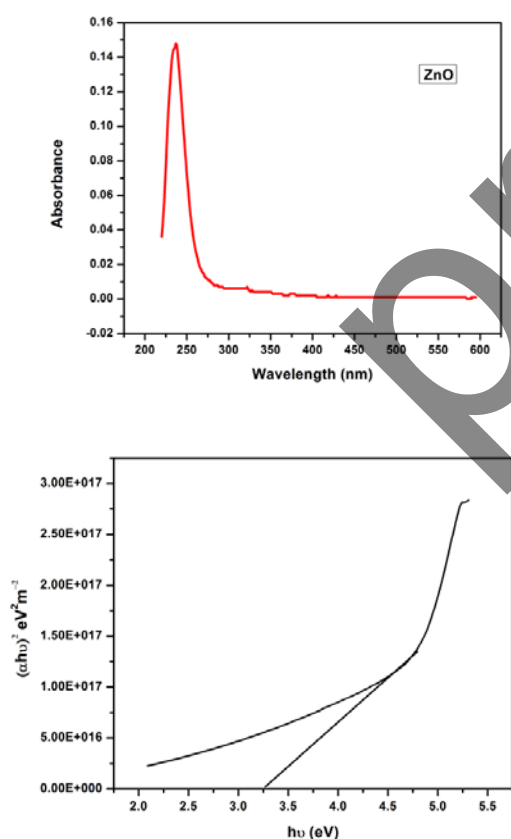


Figure 3a. UV-Visible spectra of ZnO Figure 3b. Tauc plot of ZnO

### 3.4 SEM Analysis

Figure 4a shows the SEM micrograph of the pure ZnO nanoparticles synthesized by microwave assisted hydrothermal method. It can be observed that nanosized ZnO particles are formed as nanoclusters. From the SEM image of PANI / ZnO Nanocomposite (Figure 4b), it is observed that ZnO nanoparticles are surrounded by polyaniline matrix and hence it appears as agglomerated macromolecules.

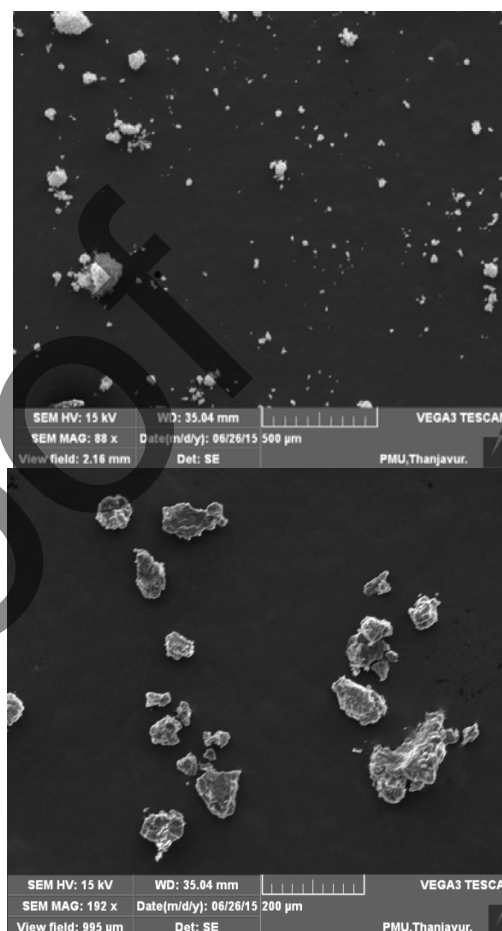


Figure 4a. SEM image of ZnO NPs Figure 4b. SEM image of PANI / ZnO Nanocomposite

### 3.5 Microstructural properties by HRTEM and SAED pattern

The morphology and particle size of Zinc Oxide nanoparticles were observed using HRTEM micrograph (Figure. 5a). These particles with particle size of 50nm were observed. The particle size of ZnO nanoparticles was observed as 50nm and it is same for PANI / ZnO nanocomposites. The presence of rod-like shaped PANI / ZnO nanocomposite was observed from HRTEM micrograph (Figure 5c). The particle size observed from HRTEM micrograph matches with the particles size



calculated from the XRD investigation. These results confirm the formation of crystalline Zinc Oxide nanoparticles. The corresponding SAED pattern of ZnO nanoparticles and PANI/ZnO are shown in Figures 5b & 5d. SAED pattern provides rings made up of bright spots, denotes the crystalline nature of the prepared ZnO nanoparticles.

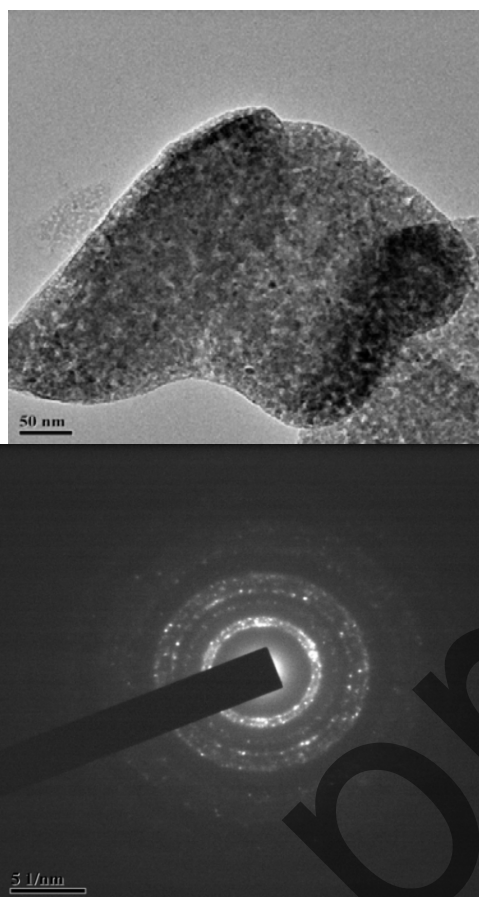


Figure 5a. HRTEM image of Pure ZnO NPs Figure 5b. SAED pattern of ZnO NPs

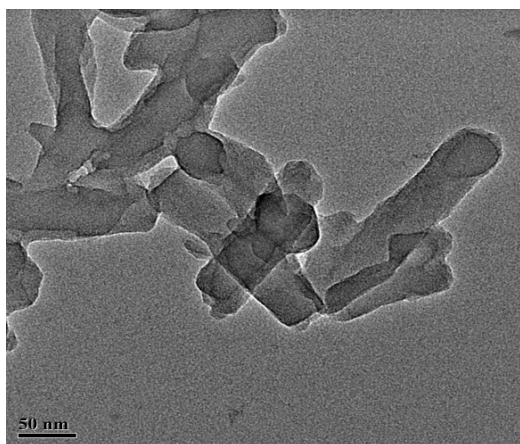


Figure 5c. HRTEM micrograph of PANI / ZnO Figure 5d. SAED pattern of PANI / ZnO

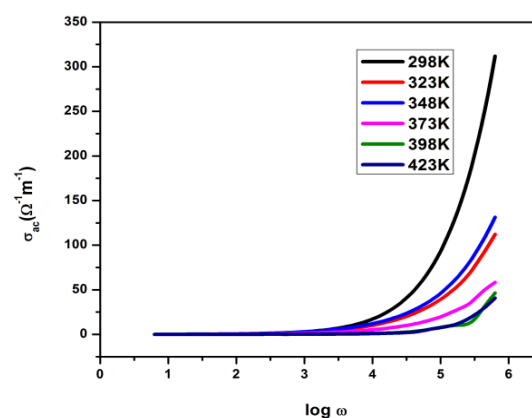
### 3.6 Electrical studies

#### 3.6.1 Determination of AC conductivity

The dielectric properties of ZnO Nanoparticles can be explained as a function of frequency of the applied electric field and temperature. Figure 6a and 6b. shows the variation of ac conductivity with varying frequency for ZnO nanoparticles and PANI / ZnO at different temperatures. The ac conductivity of ZnO Nanoparticles was calculated using the formula,

$$\sigma_{ac} = \epsilon_0 \epsilon_r \omega \tan \delta$$

where  $\epsilon_0$  is the permittivity of free space ( $8.85 \times 10^{-12}$  Farad/metre),  $\epsilon_r$  is the dielectric constant,  $\omega (2\pi f)$  is the angular frequency and  $\tan \delta$  is the loss factor. It is observed from the figure that the ac conductivity remains almost constant upto 1 KHz. Above 1 KHz, it increases gradually upto 40 KHz and then increases rapidly from 40 – 620 KHz. The result revealed that ZnO nanoparticles shows frequency dependence behaviour and the temperature independence behaviour of conductivity.



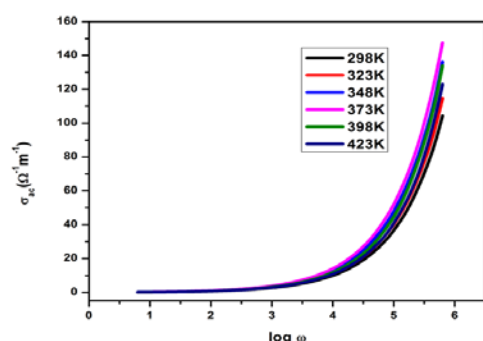


Fig6a Variation of ac conductivity with Frequency of ZnO  
Fig 6b. Variation of ac conductivity with Frequency of of  
PANI / ZnO

### 3.6.2 Dielectric constant of ZnO Nanoparticles

Figure 7. shows the variation of dielectric constant ( $\epsilon_r$ ) with varying frequency in the range of 10Hz - 620 KHz. The  $\epsilon_r$  decreases faster at lower frequency and slowly at higher frequency. The frequency dependence of electrical properties shows that the dielectric constant  $\epsilon_r$  decreases due to the increase of ac conductivity with increasing frequency. The rapid decrease of  $\epsilon_r$  in the low frequency region was due to space-charge contribution.

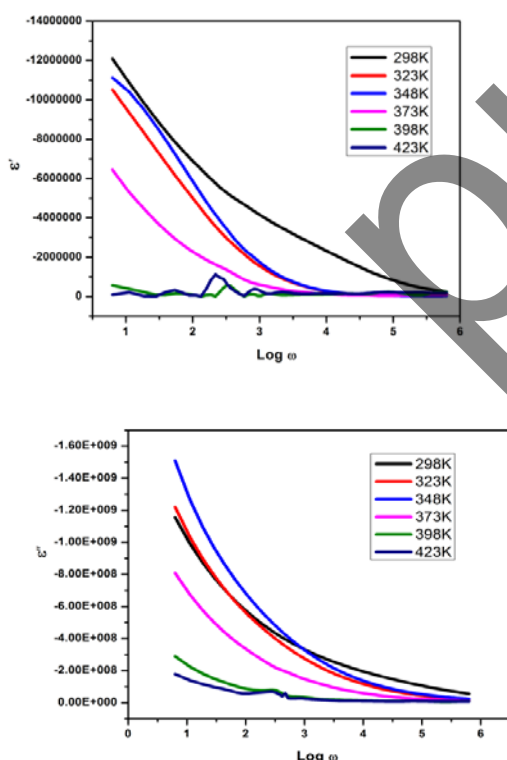


Figure 7. Frequency dependence of dielectric constants (real & Imaginary) of ZnO NPs

## IV. CONCLUSION

ZnO Nanoparticles were prepared using a microwave assisted hydrothermal method. The XRD analysis confirmed that pure ZnO nanoparticles were formed in this method. Crystallite size for ZnO nanoparticles synthesized in this method was found to be 45nm. The results obtained from TEM studies exactly matches with that of XRD results, which confirmed the formation of ZnO nanoparticles. FT-IR analysis also confirmed the formation of Zinc Oxide nanoparticles. XRD and FTIR of PANI / ZnO nanocomposite revealed that PANI undergoes interaction with ZnO Nanoparticles which are embedded in polymer matrix. SEM and TEM micrograph shows the uniform distribution of ZnO Nanoparticles in PANI / ZnO nanocomposite. Dielectric studies of ZnO nanoparticles and PANI / ZnO nanocomposite shows the frequency dependence dielectric behavior of ZnO nanoparticles. Results reveals that the dielectric constant decrease with the increasing frequency whereas the ac conductivity of the sample increases with the increase in frequency. The decrease of dielectric constant  $\epsilon_r$  was due to the increase of ac conductivity with increasing frequency. The rapid decrease of the dielectric constant ( $\epsilon_r$ ) in the low frequency region was attributed to space-charge contribution.

## REFERENCES

- [1] Wang, ZL, Zinc oxide nanostructures: growth properties and applications. J. Phys. Condens. Matter. 16, 829–858 (2004).
- [2] Braga, D, Fortunato, E, Ferreira, I, Aguas, H, Martins, R: New insights on large area flexible position sensitive detectors. J. Non-Cryst. Solids. 299, 1272–1276 (2002).
- [3] Ashour, A, Kaid, MA, El-Syed, NZ, Ibrahim, AA: Physical properties of ZnO thin films deposited by spray pyrolysis technique. Appl. Surf. Sci. 252, 7844–7848 (2006).
- [4] Suche, M, Christoulakis, S, Moschovis, K, Katsarakis, N, Kiriakidis, G, ZnO transparent thin films for gas sensor applications. Thin Solid Films. 515, 551–554 (2006).
- [5] Kajbafvala, A, Shayegh, M. R.; Mazloumi, M.; Zanganeh, S.; Lak, A.; Mohajerani, M. S.; Sadmezhad, S. K.; J. Alloys Compd. 2009, 469, 293.
- [6] Hejazi, S. R.; Madaah Hosseini, H. R.; Sasani Ghamsari, M.; J. Alloys. Compd. 2008, 455, 353.
- [7] Jiang, H.; Hu, J. Q.; Gu, F.; Li, C. Z.; J. Alloys Compd. 2009, 478, 550.
- [8] Yousefi, R.; Kamaluddin, B.; J. Alloys. Compd. 2009, 479, 11.
- [9] Wang, X. H.; Liu, S.; Chang, P.; Tang, Y.; Phys. Lett. A, 2008, 372, 2900.
- [10] Bacaksiz, E.; Yilmaz, S.; Parlak, M.; Varilci, A.; Altunbas, M.; J. Alloys Compd. 2009, 478, 367.
- [11] Yan, H. W.; Hou, J. B.; Fu, Z. P.; Yang, B. F.; Yang, P. H.; Liu, K. P.; Wen, M. W.; Chen, Y. J.; Li, F. Q.; Mater. Res. Bull. 2009, 44, 1954.
- [12] Shin. W. C., M. S. Wu, and J. Cryst. Growth vol. 137, 1994, pp. 319.
- [13] Shukla, S. K., N. B. Singh, R. P. Rastogi, Indian Journal of Engg and Materials Sciences, 20, 2013, pp 319 – 324.
- [14] Cullity. B. D, "Elements of X-Ray Diffraction," Addison - Wesley, Reading, 2005.
- [15] Kondawar, S. B., S. P. Agrawal, S. H. Nimkar, H. J. Sharma, P. T. Patil, Adv. Mat. Lett. 2012, 3(5), 393.

- [16] Kondawar, S.B. S.A.Acharya, S.R. Dhakate, Adv. Mat.Lett.2011, 2(5), 362.  
Shukla, S. K, A.Tiwari, Advanced Materials Research, 2011, 306-307, 82.  
Tiwari, A, R.Kumar, M.Prabaharan, R.R. Pandey, P. Kumari, A. Chaturvedi, A.K. Mishra, Polymers for Advanced Technologies, 2010, 21, 615.
- [17] Ansari, S. P, F. Mohammad, "Electrical studies on the composite of polyaniline with Zinc oxide nanoparticles," The IUP Journal of Chemistry, vol. 4, pp. 7–18, 2010.
- [18] Shahid Pervez Ansari and Faiz Mohammad, ISRN Materials Science, 2012, Vol 1298697pages.
- [19] Sanjay L. Patil<sup>1</sup>, Manik A. Chougule, Shailesh G. Pawar, ShashwatiSen, Vikas B. Patil, Soft Nanoscience Letters, 2012, 2, 46-53.
- [20] Subhash B. Kondawar\*, Pallavi T. Patil, Shikha P. Agrawal, Adv. Mat. Lett. 2014, 5(7),389-395.
- [21] Amrut S. Lanje, Satish J. Sharma, S. Raghumani, J. Ningthoujam, S. Ahn, Ramchandra B. Pode.
- [22] Verma. NK, Effect of Zinc Oxide Nano Particle Concentration in the Polyaniline-Zinc Oxide Nanocomposite on the Dielectric Property, Mat.Sci.Res.India;11(2),
- [23] Shukla. SK ,N.B.Singh., R.P.Rastogi, Ind J of Engg& Mat Sciences, 20, 2013, P319-324
- [24] Olad, A, P. Nosrati, Res ChemIntermed, 2012, 38, 323.

proof

# Synthesis, Characterisation and Biological Studies on Cu (I) and Mn (II) Quinoline Schiff Base Complexes

N. Sudha, S. Malathi, P. Maheswari and M. Gomathi

**Abstract---** Schiff bases play an important role in inorganic chemistry as they easily form stable complexes with most transition metal ions. The preparation and study of inorganic compounds containing biologically important ligands. The fact that copper, magnesium, iron, zinc and manganese are important metallic elements and display great biological activity when associated with certain metal-protein complexes, participating in oxygen transport, electronic transfer reactions has produced enormous curiosity in the study of systems containing these metals. Molecules containing donor-acceptors such as Schiff bases have ability to serve as polymeric ultraviolet stabilizers, laser dyes. The present work is focused on the study of co-ordination behaviour of thiosemicarbazone Schiffbase with hydrated Cu(II) and Mn(II) chlorides. Analytical and spectral data confirmed the structure of the complexes. Also absorption at 305nm might be due to the extended conjugation of the ring or may be due to the ring residue. Antibacterial and Antifungal activities were carried out using Disc diffusion method and the compounds were found to be active. A number of metal coordination complexes of Schiff bases have been suggested as antibacterial, antifungal, cytotoxic, anti-inflammatory and Cytostatic agents.

**Keywords---** Schiff base complexes, Antibacterial activity, Antifungal activity.

## I. INTRODUCTION

COORDINATION compounds have found application in medicine in the treatment and diagnosis of diseases Fenton (1995). Coordination compound, any of a class of substances with chemical structures in which a central metal atom is surrounded by nonmetal atoms or groups of atoms, called ligands, joined to it by chemical bonds. Many enzymes, the naturally occurring catalysts that regulate biological processes, are

metal complexes. A hydrolytic enzyme important in digestion, contains a zinc ion coordinated to several amino acid residues of the protein. J. Anastassopoulou (1995). The synthesis and characterization of transition metal complexes containing Schiff bases as ligands due to their application as catalyst and a hydrolytic enzyme in many reactions related to synthetic organic and natural oxygen carriers. The Cu(II) complex has a square-planar geometry distorted towards tetrahedral, The divalent cations  $Zn^{2+}$ ,  $Ca^{2+}$  and  $Mg^{2+}$  prevent cytotoxicity. Among the transition metals iron, cobalt, nickel, zinc and copper complexes are extensively studied because of their application towards novel biological properties Crichton (1991). Transition metal complexes acts as a homogeneous catalyst in many industrially important reactions such as hydrogenation, hydrosilation, hydroformylation, polymerization, isomerisation, acylation and oxidative hydrolysis of olefins and related to synthetic organic and natural oxygen carriers Mutterliuer (1975) and Brink - Shoemaker et.al (1964). Bimetallic coordination complexes may serve as model for variety of biological reactions such as oxygen transport, oxygen activation, photosynthetic water reduction, the study of electron transfer process, metal-metal interactional multi centered catalysis Lingappa etal (1996). Iron plays an important role in biology, forming complexes with molecular oxygen in hemoglobin and myoglobin. The color of blood is due to the hemoglobin, an iron-containing protein. Finely divided Nickel is used as a catalyst in the hydro generation of oils and fats Mowton (1980). In coenzyme B<sup>12</sup> cobalt is bound to a tetraazamacrocyclic ligand Nishiya etal(1986). In addition to the varied magnetic property and catalytic activities, the transition metal Schiff base complexes can also serve as efficient models for metalloproteins and enzymes. Molecules containing donor-acceptors such as Schiff bases have ability to serve as their implication in biology Christou etal(1979). The structural properties and the reactivity of naturally occurring complexes of these ions in such processes.

## II. EXPERIMENTAL WORK

All the chemicals used were of analar grade . The solvents used were neat and dried. The TLC Plates were prepared by using silica gel G. Petroleum ether, Ethyl

N. Sudha, Department of Chemistry, Erode Sengunthar Engineering College, Erode-638057, India. E-mail: sudhakaruna27@gmail.com

S.Malathi, Department of Chemistry, Erode Sengunthar Engineering College, Erode-638057, India

P. Maheswari , Department of Chemistry, Erode Sengunthar Engineering College, Erode-638057, India

M. Gomathi, Department of Chemistry, Erode Sengunthar Engineering College, Erode-638057, India



acetate and ethanol were used as irrigants. Microwave oven was used for the irradiation of reactions.

#### A. Preparation of Ligands:

Preparation of 2-Hydroxy-7-Methyl-quinoline-4-Carboxy Thiosemicarbazone (1):

When equal moles of 7-methyl-quinoline-3-carbonyl chloride and thiosemicarbazone in ethanol was refluxed for 18-22 hours on irradiation give 2-Hydroxy-7-methyl-quinoline-4-carboxy thiosemicarbazone. The completion of the reaction confirmed by thin layer chromatography and the reaction mixture, washed with Petroleum ether and dried.

Melting Point: 174°C.

Yield: 5.2g (87%).

Preparation of 7-Methyl -2- Hydroxy- Quinoline-4-Carboxy Thiosemicarbazone-Schiff base (2):

An ethanolic solution of 0.500g, 7-methyl quinoline thiosemicarbazone was irradiated for 40 seconds with 0.3ml of benzaldehyde which give 7-methyl 2- hydroxy quinoline-4-carboxy thiosemicarbazone-schiff base the excess solvent was evaporated, washed and recrystallised from ethyl acetate.

Melting Point :140°C.

Yield :3.8. g (73%).

#### B. Preparation of Copper Complex (3):

An ethanolic solution 0.080g of copper chloride was slowly added to the quinoline semicarbazone Schiff base(III) and the mixture was irradiated for 30 seconds. The reaction mixture was allowed to stand for 2 days at room temperature. A blue coloured needles were obtained.

Appearance: Needles

Color: Blue

Melting point : 230°C.

#### C. Preparation of Manganese complex (4):

An ethanolic solution of 0.0756 g of manganese chloride was slowly added to the quinoline semicarbazone Schiff base (2) and the mixture was irradiated for 30 seconds. The reaction mixtures were allowed to stand for 2 days at room temperature. A colourless needle was obtained.

Appearance: Needles

Color: Colourless

Melting point:218°C.

### III. RESULTS AND DISCUSSION

The present work is focused on the study of co-ordination behavior of thiosemicarbazone Schiffbase with hydrated Cu(II) and Mn(II) chlorides. The complex thiosemicarbazone Schiff base was obtained via

7-methyl quinoline-4-carboxy-thiosemicarbazone synthesized by refluxing equal moles of 7-methylquinoline -4-carbonylchloride and thiosemicarbazide in ethanol for 18-22 hrs. The 7-methyl quinoline -4-carboxythiosemicarbazone and benzaldehyde in equal moles were refluxed in ethanol for 18hrs at 80°C.

IR spectrum of the compound (1) showed absorption peaks at 1692cm<sup>-1</sup>(CO), 1670 cm<sup>-1</sup> (CO), 1635 cm<sup>-1</sup> (CN of quinoline ring), 1646cm<sup>-1</sup> (CH=N,) 1215cm<sup>-1</sup> (C=S) fig(1). UV spectrum of the compound showed absorption at 280nm, 271nm, 227nm.

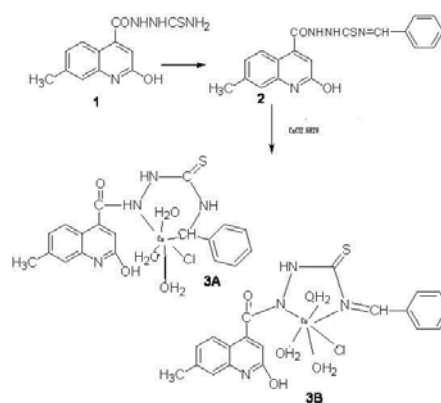
The Schiff base obtained was then irradiated with the ethanolic solution of copper chloride to form the copper complex. 0.500g (0.00031mol) of Schiff base and 0.080g (0.00031mol) of FeCl<sub>2</sub>.6H<sub>2</sub>O was taken in hot solution of ethanol and irradiated in microwave oven. A blue colour crystal of needle shape was obtained.

IR spectrum of the compound 2-Hydroxy-7-methyl-quinoline-4-carboxy thiosemicarbazone showed absorption peaks at 1699 cm<sup>-1</sup> (CO), 1672 cm<sup>-1</sup> (CO), 1635 cm<sup>-1</sup> (CN of quinoline ring), 1212cm<sup>-1</sup> (C=S) disappearance of peak at 1636 cm<sup>-1</sup>.

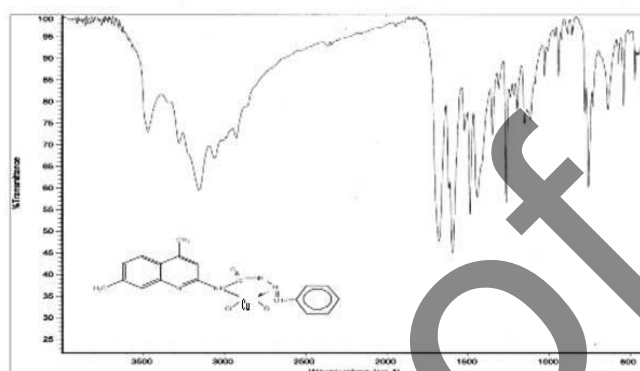
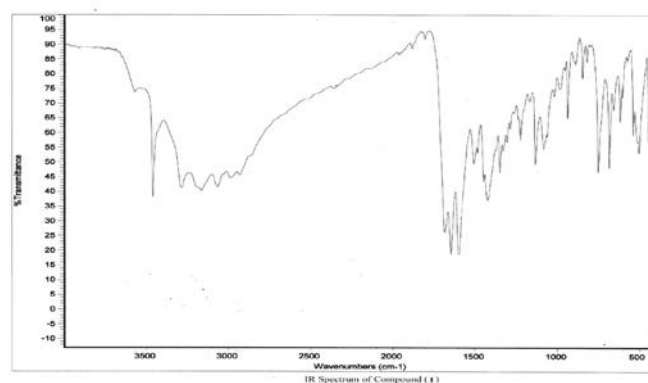
UV spectrum of the compound showed absorption at 280nm, 232nm, a disabsorption at 279 nm which might be due to the loss of one extended conjugation. Disappearance of peak at 1636 cm<sup>-1</sup> interferes that the C=N group of the Schiff base is utilized in the formation of co-ordination between the metal and the complex .

A desorption at 279nm in the UV absorption spectrum indicates the non existence of one extended conjugation during co-ordination.

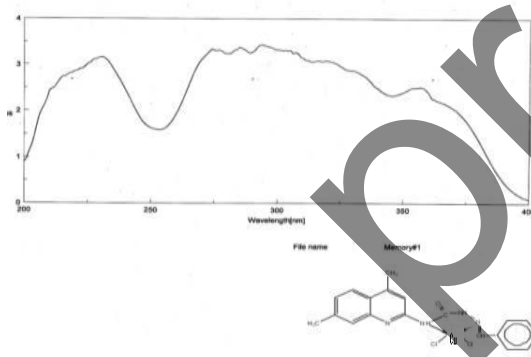
Thus from the spectral and analytical data the structure of the compound formed was confirmed to be 3A and not 3B.



Reaction Scheme for the Formation of Copper Complex



IR Spectrum of the Compound 3A



UV Absorption Spectrum of Copper Complex

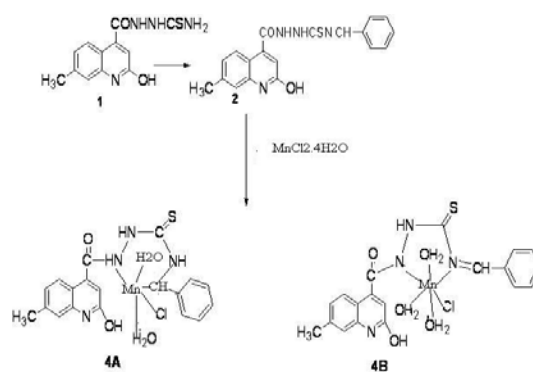
The 7-methyl 2 hydroxy quinoline-4-carboxy thiosemicarbazone-schiff base was then subjected to salt to coordinate with manganese to form the manganese complex.

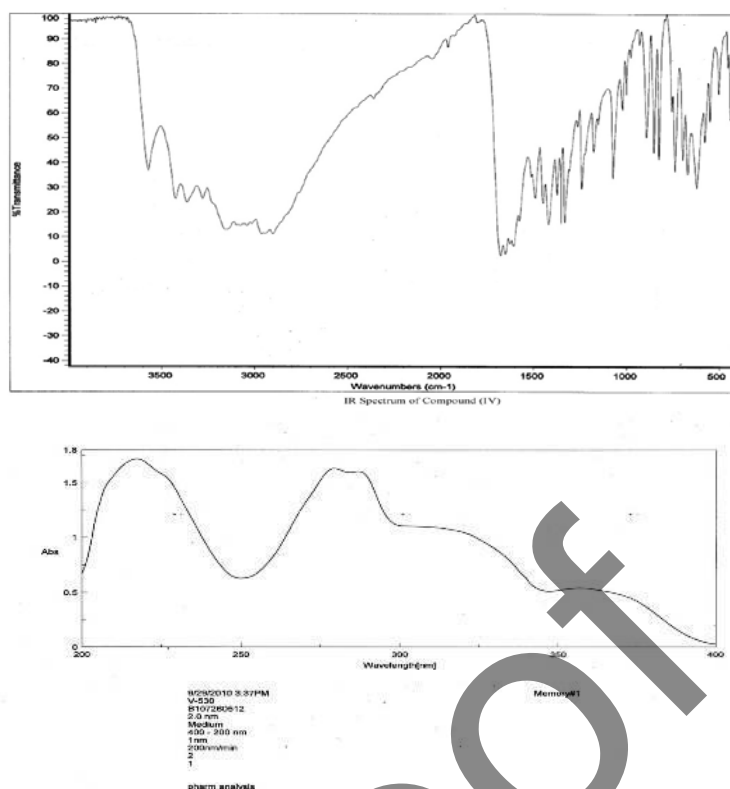
To a hot ethanolic solution of 0.500g(0.0031mol) of Schiff base(2) and 0.0756 g (0.0031mol) of  $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$  in ethanol was added and irradiated in the microwave oven for 50 seconds a colourless needle was obtained.

IR spectrum of the compound 2-Hydroxy-7-methyl-quinoline-4-carboxy thiosemicarbazone showed absorption peaks at  $1713 \text{ cm}^{-1}$  (CO),  $1630 \text{ cm}^{-1}$  (CN of

quinoline ring);  $1611 \text{ cm}^{-1}$  ( $\text{CH}=\text{N}$ );  $3288 \text{ cm}^{-1}$  ( $\text{NH}=\text{C}=\text{S} \rightleftharpoons \text{N}=\text{C}-\text{SH}$ );  $1213 \text{ cm}^{-1}$  and  $761 \text{ cm}^{-1}$  ( $-\text{C}=\text{S} \rightleftharpoons \text{C}-\text{SH}$ ).

UV spectrum of the compound showed absorption at 302nm, 289nm, 280nm, 235nm. Presence of absorption max at 302nm. The tautomerism in the IR spectrum showed the  $\text{NH}=\text{C}$  moiety is not disturbed during coordination. Absorption at 302nm might be due to the extended conjugation of the ring or may be due to the ring residue. This shows that the the coordination is formed between the lone pair of nitrogen and hence a 5-membered -6-coordination was confirmed. From the spectral and analytical data the structure of the compound formed was confirmed to be 4B and not 4A.





#### IV. BIOLOGICAL ACTIVITY

The disc diffusion method uses filter paper discs, 6.0mm in diameter, charged with appropriate concentrations of the drugs. The disc are stored dry in cold. A suitable dilution of a broth culture or a broth suspension of the test bacterium is flooded on the surface of a solid medium (Mueller-Hinton agar). Compounds 1, 2, 3A and 4B were tested against the bacterias *E.Coli* and *staphylococcus albus* and the fungi *candida* species and *Aspergillus niger* at various concentrations 100µg/L, 50µg/L, 25µg/L.

#### V. ANTIBACTERIAL & ANTIFUNGAL ACTIVITIES :

Antibacterial and antifungal activities were carried by Kirby-Bauer Method (Disc diffusion method). The media for antibacterial study is Muller Hintan Agar(MHA). The media for antifungal study is Sabouraul Dextrose Agar(SDA). The standard used was Gentamycin for antibacterial studies. The standard used for antifungal studies was Ketocandizole.

Table-1 shows the antibacterial activity of the compounds 1, 2, 3A and 4B against *E.coli* and *Staphylococcus albus*. It was found that all the compounds were active. Among the four compounds 3A and 4B are active than their precursors. The antibacterial

activity of the compound was almost closer to the standard gentamycin.

Table-2 shows the antifungal activity of the compounds 1, 2, 3A and 4B against *Candida* species and *Aspergillus niger*. It was found that all the compounds were active. Among the four compounds 3A and 4B are active than their precursors. The Fungi *Candida* species was found to be active than *Aspergillus niger*. *Aspergillus niger* shows only moderate activity

The antifungal activity of the compound was almost closer to the standard Ketocandizale.

Table-1 Antibacterial Activity

Samples	Concentrations (100µg/l) (50µg/L) (25µg/L) in mm			Concentrations (100µg/l) (50µg/L) (25µg/L) in mm		
	E.Coli			Staphylococcus albus		
	5	3	3	5	3	2
Compound 3A	5	4	4	7	5	1
Compound 3B	7	5	4	7	4	2
Compound 4A	7	3	2	8	6	2
Compound 4B	10	8	8	12	10	8
Gentamycin						

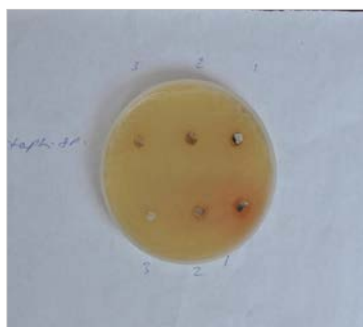


Table-2 Antifungal Activity

Samples	Concentrations (100µg/l) (50µg/L) (25µg/L) in mm			Concentrations (100µg/l) (50µg/L) (25µg/L) in mm		
	Candida species			Aspergillums niger		
Compound 3A	6	3	4	5	3	2
Compound 3B	5	4	4	4	2	2
Compound 4A	5	3	3	6	2	2
Compound 4B	8	6	2	6	2	2
Ketocandizale	10	8	8	8	6	6



## VI. CONCLUSION

Co-ordination behavior of Cu(II) and Mn(II) complexes and the antibacterial activity and antifungal activity were studied in the present work. The acid chloride(1) was reacted with thiosemicarbazide at 80°C for 16-22 hours and to obtained thiosemicarbazone(2). Equal moles of thiosemicarbazone(2) and CuCl<sub>2</sub>.6H<sub>2</sub>O were irradiated under microwave oven to obtain the complex 3A. Equal moles of thiosemicarbazone(2) and MnCl<sub>2</sub>.6H<sub>2</sub>O were irradiated under microwave oven to obtain the Mn complex(4B). Analytical and spectral data confirmed the structure of the complex as 3A and 4B. Antibacterial and Antifungal activity were carried out using Disc diffusion method and the compounds were found to be active.

## REFERENCES

- [1] D.E. Fenton , Biocoordination chemistry , Oxford Newyork, Toky, Oxford University Press, P-85 (1995)
- [2] R.R Crichton, Inorganic Biochemistry of Iron Metabolism , Ellis, Harwood, Newyork (1991)
- [3] B.I Mutterliuer, Bull .Soc Bels., 84, 959 (1975)
- [4] C. Brink - Shoemaker et.al, Proc .Roy , Soc ., London , Ser.A 278 (1964),
- [5] Y.Lingappa & K.H. Reddy , Indian j.Chem., a) 33A, 919 (1994),B) 35a, 775 (1996)
- [6] C.J. Mowton & B.L Shaw , J.Chem. Soc, Dalton trans ; 299 (1980)
- [7] T. Nishiya, S. Yamauchi, N.Hirota, M.Baba & I.Hunazuki, J.Phys Chem., 90, 5730 (1986)
- [8] Christou ,B.Ridge & H.N. Rydon, J. Chem, Commun. (1979) 20.
- [9] J. Anastassopoulou & T. Theophanides, Bioinorganic Chemistry, Volume 459 pp 209-218
- [10] Albertin G, Bordignon E, Orio A (1975) Five-coordinate copper (II) complexes. Synthesis and properties of [Cu(tren)L]<sup>2+</sup> cations. Inorg Chem 14: 1411-1413.
- [11] Karlin KD, Zubieta J (1983) Copper Coordination Chemistry: Biochemical and Inorganic Perspectives, New York.

- [12] Rehman W, Badshah A, Khan S, Tuyet LTA (2009) Synthesis, characterization, antimicrobial and antitumor screening of some diorganotin(IV) complexes of 2-[(9H-Purin-6-ylimino)]-phenol. *Eur J Med Chem* 44: 3981-3985.
- [13] Rehman W, Baloch MK, Badshah A (2008) Synthesis, spectral characterization and bio- analysis of some organotin(IV) complexes *Eur J Med Chem* 43: 2380-2385.
- [14] Rosu T, Gulea A, Nicolae A, Georgescu R (2007) Complexes of 3d(n)metal ions with thiosemicarbazones: synthesis and antimicrobial activity. *Molecules* 12: 782-796.

proof

# Agricultural Waste as a Low Cost Adsorbent for Heavy Metal Removal from Wastewater

Malathi . S, Sudha. N, Maheswari. P and Gomathi. M

**Abstract---** Activated carbon prepared from sulphuric acid treatment followed by thermal activation of cotton seed carbon is investigated for the removal of Cr (VI) ion from solutions. The influence of various factors such as agitation time, pH & carbon dosage on the adsorption capacity has been studied. Freundlich equation could be used to interpret adsorption data. Sorption kinetics has indicated that reversible first order kinetics model could be applied with diffusion as the controlling mechanism.

**Keywords---** Cotton seed carbon, Cr(VI) adsorption, Freundlich method.

## I. INTRODUCTION

WATER is considered as a most useful compound, which is abundantly available on this earth. It is not only used for the human existence but also used extensively for many of the industrial manufacturing process<sup>1</sup>. The heavy metals present in these wastewaters from factories are posing serious problems in recent years; traces of heavy metal such as Hg, Cd, Pb, AS, Co, Mn & Cr have been identified as deleterious to aquatic aqueous system & human health<sup>2</sup>. Chromium compounds are used extensively in industrial process such as metal pickling, electroplating, & aluminum anodizing, leather caning and in ceramics<sup>3</sup>. Chromium generally occurs in hexavalent and in trivalent form. Chromium is capable of causing skin disorders & liver damage<sup>4</sup>. These harmful effects of Cr (VI) ions necessitate its removal from wastewaters before release into streams.

Activated carbons from cheaper & readily available materials such as rice husk<sup>5</sup>, coconut shell<sup>6</sup> etc, have been applied for the removal of Cr (VI) from wastewaters. In this connection it was proposed to make a carbon from cottonseed<sup>7</sup>, a seed variety, utilized for the removal of Cr (VI) from water and wastewater<sup>8</sup>.

## II. EXPERIMENTAL

50 g of dried cottonseeds treated with 200 g of sulphuric acid and then kept in an air oven maintained at 140-160°C for a period of 24 hours. The product was washed with water to remove sulphuric acid and dried at 110°C. After the acid process was completed the material was thermally activated using muffle furnace maintained at 800°C. This carbon taken in the size range (20-50 mesh) CSC was evaluated for chromium (VI) removal. After the activation period the carbonized sample was transferred in to a beaker & covered it immediately with a watch glass to avoid the formation of ash. The process was repeated till the required amount of carbon obtained. This carbon was used for batch studies & kinetic experiments. The carbon characteristics were found out using ISI-877 procedures & given in Table -1. It could be seen that this carbon contains sufficient bulk density, phenol number, and surface area & exchange capacity so that it can be used for adsorption purposes.

Table 1 Carbon characteristics (CSC)

S. No.	Description	Results
1	Bulk density, g/cc	0.54
2	Moisture content, %	12.32
3	Ash, %	8.00
4	Matter soluble in water, %	2.37
5	Matter soluble in acid, %	5.27
6	Decolorizing power, mg/g	0.15
7	Phenol number	15
8	Ion exchange capacity milli equivalent / g	0.294
9	Surface area sq.m/g	545.6
10	Iron contents, %	1.15
11	pH	6.50

### A. Batch mode studies;

A stock solution of Cr (VI) ions (50mg/L) was prepared by dissolving 0.1414g of potassium dichromate in water and diluting to one liter. Appropriate volumes of stock solution were suitably diluted with water to obtain a concentration of 20 mg /L for batch experiment & 0.2g of Carbazide (1,5- diphenyl carbazide) was dissolved in

Malathi . S, Department of Chemistry, Erode Sengunthar Engineering college, Purunduri-638057, Tamil Nadu, India. E- mail: sabari.malathi@gmail.com

Sudha. N, Department of Chemistry, Erode Sengunthar Engineering college, Purunduri-638057, Tamil Nadu, India.

Maheswari. P, Department of Chemistry, Erode Sengunthar Engineering college, Purunduri-638057, Tamil Nadu, India.

Gomathi. M, Department of Chemistry, Erode Sengunthar Engineering college, Purunduri-638057, Tamil Nadu, India.

100mL of isopropyl alcohol. To this 100mL of 3.6 N sulphuric acid solution was added slowly with constant stirring. The solution was kept in the refrigerator. Experiment have been conducted with 100 mL of 10 mg/L of Cr (VI) ions under investigation were taken in the bottles and equilibrated for specific periods of time in a rotary mechanical shaker. At the end of the equilibrated period, the solution was filtered; using a G3 crucible if necessary and the concentration of respective ions were established by spectrophotometry.

### III. RESULTS AND DISCUSSION:

Batch experiments were performed to establish various parameters for the removal of chromium (VI) from aqueous solutions. Experiments were carried out using 100mL of solution containing 10mg of Cr (VI) /L adjusted to pH ranges 1.0-10.0 contained in 300ml stopper bottles; after adding required amounts of carbon. The solutions were equilibrated in a mechanical shaker. The equilibrated solutions were filtered using G3

crucible, if necessary and the amount of hexavalent chromium present in the solution was determined. From these data chromium taken up by the carbon was established. The performance of cottonseed carbonized with sulphuric acid after thermal activation at 800<sup>0</sup>c was taken for experimental purposes. This carbon taken in the size range (20-50mesh) (CSC) was evaluated for chromium (VI) removal.

#### 3.1. Effect of equilibrium time

In order to find out the optimum equilibration time, experiments were carried out using 0.1g of carbon and 100mL chromium (VI) solution were analyzed and a chromium (VI) removed was established. The results are shown in Fig -1. From which it is clear that 1.5 hours of equilibration time is sufficient for maximum chromium (VI) removal by CSC. However it was decided to maintain equilibration time of 3 hours in all subsequent experiments.

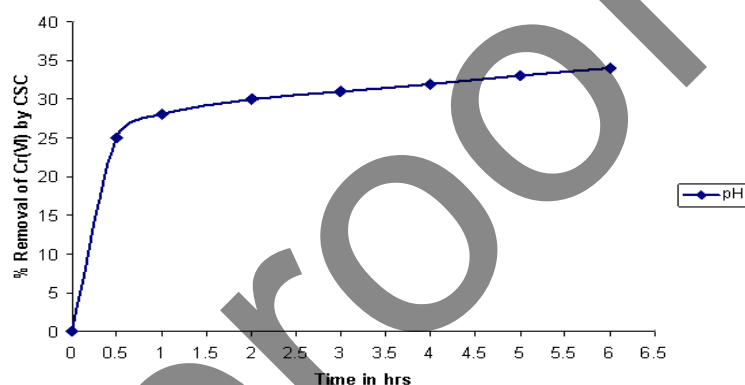


Fig.1: Effect of Time for the Removal of Cr (VI) of Concentration 10mg/L-Carbon Dose 100mg/100mL; pH: 5.0

#### 3.2. Effect of pH

In order to find out the optimum pH for the maximum chromium (VI) removal ,experiments were carried out by varying the pH of the solution over the range 1.0-10.0 after the equilibrating for 3 hours .The solutions were analyzed and hexavalent chromium removed were established. The results are shown in fig-2. The amount of carbon used was 100mg/ 100ml of the solution; it is clear from the plot that maximum removal of chromium (VI) occurred, over the pH range 1.0-2.0 for CSC. The removal of chromium (VI) falls of gradually over the pH range 3 to 5 and practically remains constant from pH 5.0 to 9.0.

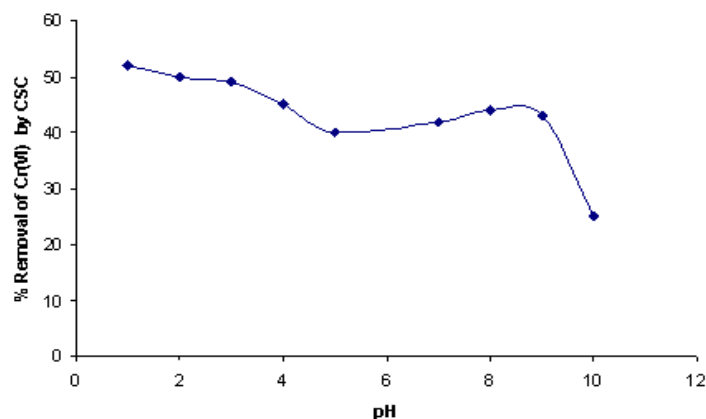


Fig.2: Effect of pH on Adsorption of Cr (VI) of Concentration 10mg /L-Time: 3hrs:Carbon Dose 100mg/100mL; pH: 5.0-9.0

### 3.3. Effect of carbon dosage

In order to find out, the optimum carbon dose required for chromium (VI) removal experiments were carried out with 100ml chromium (VI) solutions of 10mg/L over the pH range of 1.0-7.0. The concentration of carbon is varied from 0.05g-0.6g. Hexavalent chromium removed in each instance was established after equilibrating the solution for 3 hours. The results are given in figures 3-5.

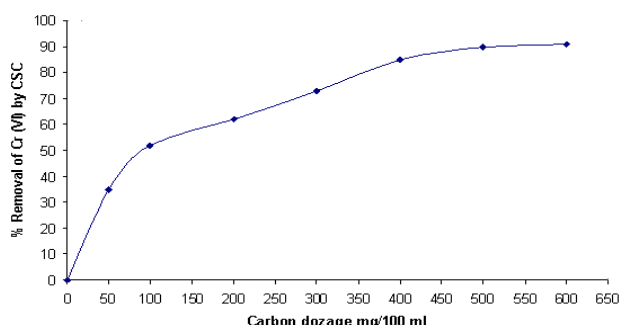


Fig: 3 Effect of Carbon Dosage on Adsorption of Cr (VI) of Concentration 10mg/L- Time 3Hrs; pH : 2

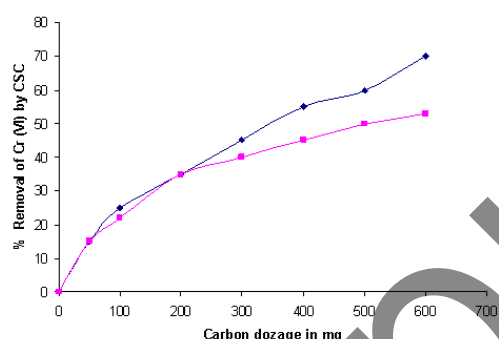


Fig: 4 Effect of Carbon Dosage on Adsorption of Cr (VI) of Concentration 10mg/L- Time 3Hrs; pH : 3

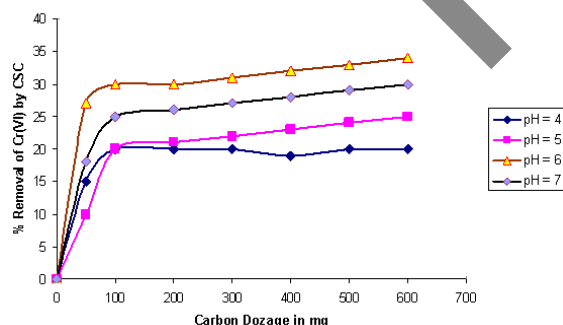


Fig: 5 Effect of Carbon Dosage on Adsorption of Cr (VI) Of Concentration 10mg/L- Time 3Hrs; pH : 4 to 7

It could be seen that at pH 1.0, a minimum 0.5g of carbon is required for a maximum removal of 95% of chromium (VI)/ 100ml of the solution. At pH 2.0, 0.6g is

required per 100ml to effect a removal of 75% of chromium (VI). Whereas pH 3.0 a further reduction in the chromium (VI) removal occurred, of 0.5g per 100mL. However, at pH 4.0-7.0 a chromium (VI) removal more or less remained constant to extent to an extent 20-30% only and minimum carbon dosage of 0.19 is required to effect removal 20%. From the above experimental results, it could be inferred that as the pH conditions is lowered, the minimum carbon dosage required for the maximum Cr (VI) removal is also increased which suggest that a part of the Cr (VI) may be undergoing is reduction process to Cr (III) and this fact explains that Cr (VI) removal at lower pH condition is controlled by proton to Cr(VI) ratio.

### 3.4. Mechanism of Cr (VI) Removal

In the case of Hexavalent chromium, at low pH conditions (>2.0), Chromic acid and dichromate ions are the predominate species and between pH 2.0 and 6.0 dichromate ions are the major species present in aqueous solution. At pH conditions >6.0, conversion of dichromate to chromate ions occur rapidly, though the process actually starts at pH>4.5<sup>9</sup>. In other words, Chromate ions are the major species available at high pH condition (>8.0).

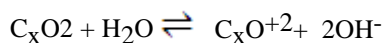
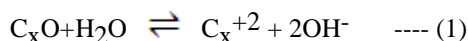
In the case of trivalent chromium, positively charged hydrated species occurs in the pH ranges 0-2.5. Over the pH ranges 4.0-6.0 the positive charge on the hydrated species decreases and eventually hydrated chromium species appears at pH conditions greater than 6.0.

According to Shilov, Shatunovska, Chmutov<sup>10</sup> and Frumkin<sup>11</sup> groupings such as  $CxO$  or  $CxO_2$  were formed on the surface of carbons during the activation of raw coke materials and cellulosic materials such as waste organic matter during the carbonization process. The existence of surface oxides should be considered as a primary product of the interaction between carbon and oxygen that is capable of being subsequently decomposed in to ultimate gaseous products of combustion-carbon monoxide and carbon dioxide. It has been reported that surface oxides participate in the adsorption of strongly ionized acids and bases as well as in the hydrolytic adsorption of inorganic salts<sup>12, 13</sup>.

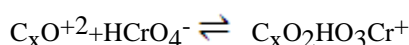
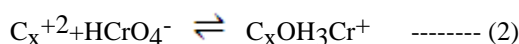
Studies made by Frumkin on carbon have shown that carbon acts like a gas electrode. The absorbed hydrogen in the presence of water formed hydronium ions that readily exchanged for other cations present in the solution phase. The adsorbed oxygen in the presence of water was transformed in to hydroxyl ions in natural or alkaline environment. As a result of this reaction, hydroxyl ions were produced and the pH of the solution was increased. The  $OH^-$  ions were held at the carbon surface by



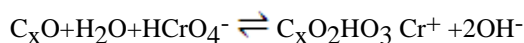
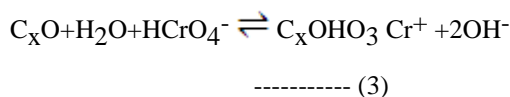
electrovalent forces and thus facilitated the exchange with other anions.



Based upon the above reaction, Huang and Wu<sup>14</sup> proposed a mechanism of Cr (VI) adsorption from solution maintained at pH<6.0. Since dichromate ions are the predominant species under these conditions, its interaction with carbon surface was expressed as,



An overall reaction scheme was obtained by combining equations (1) and (2).



### 3.5. Freundlich Adsorption Isotherm

The Freundlich adsorption equation is the widely used mathematical description of adsorption in aqueous systems. The equation is expressed as<sup>15</sup>,

$$X/m = K.C_e^{1/n} \quad \text{..... 1}$$

Where

X = the amount of solute adsorbed

M = the weight of adsorbent

C<sub>e</sub> = Equilibrium concentration of the solute

K, 1/n = Constants characteristics of the system.

The Freundlich equation is an empirical expression that encompasses the heterogeneity of the surface and the exponential distribution of sites and their energies.

For linearization of data, the Freundlich equation is written in logarithmic form,

$$\log x/m = \log K + 1/n \log C_e \quad \text{..... 2}$$

Plotting log x/m Vs C<sub>e</sub>, a straight line is obtained with a slope of 1/n, and log k is intercept of log x/m at log C<sub>e</sub> = 0 (C<sub>e</sub>=1). The value of 1/n obtained for absorption of the most organic compound by activated carbon is less than 1. Steep slopes of 1/n close to 1 indicate high adsorptive capacity at high equilibrium concentration that

rapidly diminished at lower equilibrium concentrations covered by the isotherm. Relatively flat slopes i.e., 1/n << 1 indicate the adsorptive capacity is only slightly reduced at lower equilibrium concentrations. As the Freundlich equation indicated the adsorptive capacity (or) loading factor on the carbon, x/m is a function of equilibrium concentrations of the solute. Therefore, higher capacities are obtained at higher equilibrium concentrations.

The Freundlich equation can be used for calculating the amount of activated carbon. Required to reducing any initial concentration (C<sub>o</sub>) to a predetermined final concentration (C<sub>e</sub>) by substituting (C<sub>o</sub>-C<sub>e</sub>) for x in equation (2),

$$\log ([C_o - C_e]/m) = \log K + 1/n \log C_e \quad \text{..... 3}$$

Comparison of different activated carbons for the removal of different compounds or removal by the same carbon can be made using equation (3).

In order to establish the adsorption capacity of this carbon (CSC) experiments were conducted with different initial concentrations of Cr(VI) over the 10-60 mg/l using both distilled water and tap water. The pH was maintained at 1.0-2.0. The amount of carbon added was 1g/1000 ml and the Solution was equilibrated for a period of 24 hrs. At the end of the equilibration, the solutions were analyzed and hexavalent chromium removed was established. From the data, the amount of Cr (VI) removed per unit weight of carbon was calculated for all the concentrations of Cr (VI) under study (x/m).

The log values of the calculated quantities were plotted against the log of concentrations of Cr(VI) remaining in the solution (C<sub>e</sub>) for this carbon. The plots are represented in the fig 6 and fig 7. The straight line nature of the plot indicated that the process followed Freundlich adsorption type. It could be seen from the graph 11 that at pH 1.0 the adsorption isotherm of Cr (VI) in distilled water solution occurs at a lower level when compared with Cr (VI) at tap water. It could be stated that at pH 1.0, the dichromate anion formed may be effectively removed by Ca and Mg present in the tap water with the result the adsorption isotherm drawn for Cr (VI) removal occurs slightly at elevated level when compared with distilled water. At pH 2.0 the Chromium (VI) adsorption isotherm for distilled water occurs at and elevated level than the adsorption isotherm drawn for tap water. At pH 2.0, it is assumed that most of the Cr (VI) that may be available in the form of dichromate ion, there by removal of Cr (VI) by the Ca and Mg ions in the form of calcium dichromate and magnesium dichromate might have been reduced.

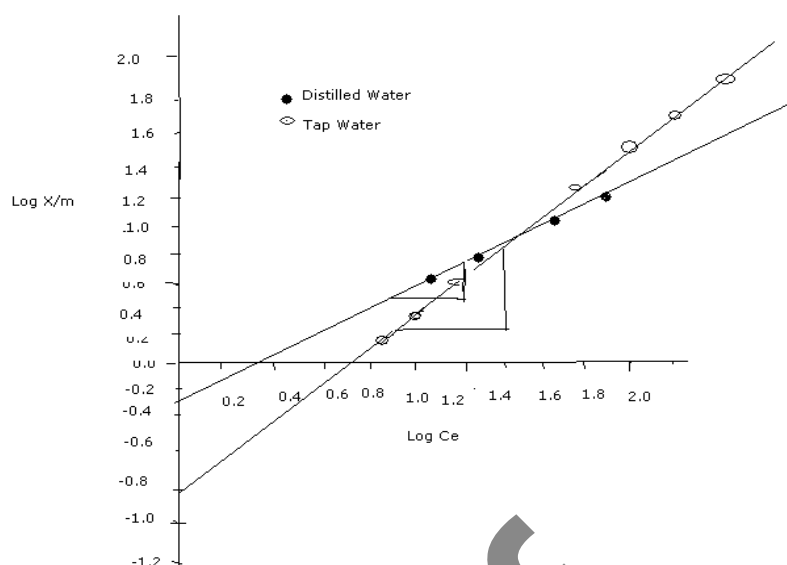


Fig.6: Freundlich Adsorption Isotherm for the Adsorption of Cr (VI);

Time: 10Hrs: pH: 1

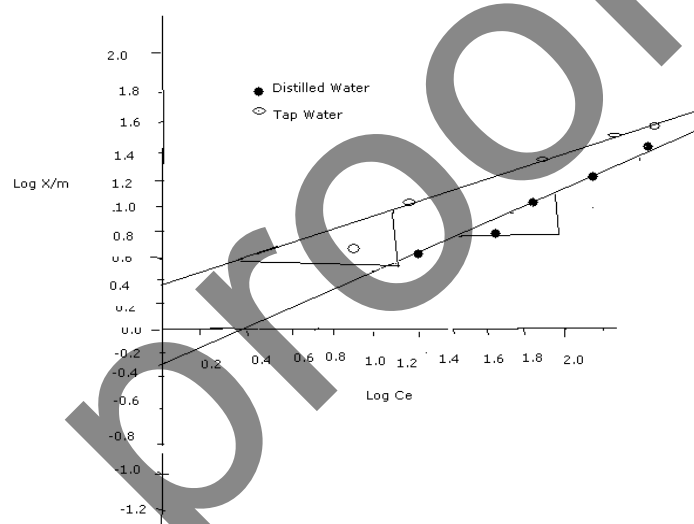


Fig.7: Freundlich Adsorption Isotherm for the Adsorption of Cr (VI) ;

Time: 10Hrs: pH: 2

The  $k$  value of adsorption equation for all the chromium (VI) concentration under study for distilled and tap water were obtained from the intercept on the  $x/m$  axis. The sorption intensities  $1/n$  were obtained for (CSC) from the slope of the straight-line curve.

The Freundlich equations in the case both distilled water and tap water written as follows.

At pH 1.0

For distilled water  $x/m = 0.5 \times C^{1.55}$

For tap water  $x/m = 0.15 \times C^{1.17}$

At pH 2.0

For distilled water  $x/m = 1.74 \times C^{0.62}$

For tap water  $x/m = 0.52 \times C^{0.75}$

According, the sorption capacities of distilled water and tap water are worked out to be 0.5 mg/g and 0.15 mg/g respectively. However at pH 2.0 at sorption capacities are worked out to be 0.42 and 0.09 respectively for distilled and tap water. A very low amount of adsorption capacity at pH 1.0 suggest that most of the Cr(VI) removal process may subjected to the reduction of Cr(VI) to Cr(III) on carbon surface.

#### IV. CONCLUSION

The results have clearly demonstrated that cotton seed carbon could be employed successfully for the removal of Hexavalent chromium. The carbon has moderate hardness and surface area so that it can be applied for wastewater treatment containing heavy metals such as Cr (VI).

#### REFERENCES

- [1] Rao, M. M., Ramesh, A., Rao, G.P.C and Sessaiah, K, Journal of hazardous materials, 129 (1- 3): 123-129, (2006)
- [2] World Health organization; Environmental health criteria 134, Cadmium International Programme on Chemical safety (IPCS), monograph (1992)
- [3] Tsczos, M., Biosorption of metals, the experience accumulated and the outlook for technology Development, Hydrometallurgy 59, 241-243, (2001)
- [4] Santhy, K. and Selvapathy, P, Separation Science and Technology, 39 (14):3331-3351, (2004)
- [5] Srinivasan, K. Evaluation of Rice husk carbon for the removal of trace inorganic form water, Thesis Submitted to I.I.T Madras (1986)
- [6] Iqbal, M., Saeed, A. and Zafars, S. I, Journal of Hazardous materials, 148, 47 (2007)
- [7] Srinivasan, K. and Sathiya, E., Bimetal Adsorption by Cotton Seed Carbon: Equilibrium and Kinetic Studies, E- journal of Chemistry, 6(4), 1167-1175 (2009)
- [8] McKay, G, use of adsorbents for the removal of pollutants from wastewater, CRC Press, Boca Raton, FL (1995)
- [9] Haight, G.P., Richardson, D.C., and Coburn, N.H., Inorganic Chemistry, 1777, 3 (1964)
- [10] Shilov, N., Shatunovska, H., and Chmutov, K., Z.Physik. Chemistry, 211, 149 (1990)
- [11] Frumkin, A., Kolloidz, 51, 123 123 CA: 24, 3, 412 (1930)
- [12] King, A., Journal of Chemical Society, 22 (1934)
- [13] Wiegand, W.B., Industrial Engineering Chemistry, 953, 29 (1937)
- [14] Huang, W.B. and Wu, M.H. , Journal of Water Pollution Control, 2437, 47 (1975)
- [15] Freundlich, H. and Helle, W. J, Journal of American Chemical Society, 61 (2) (1939)

# Facile Synthesis of Ni(II) Schiff Base Complexes: Spectral Investigation, Antimicrobial Activities and Catalytic Oxidation of Alcohols

S. Arunachalam

**Abstract---** Air stable Ni(II) Schiff base complexes viz.  $[Ni(L^1)(PPh_3)]$  and  $[Ni(L^2)(PPh_3)]$  [where  $L^1$  and  $L^2$  are dianions of Schiff base ligands respectively] have been synthesized and characterized by analytical and spectral (electronic, FT-IR,  $^1H$ ,  $^{13}C$  and  $^{31}P$  NMR) methods. The assignment of all the aromatic carbon-hydrogen resonances is made on the basis of  $^1H$ - $^{13}C$  HSQC spectrum of the complexes. The Schiff base ligands behave as a bibasic tridentate ligands and get bonded through ONO and ONS mode. A square planar structure has been proposed on the basis of spectral data. Novel Ni(II) Schiff base complexes exhibited good antimicrobial activity towards the strains *Staphylococcus epidermidis* and *Escherichia coli*. Thermal and air stability of the complexes offer the advantage of oxidation of alcohols

**Keywords---** Ni(II), Schiff Base Complexes, Square Planar Nickel, Tridentate Ligands, Oxidation of Alcohols.

## I. INTRODUCTION

THE chemistry of transition metal complexes with coordinated phosphorous ligands has been known for a long time. During the last years we have been working on the coordination chemistry and biological properties of different metal complexes of isatin and other Schiff base ligands in order to establish a possible relationship between chemical structure and biological activity. Schiff bases have been reported to show a variety of biological actions by virtue of the azomethine linkage, which is responsible for various antibacterial, antifungal, herbicidal, clinical and analytical activities. Following this research line, here we report the synthesis and characterization of Schiff bases of isatin with *o*-aminophenol and *o*-aminothiophenol (Scheme. 1) as well as some of their nickel(II) complexes.

## II. RESULTS AND DISCUSSION

The Ni(II) Schiff base complexes of the type  $[Ni(PPh_3)(L)]$  were synthesized by reacting equimolar

solution of  $NiCl_2 \cdot 6H_2O$ , Schiff base ligands ( $H_2L^1$  and  $H_2L^2$ ) and triphenyl phosphine in ethanolic medium, refluxed for 6 hours. The complexes are non-hygroscopic and are soluble in common organic solvents. In all the reactions, it was found that Schiff bases behave as bidentate tridentate ligands. The analytical data obtained for the new Ni(II) Schiff base complexes are agreed very well with proposed molecular formulae (Table 1).

### A. Infrared Spectra

The IR spectra of the ligands were compared with those of the nickel complexes in order to confirm the binding mode of the Schiff base ligands to the nickel(II) atom in the complexes (Table 2). The free Schiff base ligands showed a strong band in the region 1615-1617  $cm^{-1}$ , which is characteristic of the azomethine  $\nu_{(C=N)}$  group. Coordination of the Schiff bases to the metal through the nitrogen atom is expected to reduce the electron density in the azomethine link and lower the  $\nu_{(C=N)}$  absorption frequency. The band due to  $\nu_{(C=N)}$  is shifted to lower frequencies and appears around 1580-1592  $cm^{-1}$ , indicating coordination of the azomethine nitrogen to the nickel metal[1-6]. A strong band observed at 1343  $cm^{-1}$  in the free Schiff base  $H_2L^1$  has been assigned to phenolic C-O stretching. On complexation, this band is shifted to a higher frequency at 1438  $cm^{-1}$ , indicating coordination through the phenolic oxygen. This has been further supported by the disappearance of the broad band  $\nu_{(OH)}$  around 3000  $cm^{-1}$  in the complex  $[Ni(PPh_3)(L^1)]$ , indicating deprotonation of the phenolic proton prior to coordination[4-7]. In the IR spectra of the Schiff base  $H_2L^2$ , a very weak absorption band appeared at 2834  $cm^{-1}$  corresponding to  $\nu_{(S-H)}$  disappeared in the spectra of the complexes due to the fact that coordination has taken place through the sulphur atom after deprotonation. Moreover, the absorption due to  $\nu_{(C-S)}$  of the ligand at 1224  $cm^{-1}$  is shifted to a higher frequency 1256  $cm^{-1}$  in the complexes  $[Ni(PPh_3)(L^2)]$ , indicating that the other coordination is through thiophenolic sulphur atom. The characteristic bands due to triphenylphosphine were observed in the expected region. The characteristic band for  $\nu_{(C=O)}$  and  $\nu_{(NH)}$  disappears on complexation. This may be due to the enolisation and subsequent coordination through the deprotonated oxygen atom[8].

S. Arunachalam, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore, Tamil Nadu 641008, India.edu

### B. Ultraviolet - Visible Spectra

The electronic spectra of all the ligands and complexes in dichloromethane showed four to seven bands in the 230–494 nm regions. The electronic spectra of Ni(II) Schiff base complexes and the positions are similar to the one that have been observed for other nickel(II) square planar complexes showed one to four bands at the region 230–440 nm due to  ${}^2B_{1g} \rightarrow {}^2A_{1g}$  transition in a square planar geometry. The results are in accordance with the electronic spectra of other similar square planar Ni(II) complexes[9,10]. The UV-Visible spectral data are given in Table 2.

### C. ${}^1H$ , ${}^{13}C$ and ${}^{31}P$ -NMR Spectra of the Ni(II) complexes

The  ${}^1H$  - NMR spectra of all the complexes were recorded to confirm the binding of Schiff bases to the nickel ion (Table 3). Multiplets are observed around 5.4–7.6 ppm in all the complexes have been assigned to aromatic protons of triphenylphosphine, and Schiff base ligands. The disappearance of signals due to phenolic, enolic and thiolato hydrogen atoms in the  ${}^1H$ -NMR spectra of all the Ni(II) complexes indicates the deprotonation of these groups and the Schiff bases are coordinated to metal ions as dianionic ligands, which indicates the coordination of nickel(II) through the Ph-O, Ph-S and enolic-O atoms.

The  ${}^{13}C$  NMR data for the complexes have been recorded and summarised in table 3. The assignment of all the aromatic carbon resonances is made on the basis of  ${}^1H$ - ${}^{13}C$  HSQC spectrum of the complex  $[Ni(PPh_3)(L^1)]$  and  $[Ni(PPh_3)(L^2)]$  are provided in the figure 1 and 2. The chemical shifts for the aromatic carbon atoms of triphenylphosphine and phenyl groups in the complexes appear at 109–137 ppm. In all the complexes, Ph-C-O and Ph-C-S appears at 137 and 134 ppm respectively and also for Ph-C=N-Ph and Ph-N=C-O in the complexes appears in the range 136–153 ppm and 145–159 ppm respectively.

${}^{31}P$ -NMR spectra were recorded for two complexes in order to confirm the presence of triphenylphosphine group of the complexes. The complexes  $[Ni(PPh_3)(L^1)]$  and  $[Ni(PPh_3)(L^2)]$  exhibits only one signal at 23.91 and 26.00 ppm confirming the presence of triphenylphosphine respectively (Figure 3).

### D. Microbial Studies

The *in vitro* cytotoxicity of ligands and the complexes were screened in order to evaluate activity against *Staphylococcus epidermidis* and *Escherichia coli* at 0.25 %, 0.50 % and 1 % concentration and the results (table 4) are shown. From the results, it is inferred that the Ni(II) Schiff base complexes show higher efficiency when compared with the standard (*Co-trimoxazole*), parent ligands, nickel(II) precursors and standard reference against same microbes under identical experimental

conditions. This would suggest that the chelation could facilitate the ability of a complex to cross a cell membrane and can be explained by Tweedy's chelation theory[11]. Chelation considerably reduces the polarity of the metal ion because of partial sharing of its positive charge with donor groups and possible  $\pi$ -electron delocalization over the whole chelate ring. Such a chelation could enhance the lipophilic character of the central metal atom, which subsequently favours its permeation through the lipid layer of the cell membrane. This increased lipophilicity enhances the penetration of the complexes into lipid membrane and blocking the metal binding sites on enzymes of microorganism. These complexes also disturb the respiration process of the cell and thus block the synthesis of proteins which restrict the further growth of the organism[11–13]. The variation in the effectiveness of different compounds against different organisms depends either on the impermeability of the cells of the microbes or on differences in the ribosome of microbial cells. A couple of new nickel(II) Schiff base complexes exhibits a greater activity when compared with the Ru(III) Schiff base complexes[6], which contains the same ligands.

### E. Oxidation of Alcohols

Catalytic oxidation of cyclohexanol, benzylalcohol and cinnamylalcohol by the synthesized nickel(II) Schiff base complexes were carried out in  $CH_2Cl_2$  under an oxygen atmosphere at ambient temperature which is a green technique and the results are summarized in Table 4. Activation of molecular oxygen by transition metals for the catalytic oxidation of organic substrates has been of continued interest in organic synthesis[14]. Cyclohexanone, Benzaldehyde and cinnamaldehyde were formed from cyclohexanol, benzylalcohol and cinnamylalcohol respectively, after stirring for about 6 hours and the carbonyl compounds were quantified as 2,4-dinitrophenylhydrazone derivatives. Only a very little amount of carbonyl compound is formed when the reaction is carried out without the catalyst in presence of oxygen atmosphere at ambient temperature. This is an insignificant amount compared with the yields of carbonyl compounds that have been obtained from the reaction catalyzed by nickel complexes. The relatively higher product yield obtained for oxidation of cinnamyl alcohol and benzyl alcohol compared with cyclohexanol is due to the fact that  $\alpha$ -CH unit of benzyl alcohol is more acidic than cyclohexanol[14].

## III. EXPERIMENTAL SECTION

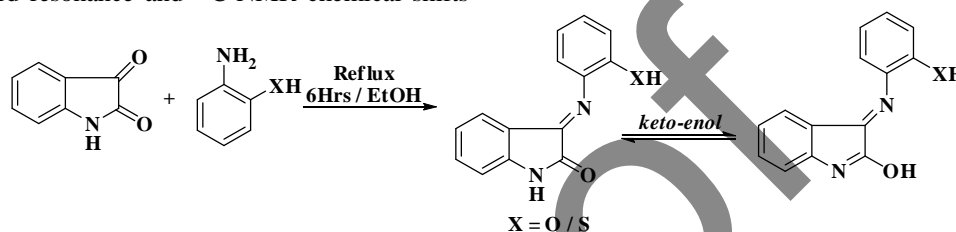
All the reagents used were of analar grade and purchased from Sigma Aldrich chemicals and was used without further purification. Melting points were recorded on a Veego VMP-DS melting point apparatus and are uncorrected. The analysis of carbon, hydrogen, nitrogen

and sulphur were performed in Vario EL III CHNS analyzer at Cochin University, Kerala, India. Infra Red spectra were recorded as KBr pellets in the 400 - 4000  $\text{cm}^{-1}$  region using a Perkin Elmer FT-IR 8000 spectrophotometer with a resolution of 4  $\text{cm}^{-1}$  in transmittance mode. Electronic spectra of all the complexes were taken in dichloromethane solution in quartz cells. The concentration of the complexes ranges around 0.02 – 0.3N. The spectra were recorded on a Systronics double beam UV-Vis Spectrophotometer 2202 in the range 200-800 nm at room temperature.  $^1\text{H}$  and  $^{13}\text{C}$ -NMR spectra for the ligand were recorded using Bruker 500 MHz instrument in  $\text{CDCl}_3$  at room temperature in Indian Institute of Science, Bangalore. Minimum quantities of ligands were dissolved in deuterated  $\text{CDCl}_3$ .  $^1\text{H}$ -NMR chemical shifts were referenced to tetramethylsilane (TMS) as an internal solvent standard resonance and  $^{13}\text{C}$ -NMR chemical shifts

were referenced to the internal solvent resonance. Signals are quoted in parts per million as  $\delta$  downfield from internal reference.

#### A. Preparation of new tridentate Schiff base ligands

To an ethanolic solution of isatin (0.147 g; 0.1 mmol) with *o*-aminophenol (0.109 g; 0.1 mmol)/ *o*-aminothiophenol (0.125 ml; 0.1 mmol) was added in 1:1 ratio with stirring in the magnetic stirrer for about half an hour and then refluxed in a round bottomed flask fitted with double surface condenser on the water bath for about 6 hours (Scheme 1). The resultant product was washed with ethanol and the purity of the ligands were checked by TLC and was column chromatographed on silica gel (Petroleum ether : Ethylacetate) (Yield  $\approx 79\%$ ). The C,H,N,S analysis were recorded.

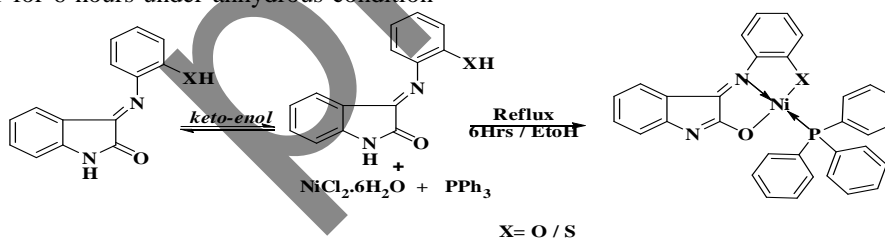


Scheme 1. Synthesis and *keto-enol* form of Schiff base ligands

#### B. Preparation of new Ni(II) Schiff base complexes

To a solution of  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$  (0.1 mmol) in ethanol (20  $\text{cm}^3$ ) the appropriate Schiff base (0.1 mmol) was added with  $\text{PPh}_3$  (0.1 mmol) in 1:1 molar ratio and heated under reflux in a round bottomed flask fitted with a double surface condenser for 6 hours under anhydrous condition

(Scheme 2). The solution was then concentrated on the water bath to 3  $\text{cm}^3$  and cooled. The complex was precipitated by the addition of small quantity of petroleum ether (60-80°C) and recrystallized from  $\text{CH}_2\text{Cl}_2$ /petroleum ether and dried *in vacuo*. (Yield  $\approx 76\%$ ).



Scheme 2. Synthesis of new Ni(II) Schiff base complexes

#### C. Antimicrobial activities

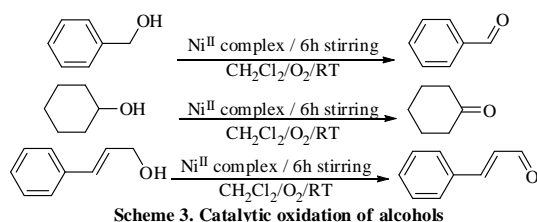
The *in vitro* cytotoxicity of the complexes were screened in order to evaluate activity against *Staphylococcus epidermidis* and *Escherichia coli* at 0.25 %, 0.50 % and 1 % concentration by Disc Diffusion method. *Streptomycin* was used as a standard. The bacteria (*Staphylococcus epidermidis*, *Escherichia coli*) were grown in nutrient broth and incubated at 37 °C for 48 hours followed by frequent subculture to fresh medium and were used as test bacteria. Then the petriplates were inoculated with a loop full of bacterial culture and spread throughout the petriplates uniformly with a sterile glass spreader. To each disc, the test samples and reference

antibiotic (*Streptomycin*) were added with a sterile micropipette. The plates were then incubated at  $35 \pm 2^\circ\text{C}$  for 24 h for bacteria. Plates with disc containing respective solvents served as control. Inhibition was recorded by measuring the diameter of the inhibitory zone after the period of incubation[6].

#### D. Catalytic oxidation reactions by Ni(II) Schiff base complexes

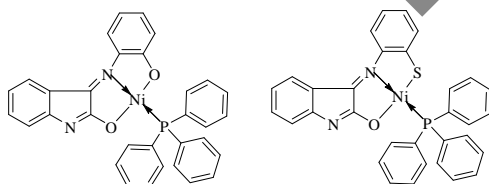
Catalytic oxidation of alcohols to corresponding carbonyl compounds by Ni(II) Schiff base complexes was carried out in the presence of oxygen atmosphere at ambient temperature (Scheme 3). A typical reaction using the complexes  $[\text{Ni}(\text{L})(\text{PPh}_3)]$  as a catalyst and alcohols as

substrates at a 1:100 molar ratio is described as follows. A solution of Ni(II) Schiff base complexes (0.01 mmol) in 20 cm<sup>3</sup> CH<sub>2</sub>Cl<sub>2</sub> was added to the solution of alcohol (1 mmol) under 1 atm oxygen atmosphere at ambient temperature. The solution mixture was stirred at room temperature for 6 hours and the solvent was then evaporated from the mother liquor under reduced pressure. The residue was then extracted with petroleum ether (60-80 °C) (20 cm<sup>3</sup>) and the carbonyl compounds were treated with 2,4 – dinitrophenylhydrazine, methanol and few drops of sulphuric acid. The yellow colour product obtained is quantified as 2,4 – dinitrophenylhydrazone derivatives[5-7].



#### IV. CONCLUSIONS

Nickel(II) complexes with dibasic tridentate Schiff bases have been prepared and characterized by (FT-IR, UV-Vis and NMR). The Ni(II) ion is assigned a square planar geometry and coordination of the ligands through ONO / ONS atoms (Scheme 4). The [Ni(L<sup>1</sup>)(PPh<sub>3</sub>)] complex can serve as good catalyst for the oxidation of alcohols to corresponding carbonyl compounds reactions. All complexes were screened for their antimicrobial studies. The Ni(II) Schiff base complexes show higher efficiency when compared with the standard (*Cotrimoxazole*), parent ligands, nickel(II) precursors and standard reference. The [Ni(L<sup>2</sup>)(PPh<sub>3</sub>)] complex is more active due to the presence of thiophenolic moiety in the ligand. Thermal and air stability of the complexes offer the advantage of oxidation of alcohols and antimicrobial activities.



#### REFERENCE

- [1] C.A. McAuliffe, Aspects of Inorganic Chemistry, Halsted Press, New York, 1973.
- [2] G.M. Kosolapoff, L. Maier, Organic Phosphorus Compounds, Wiley Interscience, New York 1972.
- [3] N. Padma Priya, S. Arunachalam, N. Sathya, V. Chinnusamy, C. Jayabalakrishnan, Trans. Met. Chem. 2009, 34, 437-435.

- [4] N. Padma Priya, S. Arunachalam, A. Manimaran, D. Muthupriya, C. Jayabalakrishnan, Spectrochim. Acta Part A, 2009, 72, 670-676.
- [5] S. Arunachalam, N. Padma Priya, K. Boopathi, C. Jayabalakrishnan, V. Chinnusamy, Appl. Organometal. Chem. 2010, 24, 491-498.
- [6] S. Arunachalam, N. Padma Priya, C. Saravanakumar, C. Jayabalakrishnan, V. Chinnusamy, J. Coord. Chem. 2010, 63, 1795-1806.
- [7] N. Padma Priya, S. Arunachalam, N. Sathya, C. Jayabalakrishnan, J. Coord. Chem. 2010, Vol. 63, 1440-1450.
- [8] S. Manivannan, R. Prabhakaran, K.P. Balasubramanian, V. Dhanabal, R. Karvembu, V. Chinnusamy, K. Natarajan, Appl. Organomet. Chem. 2007, 21, 952-957.
- [9] A.B.P. Lever, Inorganic Electronic Spectroscopy, 2nd edn. Elsevier, New York, 1984.
- [10] M. Muthu Tamizh, R. Karvembu, Inorg. Chem. Commun. 2012, 25, 30-34.
- [11] B.G. Tweedy, Phytopathology, 1964, 55, 910.
- [12] E. Kikuta, N. Katsube, E. Kimura, J. Biol. Inorg. Chem. 1999, 4, 431-437.
- [13] L.F. Tan, X.H. Liu, H. Chao, L.N. Ji, J. Inorg. Biochem. 2007, 101, 56-61.
- [14] D. Chatterjee, A. Mitra, S. Mukherjee, J. Mol. Catal. 2001, 165, 295-301.

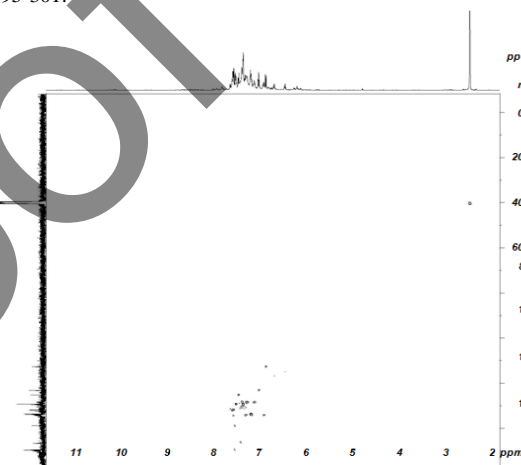


Figure 1. <sup>1</sup>H-<sup>13</sup>C HSQC Spectrum of the complex [Ni(L<sup>1</sup>)(PPh<sub>3</sub>)]

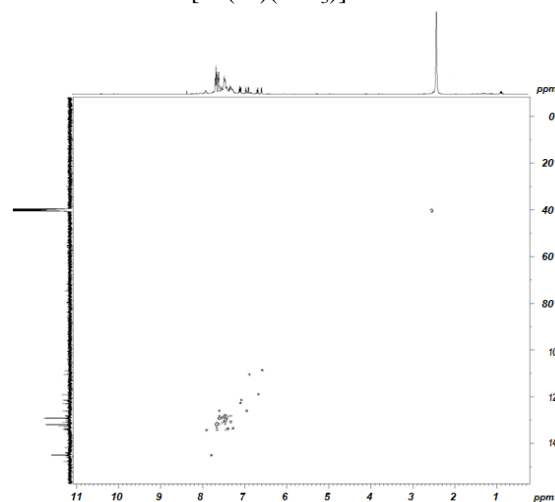


Figure 2. <sup>1</sup>H-<sup>13</sup>C HSQC Spectrum of the complex [Ni(L<sup>2</sup>)(PPh<sub>3</sub>)]

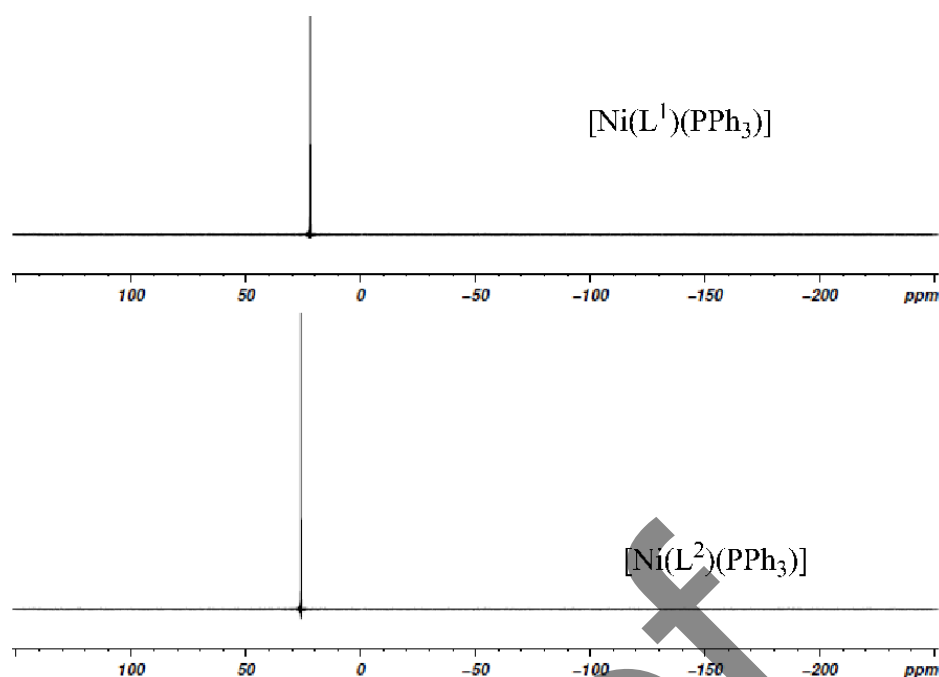
Figure 3.  $^{31}\text{P}$ -NMR Spectra of the complexes

Table 1. Analytical data of Ni(II) Schiff base complexes

Ligands and Complexes	Colour	M.p. (°C)	Empirical formula	Molecular weight	Elemental analysis Calculated (found) (%)			
					C	H	N	S
$\text{H}_2\text{L}^1$	Brown	128	$\text{C}_{14}\text{H}_{10}\text{N}_2\text{O}_2$	238.24	70.57(70.21)	4.22(4.15)	11.75(11.56)	-
$\text{H}_2\text{L}^2$	Orange	135	$\text{C}_{14}\text{H}_{10}\text{N}_2\text{OS}$	254.31	66.11(66.01)	3.95(3.76)	11.01(10.93)	12.6(12.34)
$[\text{Ni}(\text{L}^1)(\text{PPh}_3)]$	Green	230	$\text{C}_{32}\text{H}_{23}\text{N}_2\text{NiO}_2\text{P}$	557.2	68.98(68.86)	4.16(4.09)	5.03(4.91)	-
$[\text{Ni}(\text{L}^2)(\text{PPh}_3)]$	Brown	283	$\text{C}_{32}\text{H}_{23}\text{N}_2\text{NiOPS}$	573.27	67.04(66.97)	4.04(3.91)	4.89(4.79)	5.59(5.49)

## 2. FT-IR spectral and UV-Vis data of new Ni(II) Schiff base complexes

Ligands & Complexes	IR spectra ( $\text{cm}^{-1}$ )			UV-Vis $\lambda_{\text{max}}$ (nm)
	$\nu_{\text{C}=\text{N}}$	$\nu_{\text{C}=\text{O}}$	$\nu_{\text{C}-\text{S}}$	
$\text{H}_2\text{L}^1$	1615	1343	-	255,296,369,401
$\text{H}_2\text{L}^2$	1617	-	1224	256,297,369,404,435,472,494
$[\text{Ni}(\text{L}^1)(\text{PPh}_3)]$	1592	1438	-	290, 330, 322, 412
$[\text{Ni}(\text{L}^2)(\text{PPh}_3)]$	1580	-	1260	266, 322, 428



Table 3. <sup>1</sup>H, <sup>13</sup>C and <sup>31</sup>P - NMR spectral data of Ni(II) Schiff base complexes

Ligands and Complexes	<sup>1</sup> H-NMR (ppm)	<sup>13</sup> C-NMR (ppm)
H <sub>2</sub> L <sup>1</sup>	6.2-7.6 (m, aromatic), 10.8 (s, Ph-OH), 12.8 (s, enolic-OH)	110, 114, 116, 122, 136, 143, 153 (aromatic C), 155 (Ph-C-OH), 158 (Ph-C=N-Ph), 163 (Ph-N=C-OH)
H <sub>2</sub> L <sup>2</sup>	6.4-7.8 (m, aromatic), 3.4 (s, Ph-SH), 10.4 (s, enolic-OH)	108, 116, 121, 125, 130, 135, 141 (aromatic C), 154 (Ph-C-SH), 158 (Ph-C=N-Ph), 176 (Ph-N=C-OH)
[Ni(L <sup>1</sup> )(PPh <sub>3</sub> )]	6.3-7.6 (m, aromatic)	111, 115, 118, 123, 128, 129, 137 (aromatic C), 137 (Ph-C-O), 153 (Ph-C=N-Ph), 159 (Ph-N=C-O)
[Ni(L <sup>2</sup> )(PPh <sub>3</sub> )]	5.4-7.5 (m, aromatic)	109, 120, 124, 126, 129, 130, 131, 132 (aromatic C), 134 (Ph-C-SH), 136 (Ph-C=N-Ph), 145 (Ph-N=C-O)

Table 4. Oxidation of alcohols and biocidal activity of new Ni(II) Schiff base complexes

Complexes	Benzyl alcohol		Cyclohexanol		Cinnamyl Alcohol		<i>Staphylococcus epidermidis</i>			<i>Escherichia coli</i>		
	Yield (%)	Turnover number	Yield (%)	Turnover number	Yield (%)	Turnover number	Inhibition Zone (mm)					
							0.25%	0.5%	1%	0.25%	0.5%	1%
[Ni(L <sup>1</sup> )(PPh <sub>3</sub> )]	71	73	59	61	47	49	24	24	26	27	27	29
[Ni(L <sup>2</sup> )(PPh <sub>3</sub> )]	69	71	59	61	43	45	26	27	27	29	29	30
Standard							<i>Co-trimoxazole</i> (21)			<i>Co-trimoxazole</i> (22)		

<sup>a</sup> moles of product per mole of catalyst.

# One Pot Synthesis, Spectral Characterization and Biocidal Investigation of Ru(II) Schiff Base Complex

S. Arunachalam, N. Padma Priya, P.N. Magudeswaran,  
M. Jayaraj, S. Deepa, C. Arun Paul and L. Jayanthi

**Abstract---** Stable ruthenium (II) carbonyl complexes having the general composition  $[\text{Ru}(\text{CO})(\text{PPh}_3)(\text{pyridine})(\text{L})]$  (where; L= biantion of tridentate Schiff base ( $\text{H}_2\text{L}$ )) were synthesized from the reaction of  $[\text{RuHCl}(\text{CO})(\text{PPh}_3)_2(\text{pyridine})]$  with bidentate Schiff base ligands derived from condensation of isatin with *o*-aminophenol and aminothiophenol. The new complexes were characterized by elemental analysis, IR, UV-Vis and  $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{31}\text{P}$  - NMR spectral data. An octahedral geometry has been assigned tentatively for all the complexes. In all the above reactions, the Schiff base replaces a hydride and chloride ion and  $\text{PPh}_3$  from the starting complex, which indicate that the Ru–N bonds present in the complexes containing heterocyclic nitrogen bases are stronger than the Ru–P. This complex were also subjected to study its biocidal activity against *S. epidermidis* and *E. coli*.

## I. INTRODUCTION

INTERACTION of metal ions with N, O and S containing organic moieties has attracted much attention in recent years [1,2]. Such ligands and their complexes have become important due to their biological activity [3-5] and also because they provide a better understanding of metal protein binding [6]. Thus, Schiff bases containing these groups could act as a versatile model of metallic biosites [7]. For the synthesis of model

compounds, dibasic tridentate ligands proved to be especially favourable [8]. Interest in transition metal complexes of these Schiff bases continues not only due to the interesting structural and bonding modes they possess, but also because of their various industrial applications [9]. There has been a remarkable interest in the synthesis and study of unsymmetrical Schiff base complexes with transition metal cations [10–15], arising from the awareness that the resulting complexes may serve as models of relevance to bio-inorganic chemistry such as metalloproteins and metalloenzymes [16–20] in which transition metals are bound to a macrocycle, such as a heme ring, or to donor atoms of peptide chains, usually in a distorted environment.

## II. PHYSICAL MEASUREMENTS

Melting points were recorded on a Veego VMP-DS melting point apparatus and are uncorrected. The analysis of carbon, hydrogen, nitrogen and sulphur were performed in Vario EL III CHNS analyzer at Cochin University, Kerala, India. IR spectra were recorded as KBr pellets in the 400 - 4000  $\text{cm}^{-1}$  region using a Perkin Elmer FT-IR 8000 spectro-photometer with a resolution of 4  $\text{cm}^{-1}$  in transmittance mode. Electronic spectra of all ligands and the complexes were taken in dichloromethane solution in quartz cells. The concentration of the complexes ranges around 0.02 – 0.3N. The spectra were recorded on a Systronics double beam UV-Vis Spectrophotometer 2202 in the range 200-800 nm at room temperature.  $^1\text{H}$  and  $^{13}\text{C}$ -NMR spectra for the ligands and complexes were recorded using Bruker 500 MHz instrument in  $\text{CDCl}_3$  at room temperature in Indian Institute of Science, Bangalore. Minimum quantities of ligands and complexes were dissolved in deuterated  $\text{CDCl}_3$ .  $^1\text{H}$ -NMR chemical shifts were referenced to tetramethylsilane (TMS) as an internal solvent standard resonance and  $^{13}\text{C}$ -NMR chemical shifts were referenced to the internal solvent resonance.  $^{31}\text{P}$ -NMR spectra of the complexes were obtained at room temperature using *o*-phosphoric acid as a reference. Signals are quoted in parts per million as  $\delta$  downfield from internal reference.

## III. METHODS

The starting complex  $\text{RuHCl}(\text{CO})(\text{py})(\text{PPh}_3)$  [21] and tridentate Schiff base ligands (Scheme 1) [2] were

S. Arunachalam, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India. E-mail: drarunachalam.s@gmail.com

N. Padma Priya, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India.

P.N. Magudeswaran, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India.

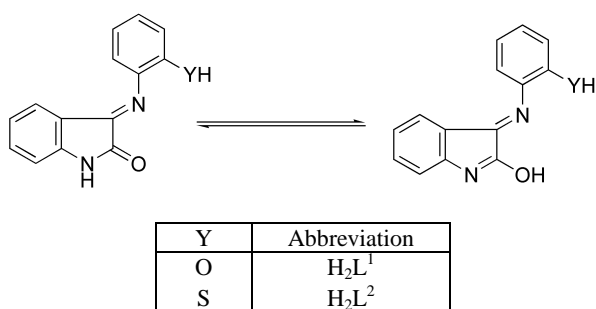
M. Jayaraj, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India.

S. Deepa, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India.

C. Arun Paul, Department of Physics, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India.

L. Jayanthi, Department of Physics, Sri Krishna College of Engineering and Technology, Coimbatore – 641008, India.

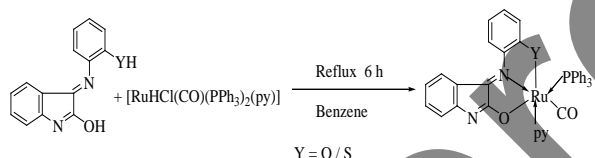
prepared according to the literature procedures. Microbial studies [2] were carried out according to reported procedure.



Scheme.1 Keto-enol tautomerism of the new Schiff base ligands

#### IV. SYNTHESIS OF NEW Ru(II) SCHIFF BASE COMPLEXES

All the new complexes were prepared by the following general procedure as described below (Scheme 2). To a solution of [RuHCl(CO)(PPh<sub>3</sub>)<sub>2</sub>(py)] (0.1 mmol) in benzene (20 cm<sup>3</sup>) the appropriate Schiff base (0.1 mmol) was added in 1:1 molar ratio and heated under reflux for 6 hours. The resulting solution was then concentrated to 3 cm<sup>3</sup> and cooled. The complex was precipitated by the addition of small quantity of petroleum ether (60-80 °C) and dried *in vacuo*.



Scheme 2. Preparation of new Ru(II) Schiff base complexes

#### V. RESULTS AND DISCUSSION

Stable ruthenium(II) Schiff base complexes of the general formula [Ru(L)(CO)(PPh<sub>3</sub>)(py)] (where L = biantion tridentate Schiff base) have been prepared by reacting [RuHCl(CO)(PPh<sub>3</sub>)<sub>2</sub>(py)] with the respective Schiff bases in a 1:1 molar ratio in benzene (Scheme 2). All the complexes are soluble in most of the common organic solvents. Their purity was checked by TLC on silica gel. The analytical data obtained for the new complexes agree well with the proposed molecular formula. In all of the above reactions, the Schiff bases behave as bidentate tridentate ligands.

#### VI. SPECTROSCOPIC STUDIES

##### Infrared spectral analysis

The IR spectra of the ligands were compared with those of the ruthenium complexes in order to confirm the binding mode of the Schiff base ligands to the ruthenium

atom in the complexes. The band due to  $\nu_{(C=N)}$  is shifted to lower frequencies and appears around 1589-1596 cm<sup>-1</sup>, indicating coordination of the azomethine nitrogen to the ruthenium metal [2,22]. A strong band observed at 1343 cm<sup>-1</sup> in the free Schiff base H<sub>2</sub>L<sup>1</sup> has been assigned to phenolic C–O stretching. On complexation, this band is shifted to a higher frequency at 1434 cm<sup>-1</sup>, indicating coordination through the phenolic oxygen. This has been further supported by the disappearance of the broad band  $\nu_{(OH)}$  around 3000 cm<sup>-1</sup> in the complex [Ru(CO)(PPh<sub>3</sub>)(py)(L<sup>1</sup>)], indicating deprotonation of the phenolic proton prior to coordination [2,22]. In the IR spectra of the Schiff base H<sub>2</sub>L<sup>2</sup>, a very weak absorption band appeared at 2834 cm<sup>-1</sup> corresponding to  $\nu_{(S-H)}$  disappeared in the spectra of the complexes due to the fact that coordination takes place through the sulphur atom after deprotonation. Moreover, the absorption due to  $\nu_{(C-S)}$  of the ligand at 1224 cm<sup>-1</sup> is shifted to a higher frequency at 1261 cm<sup>-1</sup> in the complex [Ru(CO)(PPh<sub>3</sub>)(py)(L<sup>2</sup>)], indicating that the other coordination is through thiophenolic sulphur atom [2,22]. The characteristic band for  $\nu_{(C=O)}$  and  $\nu_{(NH)}$  disappears on complexation [23]. This may be due to the enolisation and subsequent coordination through the deprotonated oxygen atom [23]. In the entire complexes strong band appears in the region 1941-1967 cm<sup>-1</sup> owing to terminal carbonyl group. In all the complexes, a medium intensity band is observed in the 1091-1093 cm<sup>-1</sup> region characteristic of the coordinated pyridine [24].

#### VII. ELECTRONIC SPECTRAL ANALYSIS

The electronic spectra of all the complexes in dichloromethane showed five to seven bands in the 256-462 nm regions. The electronic spectra of all the complexes showed two types of transitions, the first one appeared at range 256-301 nm which can be assigned to  $\pi\text{-}\pi^*$  transition due to transitions involving molecular orbitals located on the phenolic and thiophenolic chromophore. This reveals that one of the coordination site is oxygen of the phenolic and carboxylic and sulphur of the thiophenolic groups respectively. The second type of transitions appeared at range 349-462 nm assigned to  $n\text{-}\pi^*$  transition due to azomethine groups and benzene ring of the ligands. These bands have also been shifted in the spectra of the new complexes indicating the involvement of imine group nitrogens in coordination with central metal atom. All the complexes are diamagnetic, indicating the presence of ruthenium in the +2 oxidation state. The ground state of ruthenium(II) in an octahedral environment is  $^1A_{1g}$ , arising from the  $t_{2g}^6$  configuration. The excited state terms are  $^3T_{1g}$ ,  $^3T_{2g}$ ,  $^1T_{1g}$  and  $^1T_{2g}$ . Hence four bands corresponding to the transition  $^1A_{1g} \rightarrow ^3T_{1g}$ ,  $^1A_{1g} \rightarrow ^3T_{2g}$ ,  $^1A_{1g} \rightarrow ^1T_{1g}$  and  $^1A_{1g} \rightarrow ^1T_{2g}$  are possible in order of increasing energy. The other high intensity band in the visible region around 256-462 nm

has been assigned to charge transfer transitions arising from the metal  $t_{2g}$  level to the unfilled  $\pi^*$  molecular orbital of the ligand [25-29]. The pattern of the electronic spectra for all the complexes indicate the presence of an octahedral environment around the ruthenium(II) ion similar to that of other ruthenium octahedral complexes [25-30].

#### <sup>1</sup>H -NMR Spectra of Ru(II) Schiff base complexes

The <sup>1</sup>H - NMR spectra of all the complexes were recorded to confirm the binding of Schiff bases to the ruthenium ion. Multiplets are observed around 6.5–7.9 ppm in all the complexes have been assigned to aromatic protons of triphenylphosphine, pyridine and Schiff base ligands [31,32]. A sharp singlet observed for Ph-OH, Ph-SH and enolic-OH protons for all the ligands were disappeared in all the complexes which indicates the coordination of ruthenium through the Ph-O, Ph-S, Ph-COO [33,34] and enolic-O atoms [23]

#### <sup>13</sup>C -NMR Spectra of Ru(II) Schiff base complexes

The <sup>13</sup>C NMR data for the complexes [Ru(CO)(PPh<sub>3</sub>)(py)(L<sup>1</sup>)], [Ru(CO)(PPh<sub>3</sub>)(py)(L<sup>2</sup>)] and [Ru(CO)(PPh<sub>3</sub>)(py)(L<sup>3</sup>)] have been. The chemical shifts for the aromatic carbon atoms triphenylphosphine of the complexes appears at 108-137 ppm. In all the complexes, Ph-C-O and Ph-C-S appears at 138 and 133 ppm respectively and also for Ph-C=N-Ph and Ph-N=C-O in the complexes appears in the range 134-159 ppm and 159-181 ppm respectively. For all the complexes, the terminal carbonyl group C=O appears in the range 181-184 ppm respectively.

#### <sup>31</sup>P -NMR Spectra of the Ru(II) complexes

<sup>31</sup>P-NMR spectra were recorded for all the complexes in order to confirm the presence of triphenylphosphine group. For the complexes [Ru(L<sup>1</sup>)(CO)(PPh<sub>3</sub>)(py)], [Ru(L<sup>2</sup>)(CO)(PPh<sub>3</sub>)(py)] and [Ru(L<sup>3</sup>)(CO)(PPh<sub>3</sub>)(py)] peak appears at 26.46, 26.91 and 28.09 ppm respectively, indicates the presence of only one triphenylphosphine [35].

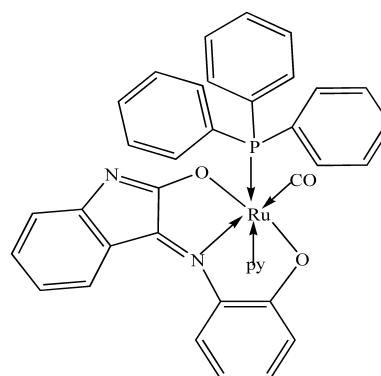
#### Microbial Studies

The *in vitro* cytotoxicity of ligands and the complexes were screened in order to evaluate activity against *Staphylococcus epidermidis* and *Escherichia coli* at 0.25 %, 0.50 % and 1 % concentration and the results are shown in Table 1. From the results it is inferred that the ruthenium(II) Schiff base complexes show higher efficiency when compared with the standard (*Ciprofloxacin*), parent ligands, ruthenium(II) precursor against same microbes under identical experimental conditions. This would suggest that the chelation could facilitate the ability of a complex to cross a cell membrane [47] and can be explained by Tweedy's chelation theory [48] Chelation considerably reduces the

polarity of the metal ion because of partial sharing of its positive charge with donor groups and possible  $\pi$ -electron delocalization over the whole chelate ring. Such a chelation could enhance the lipophilic character of the central metal atom, which subsequently favours its permeation through the lipid layer of the cell membrane. This increased lipophilicity enhances the penetration of the complexes into lipid membrane and blocking the metal binding sites on enzymes of microorganism. These complexes also disturb the respiration process of the cell and thus block the synthesis of proteins which restrict the further growth of the organism [36,37] The variation in the effectiveness of different compounds against different organisms depends either on the impermeability of the cells of the microbes or on differences in ribosome of microbial cells.

## VIII. CONCLUSION

An interesting family of new six coordinated ruthenium(II) complexes incorporates with bifunctional tridentate Schiff base ligands (have been synthesized by condensing isatin with *o*-aminophenol/*o*-aminothiophenol/*o*-aminobenzoic acid in the 1:1 stoichiometric ratio in ethanolic medium). The ligands and the new complexes have been characterized by analytical, mass spectra, IR, electronic and <sup>1</sup>H, <sup>13</sup>C and <sup>31</sup>P-NMR studies. An octahedral structure (Scheme 3) has been tentatively proposed for all the complexes. All the complexes show good antimicrobial activity.



Scheme 3. Proposed structure for the new ruthenium(II) Schiff base complexes

## REFERENCES

- [1] J.P. Tandon, K. Singh (1986) Synth. React. Inorg. Met. Org. Chem: vol 16, 1341.
- [2] S. Arunachalam, N. Padma Priya, K. Boopathi, C. Jayabalakrishnan, V. Chinnusamy (2010) Appl. Organomet. Chem: vol 24, 491.
- [3] L.D. Dave, S.K. Thampy, R. Shelat (1981) J. Inst. Chem. (India): vol 169, 237.
- [4] H. Singh, L.D.S. Yadav, S.B.S. Mishra (1981) J. Inorg. Nucl. Chem: vol 43, 1701.
- [5] L. Albanus, N.E. Bjorklund, B. Gustafsson, M. Johnson (1975) Acta Pharm. Toxic Suppl: vol 26, 93.

- [6] M.R. Bermejo, A. Sousa, A. Garcia-Deibe, M. Maneiro, J. Sanmartin, F. Fondo (1998) *Polyhedron*: vol 18, 511.
- [7] L. Casella, M. Gullotti, P. Vigano (1986) *Inorg. Chim. Acta*: vol 121, 124.
- [8] W. Banbe, J. Fliegner, S. Sawusch, U. Schilde, E. Uhlemann (1998) *Inorg. Chim. Acta*: vol 269, 350.
- [9] D. Coucouvanis (1979) *Prog. Inorg. Chem*: vol 26, 301.
- [10] E. Kwiatkowski, M. Kwiatkowski (1980) *Inorg. Chim. Acta*: vol 42, 197.
- [11] J.P. Costes (1987) *Inorg. Chim. Acta*: vol 130, 17.
- [12] E. Kwiatkowski, M. Kwiatkowski (1984) *Inorg. Chim. Acta*: vol 82, 101.
- [13] J.P. Costes, M.I. Fernanes-Garvia (1995) *Inorg. Chim. Acta*: vol 237, 57.
- [14] P. Bindu, M.R.P. Kurup, T.R. Satyakeerty (1998) *Polyhedron*: vol 18, 321.
- [15] V. Chinnusamy, K. Natarajan (1993) *Synth. React. Inorg. Met. Org. Chem*: vol 23, 889.
- [16] R.J.P. Williams (1990) *Biochem. Soc. Trans*: vol 18, 689.
- [17] G. Wilkinson (1987) *Comprehensive Coordination Chemistry*, Pergamon, Oxford: 494.
- [18] J. Cotamagana, J. Vargas, R. Latorre, A. Alvarado, G. Mena (1992) *Coord. Chem. Rev*: vol 119, 67.
- [19] Y.S. Pey, H.N. Pey, P. Mathur (1994) *Polyhedron*: vol 13, 3111.
- [20] R.E. Siecker, L.C. Jensen, J. Saunders-Lochr (1981) *Nature (London)*: vol 291, 263.
- [21] S. Gopinathan, I.R. Unny, S. Deshppe, C. Gopinathan (1986) *Ind. J. Chem. A*: vol 25, 1015.
- [22] S. Arunachalam, N. Padma Priya, C. Jayabalakrishnan, V. Chinnusamy (2009) *Spectrochim. Acta Part A*: vol 74, 591.
- [23] S. Manivannan, R. Prabhakaran, K.P. Balasubramanian, V. Dhanabal, R. Karvembu, V. Chinnusamy, K. Natarajan (2007) *Appl. Organomet. Chem*: vol 21, 952.
- [24] R.C. Maurya, P. Patel, S. Rajput (2003) *Synth. React. Inorg. Met. Org. Chem*: 23, 817.
- [25] K.N. Kumar, R. Ramesh (2004) *Spectrochim. Acta Part A*: vol 60, 2913.
- [26] N. Dharmaraj, P. Vishwanathamoorthy, P.K. Suganthi, K. Natarajan (1998) *Trans. Met. Chem*: vol 22, 129.
- [27] R. Ramesh, M. Sivagamasundari (2003) *Synth. React. Inorg. Met. Org. Chem*: vol 33, 899.
- [28] A.B.P. Lever, *Inorganic Electronic Spectroscopy*, 2nd edn (1984) Elsevier, New York.
- [29] K. ChiChak, U. Jacquenard, N.R. Branda (2002) *Eur. J. Inorg. Chem*: vol 2002, 357.
- [30] K. Natarajan, R.K. Poddar, C. Agarwala (1977) *J. Inorg. Nucl. Chem*: vol 39, 431.
- [31] L.D. Field, B.A. Messerle, L. Soler, I.E. Buys, T. Hambley (2001) *J. Chem. Soc. Dalton Trans*: 1959.
- [32] M.S. El Shahawi, A.F. Shoaib (2004) *Spectrochim. Acta A*: vol 60, 121.
- [33] C. Jayabalakrishnan, R. Karvembu, K. Natarajan (2002) *Trans. Met. Chem*: vol 27, 790.
- [34] M. Muthu Tamizh, K. Mereiter, K. Kirchner, B.R. Bhat, R. Karvembu (2009) *Polyhedron*: vol 28, 2157.
- [35] N. Dharmaraj, P. Viswanathamurthi, K. Natarajan (2001) *Trans. Met. Chem*: vol 26, 105.
- [36] C.S. Allardyce, P.J. Dyson, D.J. Ellis, P.A. Salter (2003) *J. Organomet. Chem*: vol 668, 35.
- [37] B.G. Tweedy (1964) *Phytopathology*: vol 55, 910.

Table 1. Biocidal activity of new Ru(II) Schiff base complexes

Complexes	Diameter of inhibition zone (mm)					
	<i>S. epidermidis</i>			<i>E. coli</i>		
	0.25 %	0.5 %	1.0 %	0.25 %	0.5 %	1.0 %
[Ru(L <sup>1</sup> )(CO)(PPh <sub>3</sub> )(py)]	22	22	22	21	23	23
[Ru(L <sup>2</sup> )(CO)(PPh <sub>3</sub> )(py)]	28	28	29	29	29	30
[Ru(L <sup>3</sup> )(CO)(PPh <sub>3</sub> )(py)]	27	27	27	26	27	27
Standard	<i>Ciprofloxacin</i> (22)					

# To determine the Water Quality Index of River Noyyal Connected Ukkadam Pond, Coimbatore District, Tamil Nadu, India

Jeyaraj M, Arunachalam S, ArunPaul C and Magudeswaran P.N

**Abstract---** *The present work aims at assessing the Water Quality Index (WQI) of the surface water quality of river Noyyal connected Ukkadam pond situated in Coimbatore, at two different seasons (monsoon and summer). Among the several methods of water quality determination, the National Sanitation Foundation Water Quality Index (NSF-WQI) has been followed in this present study. The following physico-chemical and biological parameters like Dissolved Oxygen (DO), pH, Biological Oxygen demand (BOD), Phosphate, Nitrates, Turbidity, Total dissolved solids (TDS) and faecal coliform bacteria counts were analysed. The correlation coefficients of WQI of surface water between stations during both rainy and summer seasons were calculated. All the measured parameters were found to be very high compared to the limits prescribed by WHO. This analysis reveals that the surface water of river, Noyyal connected Ukkadam pond needs some degree of treatment before consumption for public.*

## I. INTRODUCTION

FRESH WATER is essential in many spheres of human life<sup>1</sup> and in general it has been seen as an focal input to human production and an effective tool of economic development<sup>2,3</sup>. It plays a significant role in social prosperity<sup>3,4</sup> and the well-being of all people<sup>5,6</sup>. Unfortunately, in many countries around the world, including India, some drinking water supplies have become contaminated<sup>5,6</sup> and the deteriorated quality of surface water is becoming a grave issue in many parts of the globe<sup>1</sup>. Water pollution from diffuse sources<sup>4</sup> and various types of pollution is not only a serious environmental issue but also an economic and human health problem<sup>4,6</sup>. Changes in the physico-chemical

characteristics of water quality are influenced not only by anthropogenic factors,<sup>7-10</sup> but also by the combined interactive natural processes such as hydrological conditions, topography and lithology, climate<sup>7,9,11</sup> precipitation inputs<sup>3</sup>, catchment area<sup>9,12</sup>, tectonic<sup>7,11</sup> and edaphic factors<sup>7</sup>, erosion, weathering of crustal materials and bedrock geology<sup>8</sup>, in combination with environmental influence<sup>9,11</sup>.

The present study has been carried out to evaluate the water quality characteristics of Ukkadam pond connected with river Noyyal at Coimbatore, India using Water Quality Index (WQI-NSF) method. Also, the correlation coefficients between stations during both rainy and summer seasons were calculated.

## II. STUDY AREA

The river Noyyal, a tributary of Cauvery originates from Velliangiri hillocks on the Western Ghats in Tamil Nadu, India and drains in to Cauvery River. This cuts through the states of Karnataka, Tamil Nadu and enters Bay of Bengal. It flows through Coimbatore, Tirupur, Erode and Karur districts. The Noyyal river basin covers a total area of 3510 km<sup>2</sup> and extends about 170 km from west to east. The average width of the basin is 25 km and the annual rainfall varies extensively. River Noyyal is a seasonal river flooded during monsoon season and reduces to small pools during summer season. The river supplies water to several tanks located in and around Coimbatore. The area of land irrigated by river in Coimbatore district is approximately 1600 acres<sup>13</sup>.

Coimbatore big Lake also known as "Ukkadam pond" is situated close to Ukkadam bus-stand Coimbatore. The Capacity of the tank is 69.95 mc.ft and depth is 19.10 feet and the tank is located to the north of the river Noyyal. During the rainy season adequate quantity of water is flooded in to the tank from river Noyyal and thereby helping the fishermen societies in carrying out fishing<sup>14</sup>.

The sample locations were in both rural and urban area Surface water samples were collected from two stations in Coimbatore district viz., river Noyyal at source (S<sub>1</sub>), Ukkadam pond (S<sub>2</sub>), during rainy and summer season in the year of 2015. Samples were collected in plastic bottles for physico-chemical purpose and in

Jeyaraj M, Research and Development Center, Bharathiar University, Department of Chemistry, Sri Krishna College of Engineering and Technology, Coimbatore-641 008. E-mail: jeyaraja100@gmail.com

Arunachalam S, Research and Development Center, Bharathiar University, Coimbatore - 641 046

ArunPaul C, Department of Physics, Sri Krishna College of Engineering and Technology, Coimbatore-641 008

Magudeswaran P.N, Research and Development Center, Bharathiar University, Coimbatore - 641 046.



sterilised glass bottle for bacteriological quality to avoid unpredictable changes in the characteristics.

### III. METHODS OF ANALYSIS

pH was measured using Digital pH meter. Dissolved oxygen and biochemical oxygen demand was measured using Winkler's titrimetric method. The multiple tube fermentation method was used to determine the presence of bacteria. The confirmed and complete test was carried out for the samples by using the nutrient froth. The turbidity was measured by using Digital Turbidity meter, 863D 'Bio-Chem make. The evaporation method is used for determining the total solids by using standard procedures and Nitrate ion was determined using Brucine method. To determine the total phosphorus stannous chloride method is used by following the established procedure<sup>15</sup>.

### IV. STATISTICAL ANALYSIS

Statistical analyses were performed by xlstat 2015 statistical trial package and Microsoft excels 2003 & 2007 for performing the correlation analysis and water quality index assessment. Correlation analysis is a preliminary descriptive technique to estimate the degree of association among the variables involved<sup>16</sup>.

### V. RESULTS AND DISCUSSION

The physico-chemical and biological characteristics of the water samples in different seasons are given in the from Table-1 to 4 (during rainy and summer seasons)

Table 1: Physico-chemical characteristics and Water quality Index of River Noyyal at source (S1) during rainy season (2015)

Si. No	Parameters	Results	Units	Q-value	Weighing factor (W)	Subtotal (WxQ)
1	DO	96.0	% saturation	99	0.19	18.81
2	FC	2.00	MPN/100ml	91	0.18	16.38
3	pH	7.20	pH units	92	0.12	11.04
4	BOD	0.70	mg/l	97	0.12	11.64
5	P	0.20	mg/l	92	0.11	10.12
6	N	0.50	mg/l	97	0.11	10.61
7	Turbidity	3.00	NTU	90	0.09	8.10
8	TDS	62	mg/l	87	0.08	6.96
Overall WQI = 93.66						

Table 2: Physico-chemical characteristics and Water quality Index of River Noyyal at source (S1) during summer season (2015)

Si. No	Parameters	Results	Units	Q-value	Weighing factor (W)	Subtotal (WxQ)
1	DO	94.50	% saturation	98	0.19	18.62
2	FC	4.00	MPN/100ml	82	0.18	14.76
3	pH	7.50	pH units	93	0.12	11.16
4	BOD	0.80	mg/l	96	0.12	11.52
5	P	0.25	mg/l	87	0.11	9.57
6	N	0.62	mg/l	96	0.11	10.56
7	Turbidity	2.75	NTU	91	0.09	8.19
8	TDS	87	mg/l	85	0.08	6.8
Overall WQI = 91.18						

along with the respective water quality index value. Correlation coefficient of WQI of surface water between stations during both rainy and summer seasons is given in the Table-5. The water quality index was calculated using the eight parameters. The eight resulting values were then added to an overall water quality index<sup>17</sup>.

$$\text{WQI} = 0.19 \text{ DO} + 0.18 \text{ FC} + 0.12 \text{ pH} + 0.12 \text{ BOD} + 0.11 \text{ Total phosphate} + 0.11 \text{ Nitrates} + 0.09 \text{ Turbidity} + 0.08 \text{ Total solids}$$

The sampling station 1( S<sub>1</sub>) in the Western Ghats of Coimbatore is considered to be the source point of river Noyyal and it has greater dissolved oxygen value 96.0 % and 94.50% saturation during summer rainy and summer season, respectively. As expected, with the river reaching plains and travelling a distance of about 25km the DO value starts lowering and reaches 90% and 88% saturation during rainy and summer season respectively at Ukkadam pond (S<sub>2</sub>). The reason for decrease in DO 96.00% to 90% during rainy season and 94.50% to 88% during summer season, owing to the discharge of industrial effluents and domestic wastewater into the river stream especially at Ukkadam pond (S<sub>2</sub>). This leads to consumption of oxygen percent in water<sup>18</sup>. Low percentage of saturation of DO has affected the fish community on the whole especially during spawning because the respiratory system requires dissolved oxygen to breath<sup>19,20</sup>.

Table 3: Physico-chemical characteristics and Water quality Index of Ukkadam pond (S2) during rainy season (2015)

Si. No	Parametes	Results	Units	Q-value	Weighing factor (W)	Subtotal (WxQ)
1	DO	90	% saturation	95	0.19	18.05
2	FC	26	MPN/100ml	60	0.18	10.8
3	pH	7.68	pH units	91	0.12	10.92
4	BOD	3.70	mg/l	63	0.12	7.56
5	P	1.40	mg/l	33	0.11	3.63
6	N	3.40	mg/l	82	0.11	9.02
7	Turbidity	14	NTU	69	0.09	6.21
8	TDS	650	mg/l	20	0.08	1.6
Overall WQI = 67.79						

Table 4: Physico-chemical characteristics and Water quality Index of Ukkadam pond (S2) during summer season (2015)

Si.No	Parameters	Results	Units	Q-value	Weighing factor (W)	Subtotal (WxQ)
1	DO	88	% saturation	93	0.19	17.67
2	FC	120	MPN/100ml	42	0.18	7.56
3	pH	7.80	pH units	90	0.12	10.8
4	BOD	4.00	mg/l	61	0.12	7.32
5	P	2.30	mg/l	25	0.11	2.75
6	N	5.50	mg/l	63	0.11	6.93
7	Turbidity	12	NTU	72	0.09	6.48
8	TDS	855	mg/l	20	0.08	1.6
Overall WQI = 61.11						

Table 5: Correlation coefficient of WQI of surface water between stations during rainy and summer season

Rainy Season			Summer Season		
	Station-1	Station-2		Station-1	Station-2
Station-1	1		Station-1	1	
Station-2	0.555008	1	Station-2	0.669294	1

Faecal coliform count refers to the presence of domestic sewage concentration in water. It has been seen that there is a steady increase in concentration of faecal coliforms from S<sub>1</sub> to S<sub>3</sub> during both rainy and summer season indicating that certainly domestic sewage has let into the river stream. At Ukkadam pond (S<sub>2</sub>) there is comparatively maximum coliform during rainy and summer season because of free flow of sewage into the river.

P<sup>H</sup> is a numerical expression that indicates the degree to which water is acidic or alkaline, with lower P<sup>H</sup> value tends to make water corrosive and higher P<sup>H</sup> provides taste complaints and negative impact on skin and eyes<sup>21</sup>. For potable water, the BIS, WHO and ICMR standards have prescribed the limiting value of PH between 6.50 to 8.50. In all these samples the P<sup>H</sup> value ranged between 7.20 to 7.80. The results obtained from analysis of water samples of river Noyyal at various stations in the study areas are shown in table from 1-4.

BOD is a measure of the amount of food for bacteria that is found in water. Nearly 30% of BOD comes from industrial activity in Indian River system<sup>22</sup>. The minimum BOD in river Noyyal at source (S<sub>1</sub>) 0.70mg/l and 0.80mg/l was observed during rainy and summer season

respectively and the maximum value of was observed in Ukkadam pond (S<sub>2</sub>) 3.70 mg/l and 4.00 mg/l during rainy and summer season respectively. High level of BOD at station -2 Ukkadam pond indicates high organic load in surface water which depletes oxygen for its oxidation process.

In the present study, the concentration of phosphate in river Noyyal was found to be ranging from 0.20 mg/l to 2.30 mg/l. Among the two sampling stations, S<sub>2</sub> showed high phosphate content when compared stations one (S<sub>1</sub>) during both rainy and summer seasons. The high concentration of phosphate in S<sub>2</sub> may be due to human and animal waste that are flushed into water ways either from poorly treated sewage, surface runoff or some industrial waste that carries phosphorous in the river which eventually has a considerable effect on the quality of river<sup>23</sup>.

In the present study, the nitrate concentration in surface water sample ranged between 0.50mg/l to 5.50 mg/l. The amount of nitrate found to be high at Ukkadam pond (S<sub>2</sub>) 3.40 mg/l to 5.50mg/l compared to source 0.50mg/l to 0.62mg/l during rainy and summer season respectively. High concentration of nitrate can cause



health problems to infants and animals as well as eutrophication of water bodies.

Turbidity is a measure of the relative clarity or cloudiness of water<sup>24</sup>. The occurrence of turbidity may be permanent or seasonal<sup>25</sup>. The turbidity is the main problem in the supply system during all analysed periods. In the present study the water from river Noyyal at source (S<sub>1</sub>) has good turbidity 3.00 NTU and 2.75 NTU during rainy and summer season respectively while other sample at S<sub>2</sub> shows 14NTU and 12NTU, during rainy and summer season which is shown in table from 1 to 4.

Total Dissolved Solids measure the suspended solids in a water body. Thus it is related to both conductivity and turbidity. According to WHO, the permissible limit of total dissolved solids for drinking water is < 500mg/l<sup>26</sup>. In the present study, the minimum value of TDS has been found in a range of 62mg/l to 87mg/l at S<sub>1</sub> during rainy and summer season respectively. The maximum value has been found in a range 650mg/l to 855mg/l at S<sub>2</sub> during rainy and summer season respectively, which is shown in tables 3 and 4.

## VI. CONCLUSION

The NSF-WQI serves as a useful tool in water quality monitoring. The physico-chemical and biological characteristic of surface water samples of Ukkadam pond during both rainy and summer seasons reveal that the most of the parameters exceeds the prescribed standard limits for drinking water. Water quality in the pond seen to be medium for both the seasons. As per drinking water standards of Bureau of Indian Standards and WHO guidelines<sup>26</sup>, WQI value of the station-2 is not suitable for drinking and usage of domestic purpose. Regular monitoring of river and taking suitable remedial measures like collection of domestic sewage and setting up the common treatment plant before discharge of sewage in to river system is highly required. This would control pollution and prevent the depletion of the quality of Noyyal river water and its connected ponds.

## ACKNOWLEDGEMENT

The author M. Jeyaraj is greatly thankful to Mrs. S. Malarvizhi, Chair Person and Managing Trustee, Sri Krishna Group of Institutions, Coimbatore for irrecoverable support and providing at the necessary facilities.

## REFERENCES

- [1] Witek Z., Jarosiewicz A. Long-Term Changes in Nutrient Status of River Water. *Pol. J. Environ. Stud.* 18, (6), 1177, (2009).
- [2] Chen C. C. A Framework for Gray water Recycling of Household Wastewater. *Pol. J. Environ. Stud.*, 16, (1), 23, (2007).
- [3] Reza R., Singh G. Assessment of Ground Water Quality Status by Using Water Quality Index Method in Orissa, India. *World Applied Sciences Journal* 9, (12), 1392, (2010).
- [4] Yang Y.S., Wang L. Catchment-scale vulnerability assessment of groundwater pollution from diffuse sources using the DRASTIC method: a case study. *Hydrolog. Sci. J.*, 55, (7), 1206, (2010).
- [5] Akoto O., Adiyiah J. Chemical analysis of drinking water from some communities in the Brong Ahafo region, *Int. J. Environ. Sci. Tech.*, 4, (2), 211, (2007).
- [6] Mohemmad R. K., Rmchar T., Umamahesh M. A study on chemical analysis of drinking water from some communities in Nandyal rural areas of Kurnool district, Andhra Pradesh, India. *International Journal of Civil and Structural Engineering*. 2, (1), 351, (2011).
- [7] Michalik A., The Use of Chemical and Cluster Analysis for Studying Spring Water Quality in Świętokrzyski National Park. *Pol. J. Environ. Stud.* 17, (3), 357, (2008).
- [8] Nas S. S., Bayram A., Nas E., Bulut V. N. Effects of Some Water Quality Parameters on the Dissolved Oxygen Balance of Streams, *Pol. J. Environ. Stud.* 17, (4), 531, (2008).
- [9] Kašiarova S., Feszterova M. Changes in Stream Water Contamination in Select Slovakian Settlements. *Pol. J. Environ. Stud.* 19, (2), 343, (2010).
- [10] Robles E., Ramirez E., Martinez B., Sainz M. G., Gonzalez M. E. Comparison of the Water Quality of Two Aquifers Established in Different Development Zones of Mexico. *Universal Journal of Environmental Research and Technology*, 1, (2), 203, (2011).
- [11] Glińska-Lewczuk K. Effect of Land Use and Lake Presence on Chemical Diversity of the Łyna River System, *Pol. J. Environ. Stud.* 15, (2), 259, (2006).
- [12] Aydin A. The Microbiological and Physico-Chemical Quality of Groundwater in West Thrace, Turkey. *Pol. J. Environ. Stud.* 16, (3), 377, (2007).
- [13] M. Palanivel and P. Rajaguru, Proceedings of the workshop on environmental status of the river Tamil Nadu, 26-27, 53, (1999).
- [14] G. Nirmaladevi, M. Jeyaraj and P.N. Magudewan, *J. Biosci.*, 1, (2), 100-103, (2014).
- [15] APHA, Standard methods for the examination of water and waste water. American Public Health Association, Washington, DC 86, 1216 (1995).
- [16] Ahamed A., Jafer and Loganathan k., Assessment and correlation analysis of surface and ground water of Amaravathi river basin-Karur, Tamilnadu, India, *Journal of chemical and Pharmaceutical Research*, 4, (8), 3972-3983, (2012).
- [17] P.N. Magudewan, Water Quality Assessment of Noyyal River, Ph.D. Thesis Bharathiyar University, Coimbatore, Tamil Nadu, India, (2004).
- [18] Jammel A., Physico-chemical studies in Vyakondan channel water of Cauvery. *Pollution Research*; 17(2): 111-114, (1998).
- [19] A. Jammel, *Pollut. Res.*, 17, 111 (1998).
- [20] E. Hoge, *J. Water Resour. Res.*, 123, 2227, (1987).
- [21] Rao G.S, Rao G.N Study of ground water quality in greater Visakhapatnam city, Andhra Pradesh, India, *J. Environ. Sci. Eng.* 52, (2), 137-146, (2010).
- [22] Moherjee D., Chattopadhyay M., Lahiri S.C., Water quality of river Ganga and some of its physico chemical Properties. *The Environmentalist*. 13, (3), 199-210 (1993).
- [23] Indian standards tolerance limits for Inland surface water subjected to pollution, (1982).
- [24] CCME (Canadian Council of Ministers of the Environment). Canadian water quality guidelines for the protection of aquatic life: CCME Water Quality Index 1.0, User's Manual. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, (2001).
- [25] Nduka J. K., Orisakwe O. E., Ezenweke L. O. Some physicochemical parameters of potable water supply in Warri, Niger Delta area of Nigeria. *Scientific Research and Essay*, 3, (11), 547, (2008).
- [26] WHO, Guidelines for drinking water quality, Geneva, Switzerland, (1984).

# Preparation and Characterization of Manganese, Cobalt and Copper Complexes of Tetradentate N6-Macrocyclic Ligand

Mary Juliet B and Amaladasan M

**Abstract---** *Macrocyclic complexes of Mn, Co and Cu via Schiff base reactions. These 12-membered tetradentate N<sub>6</sub>-macrocyclic complexes were characterized by elemental analysis, conductance, magnetic susceptibility measurements and the spectral studies like IR spectra, Electronic spectra and NMR spectra. Thus, the macrocyclic ligand coordinates through imine and secondary amine nitrogens of the macrocyclic ring. The spectral data suggest that the complexes of metal chlorides have octahedral and that of metal sulphates have tetrahedral geometry.*

**Keywords---** *Synthesis, Characterization, L-glycine, Complexes of Mn<sup>II</sup>, Co<sup>II</sup>, Cu<sup>II</sup>*

## I. INTRODUCTION

A Number of nitrogen donor macrocyclic derivatives have long been used in analytical, industrial and medical applications (1). Macrocyclic compounds and their derivatives are interesting ligand system because they are good hosts for metal anions, neutral molecules and organic cation guests (2). The macrocyclic complexes show remarkable stability (3) compared to its closed chain analogues and the metal ion is firmly held in the cavity of macrocycles.

In the present study, the preparation and characterization of Mn<sup>II</sup>, Co<sup>II</sup> and Cu<sup>II</sup> Complexes of tetradentate N<sub>6</sub>-macrocyclic ligand are discussed. Complexes were characterized using various physico-chemical techniques, such as IR and UV/Vis spectroscopy, elemental analysis, magnetic susceptibility and conductivity measurements.

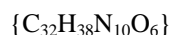
## II. MATERIALS AND METHODS

All the chemicals used for the preparation of the ligands were of BDH quality, AR grade. The micro elemental analysis was carried out using CHN-Rapid

Analyzer. Conductivity was measured on a Toshniwal conductivity bridge using dip type platinised platinum electrode. Molecular weights were determined by the Rast Camphor method. The magnetic susceptibilities were measured out by using Guoy balance. Proton NMR spectra were recorded on an EM 300-30MHZ NMR spectrometer in DMSO. IR spectra(KBr) of the samples were recorded on a shimadzu FTIR-8400s Spectrophotometer. The electronic spectra(chloroform) were recorded on the Lambda 35 spectrometer.

## III. SYNTHESIS OF LIGAND

The condensation reaction was carried out as follows an methanolic solution(50ml) of the trimethoprim(0.02mol) was added to a hot solution of the L-glycine (0.02 mol) in methanol. The mixture was stirred well and refluxed on a water bath. Then, concentrated hydrochloric acid(1 ml) was added and further refluxed for 6-8hrs. It was then concentrated to half of the volume and set aside for 2 days. The resulting pale brown crystals were washed with methanol and ether and dried at 60°C. The crude product was recrystallised from alcohol. The desired condensation product was obtained more readily 60-65% yield by the method.



Yield: 95 %; color: pale brown. Anal. Calc. for C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub> (Mw:658); C, 58.34; H, 5.82; N, 21.26. Found: C, 58.64; H, 5.90; N, 21.12. IR (KBr, cm<sup>-1</sup>): 3503γ(NH<sub>2</sub>), 3090γ(NH), 1640(C=N), 1154γas(C-C-N), 1565, 985 (pyrimidine ring). <sup>1</sup>H NMR (DMSO, ppm) δ= 2.0(4H, s, -C-CH<sub>2</sub>-); δ= 2.4(4H, t, free-NH<sub>2</sub>); δ= 3.7(18H, s, -OCH<sub>3</sub>); δ= 5.4 (2H, s, ring NH); δ= 6.6 (4H, s, Pyrimidine-CH<sub>2</sub>-Ar); δ= 7.8 (2H, d, pyrimidine -H); δ= 8.3 (4H, d, Ar-H).

## IV. SYNTHESIS OF THE METAL COMPLEXES

To a solution of the metal chloride(or) sulphate (0.01 mol) in methanol were added and refluxed for 5 hrs. The resultant solution was cooled two days and the crystals which separated out were filtered washed with methanol-ether mixture (1:1) and dried in vacuum (4-6) over anhydrous CaCl<sub>2</sub>.

Mary Juliet B, Post Graduate and Research department of Chemistry, St. Joseph's college (Autonomous), Tiruchirappalli 620002, Tamil Nadu, India

Amaladasan M, Post Graduate and Research department of Chemistry, St. Joseph's college (Autonomous), Tiruchirappalli 620002, Tamil Nadu, India

**{Mn (L<sub>1</sub>)Cl<sub>2</sub>}**

Yield: 86 %; color: pale pink. Anal. Calc. for [Mn(C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub>)Cl<sub>2</sub>]: C,48.32; H,4.75; N,17.82. Found: C,48.99; H,4.88; N,17.86. IR (KBr,cm<sup>-1</sup>): 3346 γ(NH<sub>2</sub>),3050γ(NH), 1599(C= N),1115γas(C-C-N),1506,958 (pyrimidine ring),542(M-N),318(M-Cl). Λ<sub>m</sub>/Ω<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup>(in CH<sub>3</sub>CN): 32.18. μ<sub>eff</sub> (300K): 5.83 B.M.

**{Mn (L<sub>1</sub>)SO<sub>4</sub>}**

Yield: 81 % ; color: cream white. Anal. Calc. for [Mn(C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub>)SO<sub>4</sub>] : C,47.38; H,4.80; N,17.20. Found: C,47.47; H,4.73; N,17.29. IR (KBr,cm<sup>-1</sup>): 3405 γ(NH<sub>2</sub>), 3030γ(NH), 1589 (C= N),1129γas(C-C-N),1570, 992 (pyrimidine ring), 511 (M-N), 907 (SO<sub>4</sub>). Λ<sub>m</sub>/Ω<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup>(in CH<sub>3</sub>CN): 130. μ<sub>eff</sub> (300K): 5.48 B.M.

**{Co (L<sub>1</sub>)Cl<sub>2</sub>}**

Yield: 83 % ; color: dark pink , Anal. Calc. for [Co(C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub>)Cl<sub>2</sub>] : C, 48.26; H, 4.81; N,17.66. Found: C,48.80; H,4.86; N,17.80. IR (KBr,cm<sup>-1</sup>): 3405 γ(NH<sub>2</sub>), 3008γ(NH), 1589 (C= N), 1129γas(C-C-N), 1530, 958 (pyrimidine ring), 507 (M-N), 335 (M-Cl). Λ<sub>m</sub>/Ω<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup>(in CH<sub>3</sub>CN): 20.00. μ<sub>eff</sub> (300K): 5.14 B.M.

**{Co (L<sub>1</sub>)SO<sub>4</sub>}**

Yield: 80 %; color: blue. Anal. Calc. for [Co(C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub>)SO<sub>4</sub>] : C,47.33; H,4.80; N,17.20. Found: C,47.23; H,4.71; N,17.21. IR (KBr,cm<sup>-1</sup>): 3404 γ(NH<sub>2</sub>), 3167γ(NH), 1422 (C= N), 1129γas(C-C-N), 1500, 909 (pyrimidine ring), 507 (M-N), 992 (SO<sub>4</sub>). Λ<sub>m</sub>/Ω<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup>(in CH<sub>3</sub>CN): 95.00. μ<sub>eff</sub> (300K): 4.42 B.M.

**{Cu (L<sub>1</sub>)Cl<sub>2</sub>}**

Yield: 88 %; color: green , Anal. Calc. for [Cu(C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub>)Cl<sub>2</sub>] : C, 48.42; H, 4.88; N,17.36. Found: C,48.46; H,4.83; N,17.60. IR (KBr,cm<sup>-1</sup>): 3364 γ(NH<sub>2</sub>), 3040γ(NH), 1595 (C= N), 1154 γas(C-C-N), 1595, 959 (pyrimidine ring), 571 (M-N), 348 (M-Cl). Λ<sub>m</sub>/Ω<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup>(in CH<sub>3</sub>CN): 40.19. μ<sub>eff</sub> (300K): 1.95 B.M.

**{Cu (L<sub>1</sub>) SO<sub>4</sub>}**

Yield: 80 %; color: red orange. Anal. Calc. for [Mn(C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub>)SO<sub>4</sub>] : C,46.80; H,4.59; N,17.10. Found: C,46.97; H,4.68; N,17.12. IR (KBr,cm<sup>-1</sup>): 3403 γ(NH<sub>2</sub>), 3035γ(NH), 1589 (C= N), 1130γas(C-C-N), 1528, 899 (pyrimidine ring), 524 (M-N), 1042 (SO<sub>4</sub>). Λ<sub>m</sub>/Ω<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup>(in CH<sub>3</sub>CN): 120. μ<sub>eff</sub> (300K): 1.26 B.M.

**V. RESULTS AND DISCUSSION**

The Schiff base macrocyclic complexes were prepared from C<sub>32</sub>H<sub>38</sub>N<sub>10</sub>O<sub>6</sub> in the presence of MX (where M=

Mn<sup>II</sup>,Co<sup>II</sup>,and Cu<sup>II</sup>,X=Cl<sup>-</sup>,SO<sub>4</sub><sup>2-</sup>) produced a new series of 12-membered tetradentate macrocyclic metal complexes of the type M(L<sub>1</sub>)Cl<sub>2</sub> and M(L<sub>1</sub>) SO<sub>4</sub> as shown in Fig(1& 2).

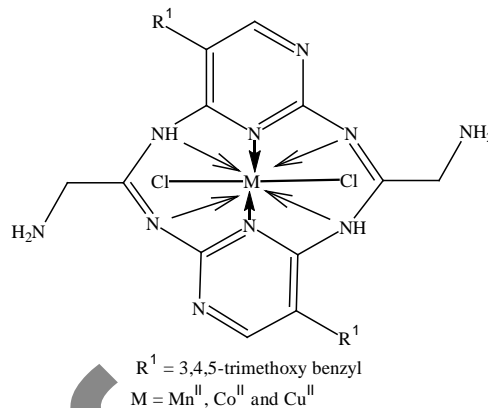


Fig (1): Proposed structure of metal(II) chloride macrocyclic complexes of L<sub>1</sub>

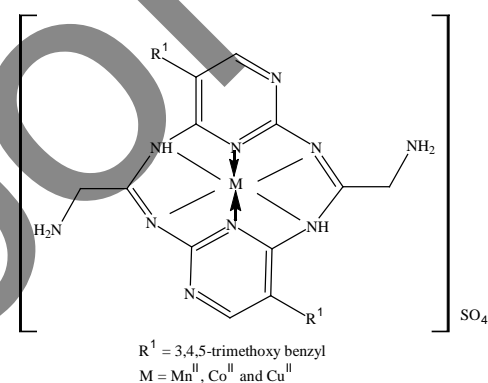


Fig (2): Proposed structure of metal(II) sulphate macrocyclic complexes of L<sub>1</sub>

The resulting metal derivatives are colored solids which are stable at room temperature and are non-hygroscopic. The monomeric nature of these complexes is confirmed by molecular weight determination. All the complexes are slightly soluble in methanol or ethanol but soluble in DMF and DMSO. The analytical data of the complexes are in good agreement with the calculated values,thus confirming the proposed composition for all the complexes.

**A. Molar conductance**

The molar conductance of these macrocyclic complexes of (L<sub>1</sub>) in acetonitrile were measured and the calculated molar conductance values.

The molar conductivities of the sulphate complexes (L<sub>1</sub>) in acetonitrile are in the range of 90-130 ohm<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup> which is characteristic of 1:1 electrolytes, indicating that the sulphate groups are ionic in nature. The conductivities of the metal chloride complexes are in the

range of  $20\text{--}48\text{ ohm}^{-1}\text{ cm}^2\text{ mol}^{-1}$  suggest that all of them non-electrolytes (7). The presence of chloride ions is evident only after decomposition of the complexes, probably due to their presence in the coordination sphere.

### B. IR spectra

The infrared spectra of the ligand are compared with those of the complexes to determine the bonding mode of the ligand to the metal in the complexes. The IR spectrum of the macrocyclic complexes of ligand indicate that the trimethoprim and L- glycine moieties are present. The asymmetric and symmetric stretching vibrations and deformation vibrations of the  $\text{NH}_2$  group of amino acid observe bands at  $3503$  and  $837\text{ cm}^{-1}$  respectively. This clearly shows that primary  $-\text{NH}_2$  group of amino acid do not take part in coordination (8). The free macrocyclic ligand exhibits bands at  $3090$  and  $1640\text{ cm}^{-1}$  which are assigned to N-H modes of the secondary amino group and C=N mode of the imine group respectively (9-12). In all the  $\text{Mn}^{\text{II}}$ ,  $\text{Co}^{\text{II}}$ ,  $\text{Cu}^{\text{II}}$  macrocyclic complexes secondary N-H and C=N frequency of the compound was decreases to the free ligands in range  $40\text{--}70\text{ cm}^{-1}$  and  $20\text{--}30\text{ cm}^{-1}$ . Thus, the ligand coordinates through secondary amine and imine nitrogens of the macrocyclic ring (13).

There are fairly strong IR spectral bands in the region  $3123$  to  $2965\text{ cm}^{-1}$  due to the C-H and C-N-C stretch of the pyrimidine ring, benzyl aromatic ring and methoxy groups also appear in the spectra of the complexes in the same region indicates that they do not take part in coordination.

The appearance of a new moderately intense band in the region  $543\text{--}506\text{ cm}^{-1}$  assignable to (M-N) further confirms the involvement of nitrogen in coordination (14). In the sulphate complexes a broad band of strong intensity is observed near  $1100\text{ cm}^{-1}$  which is characteristic of uncoordinated  $\text{SO}_4^{2-}$  ion and confirms its presence in the outer sphere of the complex ion (15). In addition to that the frequencies of sulphate appear at  $1100$  and  $625\text{ cm}^{-1}$  respectively without any splitting. It shows tetrahedral symmetry for the sulphate group (16). The frequencies found at  $970$  and  $1042\text{ cm}^{-1}$  which are assigned to aromatic in plane deformation and aromatic out-of-plane ring deformation respectively are not at all affected indicating that ring nitrogens (pyrimidine nitrogens) are no coordinated to the metal ion.

### C. Magnetic measurements and Electronic spectra

**Manganese complex:** The magnetic moment of the manganese(II) complex was found to be  $5.9\text{ B.M.}$ , which indicates a high spin( $d^5$ ) system. The magnetic moment of manganese(II) chloride and sulphate complexes are  $5.83\text{ B.M}$  and  $5.48\text{ B.M}$ . So, this may suggest octahedral or tetrahedral coordination for the metal ion (17). The electronic spectra of the manganese(II) chloride complex exhibits to a very weak bands at  $10204\text{ cm}^{-1}$  which are

assigned to  ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}(\text{G})$  transition. This observation reveal that the stereochemistry of this complex is consistent with six coordinate octahedral geometry. The electronic spectrum of manganese(II) sulphate complex exhibit bands do not show narrow d-d transitions are over shadowed by stronger charge transfer transitions (18,19).

**Cobalt complex:** The magnetic moment of the cobalt (II) sulphate is  $4.42\text{ B.M}$  suggesting tetrahedral (20) and Cobalt(II) chloride register magnetic moment value of  $5.14\text{ B.M.}$ , which indicates the octahedral geometry (21). The electronic spectra of the Cobalt(II) chloride complex shows three bands at  $10193$ ,  $11248$  and  $19763\text{ cm}^{-1}$  which can be assigned to  ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{T}_{2g}(\text{F})$ ,  ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{A}_{2g}(\text{F})$ , and  ${}^4\text{T}_{1g}(\text{F}) \rightarrow {}^4\text{T}_{1g}(\text{P})$  transitions respectively, in a octahedral geometry (22-24). The electronic spectrum of the Cobalt(II) sulphate complex also found in the range  $18793\text{ cm}^{-1}$  in the near infrared region is due to  ${}^4\text{A}_{2g}(\text{F}) \rightarrow {}^4\text{T}_{1g}(\text{P})$  transition. These transitions are characteristic of cobalt(II) sulphate in a tetrahedral environment.

**Copper complex:** The magnetic moment of the copper (II) chloride complex at room temperature is found to be  $1.95\text{ B.M.}$ , corresponding to the presence of one unpaired electron which offers the possibility of octahedral geometry (21). The copper (II) sulphate complex exhibit magnetic moment value of  $1.26\text{ B.M.}$ , indicating one unpaired electron showing paramagnetic character with tetrahedral geometry (25). The electronic spectrum of the copper (II) chloride complex shows a broad band in the range  $12107\text{ cm}^{-1}$  in the visible region is due to  ${}^2\text{E}_g - {}^2\text{T}_{2g}$  transition, which in good agreement with a distorted octahedral geometry for copper (II) ion (26-28). The electronic spectrum of copper (II) sulphate complex shows two electronic absorption bands, a low energy and less intense one at  $10616\text{ cm}^{-1}$  and a relatively high energy and less intense at  $14535\text{ cm}^{-1}$ . Tetrahedral complexes of copper (II) are known (29) to have a band assigned to  $\text{dx}^2\text{-y}^2\text{-dyz}$  transition has been reported for certain copper (II) complexes with a pseudo tetrahedral geometry.

### D. NMR spectra

The proton magnetic resonance (30,31) spectra of the ligand  $\text{C}_{32}\text{H}_{38}\text{N}_{10}\text{O}_6$  are recorded in DMSO solvent using TMS as internal standard. The spectral data gives some important information to conclude the formation of ligand. The spectrum shows seven signals which are observed at seven different regions from the TMS. This indicates that there are seven different types of protons.  ${}^1\text{H-NMR}$  spectrum of the macrocyclic ligand display peaks at  $\delta = 2.0$  (4H, s, -C-CH<sub>2</sub>-);  $\delta = 2.4$  (4H, t, free-NH<sub>2</sub>);  $\delta = 3.7$  (18H, s, -OCH<sub>3</sub>);  $\delta = 5.4$  (2H, s, ring NH);  $\delta = 6.6$  (4H, s, Pyrimidine-CH<sub>2</sub>-Ar);  $\delta = 7.8$  (2H, d, pyrimidine-H);  $\delta = 8.3$  (4H, d, Ar-H) and thus the  ${}^1\text{H-NMR}$  spectrum confirms the presence of trimethoprim and L-glycine

moieties in the macrocyclic condensed product. From the ratio of the intensities of the peak the number of protons can be calculated as 38.

## VI. CONCLUSION

In the present work, incorporation of pyrimidine moiety into the macrocyclic frame work is found to potentially enhancing the rigidity and binding ability of the ligands towards the transition metal ions. The electrical conductance values for the complexes in acetonitrile indicate that the chloride complexes are non-electrolytic and sulphate complexes are ionic in nature. The IR spectral studies reveal that the coordination site of the complexes by comparing with the ligand. The magnetic moments of the complexes indicate that they are all of high spin with paramagnetic in nature. The magnetic and electronic spectral studies support that all the complexes have octahedral and tetrahedral geometry. <sup>1</sup>H-NMR spectral studies were carried out for the complexes to ascertain the mode of coordination as proposed by IR spectrum.

## VII. REFERENCES

- [1] Ma,W., Tian,Y.P., Zhang,S.Y., Wu,J.Y., Fun,H.K., Chantrapromma,S., *Transition Met. Chem.*, 31,97,2006.
- [2] Chandra,S., Gautam,A., Tyagi,M., *Transition Met. Chem.*, 32, 1079, 2007.
- [3] Cabiness, D.K., and Margerum,D.W.J., *J.Am.Chem.Soc.*,9,6540,1970.
- [4] Cotton,F.A., and Wilkinson.G., “ *Advanced Inorganic Chem*” 4th Ed., Wiley Interscience,New York,1980.
- [5] Jorgerson,C.K., “*Absorption Spectra and Chemical Bonding in Complexes*” Pergamon Press,Oxford,1962.
- [6] Chandra.S., and Gupta,K., *Trans.Met.Chem.*,27,196,2002.
- [7] Laura Valencia.,Harry Adams., Fufina Bastida., Andres de Blas., David,E., Fenton., Alejandro Macias., Adol fo Kordriguez., “Teresa Rodriguez Blas”, *Inorganica ChimicaActa*,300,234,2000.
- [8] John. R. Dyer., “*Application of Absorption Spectroscopy of Organic Compounds*”, Hall of India Pvt. Ltd., New Delhi,30.
- [9] Koji Nakanishi., and Philippa,H.,Solomon.,“*Infrared Absorption Spectroscopy*”,Second Ed.Holden-Day,Inc.,San Francico,1977.
- [10] Kazuo Na Kamoto., “*Infrared Spectra of Inorganic and Coordination Compounds*”, Wiley-Interscience,New York,233,1970.
- [11] Hadzi,D., *J.Chem.Soc.*, 2725, 1956.
- [12] Singh,C.B., Rai,H.C and Sahoo,B.,J. *Inorg. Nucl. Chem.*,36,1974.
- [13] Rao,C.N.R., “*Chemical Applications of Infrared Spectroscopy*”,Academic Press,New York,1963.
- [14] Clark,R.J.H., and Williams,C.S., *Inorg.Chem.*,4,350,1965.
- [15] Rout,A.K., Patta,N.C., and Sahoo,B., *Indian J.Chem.*,28A,763,1989.
- [16] Hathaway,B.J., and Under Hill,A.E., *J.Chem.Soc.*,3091,1961.
- [17] Hassan Key Pour.,Reza Azadbakht.,Hamidreza Khavasi.,*Polyhedron*,27,648,2008.
- [18] Xuan Shen., Lu Sun., Bo-Kun Jiang., Xin Wang., Akio Nakashima., Naoki Miyamoto., Kazunori Sakata., Yanxu.,Dun-ruzhu.,*Inorganic Chemistry Communications*,14,1555,2011.
- [19] Monika Tyagi., Sulekh Chandra.,Jameel Akhtar., Dinesh Chand., “*Spectrochimica Acta Part A*”:*Molecular and Biomolecular Spectroscopy*,21,36,2013.
- [20] Cotton,F.A., and Holm,R.H., *J.Am.Chem.Soc.*,12,1954.
- [21] Figgis,B.N., and Lewis.J., “*Modern Coordination Chemistry*”, Interscience,1960.
- [22] Yan Perg., Zhimei Li., Zhigang Niu., Yinquiu Liu., Xirui Zeng., Qiuyan Luo., David. L. Hughes., Xiaoming Liu., *Inorganica Chimica Acta*, 362, 3975, 2009.
- [23] Wanda Radecka-Pary Zek., Violetta Patroniak., Maciej Kubicki., *Polyhedron*,22,2773,2003.
- [24] Rayees Ahmad Shiekha., Sheikh Shreazb., Luqman Ahmad Khanb., Athar Adil Hashmia., *J.Chem.Pharm.Res.*,2(2),172,2010.
- [25] Sacconi,L., *J.Am.Chem.Soc.*,76, 3400, 1954.
- [26] Hathaway,B.J., and Billing,D.E., *Coord. Chem. Rev.*, 5,143,1970.
- [27] Hathaway,B.J, Duggan,M., Murphy,A., Mullane,J., Power,C., Walsh,A., and Wahsh.B., *Coord. Chem. Rev.*, 36, 267, 1981.
- [28] Bersuker,I.B., *Coord. Chem. Rev.*, 14,367,1975.
- [29] Nanoyama,K., Ouima,H., and Nanoyama., *Inorg. Chim. Octa*, 59, 275, 1982.
- [30] Baker,A.J., Cairns,T., Eglinton,G., and Preston,F.J., “*More Spectroscopic Problems in Organic Chemistry*”, 2nd Ed., Heylen Son Ltd., 1975.
- [31] Robert Silberstein,M., Clayton Bassler,G., and Morill,C., “*Spectroscopic Identification of Organic Compounds*”, John Wiley, New York, 1981.

# Synthesis and Characterization of New Polymers Having Azomethine Group

S.J. Pradeeba, K. Sampath and A. Ramadevi

**Abstract** --- Recently soluble Polyazomethine with good thermal stability, Mechanical stability, electrical and optical properties are much in the polymer field. One such attempt was made to synthesis Polyazomethine by solution polycondensation of monomers diformyl biphenyl with diaminopyridine. The polymers were characterized by FT-IR, and UV spectroscopical analysis.

**Keywords**---Polyazomethines, Solution poly condensation, Optoelectronic properties

## I. INTRODUCTION

RECENTLY Aromatic polymers containing both ester and azomethine units are a type of high performance polymers with excellent thermal, physical, optical and mechanical properties and are utilized in various fields such as electric, electronic, photonics & in industrial material field.[1-5] Electronic materials exhibited a reversible optical change in absorption or transmittance upon electrochemically oxidized or reduced such as transition metal oxides inorganic co-ordination complexes, organic molecules and conjugated polymers. PAMs had also been explored for applications in organic electronics such as light emitting materials, pH sensors and metal collecting polymers [5-6].

The azomethine and hydroxyl groups have been used in various field. They have useful properties such as paramagnetism electrochemical cell and resisting materials to high energy. Because of these properties they were used to prepare the composites with resistance to high temperature and graphite materials, epoxy oligomer and block copolymers adhesives, fotoresist and antistatic materials. Analysis of their multiple technology from bulk utilization such as antistatic coatings or energy storage materials to highly sophisticated, electronic, photonic and bioelectronic devices [7-9]. Among conjugated polymers, those with extended system involving alternating C=C & C-C bonds are predominant. Non- linear optical materials are key elements for future photonic technologies of optical communication, optical interconnect oscillator,

amplifier, frequency converter etc. Research significant effects are being made for the selection of materials showing larger NLO susceptibility [10-12].

In this paper one such conjugated polyazomethine was prepared by solution polymerization method and structural characterization like FT-IR and UV-Visible spectra were studied.

## II. 2. EXPERIMENTAL PROCEDURE

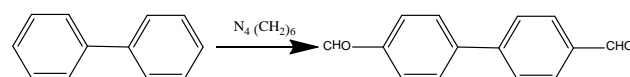
### 2.1. Materials

Hexamethylene tetra amine (Aldrich), 4,4'-bis(chloromethyl) biphenyl (Aldrich) pyridine, Sodium amide and ethanol.

### 2.2. Monomer Synthesis:

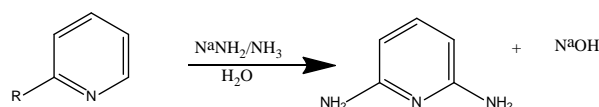
#### 2.2.1 4,4'-Diformyl biphenyl

Hexamethylene tetra amine (6.80g, 48mmol) dissolved in ethanol (90ml), 4,4'-bis (chloromethyl) biphenyl (3.00g, 12mmol) was added at 40°C. The mixture was stirred 1.5 hour at 45-50°C. The precipitate was collected, washed with ethanol for two times and dried and then acetic acid (40ml, 50%) was added. The mixture was heated to reflux for 10hours and filtered. The filtrate was cooled overnight and the crystals were attained. The crystals were purified further by crystallization from absolute ethanol to give 0.93g (36.9%) [8].



#### 2.2.2 2, 6-Diamino pyridine

It is prepared by chichibabin amination reaction in which pyridine is reacted with sodium amide in an organic solvent. This is a complicated reaction requiring relatively severe conditions (eg a temperature of 200°C at high pressure). It was reported by Aleksei chichibabin in 1914. The following is the overall form of the general reactions.



S.J. Pradeeba, Department of Chemistry, Sri Guru Institute of Technology, Coimbatore, Tamil Nadu

K. Sampath, Department of Chemistry, Kumaraguru College of Technology, Coimbatore, Tamil Nadu

A. Ramadevi, Department of Chemistry, Alagappa Chettiyar College of Engineering & Technology, Karaikudi, Tamil Nadu

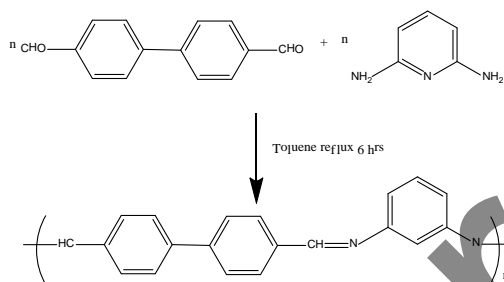
### 2.3 Polymer Synthesis

In a 25ml round bottom flask equipped with a magnetic stirrer a condenser and inlet – outlet Dean stark system, 0.1536g (0.5mmol) of 4,4'-diformyl biphenyl and 0.05456g (0.5mmol) of 2,6 diamino pyridine. 7ml of DMF and 2ml of toluene were introduced. The reaction mixture was refluxed at the boiling temperature of toluene for 6 hours. After cooling at room temperature, the reaction mixture was poured in a large amount of methanol and the polymers precipitate was filtered and dried [3].

### III. RESULT AND DISCUSSION

Polyazomethines were synthesized by interfacial polycondensation of an equimolar mixture of aromatic dialdehydes and diamine. The reaction was carried out in homogeneous phases using DMF and toluene for 6 hours. After cooling at room temperature the reaction mixture was poured in a large amount of methanol and the polymers precipitate was filtered and dried.

#### Synthetic route for PAZ



Polyazomethine was characterized by FT-IR and UV-Visible spectroscopy. According to FT-IR (Figure-1), the appearance of strong absorption band at  $1635\text{ cm}^{-1}$  shows the presence of  $\text{CH}=\text{N}$  group, the bands at  $1118\text{ cm}^{-1}$  and  $810\text{ cm}^{-1}$  shows the presence of aromatic C-H stretching,  $3340\text{ cm}^{-1}$  shows the presence of  $-\text{N}-\text{H}-$  stretching, Azo ( $-\text{N}=\text{N}-$ ) frequency occurs at  $1404\text{ cm}^{-1}$  [1-4].

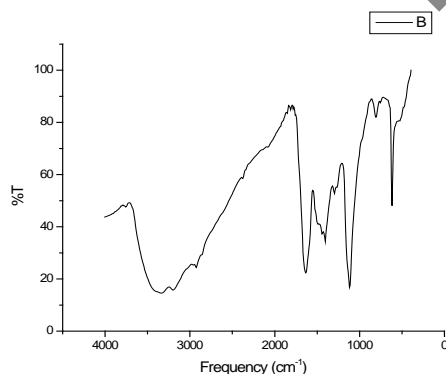


Figure-1-FT-IR of PAZ

Figure-2 of UV-Visible absorption spectrum, the appearance of two absorption bands at maximum ( $\lambda_{\text{max}}$ ) is 258 and 226 nm, shows the presence  $\pi-\pi^*$  and  $n-\pi^*$  transitions. Those absorption bands confirms that PAZ is a conjugated polymer ( $-\text{C}=\text{C}-$ ) and it has a non-bonded electron in the structure ( $-\text{N}=\text{H}-$ ) and since it is UV active so it has a electrochromic property [1-4].

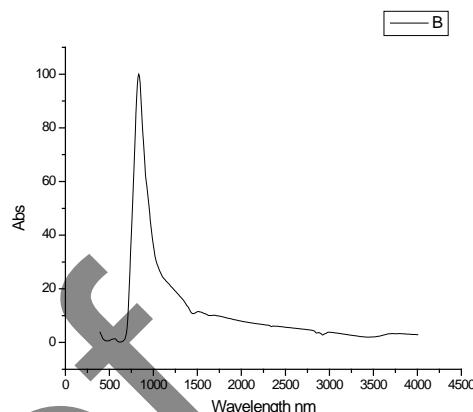


Figure-2-UV-Visible absorption spectrum of PAZ

### IV. CONCLUSIONS

Further series of polyazomethines are planned to prepare by varying the monomers and polymerization technique and characterized its physical, electrical and thermal properties. Future plan is to make Nano PAZ.

### V. ACKNOWLEDGEMENT

The Authors thank to the Management and Principal of SriGuru Institute of Technology to carry out the work successfully.

### REFERENCES

- [1] B.Joy Vasanthi and L.Ravikumar, "Synthesis and Characterisation of Poly (azomethine ester)s with a pendent dimethoxy benzylidene group", open journal of polymer chemistry, scientific research, vol.3, pp. 70-77, August 2013.
- [2] A.Amironesei, A.Airnei, D. Timpu, V.Coza, A.P. Rambu, M.Irimia, F.Iacomi, G.I.Rusu, "Electrical and optical properties of some polyazomethine thin films prepared by a spin coating method", Journal of optoelectronics and Advanced materials, vol.13, no.7, pp. 802-806, July 2011.
- [3] Loredana vacareanu, Irina Mihaela Dorin, Mircea Grigoras, "Polyimines with Electron-Donating and Accepting groups: Synthesis and Characterization", Rev.Chim, vol. 61, pp. 74-77, 2010.
- [4] Ismet Kaya and Ali Bilici, "Synthesis, Characterisation, Thermal Analysis, Conductivity and Band Gaps of oligo 4-[2-Hydroxyl]-1-Naphthyl) Methylene]- Aminobenzoic acid, Chinese Journal of polymer science, vol.27, no.2, pp. 209-219, January 2009.
- [5] Hung-Ju Yen, Guey - Sheng Liou, "Novel blue and red electrochromic polyazomethine ethers based on electroactive triphenylamine moieties", Organic Electronics, vol.11, pp. 299-310, 2009.

- [6] Aurica Farcas and Valeria Harabagiu, " Synthesis and Characterization of a new conjugated polyazomethine", *Revue Roumaine de chimie*, vol. 52, pp. 887-890, Februray 2007.
- [7] Aurica Farcas and Cristofor.I.Simionescu, " Conjugated polymers with Rotaxane Architecture", *Revue Roumaine de chimie*, vol. 51(12), pp. 1153-1156, April 2006.
- [8] Yan He Chaofan Zhong, Yu Zhou and Hailiang Zhang, " Synthesis and luminescent properties of novel Cu (II), Zn (II) polymeric complexes based on 1,10-phenanthroline and biphenyl groups", *J.Chem.Sci.*, vol.121, pp. 407-412, July 2009.
- [9] Mylsamy Sivadhyanthy, Lingam Ravikumar and Ramachandran, " Synthesis and Characterization of thermally stable novel polymers containing phenylthiourea, azo and sulfone groups in the back bone", *Journal of the Chilean chemical society*, vol. 52, pp. 1230-1234, Sep 2007.
- [10] P.K.Dutta, Pragma Jain, Pratima Sen, Rashmi trivedi, P.K.Sen, Joydeep Dutta, " Synthesis and characterization of a novel polyazomethine ether for NLO application", *European polymer Journal*, Elsevier, vol.39, pp. 1007-1011, January 2003.
- [11] Kunio Kimura, Jin-Huang Zhuang, Kohtaro Shirabe, Yuhiko Yamashita, " Preparation of needle like poly(azomethine) crystals by means of reaction induced crystallization of oligomers", *Polymer*, Elsevier, vol.44, pp. 4761-4764, January 2003.
- [12] Chenggang Wang, Seaver Shieh, Eugene Legoff and Mercouri G.Kanatzidis, " Synthesis and Characterization of a New Conjugated Aromatic polyazomethine derivative based on the 3,4 – Dibutyl- $\alpha$ -Terthiophene building block", *Macromolecules*, vol. 29, pp. 3147 – 3156, January 1996.



# Green Synthesis of 9-Acridones

M. Abirami, V. Nadaraj and S. Thamarai Selvi

**Abstract----** A highly efficient method for the synthesis of 9-acridone derivatives by using a cyclic condensation of aromatic amines with *o*-chlorobenzoic acid over Lewis acid catalysts in microwave reactor is described.

**Keyword---** microwave, condensation, acridone

## I. INTRODUCTION

ACRIDONE derivatives exist in numerous natural products and pharmaceutical agents that show broad biological activities.<sup>1-4</sup> Derivatives and salts of acridines are characteristically crystalline, stable, attractively coloured, and often strongly fluorescent and rewardingly display a range of anti-microbial properties, which have influenced a secured position in the field of chemotherapy.<sup>5-8</sup> Various new synthesis methods<sup>9-12</sup> for the acridone derivatives have been reported and Concentrated H<sub>2</sub>SO<sub>4</sub>, PPA, POCl<sub>3</sub>, P<sub>2</sub>O<sub>5</sub> were widely employed as catalyst for the cyclisation of N-phenylanthranilic acids to give acridones.

Recently,<sup>13</sup> we also reported a synthesis of such compounds through a PTSA catalyzed cyclisation of N-phenylanthranilic acids under microwave irradiation. A microwave (MW, frequency 2.45 GHz) heating technique should be a promising candidate, replacing conventional heating because microwave-assisted organic syntheses can lead to large reductions in reaction time, clean and to enhancement in conversion and selectivity compared to conventional heating.<sup>14-16</sup> The concept of green chemistry<sup>17</sup> encouraged us to develop a new synthetic routes using an even safer and non-waste-producing alternative catalyst. Solid acid catalysts are not only environmentally friendly but also have many economic advantages.<sup>18,19</sup> Though a number of thermal synthetic methods of acridines are available in the literature, microwave induced synthesis of acridines are very few. Herein we wish to report a simple, clean and efficient method for the synthesis of 9-acridone derivatives by the reaction of aromatic amine compounds and *o*-chlorobenzoic acid catalyzed by a Lewis acid ZnCl<sub>2</sub> in microwave reactor.

## II. MATERIALS AND METHOD

Melting points (mp) were determined using Boetieus micro heating table and are uncorrected. The purity of the products was checked by TLC on pre-coated sheets of silica gel IR (KBr, cm<sup>-1</sup>) spectra were obtained on Shimadzu-8201 spectrometer. <sup>1</sup>H-NMR and <sup>13</sup>C-NMR spectra were recorded on Bruker AMX-400 MHz spectrometer using TMS as an internal reference (Chemical shifts in  $\delta$ , ppm). Elemental analyses were performed on Perkin Elmer CHN-analyzer. Mass spectra were recorded on Shimadzu GCMS-QP5050A (70 eV) mass spectrometer. The microwave system used for this experiment is Ragas Electro Magnetic System [RG3IL], complete with glass door, 700 Watt delivered power, exhaust system, triple safety interlocks, magnetic stirrer, automatic temperature control. All reactions are carried out at 5<sup>th</sup> level [120°C] in a 100 mL beaker.

## III. EXPERIMENTAL SECTION

### A. General procedure for preparation of 9-acridones (3a-e)

A mixture of *o*-Chlorobenzoic acid (0.780 g, 0.005 mole), substituted anilines (0.005 mole) and the catalyst zinc chloride were taken in a 100 mL beaker, mixed well and the reaction mixture was irradiated in an microwave oven at the power of output 160W for specified times (Table 1). The reaction was monitored for every 30 seconds by the tic. After completion of the reaction, the reaction mixture was poured into boiling water. The precipitate formed was filtered and boiled for five minutes with a solution of sodium carbonate. Again precipitate was filtered, washed well with water and purified by silical gel column chromatography [Petroleum ether: ethyl acetate; [70:30] as an eluent].

**9-Acridone 3a:** Time-4 min, Yield-95%; mp.>300°C; IR (KBr, cm<sup>-1</sup>): 1635 (>C=O), 3744-3280 (NH), 1598, 1526, 1470; <sup>1</sup>H NMR (DMSO-d<sub>6</sub>)  $\delta$ : 7.25-7.29 (t, 2H, C<sub>2</sub>-H and C<sub>7</sub>-H), 7.55-7.57 (d, 2H, C<sub>4</sub>-H and C<sub>5</sub>-H), 7.72-7.76 (t, 2H, C<sub>3</sub>-H and C<sub>6</sub>-H), 8.23-8.25 (d, 2H, C<sub>1</sub>-H and C<sub>8</sub>-H), 11.72 (s, 1H, NH); Ms (m/z): 195 (M<sup>+</sup>, 53%), 167 (M<sup>+</sup>- CO, 20%), 139, 111, 97, 85, 71, 57 (100%); Anal. Calc. (C<sub>13</sub>H<sub>9</sub>NO): C, 80.00, H, 4.65, N, 7.18; Found: C, 79.22, H, 4.55, N, 7.16.

**4-Methyl-9-acridone 3b:** Time-6 min, Yield-91%; mp.>300 °C; IR (KBr, cm<sup>-1</sup>): 1633 (>C=O), 3700-3300 (NH), 1464, 1322; <sup>1</sup>H NMR (DMSO-d<sub>6</sub>)  $\delta$ : 2.46 (s, 3H, C<sub>2</sub>-CH<sub>3</sub>), 7.25-8.38 (m, 7H, Ar-H), 10.95 (s, 1H, NH); Ms

M. Abirami, Department of Chemistry, Sri Ramakrishna Engineering College, Vattamalaipalayam, Coimbatore-641022, India

V. Nadaraj, Department of Chemistry, Tamilnadu College of Engineering, Karumathampatti, Coimbatore-641659, India

S. Thamarai Selvi, Department of Chemistry, L.R.G. Govt. Arts College for Women, Tirupur-641 604, India.

(m/z): 209; Anal. Calc. (C<sub>14</sub>H<sub>11</sub>NO): C, 80.38, H, 5.31, N, 6.70; Found: C, 80.33, H, 5.26, N, 6.60.

**2-Methyl-9-acridone 3c:** Time-5.3 min, Yield-93%; mp.>300 °C; IR (KBr, cm<sup>-1</sup>): 1633 (>C=O), 3700-3270 (NH); <sup>1</sup>H NMR (DMSO-d<sub>6</sub>) δ: 2.48 (s, 3H, C<sub>4</sub>-CH<sub>3</sub>), 7.24-8.35 (m, 7H, Ar-H), 10.65 (s, 1H, NH); Ms (m/z): 209; Anal. Calc. (C<sub>14</sub>H<sub>11</sub>NO): C, 80.38, H, 5.31, N, 6.70; Found: C, 80.31, H, 5.28, N, 6.62.

**4-Methoxy-9-acridone 3d:** Time-7 min, Yield-93%; mp.>300 °C; IR (KBr, cm<sup>-1</sup>): 1634(>C=O), 3720-3300 (NH); <sup>1</sup>H NMR (DMSO-d<sub>6</sub>) δ: 3.86 (s, 3H, C<sub>2</sub>-OCH<sub>3</sub>), 7.28-8.40 (m, 7H, Ar-H), 11.70 (s, 1H, NH); Ms (m/z): 225; Anal. Calc. (C<sub>14</sub>H<sub>11</sub>NO<sub>2</sub>): C, 74.67, H, 4.93, N, 6.22; Found: C, 74.65, H, 4.87, N, 6.16.

**2-Methoxy-9-acridone 3e:** Time-6.3 min, Yield-95%; mp.>300 °C; IR (KBr, cm<sup>-1</sup>): 16350 (>C=O), 3700-3720 (NH); <sup>1</sup>H NMR (DMSO-d<sub>6</sub>) δ: 3.90 (s, 3H, C<sub>4</sub>-OCH<sub>3</sub>), 7.27-8.39 (m, 7H, Ar-H), 11.65 (s, 1H, NH); Ms (m/z): 275; Anal. Calc.(C<sub>14</sub>H<sub>11</sub>NO<sub>2</sub>): C, 74.67, H, 4.93, N, 6.22; Found: C, 74.62, H, 4.90, N, 6.19.

#### IV. RESULTS AND DISCUSSION

To develop one-pot synthesis route for the titled compounds, by the reaction of *o*-chlorobenzoic acid (0.005 mol), anilines (0.005 mol) and ZnCl<sub>2</sub> (1g) were taken in a beaker and irradiated in the microwave reactor at a power of output of 160 W for 4 min. After irradiation, boiling water was added; the solid obtained was boiled with sodium carbonate solution, filtered, dried and recrystallized from a mixture of aniline and acetic acid. It was noticed that, condensation take

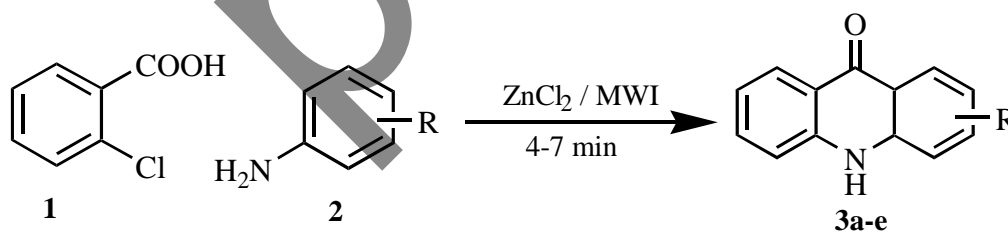
place between chlorine (1) and amine group (2) with liberation of HCl and followed by cyclisation result into desired product 9-acridone (3a, Scheme 1). All the reactions were carried out at the minimum power of 160 W. The cyclization confirmed by <sup>1</sup>H-NMR spectrum, it indicates the absence of acidic proton peaks.

Thus, IR spectrum of the solid showed characteristic absorption band at 1635 cm<sup>-1</sup> and in the range 3744-3280 cm<sup>-1</sup> for >C=O and -NH groups respectively. The <sup>1</sup>H-NMR spectrum registered two triplet at δ 7.25-7.29 for C<sub>2</sub>& C<sub>7</sub> protons and δ 7.72-7.76 for C<sub>3</sub> & C<sub>6</sub> protons and two doublet at δ 7.55 -7.57 for C<sub>4</sub> & C<sub>5</sub> protons and δ 8.23-8.25 for C<sub>1</sub>& C<sub>8</sub>-protons. The spectrum also showed a singlet at δ 11.72 for >NH proton. The mass spectrum showed a molecular ion peak at m/z 195 (M<sup>+</sup>, 53%) along with other fragment ion peaks at m/z 167 (M<sup>+</sup>-CO, 20%), 139, 111, 97, 85, 71, 57 (100%).

The structure of compounds 3(a-e) were deduced from their <sup>1</sup>H NMR, <sup>13</sup>C NMR and IR spectral data and their molecular weight confirmed by mass spectrometry.<sup>13,20</sup> The mass spectra of these compounds showed the expected molecular ion signals, selected spectroscopic data have been given in general procedure section.

#### V. CONCLUSIONS

In conclusion, we have developed clean, highly efficient and green procedure for the synthesis of 9-acridone derivatives via condensation of aromatic amines (2) and *o*-chlorobenzoic acid (1) which offers significant preparative advantages over the existing methods.



3a : R = H, 3b : R = 4-CH<sub>3</sub>, 3c : R = 2-CH<sub>3</sub>, 3d : R = 4-OCH<sub>3</sub>, 3e : R = 2-OCH<sub>3</sub>

Scheme 1 Synthesis of 9-acridones

Table 1 Physical data of 9-acridones

Compounds	Reaction Time (min)	Yield (%)
<b>3a</b>	4.0	95
<b>3b</b>	6.0	91
<b>3c</b>	5.3	93
<b>3d</b>	7.0	93
<b>3e</b>	6.3	95

#### REFERENCES

- [1] D. Carole, D. Michel, C. Julien, D.Florence, N. Anna, J. Séverine, D.Gérard, T. Pierre, G. Pierre Bioorganic & Medicinal Chemistry, 2005, 13, 19, 5560-5568.
- [2] I. Sánchez, R. Reches, D.Henry, C. Pierre, R.Maria, D.Pujol, European Journal of Medicinal Chemistry., 2006, 41, 3, 340-352.
- [3] F. Gay, B. Traoré, J. Zanoni, M. Danis, A. Fribourg-Blanc Transactions of the Royal Society of Tropical Medicine and Hygiene., 1996, 90, 5, 516-518.

- [4] P.Yang, Q.Yang, X. Qian, L. Tong, X. Li, Journal of Photochemistry and Photobiology B: Biology, 2006, 84, 3, 221-226.
- [5] A.Albert, "Selective toxicity", Chapman and Hall, London, 1985, 379.
- [6] B.Reil, M.Soll, K.Masson and W.Oettmeier, Biochem. Soc. Trans., 1994, 22, 625.
- [7] H.Taniyama, J.Pharm Soc., 1947, 67, 4.
- [8] H. Graboyes, EL.Anderson, S.H.Levinson and T.M.Resnick, Synthesis of Acridines, 1975, 12, 1225.
- [9] U.Thull and B.Testa, Biochem. Pharmacol., 1994, 47, 230.
- [10] Y.Mandi, K.Regely, I. Ocsosvsky, J.Barbe, J.P.Galy and J.Moinar, Anticancer Rec., 1994, 14, 2633.
- [11] C F H .Allen, G H W. McKee, Organic Synthesis Coll Vol 2, 15.
- [12] M.Ogata, H. Matsumoto and H.Kano, Tetrahedron, 1969, 25, 5205.
- [13] V. Nadaraj, S. Kalaivani and S. Thamarai Selvi , Indian J. Chem., 2006, 45B, 1958-1960.
- [14] V. Nadaraj, S. Thamarai Selvi ,S. Mohan, European J Chem., 2009, 44, 976-980.
- [15] V. Nadaraj, S. Thamarai Selvi\*, S.Mohan, T.Daniel Thangadurai, Med. Chem. Res., 2012, 21, 2911.
- [16] S. Caddick, Tetrahedron 1995, 51, 10403.
- [17] P. Anastas and J. C. Warner, Green Chemistry, Theory and Practice, Oxford University Press, New York, 1998.
- [18] J. H. Clark, Acc. Chem. Res., 2002, 35, 791.
- [19] M. A. Harmer and Q. Sun, Appl. Catal. A: Gen., 2001, 221, 45.
- [20] K. Lehmstedt, Chem Ber., 1932, 65, 999.

proof

# Application of Eco-Friendly Natural Dye Obtained from *Russelia Equisetiformis* on Cotton Using Combination of Mordants

M. Kumaresan

**Abstract**---- A large number of plants and plant species are found to have an important role in the day-to-day life. However, it is a matter of concern that the indigenous knowledge of extraction, processing and practice of using of natural dyes has diminished to a great extent among the new generation due to easy availability of cheap synthetic dyes. Thus by keeping in view of above, the present study has been undertaken so as to revive the age-old art of dyeing with natural dyes. The colour fastness properties of the colourant extracted from the flower of *Russelia equisetiformis* on cotton have been studied using different combination (1:3,1:1 and 3:1) of various mordants, such as myrobolan : ferrous sulphate, myrobolan : potassium dichromate myrobolan: nickel sulphate, myrobolan: stannous chloride and myrobolan: aluminium sulphate. The wash, rub, light and perspiration fastness of the dyed samples have been evaluated.

**Keywords**--- Cotton, Fastness, Mordant, Natural dye, *Russelia equisetiformis*

## I. INTRODUCTION

ENVIRONMENTAL pollution due to the discharge of dyeing industry effluents is the matter of major concern now-a-days. Up to the end of 19<sup>th</sup> century natural dyes were the main colourants for textiles. Recently, interest in the use of natural dyes has been growing rapidly due to the result of stringent environmental standards imposed by many countries in response to toxic and allergic reactions associated with synthetic dyes [1]. Until about 150 years ago all dyes were natural substances, derived mainly from plants and animals. The natural dyes present in plants and animals are pigmentary molecules [2] which impart colour to the materials. With the world becoming more conscious towards ecology and environment, there is greater need today to revive the tradition of natural dye and dyeing techniques as an alternative of hazardous synthetic dyes is an extremely crude.

There are several plants/plant parts that provide natural dyes which are used in the textile industry. However, the common drawbacks of natural dyes are their non-reproducible and non-uniform shades, poor to moderate colour fastness and lack of scientific information on the chemistry of dyeing and standardised dyeing methods [3]. Many reports are available on application of natural dyes on silk and cotton [4]

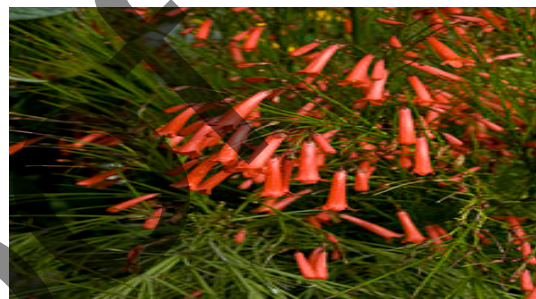


Fig :*Russelia equisetiformis*

The present investigation deals with the extraction of natural dyes from the flower extract of the plant *Russelia equisetiformis*. *Russelia equisetiformis* is a multi-branching plant with 4–5 feet (1.2–1.5 m) long arching branches. It flowers profusely with small decumbent red flowers. It can bloom year round in tropical and subtropical climates

The aim of present work has been carried out to prepare eco-friendly natural dyes from the flower extract of the plant *Russelia equisetiformis* and apply them on cotton fabric. It is an attempt has been made to study the effect of mordanting and dyeing properties [5] of cotton fabric such as, washing, rubbing, light fastness and perspiration [6] and also to visualize the effect of myrobolan and metallic mordants have been undertaken. Depending upon the mordant combination used, the colour obtained on textiles from the flower of *Russelia equisetiformis* extract may give different shades.

## II. MATERIAL AND METHODS

A known quantity of flower of *Russelia equisetiformis* was dried, powdered and soaked in warm water overnight. The colour extract was obtained by boiling it in the same water. This dye extract was allowed to cool, finally filtered and used for dyeing. The dyeing

M. Kumaresan, Professor and Head, Department of Chemistry, Erode Sengunthar Engineering College, Thudupathi, Perundurai, Erode PIN: 638 05. Email: mkumsrenu@gmail.com

was carried out at optimized dyeing conditions, dye extraction time 60min, material-to-liquor ratio 1:20, temp. 60°C, wave length 420 nm and dyeing time 50 min. The mordant combinations, viz. myrobolan: nickel sulphate, myrobolan: aluminium sulphate, myrobolan: potassium dichromate, myrobolan: ferrous sulphate, myrobolan: stannous chloride were used in the ratio of 1:3, 1:1 and 3:1. The total amount of two mordants used in each combination was 5% owf i.e. 5 g of the mordant / 100 g of the fabric. Each of the five mordant combinations in three different ratios mentioned above were used with all the three mordanting methods namely pre-mordanting, simultaneous mordanting and post-mordanting for dyeing.

Colour fastness to washing [7-9] of the dyed fabric samples was determined as per IS: 764 – 1984 method using a Sasmira launder-O-meter following IS-3 wash fastness method. The wash fastness rating was assessed using grey scale as per ISO-05-A02 (loss of shade depth) and ISO-105-A03 (extent of staining) and the same was cross-checked by measuring the loss of depth of colour and staining using Macbeth 2020 plus computer-aided colour measurement system attached with relevant software.

Colour fastness to rubbing (dry and wet) was assessed as per IS: 766-1984 method using a manually operated crock meter and grey scale as per ISO-105-A03 (extent of staining). Colour fastness to exposure to light was determined as per IS: 2454-1984 method. The sample was exposed to UV light in a Shirley MBTF Microsal fade-O-meter (having 500 watt Philips mercury bulb tungsten filament lamp simulating day light) along with the eight blue wool standards (BS1006: BOI: 1978). The fading of

each sample was observed against the fading of blue wool standards (1-8).

Colour fastness to perspiration [10] assessed according to IS 971-1983 composite specimen was prepared by placing the test specimen between two adjacent pieces of fabrics of cotton and stitched all among four sides. The sample was soaked in the test solution (acidic /alkaline) separately with MLR 1:50 for 30 minutes at room temperature. The sample was then placed between two glass plates of perspirometer under load of 4.5kgs (10 lbs). The apparatus was kept in the oven for four hours at 37±2°C. At the end of this period the specimen was removed and dried in air at a temperature not exceeding 60°C. The test samples were graded for change in colour and staining using grey scales.

### III. RESULTS AND DISCUSSION

#### A. Myrobolan: Nickel sulphate combination

The evaluation of colour fastness to light, washing, rubbing and perspiration for myrobolan: nickel sulphate combination in aqueous medium is presented in Table 1. All the treated samples subjected to light showed fairly good (3-4) light fastness for all mordant combinations. The wash fastness grades ranged between 3 and 4 for all of the treated samples and there was no colour staining. The colour change to dry and wet rubbing for all the treated samples was excellent (5). There was variation from no colour staining to negligible colour staining (5 to 4-5) in dry rubbing. Most of the treated samples showed excellent fastness grade to colour change in both acidic and alkaline media. There was no colour staining (5) for all the treated samples in both acidic and alkaline media (Table 1).

Table 1 : Fastness grades of cotton dyed with *Russelia equisetiformis* colourant at optimum dyeing conditions using myrobolan : nickel sulphate combination.

Mordanting	Mordant Proportions	Light fastness	Wash fastness		Rub fastness			Perspiration fastness			
			CC	CS	Dry		Wet	Acidic		Alkaline	
					CC	CS		CS	CC	CS	CC
Pre mordanting	1:3	3-4	3-4	5	5	5	5	5	4	5	5
	1:1	3-4	3-4	5	5	5	5	5	4-5	5	5
	3:1	3-4	3-4	5	4-5	5	5	5	4-5	5	5
Simultaneous mordanting	1:3	3-4	4	5	5	5	5	5	5	5	5
	1:1	3-4	4	5	5	5	5	5	5	5	5
	3:1	3-4	4	5	5	5	5	5	5	5	4-5
Post mordanting	1:3	3-4	3-4	5	5	5	5	5	5	5	4-5
	1:1	3-4	3-4	5	5	5	5	5	5	5	4-5
	3:1	3-4	3-4	5	5	5	5	5	5	5	4-5

CC – Colour change, CS – Colour staining

### B. Myrobolan: Aluminium sulphate combination

The evaluation of colour fastness to light, washing, rubbing and perspiration for Myrobolan: Aluminium sulphate combination in aqueous medium is presented in Table 2. All the treated samples subjected to light showed fairly good (3-4) light fastness for all the three mordant combinations. The treated samples for pre mordanting showed fair (3) wash fastness grades and they ranged between excellent to good (4-5) for all the simultaneous and post mordanting samples. There was no

colour staining. The colour change to dry and wet rubbing for all the treated samples was excellent (5). There was no colour staining ranged between no staining to negligible staining (5 to 4-5) in dry rubbing. There was slight colour staining, except for simultaneous mordanting. The perspiration fastness grades ranged between 4-5 and 4, except for 1:3 mordant proportion in pre-mordanting method, where it was fair (3). Table 2 shows that for all samples in both acidic and alkaline media, there was no colour staining (5).

Table 2 : Fastness grades of cotton dyed with *Russelia equisetiformis* colourant at optimum dyeing conditions using myrobolan :aluminium sulphate combination.

Mordanting	Mordant proportions	Light fastness	Wash fastness		Rub fastness			Perspiration fastness			
			CC	CS	Dry		Wet	Acidic		Alkaline	
					CC	CS		CS	CC	CS	CC
Pre mordanting	1:3	3-4	3	5	4-5	5	4	5	3	5	3
	1:1	3-4	3	5	5	4-5	5	5	4-5	5	4-5
	3:1	3-4	3	5	5	4-5	5	5	4-5	5	4-5
Simultaneous mordanting	1:3	3-4	4-5	5	5	5	5	5	4	5	4
	1:1	3-4	5	5	5	5	5	5	4-5	5	4-5
	3:1	3-4	4-5	5	5	5	5	5	4-5	5	4
Post mordanting	1:3	3-4	4-5	5	5	4-5	5	5	4-5	5	4-5
	1:1	3-4	4-5	5	5	4	5	5	4-5	5	4-5
	3:1	3-4	4-5	5	5	4	5	5	4-5	5	4-5

CC – Colour change, CS – Colour staining

### C. Myrobolan: Potassium dichromate combination

The evaluation of colour fastness to light, washing, rubbing and perspiration of dyed cotton samples treated with myrobolan :potassium dichromate combination in aqueous medium is presented in Table 3. The treated samples subjected to light showed fairly good (3-4) light fastness for all the ratio mordant combinations. The wash fastness grades showed fairly good (3-4) for all the treated samples. The colour change to dry and wet rubbing for all

the treated samples was excellent (5). The colour staining ranged between no staining and negligible staining (5 - 4) in dry rubbing. Most of the treated samples showed excellent fastness grade to colour change, except for 1:3 mordant proportion in pre mordanting method, where it was good (3). Table 3 shows that for all samples in both acidic and alkaline media, there was no colour staining (5).

Table 3- Fastness grades of cotton dyed with *Russelia equisetiformis* colourant at optimum dyeing conditions using myrobolan :potassium dichromate combination.

Mordanting	Mordant proportions	Light fastness	Wash fastness		Rub fastness			Perspiration fastness			
			CC	CS	Dry		Wet	Acidic		Alkaline	
					CC	CS		CS	CC	CS	CC
Pre mordanting	1:3	3-4	3	5	5	4	5	5	3	5	3
	1:1	3-4	3-4	5	5	4	5	5	4	5	4
	3:1	3-4	3-4	5	5	4	5	5	4	5	4
Simultaneous mordanting	1:3	3-4	3-4	5	5	5	5	5	4-5	5	4-5
	1:1	3-4	4	5	5	5	5	5	4	5	4
	3:1	3-4	4	5	5	5	5	5	4-5	5	4
Post mordanting	1:3	3-4	4-5	5	5	4-5	5	5	4-5	5	4-5
	1:1	3-4	4	5	5	4-5	5	5	4-5	5	4-5
	3:1	3-4	4-5	5	5	4-5	5	5	4-5	5	4-5

CC – Colour change, CS – Colour staining.

#### D. Myrobolan: Ferrous sulphate combination

The evaluation of colour fastness to light, washing, rubbing and perspiration of dyed cotton samples treated with Myrobolan: Ferrous sulphate combination in aqueous medium is presented in Table 4. The treated samples subjected to light showed fairly good (4 to 3-4) light fastness for all mordant combinations. The wash fastness grades ranged between excellent and good (5 and 4) for all the treated samples. The colour change to dry and wet rubbing for all the treated samples was excellent

(5). The colour staining ranged between no staining and slight staining (5 and 4 -5) in dry rubbing, and between slight and sharp noticeable colour staining (4-5 and 3) in wet rubbing. Most of the treated samples showed excellent fastness grade to colour change, except for 1:3 mordant proportion in simultaneous mordanting method, where it was good (4) for all samples in both acidic and alkaline media. There was no colour staining (5) for all the treated samples in both acidic and alkaline media.

Table 4- Fastness grades of cotton dyed with *Russelia equisetiformis* at optimum dyeing conditions using myrobolan :ferrous sulphate combination.

Mordanting	Mordant proportions	Light fastness	Wash fastness		Rub fastness			Perspiration fastness			
			CC	CS	Dry		Wet	Acidic		Alkaline	
					CC	CS		CS	CC	CS	CC
Pre mordanting	1:3	3-4	4-5	5	5	4-5	5	4-5	5	5	5
	1:1	3-4	5	5	5	4-5	5	4	5	5	5
	3:1	3-4	4-5	5	5	4-5	5	4-5	5	5	5
Simultaneous mordanting	1:3	3-4	5	5	5	4	5	4-5	4-5	5	5
	1:1	4	4-5	5	5	5	5	4-5	4-5	5	4-5
	3:1	4	4	5	5	5	5	4-5	5	5	5
Post mordanting	1:3	3-4	4	5	5	4-5	5	4-5	5	5	5
	1:1	3-4	5	5	5	4-5	5	4	4-5	5	5
	3:1	3-4	4-5	5	5	4-5	5	4	5	5	5

CC – Colour change, CS – Colour staining.

#### E. Myrobolan: Stannous chloride combination

The evaluation of colour fastness to light, washing, rubbing and perspiration of dyed cotton samples treated with Myrobolan: Stannous chloride combination in aqueous medium is presented in Table 5. The treated samples subjected to light showed fairly good (4 to 3-4) light fastness for all mordant combinations. The wash fastness grades ranged between excellent and good (4 and 5) for all of the treated samples and there was no colour

staining. The colour change to dry and wet rubbing for all the treated samples was excellent (5). The colour staining ranged between negligible and slight staining (4 and 5) in both dry and wet rubbing. The perspiration fastness grades ranged between 4 and 5 for all samples in both acidic and alkaline media. There was no colour staining (5) for all the treated samples in both acidic and alkaline media.

Table 5- Fastness grades of cotton dyed with *Russelia equisetiformis* colourant at optimum dyeing conditions using myrobolan :ferrous sulphate combination.

Mordanting	Mordant proportions	Light fastness	Wash fastness		Rub fastness			Perspiration fastness			
			CC	CS	Dry		Wet	Acidic		Alkaline	
					CC	CS		CS	CC	CS	CC
Pre mordanting	1:3	4	4-5	5	4	5	4	4	4-5	5	4-5
	1:1	4	4-5	5	4	5	4 -5	3	4-5	5	4-5
	3:1	4	4-5	5	4-5	5	4-5	3	4-5	5	4-5
Simultaneous mordanting	1:3	3-4	5	5	5	5	4	4-5	4	5	4
	1:1	3-4	4-5	5	4-5	5	4	4-5	5	5	5
	3:1	3-4	4	5	4	5	4	4-5	5	5	5
Post mordanting	1:3	3-4	4	5	4	5	4 -5	4-5	5	5	5
	1:1	3-4	5	5	5	5	4	4	4-5	5	5
	3:1	3-4	4-5	5	4-5	5	4-5	4	5	5	5

**Mb:** SC – Myrobolan: Stannous Chloride, CC – Colour change, CS – Colour Staining

#### IV. CONCLUSION

It is inferred that *Russelia equisetiformis* dye can be successfully used for the dyeing of cotton to obtain a wide range of soft, pastel and light colours by using various combinations of mordants. With regards to colour fastness, test samples exhibited excellent fastness to washing, except for pre-mordanting using myrobolan: potassium dichromate combination; excellent fastness to rubbing, except for pre-mordanting using Myrobolan: Potassium dichromate combination; good to excellent fastness to perspiration in both acidic and alkaline media and fairly good fastness to light.

#### V. ACKNOWLEDGEMENT

The authors are thankful to Mr.P.Santharaj, Department of Textile Processing, Erode Institute of Technology for his support in the analysis of fastness properties of the dyed samples of this work.

#### REFERENCES

- [1] Anderson, B.,1971, "Creative spinning, weaving and plant dyeing", Angus and Robinson, Singapore, pp.24-28.
- [2] Anitha,K. S. and Prasad,N.,2007, " Developing multiple natural dyes from flower parts of Gulmohur", Current Science, Vol.92(12), pp.1681-1682.
- [3] Bains, S., Singh, O.P., Goraya, G. and Kang, M.,2003, "Dyeing of cotton with mango (*Mangifera Indica*) dye", Journal of the Textile Association, pp.23-26.
- [4] Das, D., Maulik, S.R. and Bhattacharya, S.C.,2007, "Dyeing of wool and silk with *Bixa orellana*", Indian Journal of Fibre and Textile Research, Vol. 32, pp.366-372.
- [5] Das, D., Maulik, S.R. and Bhattacharya, S.C.,2008, "Colouration of wool and silk with *Rheum emodi*", Indian Journal of Fibre and Textile Research, Vol. 33, pp.163-170.
- [6] Gulrajani, M.L. and Gupta Deepti,1992, "Natural dyes and their application to textiles", Department of Textile Technology, IIT, Delhi, pp.10-25.
- [7] Kumaresan, M., Palanisamy, P.N. and Kumar, P.E., 2012, "Application of eco-friendly natural dye on cotton using combination of mordants", Indian Journal of Fibre & Textile Research, Vol.37, pp.194-198.
- [8] Kumaresan M., Palanisamy P.N. and Kumar P.E.,2012, "Dyeing of cotton fabric with eco-friendly natural dyes using single mordants: Comparison of fastness properties and colour strength", Universal Journal of Environmental Research and Technology , Vol.2(4), pp.280-285.
- [9] Kumaresan, M., 2014, "Comparison of fastness properties of dyed cotton fabric with eco-friendly natural dyes obtained from *Achras sapota* and *Cordia sebestena*", Journal of Environmental Nano Technology, Vol.3(1), pp.60-66.
- [10] Kumaresan, M., Balasubramaniam, P and Dhanasekaran, E., 2015, "Properties of eco- friendly natural dyed silk fabric- A comparison" International Journal of ChemTech Research, Vol.8(1).



# MUSA Acuminata Plant Parts as Environment Friendly Corrosion Inhibitor for Mild Steel in Acid Media

Gunavathy. N and Murugavel S.C

## I. INTRODUCTION

**C**ORROSION is an undesirable phenomenon which destroys luster and beauty of materials and lessens their life. It is a natural process of destruction like earthquakes, floods, volcanic eruptions etc. with one major difference that we can be only a silent spectator to above processes of destruction, whereas corrosion can be prevented or at least controlled (Fontana (1987)). The preliminary steps to reduce, combat or completely eradicate corrosion require the elimination or suppression of chemical reactions by use of corrosion inhibitors.

Most inorganic inhibitors used are toxic substances. Safety and environmental issues of corrosion inhibitors has become a global concern. The ultimate solution is through utilization of natural products. Use of plant extracts offers higher efficiency because corrosion inhibition is fortified through synergism (Wan Nik *et al.*, (2011)).

Review of available literature shows that selected plant materials have not been studied as acid corrosion inhibitors for mild steel and is available in plenty. The plant material and its various parts (Figure 1) used for studying corrosive inhibitive nature on mild steel are given below,

Plant: *Musa acuminata* 'Nendran'

Fruit peel	-	MAN (P)
Flower	-	MAN (F)
Bract	-	MAN (B)

In the present study, the description of methods used in characterization of plant material and corrosion monitoring techniques are investigated. Corrosion inhibition effect of peel, flower and bract extract of *Musa acuminata* in 1 N HCl, 1 N H<sub>2</sub>SO<sub>4</sub> and H<sub>3</sub>PO<sub>4</sub> on mild steel was carried out using conventional weight loss method and surface examination analysis.

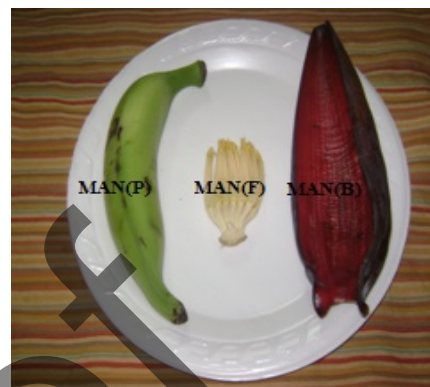


Figure 1 Photograph of *Musa acuminata* plant parts used as corrosion inhibitor

## II. MATERIALS AND METHODS

### 1.1. Phytochemical Analysis

#### • Collection of plant materials

Study was carried out on *Musa acuminata* fruit peel, flower and bract. Samples were obtained from cultivated farm in Thirumalayampalayam, Coimbatore, India. Peel was separated from fruit pulp, inflorescence was separated into florets and bracts, and air dried under shade. Dried samples were ground into powder using an electronic blender, sieved and fine powder was stored in air tight container.

#### • Preparation of the plant extract

Extraction was carried out by maceration using following solvents with increasing polarity: petroleum ether, chloroform, ethyl acetate, methanol and water. 20 g of each part of *Musa acuminata* peel, floret and bract were separately soaked in 200 ml of solvents for 48h at room temperature. Samples were agitated using mechanical shaker to obtain successive extracts and filtered. Filtrates obtained were evaporated to dryness under vacuum using rotary evaporator. These extracts of *Musa acuminata* peel, flower and bract were analyzed for preliminary phytochemical screening. Methods of analysis were carried out using standard qualitative methods as described by various researchers Kotate (1999, 2010) and Harborne (1984, 1998).

Gunavathy. N, Assistant Professor, Department of Chemistry, Nirmala College for Women, Coimbatore  
Murugavel S.C, Associate Professor, Department of Chemistry, PSG College of Technology, Coimbatore

### 1.2. Corrosion Studies

#### • Preparation of specimens

Commercially available mild steel was cut into coupons having dimensions of 5 x 1 x 0.2 cm. Coupons were polished by using emery paper 400 and 600 grade and used for weight loss experiments.

#### • Preparation of plant extract

12.5 grams of powdered plant parts were refluxed with 1 N of respective acids for about 3 hours and left overnight to obtain basic photoconstituents. Solutions were filtered and filtrate made up to 250 mL to obtain 5 % stock solutions which is used in preparing different concentrations of extracts from 0.05 % to 2.0 % v/v.

#### • Weight loss method

Prepared mild steel coupons were immersed in 100 mL of test solution without and with plant extracts of various concentrations for 1h, 3h, 5h, 7h, 12h and 24h at room temperature. Weight of coupons before and after immersion was determined. Inhibition efficiency of mild steel was calculated.

#### • SEM analysis

Surface morphological analysis of mild steel after 1 hour immersion in 1 N acid containing 2 % v/v plant extracts was studied to understand changes that occur during corrosion of mild steel in presence and absence of plant extracts.

## III. RESULTS AND DISCUSSION

### 1.3. Phytochemical analysis

Table 1, indicated that petroleum ether extract of peel, flower and bract of *Musa acuminata* contain alkaloids and glycosides, whereas chloroform extract revealed the absence of phytochemical constituents. Extracts with ethyl acetate showed the presence of flavonoids.

Table 1. Phytochemical constituents present in the extracts of *Musa acuminata*

Phyto Compound	PE			CCl <sub>4</sub>			EtOAc			CH <sub>3</sub> OH			H <sub>2</sub> O		
	P	F	B	P	F	B	P	F	B	P	F	B	P	F	B
Carbohydrates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reducing sugar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkaloids	+	+	+	-	-	-	-	-	-	+	+	+	-	-	-
Saponins	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-
Tannins	-	-	-	-	-	-	-	-	-	++	++	++	++	++	++
Flavonoids	-	-	-	-	-	-	+	+	+	+	+	+	-	-	-
Terpenoids	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-
Phlobotannins	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coumarins	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+
Cycloglycosides	+	+	+	-	-	-	-	-	-	+	+	+	-	-	-
Total phenols	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+
Quinones	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthraquinones	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steroids	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-

Key: PE – Petroleum ether, P - peel, F - flower, B - bract,

“++” active compound copiously present,

“+” active compound present,

“-“ active compound absent

Presence of alkaloids, saponins, flavonoids, terpenoids, coumarins, glycosides, phenols and steroids was confirmed by methanol extracts. Exceptional factor was tannin content which seems to be high in both methanolic and aqueous extract of *Musa acuminata*. Aqueous extracts of all parts indicated presence of phenol.

Extraction with water confirmed presence of coumarins only in aqueous extract of bract and peel parts and not in flower part of *Musa acuminata*. It is clearly evident from tabulation that other phytoconstituents like quinones, steroids and phlobotannins were absent in all three parts of *Musa acuminata*.

Results suggest that the presence of primary bioactive metabolites of commercial importance which acts as the precursors for synthesis of secondary metabolites. These in turn help in development of new bio products as corrosion inhibitor for future.

### 1.4. Inhibition efficiency (IE) and corrosion rate (CR) in different corrosive media for mild steel

Inhibition efficiency for corrosion of mild steel using peel, flower and bract extracts as inhibitor in 1 N HCl, 1 N H<sub>2</sub>SO<sub>4</sub> and 1 N H<sub>3</sub>PO<sub>4</sub> at different concentrations (0.05%, 0.10%, 0.50%, 1.00%, 1.50%, 2.00% v/v ) for 5h immersion period at room temperature are given in Tables 2 to 4. All three extracts act as good inhibitors for mild steel in all three acid media. From the table it is clear that the inhibitor efficiency is comparatively high in 1 N HCl than in 1 N H<sub>2</sub>SO<sub>4</sub> and 1 N H<sub>3</sub>PO<sub>4</sub>.

Corrosion inhibition by plant extracts takes place by adsorption mechanism. With increase in concentration of plant extracts, more phyto constituents are being adsorbed on to the surface of the metal, enhancing more uniform surface coverage, which decrease corrosion. Similar trend of increasing inhibition efficiency with increasing inhibitor concentration has been reported in literature by El Etre (2005). It is widely accepted that inhibition process is by physical or chemical adsorption of the chemical constituents. The adsorption of phyto constituents on the metal surface makes a barrier for mass and charge transfers thus protecting the metal surface from corrosion. The degree of protection increases with increasing surface fraction occupied by adsorbed molecules (Shyamala and Arulanantham, (2009)).

Table 2 CR and IE of mild steel in the presence and absence of peel extract in different acid media

Conc. % v/v	1 N HCl		1 N H <sub>2</sub> SO <sub>4</sub>		1 N H <sub>3</sub> PO <sub>4</sub>	
	CR (mm/y)	IE %	CR (mm/y)	IE %	CR (mm/y)	IE %
Blank	28.46	-	58.47	-	19.19	-
0.05	4.30	84.89	19.39	66.83	13.28	30.78
0.10	3.21	88.72	11.19	80.86	10.54	45.06
0.50	2.30	91.93	5.55	90.51	6.87	64.23
1.00	1.81	93.66	4.39	92.49	6.69	65.16
1.50	1.18	95.85	2.52	95.69	6.46	66.30
2.00	1.11	96.08	1.36	97.67	6.11	68.18

Table 3 CR and IE of mild steel in the presence and absence of flower extract in different acid media

Conc. % v/v	1 N HCl		1 N H <sub>2</sub> SO <sub>4</sub>		1 N H <sub>3</sub> PO <sub>4</sub>	
	CR (mm/y)	IE %	CR (mm/y)	IE %	CR (mm/y)	IE %
Blank	23.52	-	53.63	-	19.19	-
0.05	2.96	87.39	17.88	66.67	12.30	35.89
0.10	2.47	89.48	10.90	79.68	9.99	47.97
0.50	2.21	90.62	6.40	88.07	7.18	62.60
1.00	0.96	95.92	4.77	91.11	6.49	66.20
1.50	0.91	96.11	3.97	92.60	6.40	66.67
2.00	0.67	97.16	2.67	95.01	5.75	70.03

Table 4 CR and IE of mild steel in the presence and absence of bract extract in different acid media

Conc. % v/v	1 N HCl		1 N H <sub>2</sub> SO <sub>4</sub>		1 N H <sub>3</sub> PO <sub>4</sub>	
	CR (mm/y)	IE %	CR (mm/y)	IE %	CR (mm/y)	IE %
Blank	16.72	-	54.83	-	19.19	-
0.05	3.19	80.93	21.82	60.20	12.30	35.89
0.10	2.23	86.67	14.87	72.89	9.58	50.06
0.50	1.81	89.20	6.33	88.46	8.49	55.75
1.00	1.60	90.40	5.37	90.20	7.53	60.74
1.50	0.89	94.67	4.50	91.79	6.80	64.58
2.00	0.85	94.93	3.79	93.09	6.40	66.67

### 1.5. Surface Examination Studies

Surface morphological characteristics of uninhibited mild steel in 1N HCl, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub> and inhibited mild steel using plant extracts in 1N acid were analyzed using JOEL SEM model JSM 6360. SEM photographs of the mild steel specimens after immersion in 1N HCl, H<sub>2</sub>SO<sub>4</sub> and H<sub>3</sub>PO<sub>4</sub> for three hours at room temperature without and with inhibitor containing optimum concentration of (2 % v/v) plant extracts are presented in Figures 2-4 respectively. Inspection of figures 2-4 (a) revealed that the uninhibited specimens were rough and extremely

damaged (Patel *et al.* (2009)). The depth of surface corroded due to exposure of mild steel to acid is well visible with shallow pits, pores and cracks (Vinod Kumar *et al.* (2010)). From the figures 2-4 (b) it is clearly evident that the less damage of mild steel surface which clearly confirms the inhibition action due to the formation of protective film by phytochemical components present in plant extracts on mild steel surface resulting in a decrease in contact between metal and aggressive medium and effectively exhibit excellent inhibition effect (Deng *et al.* (2011)). It was also noticed that the corrosion products formed are found to deposit as separate layers in cluster.

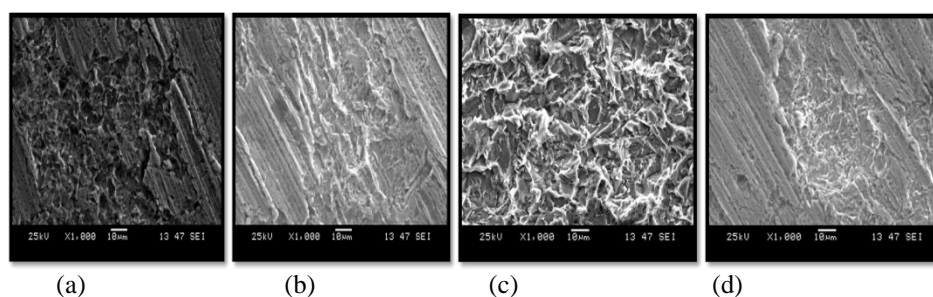


Figure 2 Mild steel exposed to (a) 1N HCl (b) peel extract (c) flower extract (d) bract extract

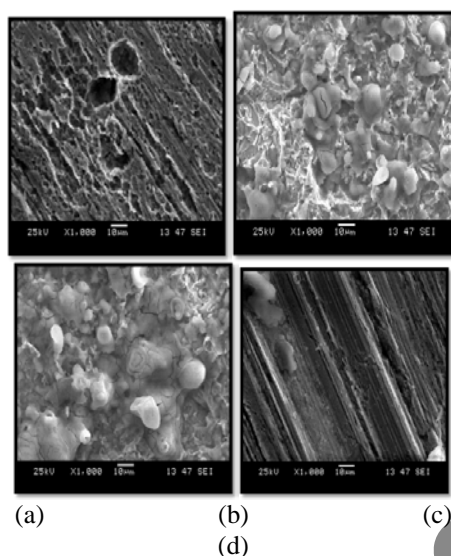


Figure 3 Mild steel exposed to (a) 1N H<sub>2</sub>SO<sub>4</sub> (b) peel extract (c) flower extract (d) bract extract

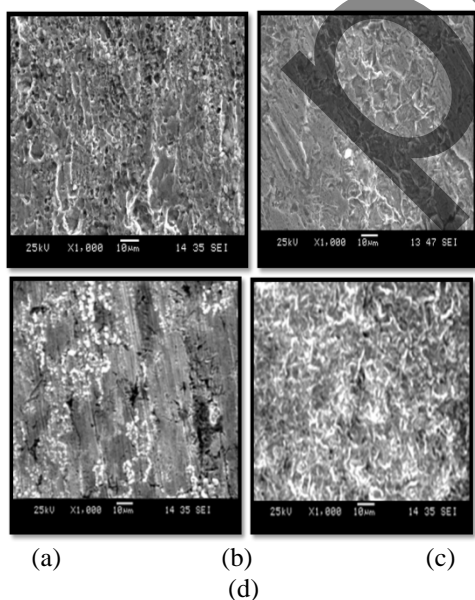


Figure 4 Mild steel exposed to (a) 1NH<sub>3</sub>PO<sub>4</sub> (b) peel extract (c) flower extract (d) bract extract

#### IV. CONCLUSION

*Musa acuminata* peel, flower and bract extracts act as good inhibitor for corrosion of mild steel in acid media. Corrosion inhibition action of plant extracts increased as its concentration increases. Surface studies involving SEM confirmed efficiency of plant extract as corrosion inhibitor for mild steel. Inhibition of mild steel in acid solution by plant extract is attributed to adsorption of phytochemical compounds present in extract onto active sites on surface of mild steel. Renewable resource based derivatives are cost-effective, abundantly available, biodegradable, environmentally benign alternatives for corrosion resistant coatings, paints and inhibitors.

#### REFERENCES

- [1] Deng, S., Li, X. and Fu, H. "Two pyrazine derivatives as inhibitors of the cold rolled steel corrosion in hydrochloric acid solution", *Corros. Sci.*, Vol.53, pp.822-828, 2011.
- [2] El-Etre, A. Y., Abdallah, M. and Eel-Tantawy, Z. E. "Corrosion inhibition of some metals using lawsonia extract", *Corros. Sci.*, Vol. 47, No.2, pp.385-395, 2005.
- [3] Fontana, M. G. and Greene, N. D. *Corrosion Engineering*, McGraw-Hill, New York, pp.265-398, 2nd Ed., 1987.
- [4] Harborne, J. B. *Phytochemical Methods: A guide to modern techniques of plant analysis*, Chapman and Hall, London, 2nd Ed., 1984 a.
- [5] Harborne, J. B. *Phytochemical Methods: A guide to modern techniques of plant analysis*, Chapman and Hall, London, pp.302, 3rd Ed., 1998 b.
- [6] Kokate, A." *Phytochemical methods*", *Phytotherapy Res.*, Vol.78, pp.126-129, 1999 a
- [7] Kokate, C. K, Purohit, A. P. and Gokhale, S. B. *Pharmacognosy*, Nirali prakashan, Pune, pp.6.15-6.36, 2010 b.
- [8] Patel, N. S., Jauhari, S. and Mehta, G. N. "Mild steel corrosion inhibition by Bauhinia Purpurea leaves extract in 1N sulphuric acid", *Arb. J. Sci. Eng.*, Vol.34, No.2C, pp.61-69, 2009.
- [9] Shyamala, M. and Arulanantham, A. "Eclipta Alba as corrosion pickling inhibitor on mild steel in hydrochloric acid", *J. Mater. Sci. Technol.*, Vol.25, No.5, pp.633-636, 2009.
- [10] Vinod Kumar, K. P., Narayanan Pillai, M. S. and Rexin Thusnavis, G. "Pericarp of the fruit of Garcinia Mangostana as corrosion inhibitor for mild steel in hydrochloric acid medium", *Portugaliae Electrochim. Acta.*, Vol.28, No.6, pp.373-383, 2010.
- [11] Wan Nik, W. B., Rosliza, R. and Izman, S. "Efficiency comparison of some natural products on corrosion inhibition of Al-Mg-Si alloy", *Advanced Mat. Res.*, Vols.328-330, pp.1206-1209, 2011.

# Synthesis and Characterization of Some Novel Nano Materials for the Degradation of Commercial Dyes

T. Maruthavanan, C. Mageswari and R. Kannan

**ABSTRACT---** *One of the greatest problems that the world is facing today is that of environmental pollution, increasing with every passing year and causing grave and irreparable damage to the earth. Among all types of environmental pollution, water pollution affords a significant contribution for the environmental degradation. In almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities. Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels. Enormous number of researchers found solutions to minimize water pollution by treating industrial waste waters with some adsorbents especially by modified activated carbons. The present study focuses the synthesis, characterization of some new and novel nano sized adsorbents for the commercial dye degradation. Nano structured manganese oxide material has been synthesized by hydrothermal method and characterized by powder XRD and SEM. The experimental results show that the nano structured material exhibits excellent catalytic oxidation towards the decolorization of some commercial dyes those are used in dyeing industries.*

## I. INTRODUCTION

ONE of the greatest problems that the world is facing today is that of environmental pollution, increasing with every passing year and causing grave and irreparable damage to the earth. Environmental pollution consists of five basic types of pollution, namely, air, water, soil, noise and light.

Pollution is the introduction of contaminants into the natural environment that causes adverse change in the earth. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants.

Pollution is often classed as point source or nonpoint source pollution. Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels (international down to individual aquifers and wells). It has been suggested that it is the leading worldwide cause of deaths and diseases, [1][2] and that it accounts for the deaths of more than 14,000 people daily.[2] An estimated 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrheal sickness every day.[3] Some 90% of China's cities suffer from some degree of water pollution,[4] and nearly 500 million people lack access to safe drinking water.[5] In addition to the acute problems of water pollution in developing countries, developed countries continue to struggle with pollution problems as well. In the most recent national report on water quality in the United States, 45 percent of assessed stream miles, 47 percent of assessed lake acres, and 32 percent of assessed bays and estuarine square miles were classified as polluted.[6]

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical or sensory changes such as elevated temperature and discoloration. Oxygen-depleting substances may be natural materials, such as plant matter (e.g. leaves and grass) as well as man-made chemicals. Other natural and anthropogenic substances may cause turbidity (cloudiness) which blocks light and disrupts plant growth, and clogs the gills of some fish species.<sup>[7]</sup>

Many of the chemical substances are toxic. Pathogens can produce waterborne diseases in either human or animal hosts.<sup>[8]</sup> Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and eutrophication. Eutrophication is an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases in the primary productivity of the ecosystem. Depending on the degree of eutrophication, subsequent negative environmental effects such as anoxia (oxygen depletion) and severe reductions in water quality may occur, affecting fish and other animal populations.

- Petroleum hydrocarbons, including fuels (gasoline, diesel fuel, jet fuels, and fuel oil) and lubricants (motor oil), and fuel combustion byproducts, from stormwater runoff[9].

T. Maruthavanan, SONASTARCH, Department of Chemistry, Sona College of Technology (Autonomous), Salem – 636 005

C. Mageswari, SONASTARCH, Department of Chemistry, Sona College of Technology (Autonomous), Salem – 636 005

R. Kannan, R&D Education Center for Specialized Graduate School of Hydrogen and Fuel Cells Engineering, Chonbuk National University, Jeonju, Korea

- Fertilizers containing nutrients--nitrates and phosphates—which are found in stormwater runoff from agriculture, as well as commercial and residential use[9]
- Heavy metals from motor vehicles (via urban stormwater runoff)[9][10] and acid mine drainage
- Silt (sediment) in runoff from construction sites, logging, slash and burn practices or land clearing sites.
- Most municipal plants are not designed to treat toxic pollutants found in industrial wastewater.[11]
- Industries generating large volumes of wastewater typically operate their own complete on-site treatment systems[12].

The basis for classification Textile dyestuffs are grouped in to 14 categories or classes.

- a. Acid dyes
- b. Basic dyes
- c. Direct (substantive)dyes
- d. Mordant (chrome) dyes
- e. Vat dyes
- f. Reactive dyes
- g. Disperse dyes
- h. Azoic dyes
- i. Sulfur dyes
- j. Developed dyes
- k. Solvent dyes

The first human-made (synthetic) organic dye, mauveine, was discovered by William Henry Perkin in 1856. Many thousands of synthetic dyes have since been prepared.

Synthetic dyes quickly replaced the traditional natural dyes. They cost less, they offered a vast range of new colors, and they imparted better properties to the dyed materials. Dyes are now classified according to how they are used in the dyeing process.

#### a. Removal of dyes in Industrial waste water by novel adsorbents

It is very important and challenging task nowadays is the disposal of industrial wastes especially dyes house effluents. So many attempts have been made so far for this purpose and the emerging technology can be used for the same purpose. One among these technologies is adsorptive removal of these industrial dyes by some novel nano sized materials.

#### b. Use of hydrogen peroxide

Degradation of organic pollutants such dyes can be removed by oxidation using hydrogen peroxide. Because hydrogen peroxide is a environmental friendly oxidant, and it does not produce any side products and cost effective. A major drawback to the use of  $H_2O_2$  is its low activity at room/lower temperatures. In order to overcome these problem various metal and metal oxide have been

used in order to improve the catalytic efficiency of  $H_2O_2$ <sup>[37-39]</sup>.

Manganese oxide materials have shown interesting properties dues to its nano size, porosity, high surface area and different structural forms. The present work focuses on the synthesis of layered manganese oxides and the metal ion impregnated manganese oxide materials, which was tested for the catalytic oxidation of Methylene blue dye in the presence and the absence of  $H_2O_2$  in aqueous solution.

The main objectives of this study include the following.

- Preparation of  $MnO_2$  and its characterization by powder X – ray diffraction.
- Catalytic studies of the catalyst towards the Commercial dye decolorization by UV-visible spectrum.
- The effect of the stoichiometric variation of catalyst towards the dye decolorization.

## II. MATERIALS AND METHODS

Manganese chloride, Sodium hydroxide, hydrogen peroxide were purchased from Merck, India. Double Distilled Water (DDW) was used throughout the experiment. The  $MnO_2$  nano particles were synthesized by the procedure as per the literature and the same is characterized by powder XRD, SEM andFT-IR methods.

### a. Degradation studies

The decolorization studies were carried out using batch studies. About 50 ml of the dye solution (commercial dye (blue) 0.1 mM), and various amount of catalysts with and without oxidant was added and the mixture was allowed to react at room temperature with continuous stirring. At format time interval, 1 ml of the mixture solution was pipette into a volumetric flask and diluted with distilled water to 20 ml prior to the analysis. The degradation studies were carried out by addition of hydrogen peroxide as an oxidant was used and the effect of oxidant was also tested. For optical absorption measurements, the diluted solution was immediately centrifuged in order to remove the catalyst particles. The centrifuged dye solution was then put into a quartz cell (path length 1.0 cm) and the absorption spectrum was measured with aElicoUV-160 ultraviolet-visible (UV-Vis) spectrophotometer equipped with computer controlled software.

## III. RESULTS AND DISCUSSION

### a. Physical characterization of Manganese oxide

Microporous and mesoporous manganese oxide, are like the clay like material and are having high technological importance. These materials can be

prepared by varieties of routes. Many of the materials with similar gross structural features nevertheless show a diversity of properties depending on the specific synthetic route. These differences can be attributed to variations in particle size and the type and amount of defects in the structures. For this reason, small changes in synthetic parameters can result in materials with novel catalytic, electrochemical, and ion-exchange properties.

Here we synthesized manganese oxide material and the structural properties of material was tested by FTIR, powder X-ray diffraction and the topology was analyzed by Scanning Electron Microscopy. The catalytic activity of the materials was tested for the degradation of organic dye (Methylene Blue) and commercial dye (Blue). The effect of initial concentration of dye, amount of catalytic, the solution pH and the amount oxidant was tested and discussed in detail.

Precipitation routes involving redox reactions of  $\text{Mn}^{7+}$  (permanganate) and/or  $\text{Mn}^{2+}$  salts are common for formation of manganese oxides because molecular  $\text{Mn}^{4+}$  materials suitable for precursors are rare. Typical materials formed from precipitation routes include layered manganese oxides (birnessites) and condensed phase materials such as hausmannite ( $\text{Mn}_3\text{O}_4$ ). The birnessites incorporate cations (typically alkali or alkaline earth metal ions) between the layers to balance the negative charge on the sheets, as well as differing amounts of hydrated water. They can undergo ion-exchange reactions, replacing the cations between the layers with other alkali or alkaline earth metal ions as well as protons.

#### b. X-ray diffraction measurements

Powder XRD technique is a powerful tool to analyze the crystalline pattern of the material. Because the crystalline pattern or type alters the catalytic property of the material. In powder XRD patterns for manganese oxide is shown in fig 3. The XRD peak at  $37^\circ$  confirms the formation of manganese oxide materials. The XRD peaks  $2\theta$  at  $12.5^\circ$  matches with the  $\text{MnO}_2$  type of layered manganese oxide with the interlayer spacing of about  $7.05 \text{ \AA}$ . The prepared material indicates it is highly porous in nature.

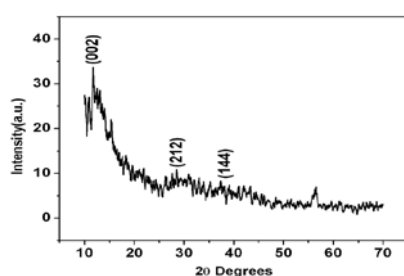


Fig 1. X-ray diffraction pattern for as prepared  $\text{MnO}_2$ .

The crystalline size was calculated from the full-width at half-maximum (FWHM) of the most intense diffraction peaks using Debye-scherrer formula:

$$D = 0.9\lambda / \beta \cos \theta$$

Where,

$\lambda$ -Wavelength of X-ray ( $1.54 \text{ \AA}$  in this case),

$\beta$ -Width half maximum of the diffraction peak (radians),

$\theta$ - Diffraction angle of the peak on the  $2\theta$  scale.

$\text{MnO}_2$  shows [Fig - (1)] fairly broad peak suggesting the nanocrystalline nature. From the JCPDS No 24-722, the three strong peaks appeared at angles ( $2\theta$ ) of  $10^\circ$ ,  $26^\circ$  and  $35^\circ$  are corresponding to (002), (212) and (144) plane which confirms the cubic crystalline structure. The size of the nano rods were calculated using Debye -Scherrer formula using (212) reflection of the XRD pattern and average particle size estimated was  $107 \text{ nm}$ . Broad peaks related to poorly crystallized compound originating from the small particle size and approximately amorphous nature of the powder.

For comparison, pure  $\text{MnO}_2$  having spiky structure with a size of  $107 \text{ nm}$  was also prepared by a simple soft chemistry route at room temperature [16]. The XRD results show the components of the structures and potential chemical changes take place in both the Baeyer reaction and thermal treatment. The high-magnification observation from the cross section shows a lattice image of layered structure in which the  $d$  spacing of the composite is  $7 \text{ \AA}$ , which coincides with the XRD result.

#### UV-visible Spectra:

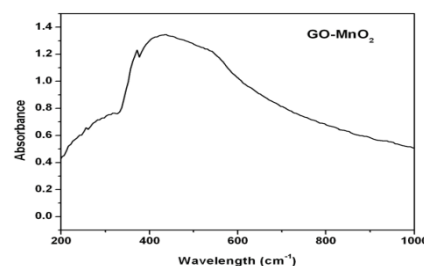


Fig 2 (a) UV-VISIBLE spectrum of  $\text{MnO}_2$  nanoparticle

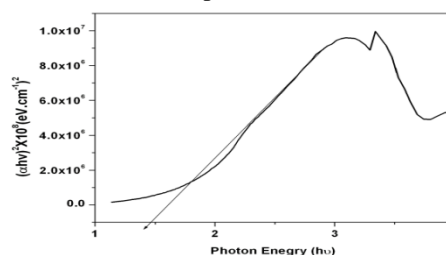


Fig 2 (b) Energy Gap graph for  $\text{MnO}_2$  nanoparticle



Before examining the photocatalytic activity it is important to study the optical absorption of the synthesized NPs because the UV-Vis absorption edge is relevant to the energy band of the semiconductor Catalyst. The study of the optical properties of the materials provides a convenient and effective method for explaining some important features concerning the band structures. Optical properties of the  $\text{MnO}_2$  nanoparticle were investigated by UV-Vis spectroscopy. The inorganic-organic intercalation compounds have strong absorption within ultraviolet and visible regions.

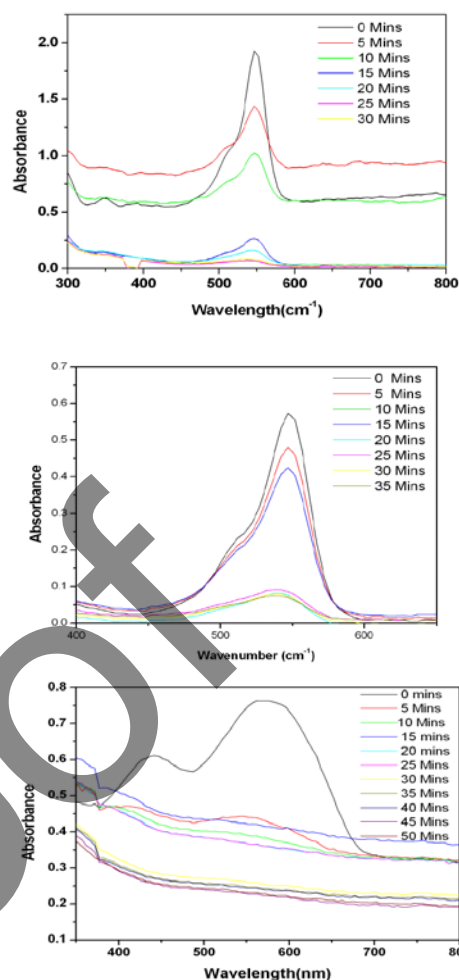
Fig. 2(a) shows the UV-Vis absorption spectrum of as-prepared  $\text{MnO}_2$  nanoparticle dispersed in ethanol. Dispersed ethanol solution of the  $\text{MnO}_2$  nanoparticle had an orange color. It is known that the sizes and morphologies greatly affect the optical properties of semiconductor nanomaterials. As shown in the Fig. 2(b), the absorption edge of the  $\text{MnO}_2$  nanoparticle is observed at the wavelength of about 425 nm. This indicates that the  $\text{MnO}_2$  nanoparticle prepared by this method could be a kind of photocatalytic material. Band-to-band absorption at 425 nm for as-obtained  $\text{MnO}_2$  nanoparticle. Using the absorption data the energy band gap ( $E_g$ ) was estimated by Tauc's relationship (Eq.(1)):

$$\alpha h\nu = k(h\nu - E_g)^{n/2}$$

where  $k$  is the probability parameter for the transition (independent of photon energy), also the constant  $k$  is a measure of the disorder of the material,  $\alpha$  is the absorption coefficient,  $m$  is frequency,  $h$  is Planck's constant,  $E_g$  is the optical band gap of the material, and  $n$  depends on the type of electronic transition and can be any value between 1 and 4<sup>[42]</sup>. If a straight line is obtained for  $n = 1$ , it indicates a direct electron transition between states of semiconductor, whereas the transition is indirect if a straight line graph is obtained for  $n = 4$ . The energy gap of the NPs has been determined by extrapolating the linear portion of the plots of (energy axis (inset in Fig. 7), while the plot of ( versus  $h\nu$  is non-linear and not shown here. For the bulk  $\text{MnO}_2$  nanoparticle, the intrinsic band gap is in the range 1.4 eV.

### c. Catalytic studies

The catalysis studies were performed by batch studies method. The effect of catalyst was tested by the following methods, initially the pure dye solution allowed to react with  $\text{H}_2\text{O}_2$ , and second one the adsorption behavior of dye on catalyst was tested. The catalytic effect of the catalytic material was tested with  $\text{H}_2\text{O}_2$  third the dye molecule. The results were shown below.



Fig(3). UV-Vis spectrum for (a) 0.1mg  $\text{MnO}_2$ +1%  $\text{H}_2\text{O}_2$ +0.1Mm Commercial dye (blue), (b) 0.1mg  $\text{MnO}_2$ + 1%  $\text{H}_2\text{O}_2$ +0.2Mm Commercial dye (blue), (c) 0.1mg  $\text{MnO}_2$ + 1%  $\text{H}_2\text{O}_2$ +0.1Mm Commercial dye (blue)

### d. Effect of concentration of dye

The effect of different initial dye concentrations on catalytic decolorization was investigated in the presence of 5 g/L catalyst at a neutral pH of 6.8, as shown in Fig. 3. The percentage of decolorization decreased with the increased of the initial dye concentrations both Commercial dye (blue). The results were in good agreement with those reported in literatures. The hydrogen peroxide 1 % with catalyst shows 98 % .The adsorption of dye on the catalyst was about 71 %. The better adsorption is lead to fast deadsorption followed by the degradation, because the catalyst will ready to supply active electron to the dye and get degrade easily.



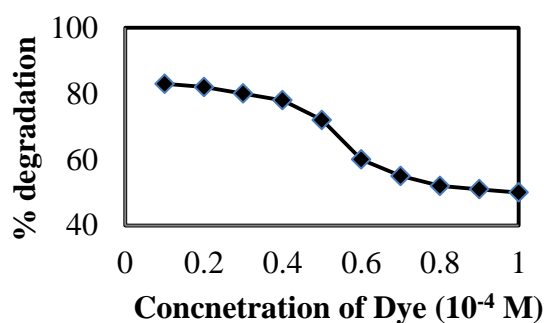


Fig4. Effect of Initial concentration of Dye for the degradation in percense of 1 % H<sub>2</sub>O<sub>2</sub>

e. *Effect of concentration of H<sub>2</sub>O<sub>2</sub>*

The effect of concentration of H<sub>2</sub>O<sub>2</sub> on the catalytic degradation green was obtained from the experiments carried out by varying by 1 %, 5 % and 10 %, maintaining concentration of green is constant. The plot of degradation vs. hydrogen peroxide is presented in Fig 4. It can be seen that the rate constant increases with increase in the concentration of H<sub>2</sub>O<sub>2</sub> from 0.1 % to 1 % and on further increase in [H<sub>2</sub>O<sub>2</sub>], the activity was decreases. The initial increase of degradation up to 0.5% addition of H<sub>2</sub>O<sub>2</sub> is due to the increased formation of hydroxyl radicals from the adsorbed H<sub>2</sub>O<sub>2</sub>. But of further increasing the hydrogen peroxide concentration though the formation of hydroxyl radical is increased, the scavenging reaction of the hydroxyl radicals predominates and resulted in the reduced dye degradation rates.

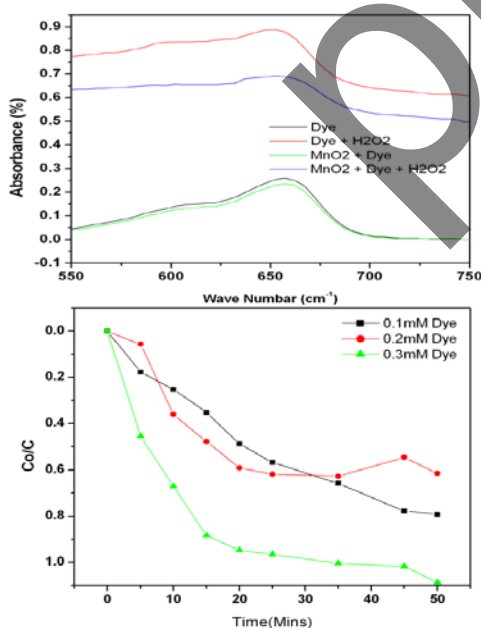


Fig 5. Plot of degradation rate for variation of [MB dye] = 0.1, 0.2, 0.3Mm

As mentioned above, the enhancement of H<sub>2</sub>O<sub>2</sub> for the degradation of commerical dye blue could be mainly due to contribution of additional •OH radicals produced from H<sub>2</sub>O<sub>2</sub> dissociation. So more •OH radicals would be produced and higher degradation ratios were observed at higher H<sub>2</sub>O<sub>2</sub> concentration. However, the enhancement did not increase when H<sub>2</sub>O<sub>2</sub> addition was more than 100 mg L<sup>-1</sup>.

f. *Effect of time*

The contact time between the dye and catalyst is an important parameter to decide the decolorization rate. For this the adsorption was checked for various time interval, the maximum adsorption is 92% in 30 min and which was remained for about 90 min, then the desorption starts. The initial adsorption of dye of about 80% was readily used for the degradation. For increasing the time the decolorization was increased up to 60 min. after that there would not any change in the decogrdation.

g. *Recyclability of catalyst*

The degradation efficiency of manganese oxide is high. After the first experiment, the catalyst was recovered and used for further experiments. The results showed that the catalyst efficiency was decreased of degradation from 98% to 92 % up to 5<sup>th</sup> cycle the catalyst showed only a decrease of 6-7% in the efficiency. This fact clearly proves that the catalyst is very efficient and reusable. Which is due to the active sites of catalyst was occupied by the degraded molecules and subsequently hinders the activity of the catalyst. The degradation rate is affected.

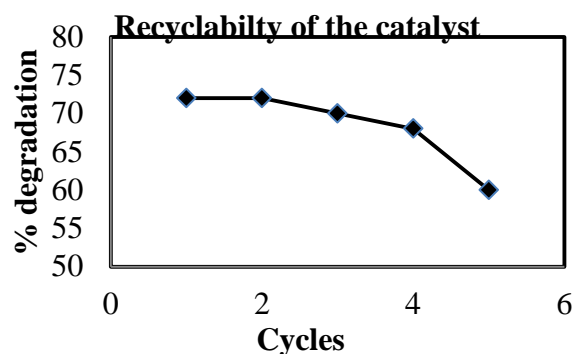


Fig.(6). Effect of recyclability of the catalyst for the degradation of dye

h. *Photodegradation of commerical dye blue in the presence of MnO<sub>2</sub>:*

The degradation is much slower. Take about additional 50mins until complete degradations of the dye according to uv-visible spectroscopy. For the largest particle the degradation reaction slows down significantly at longer irradiation times. This is not observed incase of

the smaller particle. After an sun light an irradiations time of about 60mins , the commerical dye blue is completely decomposed according to UV-Visible spectroscopy. The photodegradation rate decreased with the increasing initial concentration. For the initial concentration of 0.5mg 83% of the commerical dye blue remained in the solution even after 300 min of the illumination Fig.5.(a,b,c) . No remarkable peak shift was observed. The absorbance peak of MB significantly decreased to 0.14 after 60 min of UV irradiation, then continued down to 0.16 of the initial absorbance (0.427) upon prolonging the irradiation time to 300 min<sup>[17]</sup>.

#### i. Mechanism of Dye degradations:

According to the above analysis, it can be concluded that the demethylation of commerical dye blue dye proceeds upon the interaction with layered MnO<sub>2</sub>nanoparticles in acidic aqueous solution, which is accompanied by a rapidly-diminished absorbance at the wavelength of 600 nm and a blue shift in the UV-Vis spectra of the monitored commerical dye blue solution as shown in Fig. 3 (a,b,c).

In the later period, the aromatic ring is decomposed, which is relatively slow as compared with the demethylation and results in small molecules with one benzene ring and some inorganic ions such as NO<sub>3</sub> and SO<sub>4</sub>. The layered MnO<sub>2</sub>nanosheets, in the acidic solution, are reduced eventually to dissolve Mn<sup>2+</sup>.The acidic conditions are in favor of the efficient oxidative degradation of commerical dye blue.

#### IV. CONCLUSIONS

The Manganese Oxide was synthesized by hydrothermal method. The nanostructured material exhibits excellent catalytic oxidation towards the decolorization of MB dye and commercial dye. In this manganese oxide can acts as both platform as well as the electron transfer mediator. The hydrogen peroxide mediated degradation of dye molecules by the manganese oxide is an effective process for the removal of organic pollutants. The present study shows that the manganese oxide has great potential for practical catalytic oxidative decolorization and degradation of dyes in industrial effluents. About 98% of the dye molecules are removed by degradation with the lesser amount of hydrogen peroxide solution.

#### REFERENCES

- [1] Pink, Daniel H. (April 19, 2006). "Investing in Tomorrow's Liquid Gold".
- [2] West, Larry (March 26, 2006). "World Water Day: A Billion People Worldwide Lack Safe Drinking Water".
- [3] A special report on India: Creaking, groaning: Infrastructure is India's biggest handicap". The Economist. December 11, 2008.
- [4] "China says water pollution so severe that cities could lack safe supplies". Chinadaily.com.cn. June 7, 2005.

- [5] "As China Roars, Pollution Reaches Deadly Extremes". The New York Times. August 26, 2007.
- [6] United States Environmental Protection Agency (EPA). Washington, DC. "The National Water Quality Inventory: Report to Congress for the 2002 Reporting Cycle – A Profile." October 2007. Fact Sheet No. EPA 841-F-07-003.
- [7] EPA. "Protecting Water Quality from Agricultural Runoff." Fact Sheet No. EPA-841-F-05-001. March 2005.
- [8] C. Michael Hogan (2010). "Water pollution."Encyclopedia of Earth. Topic ed. Mark McGinley; ed. in chief C. Cleveland. National Council on Science and the Environment, Washington, DC.
- [9] Newton, David (2008). Chemistry of the Environment. Checkmark Books. ISBN 0-8160-7747-9.
- [10] "Environmental works: types of sewage. Encyclopaedia Britannica Online. N.p., 2009. Web. October 9, 2009. <http://www.search.eb.com/eb/article-72342.
- [11] EPA (2004)."Primer for Municipal Wastewater Treatment Systems." Document No. EPA 832-R-04-001.
- [12] Q. Huo, D. I. Margolese, U. Ciesla, P. Feng, T. E. Gier, P. Sieger
- [13] 13. S. Turner and P. R. Buseck, Science, 1979, 203, 456.
- [14] 14. G. Blasse, Philips Res. Rep., 1964, Suppl. No. 3. 44, 125.
- [15] 15. Q. Feng, Y. Miyai, H. Kanoh and K. Ooi, Langmuir, 1992, 8, 1861.
- [16] 16. P.R. Gogate, A.B. Pandit, Adv. Environ. Res. 8 (2004) 501.
- [17] 17. R. Kannan, A. Jegan, K. Karunakaran, A. Ramasubbu, S. Vasanthkumar, Dig. J. Nanomat. Biomater.6 (2011) 829.

# Synthesis and Characterisation of Ferrocenethiosemicarbozone – Ru(III) Complexes

Sivahari R, Mayildurai R., Aranganayagam K.R., Karthik K  
and Daniel S

**Abstract---** *Ferrocenylthiosemicarbazone and ferrocenyl-N-phenyl thiosemicarbazone ligands and that of their ruthenium(III) complexes were synthesized and characterized by using FT-IR spectroscopic studies. The results from FT-IR studies confirms the bonding sites are NS with Ru(III) ion. Elemental analysis is also in good agreement with the proposed structure.*

**Keywords---** *Ru(III) complexes, FT IR Studies, Ferrocene, Ru(III)*

## I. INTRODUCTION

PHOTO induced electron or energy transfer in multicomponent molecular devices containing electro and photoactive subunits are currently the subject of extensive investigations<sup>1-4</sup>. The electrochemical properties of molecular devices consist of bis-terpy complexes linked to a ferrocenyl moiety has been reported<sup>5</sup>. Ferrocene and its derivatives have been investigated<sup>6-7</sup> due to their use as colour pigments<sup>8</sup> and as high burning rate catalysts<sup>9</sup>. Today cisplatin is still one of the most widely used metal containing chemotherapeutic drugs in USA, Europe and Japan<sup>10</sup>. It has also been shown that compared to cisplatin, certain ferrocenium salts have more favorable 50% lethal dosage (LD<sub>50</sub>) values<sup>11,12</sup>. Ferrocenylthiosemicarbazide containing transition metal compounds have been found to be active against protozoa<sup>13</sup>, tumours<sup>14</sup>, pesticides and fungicides<sup>15</sup>. Transition metal complexes of thiosemicarbazone have been screened for medicinal properties<sup>16</sup> and possess some degree of cytotoxic activity<sup>17</sup>.

The present work is focused on the synthesis, characterization of ferrocenylthiosemicarbazone ruthenium and (III) complexes. The acetylferrocene was first prepared by the reaction of ferrocene with acetic anhydride in the presence of BF<sub>3</sub> as given in Step 1. Then ferrocenylthiosemicarbazide ligands were synthesized by the condensation of acetylferrocene with appropriate thiosemicarbazide ligands and ruthenium (III) starting complexes in dry benzene in 1:2 molar ratio (step 2) yielded trimetallic complexes of the type [RuCl(AsPh<sub>3</sub>)(L)<sub>2</sub>]; L = bidentate Schiff base ligand (Scheme 1).

## II. EXPERIMENTAL METHODS

All the reagents used were of analar or chemically pure grade. Ruthenium trichloridetrihydrate (RuCl<sub>3</sub>·3H<sub>2</sub>O), purchased from Himedia was used without further purification. Solvents were purified by following literature procedure. C, H and N analysis were performed with Vario EL III elemental analyzer. IR Spectra of the ligands and their complexes have been recorded using KBr pellets with a Shimadzu/Nicolet instrument in the 4000-400 cm<sup>-1</sup> range. Melting points were recorded on Loba India melting point apparatus.

## III. PREPARATION OF ACETYL FERROCENE

Acetyl ferrocene was prepared according to the literature procedure as follows. A stirred solution of 5 gm (0.027 mol) of ferrocene and 5.5 gm (0.054 mol) of acetic anhydride in 45 cm<sup>3</sup> of CH<sub>2</sub>Cl<sub>2</sub>, cooled in an ice bath, was saturated with gaseous borontrifluoride (copious evolution of white fumes). The amber coloured solution soon became deep purple. After stirring for 0.5 h, the reaction mixture was allowed to attain room temperature and kept intact for 4 h. Excess of sodium acetate solution was then added with stirring, whereby two layers were separated. The dichloromethane layer was washed with water, followed by the saturated solution sodium bicarbonate and dried over magnesium sulphate. After filtration the solvent was removed and the residue recrystallized from hexane to give 3 gm (60%) of orange needles of acetylferrocene.

Melting point : 85 – 86 °C

Sivahari R, Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 49. Email: sivaharikct@gmail.com

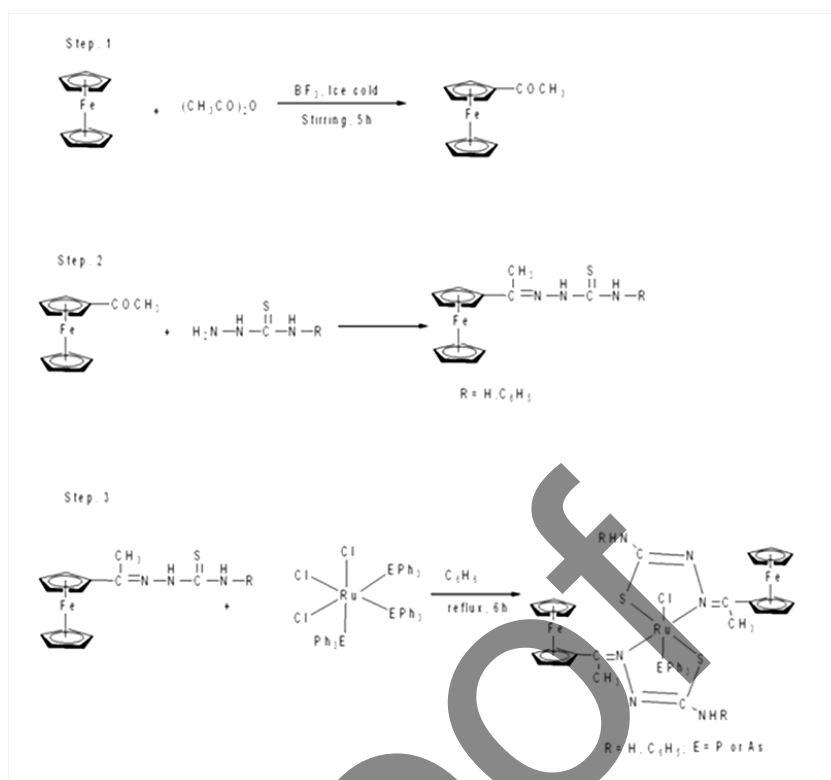
Mayildurai R., Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 49.

Aranganayagam K.R., Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 49.

Karthik K, Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 49.

Daniel S, Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 49.

Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 49. Email: sivaharikct@gmail.com



Scheme 1 Stepwise Preparation of New Ru(III) Complexes

#### IV. PREPARATION OF BIDENTATE SCHIFF BASE LIGANDS

Schiff bases of the following general structure was prepared and reacted with starting complexes to yield new complexes. The names of the abbreviations of the Schiff base are given below.

R	Name of the Ligand	Abbreviations
H	1- Acetylferrocene thiosemicarbozone	FL
C <sub>6</sub> H <sub>5</sub>	1- Acetylferrocene-4-phenylthiosemicarbozone	FPL

##### Preparation of 1- Acetylferrocenethiosemicarbazone (FL)

FL was prepared by refluxing a mixture of acetylferrocene and thiosemicarbazide in a 1:1 molar ratio in anhydrous ethanol for 5 h. A few drops of glacial acetic acid were then added and the contents were again refluxed for 1h. The resulting content was cooled and poured into ice. The granular product obtained was filtered, recrystallized from absolute ethanol and dried under vacuum.

Melting point : 130 °C

Yield : 75 %

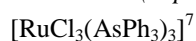
##### Preparation of 1 Acetylferrocene-4-phenylthiosemicarbazone (FPL)

FPL was prepared by refluxing a mixture of acetylferrocene and 4-phenyl thiosemicarbazide in a 1:1 molar ratio in anhydrous ethanol for 5 h. A few drops of glacial acetic acid were then added and content were again refluxed for 1 h. The resulting content was cooled and poured into ice. The granular product obtained was filtered, recrystallized from absolute ethanol and dried under vacuum.

Melting point : 175 °C

Yield : 68 %

##### Preparation of trichlorotris(triphenylarsine)ruthenium(III)



Ruthenium chloride trihydrate (0.2 g) was taken in methanol (25 cm<sup>3</sup>) and concentrated Hydrochloric acid (25 cm<sup>3</sup>) was added. The above mixture was heated under reflux for 30 minutes to the above solution, triphenylarsine (1.2 g) in methanol (25 cm<sup>3</sup>) was added and again refluxed for 30 minutes. The oily mass which separate was kept in a mortar and left to dry in air and crushed by pestle. This was washed with methanol and dried under vacuum.

Melting point : 146 °C

*Preparation of new ruthenium(III) complexes:-*

[RuCl(AsPh<sub>3</sub>)(FL)<sub>2</sub>]

The Schiff base FL (0.060 g; 0.2 mmol) was added to the solution of ([RuCl<sub>3</sub>(AsPh<sub>3</sub>)<sub>3</sub>] (0.108 g; 0.1 mmol) in dry benzene (20 cm<sup>3</sup>). The mixture was refluxed for 6 h. A brown colour solution obtained was concentrated to about 3 cm<sup>3</sup>. The complex was separated by the addition of a small amount of petroleum ether (60-80 °C). The resulting complex was recrystallised from CH<sub>2</sub>Cl<sub>2</sub>/ petroleum ether (60-80 °C) and dried under vacuum.

Colour : Brown

Melting point : 258 °C

Yield : 65 %

[RuCl(AsPh<sub>3</sub>)(FPL)<sub>2</sub>]

The Schiff base FPL 0.064 g (0.2 mmol) was added to the solution of ([RuCl<sub>3</sub>(AsPh<sub>3</sub>)<sub>3</sub>] (0.108 g; 0.1 mmol) in dry benzene (20 cm<sup>3</sup>). The above mixture was refluxed for 6 h. A black colour solution obtained was concentrated to about 3 cm<sup>3</sup>. The complex was separated by the addition of a small amount of petroleum ether (60-80 °C). The resulting complex was recrystallized from CH<sub>2</sub>Cl<sub>2</sub> / petroleum ether (60-80 °C) and dried under vacuum.

Colour : Grey

Melting point: >300 °C

Yield : 75%

## V. RESULTS AND DISCUSSION

The new ruthenium(III) complexes are stable to air and light, soluble in organic solvents such as benzene, CHCl<sub>3</sub>, CH<sub>2</sub>Cl<sub>2</sub>, DMF and DMSO. The elemental analyses obtained for some of the complexes are in good agreement with the proposed molecular formula.

The analytical data of the complexes are given in Table 1. In all the reactions, it has been observed that the ferrocenylthiosemicarbazone behaved as a monofunctional bidentate ligand by substituting two of the triphenylarsines and two of the halide ion from the starting complexes.

## VI. IR SPECTRA

The IR spectra of ferrocenylthiosemicarbazone and ferrocenyl-N-phenyl thiosemicarbazone ligands and that of their ruthenium(III) complexes are given in to their assignments are given in Table 2. The IR spectra of ruthenium(III) complexes have been compared with that of the ligands in order to fix the mode of coordination. The free Schiff base ligand showed a very strong absorption around 1651 – 1630 cm<sup>-1</sup>, which is characteristic of azomethine group (C=N). In the new complexes frequency of absorption due to (C=N) azomethine is observed at 1608 – 1631 cm<sup>-1</sup>. The decrease in absorption indicating the coordination of azomethine nitrogen atom of Schiff bases to ruthenium atom. The medium intensity band observed in the region 821-823 cm<sup>-1</sup> in the ligand due to  $\nu_{(C=S)}$  disappeared in the complex and new band in the region 722–739 cm<sup>-1</sup> appeared in all the new trimetallic complex<sup>1</sup>. This indicate that the other coordination is through the sulphur atom of the ligand takes place after the enolisation of NHC=S group of the ligand and coordination through the S atom after deprotonation. Characteristic bands due to triphenylphosphine and arsine are also present in the expected region.

Table 1. Analytical data of Ru(III) Schiff base complexes

Complex	Colour	Melting point C	Elemental Analyses calculated (found)			
			C(%)	H(%)	N(%)	S(%)
[RuCl(AsPh <sub>3</sub> )(FL) <sub>2</sub> ]	Brown	258	50.64	4.16	8.06	6.15
[RuCl(AsPh <sub>3</sub> )(FPL) <sub>2</sub> ]	Grey	>300	56.25	4.30	7.03	5.37

Table 2. IR and electronic spectral data of Schiff base ligands and new Ru(III) complexes

Complex	$\nu_{C=N}$ ( $\text{cm}^{-1}$ )	$\nu_{C=S}$ ( $\text{cm}^{-1}$ )	$\nu_{C=N} + \nu_{C=C}$	Bands for $\text{PPh}_3/\text{AsPh}_3$ ( $\text{cm}^{-1}$ )
HAFTC	1651	821	-	-
FPL	1650	815	-	-
$[\text{RuClAsPh}_3(\text{FL})_2]$	1631	738	1579	1438,1088,704
$[\text{RuClAsPh}_3(\text{FPL})_2]$	1608	739	1547	1438,1094,702

## VII. CONCLUSION

A novel Ferrocenylthiosemicarbazide (FL) and ferrocenyl-N-phenyl thiosemicarbazide (FPL) ligands and that of their ruthenium(III) complexes were synthesized and characterized. The ligands can act as NS donors in the complexes studied. The coordination modes were confirmed by FT-IR studies and CHN analyses. Further studies are needed to find out the potential of the complexes towards biology.

## REFERENCES

- [1] H. Oevering, M.N. Paddon – Row, M. Heppner, M. Oliver, E. Cotsans, J.M. Verhoeven and N.S. Hush, J. Am. Chem. Soc., 109, 3258 (1987)
- [2] G.L. Closs and J.R. Miller, Science, 240, 440 (1988)
- [3] O. Gust and T.A. Moore, Tetrahedron, 45, 4669 (1988)
- [4] R. Amadelli, R. Argazzi and F. Scandola, J. Am. Chem. Soc., 112, 7099 (1990)
- [5] J.C. Chambron, C. Coudret, J.P. Sauvage, C.J. Pedersen, N.J. Salem and V. Weinmayr US Patent No, 2875223 (1959)
- [6] V. Weinmayr, Naturwissenschaften, 45, 311 (1958)
- [7] M. Rosenblum, "Chemistry of the Iron Group Metallocenes, Ferrocene, Ruthenocene, Osmocene", Wiley, New York, 1975, Part 1.
- [8] A.N. Nesmeyanor and N.S. Kotchetkova, Russ. Chem. Rev., 43, 710 (1974)
- [9] A.S. Tompa, Thermochim. Acta, 77, 133 (1984)
- [10] S.E. Sherman and S.J. Lippard, Chem. Re., 87, 1153 (1987)
- [11] P. Kopf-Maier, H. Kopf and E.W. Neuse, J. Cancer Res. Clin. Oncol., 108, 336 (1984)
- [12] E.W. Neuse and F. Kanzawa, Appl. Organometal. Chem., 4, 19 (1990)
- [13] K. Butler, US. Patent No., 3382266 (1968)
- [14] H.G. Petering, H.H. Buskirk and G.E. Underwood, Cancer Res., 64, 367 (1964)
- [15] C.W. Johnson, J.W. Joyner and R.P. Perry, Antibiot. Chemother., 2, 636 (1952)
- [16] J.P. Scovill, D.C. Kalyman and C.E. Farnchino J. Med. Chem., 25, 1261 (1982)
- [17] M. Das and S.E. Livingstone Br. J. Cancer, 37, 466 (1978)
- [18] R. Prabhakaran, R. Karvembu, T. Hashimoto, K. Shimizu and K. Natarajan Ing. Org. Chemica Acta 358, 6093 (2005)
- [19] K.P. Deepa and K.K. Aravindakashan, Synth. React. Inorg. Met- Org. Chem 30, 1601 (2000)

# A Comparative Study on the Efficacy of Biogas Produced from Algae Collected from Pond with other Carbon Substrates

Indhumathi P, Aruna M, Muthusaravanan S, Hariharan G,  
Subhashree K R and Shoba U S

**Abstract---** In our country rural areas play a major role in the population and are also regarded as the producer of food and farm products. Because of the poor sanitation conditions, the environment is facing an intangible externality in the form of animal waste and domestic waste. And also the accumulation of greenhouse gases has increased from its threshold level due to the release of pollutants in the atmosphere. To reduce this global panic, the production of biogas by using products like algae is expected to be a good alternative. Algae transforms negative environmental externalities into positive mainly in terms of eutrophication and climate change impact categories because of assimilation of nutrients. The algae from Vaikaalmedu lake, (Vinnapalli, Sathyamangalam) was collected and the production of biogas is carried out in a bioreactor maintained at room temperature with pH7 by anaerobic digestion. The efficacy is compared with other carbon substrates that are generally used as alternative biomass cooking systems. It is found that mix of algae along with other carbon substrates is more effective and economically viable.

**Keywords---** Green house gases, algae, bio reactor, bio mass, carbon substrates.

## I. INTRODUCTION

THE need to control the reduction of water pollution caused by nitrates from wastes to protect human health, living resources and aquatic eco system are of prime importance. Also the evolution of CO<sub>2</sub> from burning bio waste and its accumulation has lead the scientific world to focus their attention on treatment of

bio waste. This has led to the utilization of bio waste as feedstock for biogas production. There are humpty number of ways of producing biogas by using different substrates (1, 4). One of them is using algal biomass as feedstock. This reduces the unwanted growth of algae on the surface of water, which blocks the sunlight and reduces the content of Phosphorous and Nitrogen (3). In this view the use of bio waste as a nutrient feedstock for cultivating algae itself acting as a catalyst for producing biogas will be a novel idea to pursue. So this study is aided to estimate the efficiency of algae as a feedstock for biogas and as well as compare it with efficiency of other carbon substrates to achieve a viable way for conversion of bio waste into a profit yielding substances. This information will be useful for the implementation of the process on a large scale in the future.

## II. MATERIALS AND METHODS

### Collection of Algae



The algae from the open pond at Vaikaalmedu (Vinapalli, Sathyamangalam), Tamilnadu was collected in large quantity and kept in an open tub in the open atmosphere for further growth of the algal biomass. The algae was allowed to grow further in order to get the fresh algal body for the process.

Indhumathi P, Department of Chemistry, Kumaraguru College of Technology, Coimbatore-641049. Email: arunakalyanijith@gmail.com

Aruna M, Department of Biotechnology, Kumaraguru College of Technology, Coimbatore-641049.

Muthusaravanan S, Department of Biotechnology, Kumaraguru College of Technology, Coimbatore-641049.

Hariharan G, Department of Biotechnology, Kumaraguru College of Technology, Coimbatore-641049.

Subhashree K R, Department of Biotechnology, Kumaraguru College of Technology, Coimbatore-641049.

Shoba U S, Department of Chemistry, Kumaraguru College of Technology, Coimbatore-641049. Email: ussche@gmail.com



### Construction of Bioreactor and Production of Biogas



The bioreactors were constructed for the production of biogas using cow dung, kitchen waste, algae, cow dung-algae, kitchen waste-algae, cow dung-kitchen waste-algae as feedstocks. To each bioreactor along with the feedstock 2 Litres of water is added. The bioreactors were provided with outlet tubes to collect gas for estimation. This was well sealed to avoid any leakages. The composite samples were digested in bioreactors at a thermophilic temperature of 30 – 32° C. The anaerobic fermentation would result with all this substrates to evolve bio gas. So the construction of bioreactor includes strict prohibition of Oxygen into the reactor by any means since fermentation is facilitated under anaerobic conditions only leads to increase in efficiency of biogas produced (2). The evolved gas was collected and continuously weighed and analyzed using Gas Chromatography.

### III. RESULTS AND DISCUSSION

The amount of gas collected in first three days was found to be of meager amount. This is due to the fact that incubation occurs during these initial days for the anaerobic micro organisms to grow and act on the substrates. After the initial incubation period, the amount of gas collected was found to increase daily. The extent of gas collected in the substrates varied as follows,

Algae < cow dung < kitchen waste < cow dung-algae < Kitchen waste-algae ≈ Kitchen waste-cow dung-algae

But after seven days a gradual decrease in amount of gas evolved from kitchen waste was noticed and increase in amount from cow dung and algae. The cow dung showed a decrease in gas after ten days but a steady increase was noticed in algae and algae mixed substrates until fifteen days. This could be due to the fact algal growth is catalysed by either algae itself or by the kitchen waste or cow dung. The extent of biogas evolved after fifteen days is of order

Kitchen waste << cow dung < algae ≈ kitchen waste-algae < cow dung-algae ≈

Cow dung -kitchen waste- algae.

But comparing the amount of gas evolved for 7<sup>th</sup> and 15<sup>th</sup> day indicate that composite sample with algae yield more biogas after a long period rather than in initial days. This is seen in table 1.

Table 1: Period during which Maximum Amount of Biogas is produced

Sample composition	Day at which maximum amount of biogas is produced (days)
Kitchen waste	8
Cow dung	13
Algae	13
Kitchen waste-algae	11
Cow dung-algae	13
Cow dung-kitchen waste-algae	>15

The quality of biogas depends on extent of Methane present in gas evolved from carbon substrates from Table 2 it is found that the Gas Chromatographic analysis data indicates that composite mix of cow dung-kitchen waste-algae yields more CH<sub>4</sub> than other substrates.

Table 2: Percentage of Methane and Carbon-Dioxide Produced

Sample composite	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	Average pH of digest
Kitchen waste	50	20	7.5
Cow dung	62	20	8
Algae	70	10	8
Kitchen waste-algae	75	15	8
Cow dung-algae	80	10	8
Cow dung-kitchen waste-algae	85	10	8

### IV. CONCLUSION

Thus, it is noticed that the energy of the biomass that had been captured from the sun and stored could be reclaimed. From the study, algae are found as a good feedstock for the production of second generation biogas. In fact utilization of algae along with kitchen waste and cow dung not only interfaces bio waste and energy production but also addresses the issue of reducing the use of non-renewable resources.

### V. ACKNOWLEDGEMENT

Our sincere thanks to the College management for providing us all the basic facilities to undertake the project. We thank the support by the DST project, Department of Chemistry and Department of Bio



Technology for allowing us to use the instruments and facilities. And also we heartly thank Mr.Muthukumaran, Mr.Saravanan, Mrs.Vijayakumari, Mr.Ganesh Moorthy, Department of Civil Engineering, our parents, teachers and friends for motivating us and helping us in our research.

#### REFERENCE

- [1] Habig C., Debusk T.A., and Ryther J.H. 1984. The Effect of Nitrogen- Content on Methane Production by the Marine-Algae, Gracilaria- Tikvahiae and Ulva Sp. Biomass 4:239-251.
- [2] Hamed M. El-Mashed and Ruihong Zhang 2010. Biogas production from co-digestion of dairy manure and food waste, Bio resource Technology 101 (2010) 4021-4028
- [3] Nallathambi Gunaseelan V. Anaerobic digestion of biomass for methane production: A review. Biomass and Bioenergy, Vol. 13, Issues 1-2, 1997, pp. 83-114.
- [4] 4.Ruihong Zhang, Hamed M. El-Mashed, Karl Hartman, Fengyu Wang, Guangqing Liu, Chris Choate, Paul Gamble, Characterization of Food waste as Feedstock for Anaerobic digestion, Bio resource Technology 98 (2007) 929-935.

proof

# Carbon Sequestration and Treatment of Sewage Water using Micro Algae

Infant Prisillah T, Sakthipriyadarshni A, Mahant T,  
Vijayakumari D and Shoba U S

**Abstract---** Research and development of algae has been receiving immense attention and funding due to its potential entrapment of atmospheric CO<sub>2</sub> and active decontamination of sewage water. Micro algae play a vital role in assimilation of pollutants in the natural water system that leads to environmental pollution. Also the release of pollutants in the atmosphere is increasing the accumulation of green house gases beyond the threshold level leading to global panic. So the study was aimed at using the algae for carbon sequestration and utilising the sewage water for irrigation and domestic purpose thus minimising pollution of air and water. This algal biomass was collected, cultured, harvested in waste water obtained from hostel and then subjected for identification studies. The algal growth rate was monitored along with the water quality parameters such as pH, TDS, Conductivity, Phosphate, Nitrate, Chloride, Total hardness and Alkalinity. Also the extent of CO<sub>2</sub> intake was monitored by purging CO<sub>2</sub>. The results that growth of algae leads to removal of impurities from sewage water thereby improving the quality of water to the extent of making it useful for irrigation purpose. Also it is noticed that around 50% of CO<sub>2</sub> uptake occurs during the growth phase of algal biomass. This study points to the possibility to transform the waste resource and environmental contaminants into useful, economically profitable resource thereby conserving fresh water and sequestering the CO<sub>2</sub> released from burning solid waste from hostels. Also the cultivated algae could be utilised for biomass cooking systems.

**Keywords---** Micro green algae, carbon sequestration, sewage water, decontamination.

## I. INTRODUCTION

The "green algae" is the most diverse group of algae, with more than 7000 species growing in a variety of habitats. Microalgae are photosynthesizing microscopic organisms, which fixate carbon from the atmosphere using sunlight, providing the oceans with life-sustaining energy [1,7]. This multiplies rapidly, requiring only carbon dioxide, water, sunlight, and a small amount of minerals to reproduce. Their abundance in species and habitats, and their fast growth make them interesting to be explored

Algae are the main primary producers in all kinds of water bodies and they are involved in water pollution. Certain algae flourishes in water polluted with organic wastes, play an important part in "self-purification of water bodies" [2-9]. So the study is aimed in utilising this characteristic of algae in transforming the waste water from hostels into useful water source for gardening and irrigation. Also it is harvested to enhance carbon sequestration.

## II. MATERIALS AND METHODS

For conducting study on carbon sequestration technique and waste water treatment by utilizing the micro green algae, algal biomass was collected from open ponds from three different places namely Kulatheri, Tiruchengode near Erode and Kalapatti. These were cultivated in bioreactors containing sewage water that has preliminarily undergone treatment before utilisation for this purpose. This biomass assay was agitated frequently and was kept in sunlight.

The variations of the water quality parameters and algal biomass were observed until the algae attained its full growth. The spectroscopic technique was selected as a testing tool and validated with dry mass measurements in this research. The results were compared.

The species identification was done after substantial growth by separating a determined portion of the algae biomass. (slide 1) Then the biomass was filtered and dried to find out its weight and it is preserved for isolation.

---

Infant Prisillah T, Department of chemistry, Kumaraguru College of technology, Coimbatore- 641 049. Email: infantprisilla@gmail.com  
Sakthipriyadarshni A, Department of chemistry, Kumaraguru College of technology, Coimbatore- 641 049  
Mahant T, Department of chemistry, Kumaraguru College of technology, Coimbatore- 641 049  
Vijayakumari D, Department of Biotechnology, Kumaraguru College of Technology, Coimbatore- 641 049  
Shoba U S, Department of Biotechnology, Kumaraguru College of Technology, Coimbatore- 641 049. Email: ussche@gmail.com



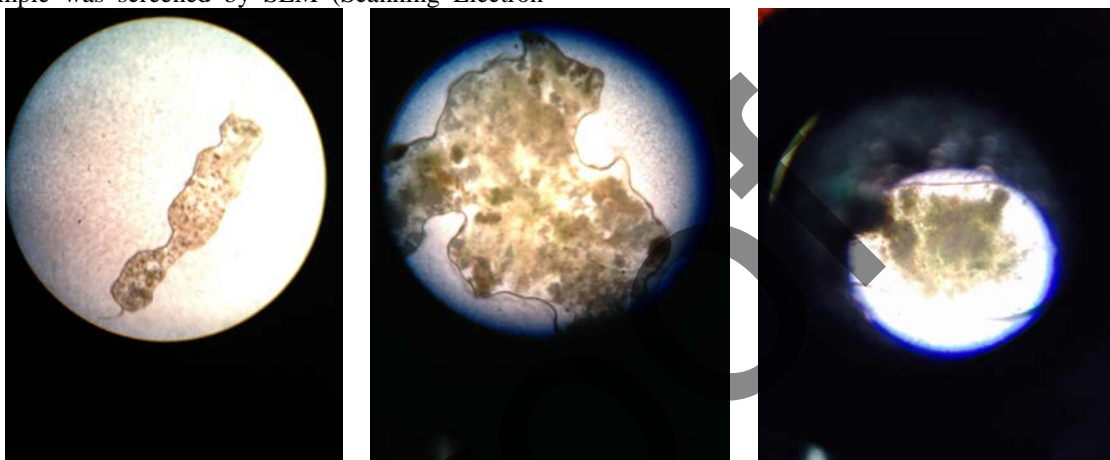
SLIDE 1 : Cultivated Algal Biomass preserved for Isolation

The algal cells were observed under light microscope for their morphological features and other cellular details. The sample was screened by SEM (Scanning Electron

Microscopy) for their absolute morphological studies. The topography of green micro algae is analyzed. The FTIR spectrum of dried algal biomass was recorded.

### III. RESULTS AND DISCUSSION

The sample obtained from open ponds was allowed to grow by exposing it to direct sunlight. The photographs of algae collected from open ponds from three different places namely Kulatheri, Tiruchengode near Erode and Kalapatti are presented in slide1. Their efficiency in cleansing the waste water were compared.



SLIDE 2 : Microalgae collected from three different sources

The pre treated sewage water from Kumaraguru college of Technology hostel is used as a medium to grow the biomass assay. The growth of the biomass was continuously monitored by measuring OD using spectrophotometer. Simultaneously weight of biomass was recorded. The variation in algae density as a function of time is found to exhibit a linear growth kinetics. As per the linear growth kinetics studies, the waste water medium supports the growth of the biomass algae.

The results of quality parameters of the waste water are tabulated in Table 1. The pH, Conductivity, Total hardness, Total dissolved solids, Chloride, Phosphate, Nitrate and Alkalinity determined at regular intervals reveals that the quality of waste water improves considerably by growing algae. The decrease in these values indicates the uptake of nutrients by algae for its growth. It is evident that, waste water qualities are improved to an extent that it could be used for gardening and irrigation purposes. Also the study on purging the CO<sub>2</sub> into the water for cultivating the algae indicates that there is uptake of CO<sub>2</sub> to around 50%.

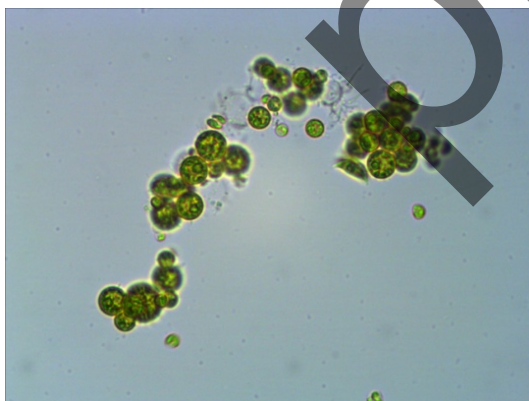
TABLE 1: Water Quality Parameters and Their Initial and Final Values

PARAMETERS	VALUES	
	Initial	Final
Total Alkalinity(ppm)	675	155
Total hardness(ppm)	1220	177
Chloride(ppm)	260	2.30
Total dissolved solids (ppm)	132	270
pH	7.3	7.9
Conductivity	3.26	6.4
Phosphate	0.0590	0.001
Nitrate	0.759	0.005

Comparing the efficacy of algae collected from open ponds it is observed that the algae obtained from the small open pond in Kalapatti did not show much growth. The

waste water in bioreactor containing the algae from Kulatheri showed improved water quality parameters to a greater extent in short duration than others and the growth rate was also greater. But due to non-replenishment of nutrients, it was found to have got deactivated and also resulting in the growth of worms. The algae from open pond from Tiruchengode showed slow growth initially and maximum growth only after 14 days. The start of deactivating phase was observed only after 16 days which was visualized with browning of algae and the initiation of production of worms. To improve the water quality parameters it took greater time duration than the others but it thrived for a longer period i.e., it had slower growth rate and greater efficiency.

The identification of microalgae collected from open pond of Tiruchengode was only carried out. In the past few years Fourier transform infrared (FTIR) spectroscopy and other spectroscopic studies have developed to become a very powerful and flexible technique for the differentiation and identification of microorganisms. The FTIR spectrum is characterized by strong peaks 1656 cm<sup>-1</sup> (amide I) and 1536 cm<sup>-1</sup> (amide II). These bands are due primarily to C=O stretching vibration and a combination of N-H and C-H Stretching vibrations in amide complexes. Strong vibrations of the C-H at 2925cm<sup>-1</sup>, and at 1079cm<sup>-1</sup>, 1047cm<sup>-1</sup> are due to lipids and carbohydrates, which absorb strongly between 1200 and 1000 cm<sup>-1</sup>. The nucleic acids also have functional groups with absorption bands in the same region of the spectrum. The strongest peaks at 1536 and 1422 is attributed to the bending modes of methyl groups of protein. Thus IR suggests the presence of lipid, carbohydrate and nucleic acid [4,5].



SLIDE 3 : Microscopic photograph of Microalgae

The Microscopic photograph of algae is present in slide 3. Cells are green in colour, unicellular and spherical in shape. Also the SEM and Characteristics Morphological feature of the isolate has identified the micro organism to be *Chlorella*. Further this was given for

PCR amplification and identification which confirmed the presence of *Chlorella vulgaris*

#### CONCLUSION

Thus it can be concluded as follows:

- The characterisation study of the micro algae collected from the open pond of Thiruchengode identifies it as *Chlorella vulgaris*.
- The parameters of the treated water were found to be within the permissible limits and hence it can further be used for irrigation and a variety of domestic purposes.
- Thus the cultivation of the algae from hostel waste water indicates that the algae has the capacity to assimilate nutrients like phosphate and nitrate within short period and this results in recovering the nutrients from bio-waste sources. The cultivation of algae from hostel waste water thus paves way for economic profitability.

#### IV. ACKNOWLEDGEMENTS

Our sincere thanks to the College management, staff of Department of chemistry and the Department of Biotechnology for providing us the basic facilities to undertake the project. We also wish to express our gratitude to the DST project for their support in utilising the instrumental facilities. We heartily thank Mr. Muthukumar, Mrs. Indhumathi, Mr. R. Saravanan, our parents, teachers and friends for their constant encouragement.

#### REFERENCE

- [1] Andersen R. A., "Algal Cultural Techniques", Elsevier academic press, London, (2005)
- [2] Chevalier P. and De la Noue J., "Wastewater Nutrient Removal With Microalgae Immobilized In Carrageenan", *Enzyme and Microbial Technology*, Vol. 7, pp. 621-624, (1985).
- [3] De la Noue J. and De Pauw N., "The Potential Of Microalgal Biotechnology: A Review Of Production And Uses Of Microalgae", *Biotechnology Advances.*, Vol. 6, pp. 725-70 , (1988).
- [4] Gray, N.F., "Biology Of Waste Water Treatment", Imperial college press, London, (2004)
- [5] Hoek C. and Mann D., "Algae An Introduction To Physiology", Cambridge university press, (1995).
- [6] Hoffman, J.P., "Waste Water Treatment With Suspended And Non-Suspended Algae": mini review" *Journal of Phycology*, Vol.34, pp. 357-363, (1998)
- [7] Indhumathi P, Soundararajan M and Syed Shabudeen PS, "Isolation and Characterisation of Green Microalgae for Carbon Sequestration, Waste Water Treatment and Bio-fuel Production", *International Journal of Bioscience and Biotechnology*, Vol.5 (2), pp. 17-26, (2013).
- [8] Oswald W.J., "Microalgae And Waste Water Treatment", *Microalgal biotechnology*, Cambridge university press, Cambridge pp. 306-328, (1988).
- [9] Wong Y.S; and Tam N.F.Y., "Wastewater Treatment With Algae", Springer, New York, (1998).

# Association of Neural P/Q type $\text{Ca}^{2+}$ Channel Encoded by CACNA1A Gene with Migraine

Gouri Srinivasan and Jyothsna Desu

**Abstract---** Mechanism based migraine therapy gained steam in early 1990s and has led to an extensive research for improved understanding of chemistry and workings behind each gene to associate it with migraine. CACNA1A is one of the many genes that are associated to migraine and rs16023 of CACNA1A gene is one among the SNPs that are localized for classical migraine. The study was conducted with cohort of 20 volunteers of South Indian origin. The results of this study indicated that 3 migraineurs exhibited A to T polymorphism which shows the association of rs16023 of CACNA1A in South Indian origin. The probable mechanism of pain phase of migraine attack is attributed to the inhibition of P/Q calcium channels encoded by CACNA1A gene and  $\text{Na}^+/\text{Ca}^{2+}$  homeostasis leading to decreased threshold for CSD and increased susceptibility to the spontaneous activation of brainstem output mechanism.

**Keywords:** Migraine, CACNA1A Gene, Classical migraine, P/Q calcium channels,  $\text{Na}^+/\text{Ca}^{2+}$  homeostasis

## I. INTRODUCTION

THE prevalence of migraine in Indian population is now getting increasingly recognized and the disability of migraine is the same as it is in other major diseases. Lack of a single well defined cause for migraine has hampered efforts in finding a cure so far. Thus, a thorough knowledge of the biochemistry and workings of each gene leading to chemical reactions may lend support to efforts aimed at a better understanding of the disease.

Migraine, is a disorder and a most common cause of headaches, yet with no particular cause or cure. Migraine is a ubiquitous familial disorder characterized by periodic, commonly unilateral, often pulsatile headaches which begin in childhood, adolescence or early adult life and recur with diminishing frequency during advancing years (1). Migraine headaches can sometimes be very debilitating.

Recently, has reported that migraine that aura migraines and migraines without aura each have their own hereditary characteristics. (1). One of the first links

that researchers have connected to classical migraine is the CACNA1A gene and its encoded P/Q type  $\text{Ca}^{2+}$  channel alpha 1 subunit which forms the pore for the calcium channel. Mutations in CACNA1A gene gives rise to abnormal channel dynamics (2) and all these mutations affect the pore or the voltage sensor part of the ion channel. These voltage gated  $\text{Ca}^{2+}$  channels are said to play an important role in pain neurotransmitter release thus leading to pain signalling. One such mutation is the SNP rs16023 of the CACNA1A gene and could be associated with migraine.

## II. MATERIALS AND METHODS

The cohort consisting of 20 volunteers with a South Indian origin, were taken up for study. 5ml of venous blood samples were collected from this cohort in sterile EDTA vials and genomic DNA was extracted from blood using rapid non-enzymatic method and confirmed its presence by agarose gel electrophoresis. FASTA sequence of CACNA1A gene was retrieved from NCBI database (3), the region containing the SNP gene was amplified after primer designing using Primer3 software and the DNA sequence was obtained using ABI Sequencer. The obtained sequences were aligned using the multiple sequence alignment tool CLUSTALW and were compared for the selected SNP.

## III. RESULTS AND DISCUSSION

Out of the 20 migraine individuals, only 3 individuals showed rs16023 A to T polymorphism for CACNA1A gene. The classical migraineurs reported visual impairment and vomiting. They added that skipping meals or sleepless nights are triggers and sensitive to bright light. They headaches were reported to be severe. This pain could be related to the mutations in the CACNA1A gene (4,8,9).

The mechanism in pain phase and involvement of the gene is reported. (4,8,9). The gene CACNA1A encodes P/Q type  $\text{Ca}^{2+}$  channel alpha 1 subunit which forms the pore for the calcium channel. These calcium channels are located in presynaptic terminals and somatodendritic membranes throughout the brain and spinal cord. They play a prominent role in initiating action potential evoked neurotransmitter release at central nervous system synapses. P/Q-type channels have a dominant role in controlling neurotransmitter release. These calcium

Gouri Srinivasan, BioAxis DNA Research Centre Private Limited, Hyderabad.Email: gourisrini92@gmail.com

Jyothsna Desu, BioAxis DNA Research Centre Private Limited, Hyderabad.

channels exhibit both Ca-dependent inactivation and Ca-dependent facilitation. Ca-dependent regulation of presynaptic calcium channels may play a crucial role in short-term synaptic plasticity during series of action potentials. (4)

The biological basis for the linkage to chromosome19 is mutations involving the *CACNA1A* gene. Mutations in *CACNA1A* gene gives rise to abnormal channel dynamics (2) and all these mutations affect the pore or the voltage sensor part of the ion channel. The voltage gated  $\text{Na}^+$  ion channels acts as propagators of electrical signal and the voltage gated  $\text{Ca}^{2+}$  channels play an important role in pain neurotransmitter release leading to pain signalling(5). Linking the channel disturbance for the first time to the aura process has demonstrated that mutations produced are due threshold for cortical spreading depression (CSD). (6)

A number of studies support the functional anatomic link between the initiation of CSD and the final pain pathway involving brainstem activation and neurogenic inflammation within the trigeminovascular system. (7)

Preclinical studies have suggested that cortical spreading depression may be a sufficient stimulus to activate the trigeminal neurons (8). Trigeminal fibers innervate in cerebral vessels arise from neurons in the trigeminal ganglion that contain substance P and calcitonin gene-related peptide(CGRP), both of which can be released when the trigeminal ganglion is stimulated in humans.[9] These two peptides are responsible for the cause and transmission of pain.

#### IV. CONCLUSION

Thus the association of gene *CACNA1A* gene was found only in female patients with classical migraine of South Indian origin. Due its polygenic inheritance, extensive research on influence of lineage ethnicity and SNP association to migraine could lead to a better understanding the on the involvement of chemical interactions leading to pain phase in migraine and thus can enhance the pharmacological interventions that could lessen or prevent pain.

#### REFERENCES

- [1] Victor M, Ropper AH. Adams and Victor's Principles of neurology, 7th edition, 2001, Chapter 10.
- [2] Tottene A, Fellin T, Pagnutti S, Luvisetto S, Striessnig J, Fletcher C, Pietrobon D. Familial hemiplegic migraine mutations increase  $\text{Ca}^{2+}$  influx through single human  $\text{CaV}2.1$  channels and decrease maximal  $\text{CaV}2.1$  current density in neurons. Proceedings of the National Academy of Sciences, Vol:99-20, 2002, p.13284-13289.
- [3] <http://www.ncbi.nlm.nih.gov/snp/?term=rs16023>
- [4] Pietrobon, D. Calcium channels and migraine. *Biochimica et Biophysica Acta (BBA)-Biomembranes*, Vol:1828-7, 2013, p.1655-1665.
- [5] Lee, S. Pharmacological inhibition of voltage-gated  $\text{Ca}^{2+}$  channels for chronic pain relief. *Current neuropharmacology*, Vol:11-6, 2013, p.606-620.
- [6] Goadsby, P. J. Pathophysiology of migraine. *Neurologic clinics*, Vol:27-2, 2009, p.335-360.
- [7] Estevez, M., & Gardner, K. L. Update on the genetics of migraine. *Human genetics*, Vol:114-3, 2004, p.225-235.
- [8] Bolay H, Reuter U, Dunn AK, Huang Z, Boas DA, Moskowitz MA. Intrinsic brain activity triggers trigeminal meningeal afferents in a migraine model. *NatMed*. 2002, Vol: 8, p.136-42.
- [9] Goadsby, P. J., Edvinsson, L., & Ekman, R. Release of vasoactive peptides in the extracerebral circulation of humans and the cat during activation of the trigeminovascular system. *Annals of neurology*, Vol:23-2,1988, p.193-196.

# A Study on Nano Semi – Generalized Continuity

A. Ezhilarasi

**Abstract---** The purpose of this paper is to introduce and study the concepts of new class of maps, namely nano semi-generalized continuous maps in nano topological spaces. I derive their characterizations in terms of nano semi-generalized closed sets, nano semi-generalized closure and nano semi-generalized interior and obtain some of their interesting properties.

**Keywords---** Nano sg-closed sets, Nano sg-open sets, Nano continuity, Nano sg-continuous functions.

## I. INTRODUCTION

IN 1970, Levine[9] introduced the concept of generalized closed sets as a generalization of closed sets in topological spaces. In 1987, P. Bhattacharyya et.al. [2] have introduced the notion of semi-generalized closed sets in topological spaces. In 1990, S.P. Arya et.al. [1] have introduced the concept of generalized semi-closed sets to characterize the  $s$ -normality axiom. The concept of semi-generalized mappings was studied by R. Devi et.al. [5] in 1993. The notion of nano topology was introduced by Lellis Thivagar [7] which was defined in terms of approximations and boundary region of a subset of an universe using an equivalence relation on it. He also established and analysed the nano forms of weakly open sets such as nano  $\alpha$ -open sets, nano semi-open sets and nano pre-open sets. The aim of this paper is to define and analyse the properties of nano semi-generalized continuity. I also establish various forms of continuities associated to nano semi-generalized closed sets.

## II. PRELIMINARIES

**Definition: 2.1[2]** A subset  $A$  of a space  $(X, \tau)$  is called a semi-generalized closed set if  $scl(A) \subseteq U$  whenever

$A \subseteq U$  and  $U$  is semi-open.

**Definition: 2.2[6]** The semi-generalized closure of a subset  $A$  of a space  $X$  is the intersection of all sg-closed sets containing  $A$  and is denoted by  $sgCl(A)$ .

**Definition: 2.3[6]** The semi-generalized interior of a subset  $A$  of a space  $X$  is the union of all sg-open sets contained in  $A$  and is denoted by  $sgInt(A)$ .

**Definition: 2.4 [10]** A function  $f: X \rightarrow Y$  is semi-generalized continuous (sg-continuous) if  $f^{-1}(V)$  is sg-closed set in  $X$  for every closed set  $V$  of  $Y$ , or equivalently, a function  $f: X \rightarrow Y$  is sg-continuous if and only if the inverse image of each open set is sg-open set.

**Definition: 2.5[7]** Let  $U$  be a non-empty finite set of objects called the universe and  $R$  be an equivalence relation on  $U$  named as indiscernibility relation. Then  $U$  is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair  $(U, R)$  is said to be the approximation space. Let  $X \subseteq U$ . Then,

(i) The lower approximation of  $X$  with respect to  $R$  is the set of all objects which can be for certain classified as  $X$  with respect to  $R$  and is denoted by  $L_R(X)$ .  $L_R(X) = U \setminus \{ R(x) : R(x) \not\subseteq X, x \in U \}$  where  $R(x)$  denotes the equivalence class determined by  $x \in U$ .

(ii) The upper approximation of  $X$  with respect to  $R$  is the set of all objects which can be possibly classified as  $X$  with respect to  $R$  and is denoted by  $U_R(X)$ .  $U_R(X) = U \setminus \{ R(x) : R(x) \cap X \neq \emptyset, x \in U \}$ .

(iii) The boundary region of  $X$  with respect to  $R$  is the set of all objects which can be classified neither as  $X$  nor as  $\text{not-}X$  with respect to  $R$  and it is denoted by  $B_R(X)$ .  $B_R(X) = U_R(X) - L_R(X)$ .

**Property: 2.6[7]** If  $(U, R)$  is an approximation space and  $X, Y \subseteq U$ , then

1.  $L_R(X) \subseteq X \subseteq U_R(X)$
2.  $L_R(\emptyset) = U_R(\emptyset) = \emptyset$
3.  $L_R(U) = U_R(U) = U$
4.  $U_R(X \cup Y) = U_R(X) \cup U_R(Y)$
5.  $U_R(X \cap Y) \subseteq U_R(X) \cap U_R(Y)$
6.  $L_R(X \cup Y) \supseteq L_R(X) \cup L_R(Y)$
7.  $L_R(X \cap Y) = L_R(X) \cap L_R(Y)$
8.  $L_R(X) \subseteq L_R(Y)$  and  $U_R(X) \subseteq U_R(Y)$  whenever  $X \subseteq Y$
9.  $U_R(X^c) = [L_R(X)]^c$  and  $L_R(X^c) = [U_R(X)]^c$
10.  $U_R[U_R(X)] = L_R[U_R(X)] = U_R(X)$
11.  $L_R[L_R(X)] = U_R[L_R(X)] = L_R(X)$ .

**Definition: 2.7 [7]** Let  $U$  be the universe,  $R$  be an equivalence relation on  $U$  and the Nano topology

A. Ezhilarasi, Assistant Professor(SRG), Department of Mathematics, Kumaraguru College of Technology, Coimbatore, Tamilnadu, India.

$\tau_R(X) = \{U, \Phi, L_R(X), U_R(X), B_R(X)\}$  where  $X \subseteq U$ . Then by property 2.5,  $\tau_R(X)$  satisfies the following axioms:

- (i)  $U$  and  $\Phi \in \tau_R(X)$ .
- (ii) The union of the elements of any sub-collection of  $\tau_R(X)$  is in  $\tau_R(X)$ .
- (iii) The intersection of the elements of any finite subcollection of  $\tau_R(X)$  is in  $\tau_R(X)$ .

Then  $\tau_R(X)$  is a topology on  $U$  called the Nano topology on  $U$  with respect to  $X$ .  $(U, \tau_R(X))$  is called the Nano topological space. Elements of the Nano topology are known as nano open sets in  $U$ . Elements of  $[\tau_R(X)]^c$  are called nano closed sets with  $[\tau_R(X)]^c$  being called Dual Nano topology of  $\tau_R(X)$ . If  $\tau_R(X)$  is the Nano topology on  $U$  with respect to  $X$ , then the set  $B = \{U, L_R(X), B_R(X)\}$  is the basis for  $\tau_R(X)$ .

**Definition:2.8 [7]** If  $(U, \tau_R(X))$  is a Nano topological space with respect to  $X$  where  $X \subseteq U$  and if

$A \subseteq U$ , then

- (i) The nano interior of the set  $A$  is defined as the union of all nano open subsets contained in  $A$  and is denoted by  $NInt(A)$ .  $NInt(A)$  is the largest nano open subset of  $A$ .
- (ii) The nano closure of the set  $A$  is defined as the intersection of all nano closed sets containing  $A$  and is denoted by  $NCl(A)$ .  $NCl(A)$  is the smallest nano closed set containing  $A$ .

**Remark:2.9[8]** Throughout this paper,  $U$  and  $V$  are non-empty, finite universes;  $X \subseteq U$  and  $Y \subseteq V$ ;  $U/R$  and  $V/R'$  denote the families of equivalence classes by equivalence relations  $R$  and  $R'$  respectively on  $U$  and  $V$ .  $(U, \tau_R(X))$  and  $(V, \tau_{R'}(Y))$  are the Nano topological spaces with respect to  $X$  and  $Y$  respectively.

**Definition:2.10[8]** A subset  $A$  of a Nano topological space  $(U, \tau_R(X))$  is said to be nano dense if  $NCl(A)=U$ .

**Definition: 2.11[3]** If  $(U, \tau_R(X))$  is a Nano topological space with respect to  $X$  where  $X \subseteq U$  and if  $A \subseteq U$ , then

- (i) The nano semi-closure of  $A$  is defined as the intersection of all nano semi-closed sets containing  $A$  and is denoted by  $NsCl(A)$ .  $NsCl(A)$  is the smallest nano semi-closed set containing  $A$  and  $NsCl(A) \subseteq A$ .
- (ii) The nano semi-interior of  $A$  is defined as the union of all nano semi-open subsets of  $A$  and is denoted by  $NsInt(A)$ .  $NsInt(A)$  is the largest nano semi open subset of  $A$  and  $NsInt(A) \subseteq A$ .

**Definition: 2.12[3]** A subset  $A$  of  $(U, \tau_R(X))$  is called nano semi-generalized closed set (Nsg-closed) if

$NsCl(A) \subseteq V$  and  $A \subseteq V$  and  $V$  is nano semi-open in  $(U, \tau_R(X))$ . The subset  $A$  is called nano sg-open in  $(U, \tau_R(X))$  if  $A^c$  is nano sg-closed.

**Definition: 2.13[8]** Let  $(U, \tau_R(X))$  and  $(V, \tau_{R'}(Y))$  be two Nano topological spaces. Then a mapping

$f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano continuous on  $U$  if the inverse image of every nano open set in  $V$  is nano open in  $U$ .

### III. NANO SG-CONTINUITY

In this section, I introduce nano semi-generalized continuous maps (Nsg-continuous maps) in Nano topological spaces. We discuss certain characterizations of Nsg-continuous maps.

**Definition:3.1** If  $(U, \tau_R(X))$  is a Nano topological space with respect to  $X$  where  $X \subseteq U$  and if  $A \subseteq U$ , then

- (i) The nano semi-generalized closure of  $A$  is defined as the intersection of all nano semi-generalized closed sets containing  $A$  and is denoted by  $NsgCl(A)$ .  $NsgCl(A)$  is the smallest nano semi-generalized closed set containing  $A$  and if  $A$  is a nano sg-closed set, then  $NsgCl(A) = A$ .

- (ii) The nano semi-generalized interior of  $A$  is defined as the union of all nano semi-generalized open subsets of  $A$  and is denoted by  $NsgInt(A)$ .  $NsgInt(A)$  is the largest nano semi-generalized open subset of  $A$ . If  $A$  is nano sg-open set, then  $NsgInt(A) = A$ .

**Definition:3.1** Let  $(U, \tau_R(X))$  and  $(V, \tau_{R'}(Y))$  be two Nano topological spaces. Then a map  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous on  $U$  if the inverse image of every nano open set in  $V$  is nano sg-open in  $U$ .

**Example:3.2** Let  $U = \{a, b, c, d\}$  with  $U/R = \{\{a\}, \{c\}, \{b, d\}\}$ . Let  $X = \{a, b\} \subseteq U$ . Then  $\tau_R(X) = \{U, \emptyset, \{a\}, \{a, b, d\}, \{b, d\}\}$  which are nano open sets.

Nano sg-open sets are  $\{U, \emptyset, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{b, c, d\}, \{b, d\}, \{a, d\}, \{a, b\}, \{a, c\}, \{a\}, \{b\}, \{d\}\}$



Nano sg-closed sets are  $\{U, \phi, \{a,c,d\}, \{a,b,c\}, \{b,c,d\}, \{b,d\}, \{c,d\}, \{b,c\}, \{a,c\}, \{a\}, \{b\}, \{c\}, \{d\}$

Let  $V = \{x,y,z,w\}$  with  $V/R' = \{\{x\}, \{y,z\}, \{w\}\}$ . Let  $Y = \{x,z\} \subseteq V$ . Then  $\tau_{R'}(Y) = \{V, \phi, \{x\}, \{y,z\}, \{x,y,z\}\}$  which are nano open sets.

Nano sg-open sets are  $\{V, \phi, \{y,z,w\}, \{x,z,w\}, \{x,y,w\}, \{x,y,z\}, \{y,z\}, \{x,w\}, \{x,y\}, \{x,z\}, \{x\}, \{y\}, \{z\}\}$

Nano sg-closed sets are  $\{V, \phi, \{x\}, \{y\}, \{z\}, \{w\}, \{x,w\}, \{y,z\}, \{z,w\}, \{y,w\}, \{y,z,w\}, \{x,z,w\}, \{x,y,w\}\}$

Then define  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  as  $f(a) = y, f(b) = x, f(c) = w, f(d) = z$ . Then  $f^{-1}(V) = U, f^{-1}(\phi) = \phi, f^{-1}(\{y,z\}) = \{a,d\}, f^{-1}(\{x\}) = \{b\}, f^{-1}(\{x,y,z\}) = \{a,b,d\}$ . Thus the inverse image of every nano open set in  $V$  is nano sg-open in  $U$ . Hence  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous.

**Theorem :3.3** A function  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous if and only if the inverse image of every nano closed set in  $(V, \tau_{R'}(Y))$  is nano sg-closed in  $(U, \tau_R(X))$ .

**Proof:** Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano sg-continuous and  $F$  be nano closed set in  $(V, \tau_{R'}(Y))$ . That is,  $V - F$  is nano open set in  $V$ . Since  $f$  is nano sg-continuous, the inverse image of every nano open set in  $V$  is nano sg-open in  $U$ . Hence  $f^{-1}(V - F)$  is nano sg-open in  $U$ . That is,  $f^{-1}(V) - f^{-1}(F) = U - f^{-1}(F)$  is nano sg-open in  $U$ . Hence  $f^{-1}(F)$  is nano sg-closed in  $U$ . Thus the inverse image of every nano closed set in  $(V, \tau_{R'}(Y))$  is nano sg-closed in  $(U, \tau_R(X))$  if  $f$  is nano sg-continuous.

Conversely, let the inverse image of every nano closed set in  $(V, \tau_{R'}(Y))$  be nano sg-closed in  $(U, \tau_R(X))$ . Let  $H$  be a nano open set in  $V$ . Then  $V - H$  is nano closed in  $V$  and  $f^{-1}(V - H)$  is nano sg-closed in  $U$ . That is,  $f^{-1}(V) - f^{-1}(H) = U - f^{-1}(H)$  is nano sg-closed in  $U$ . Hence  $f^{-1}(H)$  is nano sg-open in  $U$ . Thus the inverse image of every nano open set in

$(V, \tau_{R'}(Y))$  is nano sg-open in  $(U, \tau_R(X))$ . This implies that  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous on  $U$ .

**Theorem :3.4** Every nano continuous map is nano sg-continuous but not conversely.

**Proof:** Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano continuous on  $U$ . Also every nano closed set is nano sg-closed but not conversely. Since  $f$  is nano continuous on  $(U, \tau_R(X))$ , the inverse image of every nano closed set in  $(V, \tau_{R'}(Y))$  is nano closed in  $(U, \tau_R(X))$ . Hence the inverse image of every nano closed set in  $V$  is nano sg-closed in  $U$  and so  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous.

Conversely, all nano sg-closed sets are not nano closed sets and hence nano sg-continuous map is not nano continuous.

**Theorem:3.5** A function  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous if and only if  $f(NsgCl(A)) \subseteq NCl(f(A))$  or every subset  $A$  of  $(U, \tau_R(X))$ .

**Proof:** Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano sg-continuous and  $A \subseteq U$ . Then  $f(A) \subseteq V$ . Hence  $NCl(f(A))$  is nano closed in  $V$ . Since  $f$  is nano sg-continuous,  $f^{-1}(NCl(f(A)))$  is also nano sg-closed in  $(U, \tau_R(X))$ . Since  $f(A) \subseteq NCl(f(A))$ , we have  $A \subseteq f^{-1}(NCl(f(A)))$ . Thus  $f^{-1}(NCl(f(A)))$  is a nano sg-closed set containing  $A$ . But  $NsgCl(A)$  is the smallest nano sg-closed set containing  $A$ . Hence we have  $NsgCl(A) \subseteq f^{-1}(NCl(f(A)))$  which implies  $f(NsgCl(A)) \subseteq NCl(f(A))$ .

Conversely, let  $f(NsgCl(A)) \subseteq NCl(f(A))$  for every subset  $A$  of  $(U, \tau_R(X))$ . Let  $F$  be a nano closed set in  $(V, \tau_{R'}(Y))$ . Now  $f^{-1}(F) \subseteq U$ , hence,  $f(NsgCl(f^{-1}(F))) \subseteq NCl(f(f^{-1}(F))) = NCl(F)$ . That is,  $NsgCl(f^{-1}(F)) \subseteq f^{-1}(NCl(F)) = f^{-1}(F)$  as  $F$  is nano closed. Hence  $NsgCl(f^{-1}(F)) \subseteq f^{-1}(F) \subseteq NsgCl(f^{-1}(F))$ . Thus we have  $NsgCl(f^{-1}(F)) = f^{-1}(F)$  which implies

that  $f^{-1}(F)$  is nano sg-closed in  $U$  for every nano closed set  $F$  in  $V$ . That is,  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous.

Example :3.6 Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano sg-continuous, then  $f(NsgCl(A))$  is not necessarily equal to  $NCl(f(A))$  where  $A \subseteq U$ .

In Example 3.2, let us define  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  as  $f(a) = y, f(b) = x, f(c) = y, f(d) = z$ . Then  $f^{-1}(V) = U, f^{-1}(\phi) = \phi, f^{-1}(\{y, z\}) = \{a, c, d\}, f^{-1}(\{x\}) = \{b\}, f^{-1}(\{x, y, z\}) = U$ . Thus the inverse image of every nano open set in  $V$  is nano sg-open in  $U$ . Hence  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous on  $U$ .

Let  $A = \{b, d\} \subseteq U$ . Now  $NsgCl(A) = \{b, d\}$  and hence  $f(NsgCl(A)) = f(\{b, d\}) = \{x, z\}$ . Now  $NCl(f(A)) = NCl(f(\{b, d\})) = NCl(\{x, z\}) = \{x, y, z\}$ . That is, the equality does not hold in the above theorem when  $f$  is nano continuous and thus  $f(NsgCl(A)) \neq NCl(f(A))$  even though  $f$  is nano sg-continuous.

Theorem:3.7 Let  $(U, \tau_R(X))$  and  $(V, \tau_{R'}(Y))$  be two Nano topological spaces where  $X \subseteq U$  and  $Y \subseteq V$ . Then

$\tau_{R'}(Y) = \{V, \phi, L_{R'}(Y), U_{R'}(Y), B_{R'}(Y)\}$  and its basis is given by  $B_{R'} = \{V, L_{R'}(Y), B_{R'}(Y)\}$ . A function

$f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous if and only if the inverse image of every member of  $B_{R'}$  is nano sg-open in  $U$ .

Proof: Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano sg-continuous on  $(U, \tau_R(X))$ . Let  $B \in B_{R'}$ . Then  $B$  is nano open in  $(V, \tau_{R'}(Y))$ . Since  $f$  is nano sg-continuous,  $f^{-1}(B)$  is nano sg-open in  $U$  and  $f^{-1}(B) \in \tau_R(X)$ . Hence the inverse image of every member of  $B_{R'}$  is nano sg-open in  $U$ .

Conversely, let the inverse image of every member of  $B_{R'}$  be nano sg-open in  $U$ . Let  $G$  be nano open in  $V$ . Now  $G = \cup\{B : B \in B_1\}$  where  $B_1 \subset B_{R'}$

Then  $f^{-1}(G) = f^{-1}[\cup\{B : B \in B_1\}] = \cup\{f^{-1}(B) : B \in B_1\}$  where each  $f^{-1}(B)$  is nano sg-open in  $U$  and their union which is  $f^{-1}(G)$  is also nano sg-open in  $U$ .

By definition,  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous on  $(U, \tau_R(X))$ .

Theorem:3.8 A map  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous if and only if  $NsgCl(f^{-1}(B)) \subseteq f^{-1}(NCl(B))$  for every subset  $B$  of  $V$ .

Proof: Let  $B \subseteq V$  and  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano sg-continuous. Then  $NCl(B)$  is nano closed in  $(V, \tau_{R'}(Y))$  and hence  $f^{-1}(NCl(B))$  is nano sg-closed in  $(U, \tau_R(X))$ . Therefore,  $NsgCl(f^{-1}(NCl(B))) = f^{-1}(NCl(B))$ . Since  $B \subseteq NCl(B)$ , then  $f^{-1}(B) \subseteq f^{-1}(NCl(B))$ , i.e.,  $NsgCl(f^{-1}(B)) \subseteq NsgCl(f^{-1}(NCl(B))) = f^{-1}(NCl(B))$ . Hence  $NsgCl(f^{-1}(B)) \subseteq f^{-1}(NCl(B))$ .

Conversely, let  $NsgCl(f^{-1}(B)) \subseteq f^{-1}(NCl(B))$  for every subset  $B \subseteq V$ . Now let  $B$  be nano closed in  $(V, \tau_{R'}(Y))$ , then  $NCl(B) = B$ . Given  $NsgCl(f^{-1}(B)) \subseteq f^{-1}(NCl(B))$ . Hence  $NsgCl(f^{-1}(B)) \subseteq f^{-1}(B)$ . But  $f^{-1}(B) \subseteq NsgCl(f^{-1}(B))$  and hence  $NsgCl(f^{-1}(B)) = f^{-1}(B)$ . Thus  $f^{-1}(B)$  is nano sg-closed set in  $(U, \tau_R(X))$  for every nano closed set  $B$  in  $(V, \tau_{R'}(Y))$ . Hence

$f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous.

The following theorem establishes a criteria for nano sg-continuous functions in terms of inverse image of nano interior of a subset of  $(V, \tau_{R'}(Y))$ .

Theorem:3.9 A function  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous if and only if  $f^{-1}(NInt(B)) \subseteq NsgInt(f^{-1}(B))$  for every subset  $B$  of  $(V, \tau_{R'}(Y))$ .

Proof: Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be nano sg-continuous and  $B \subseteq V$ . Then  $NInt(B)$  is nano open in  $V$ . Now  $f^{-1}(NInt(B))$  is nano sg-open in  $(U, \tau_R(X))$  i.e.,  $NsgInt(f^{-1}(NInt(B))) = f^{-1}(NInt(B))$ .

Also for  $B \subseteq V$ ,  $NInt(B) \subseteq B$  always. Then  $f^{-1}(NInt(B)) \subseteq f^{-1}(B)$ . Therefore,  $NsgInt(f^{-1}(NInt(B))) \subseteq NsgInt(f^{-1}(B))$ , i.e.,  $f^{-1}(NInt(B)) \subseteq NsgInt(f^{-1}(B))$ .

Conversely, let  $f^{-1}(NInt(B)) \subseteq NsgInt(f^{-1}(B))$  for every subset  $B$  of  $V$ . Let  $B$  be nano open in

$V$  and hence  $NInt(B) = B$ . Given  $f^{-1}(NInt(B)) \subseteq NsgInt(f^{-1}(B))$ , i.e.,  $f^{-1}(B) \subseteq NsgInt(f^{-1}(B))$ . Also  $NsgInt(f^{-1}(B)) \subseteq f^{-1}(B)$ . Hence

$f^{-1}(B) = NsgInt(f^{-1}(B))$  which implies that  $f^{-1}(B)$  is nano sg-open in  $U$  for every nano open set  $B$  of  $V$ . Therefore  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous.

Example:3.10 In Example 3.2, let us define  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  as  $f(a) = y$ ,  $f(b) = x$ ,  $f(c) = z$ ,  $f(d) = w$ . Here  $f$  is nano sg-continuous since the inverse image of every nano open set in  $V$  is nano sg-open in  $U$ . Let  $B = \{y\} \subseteq V$ . Then  $NCl(B) = \{y, z, w\}$ . Hence

$f^{-1}(NCl(B)) = f^{-1}(\{y, z, w\}) = \{a, c, d\}$ . Also  $f^{-1}(B) = \{a\}$ . Hence

$Nsgcl(f^{-1}(B)) = NsgCl(\{a\}) = \{a\}$ . Thus  $Nsgcl(f^{-1}(B)) \neq f^{-1}(NCl(B))$ . Also when

$A = \{y, z, w\} \subseteq V$ ,  $f^{-1}(NInt(A)) = f^{-1}(\{y, z\}) = \{a, c\}$

But  $NsgInt(f^{-1}(A)) = NsgInt(\{a, c, d\}) = \{a, c, d\}$ . That is,

$f^{-1}(NInt(A)) \neq NsgInt(f^{-1}(A))$ . Thus the equality does not hold in Theorems 3.7 and 3.8 when  $f$  is nano continuous.

Theorem :3.11 Let  $(U, \tau_R(X))$  and  $(V, \tau_{R'}(Y))$  be two Nano topological spaces with respect to  $X \subseteq U$  and  $Y \subseteq V$  respectively, then for any function  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$ , the following are equivalent :

1.  $f$  is nano sg-continuous
2. The inverse image of every nano closed set in  $V$  is nano sg-closed in  $(U, \tau_R(X))$ .
3.  $f(NsgCl(A)) \subseteq NCl(f(A))$  for every subset  $A$  of  $(U, \tau_R(X))$ .
4. The inverse image of every member of  $B_{R'}$  is nano sg-open in  $(U, \tau_R(X))$ .
5.  $NsgCl(f^{-1}(B)) \subseteq f^{-1}(NCl(B))$  for every subset  $B$  of  $(V, \tau_{R'}(Y))$ .

Proof of the above theorem follows from Theorems 3.3 to 3.8

Theorem : 3.12 Let  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  be an onto, nano sg-continuous function. If  $A$  is nano sg-dense in  $(U, \tau_R(X))$ , then  $f(A)$  is nano dense in  $(V, \tau_{R'}(Y))$ .

Proof: Given  $A$  is nano sg-dense in  $(U, \tau_R(X))$ . Hence  $NsgCl(A) = U$ . As  $f$  is onto,  $f(NsgCl(A)) = f(U) = V$ . Since  $f$  is nano sg-continuous on  $U$ , by Theorem 3.5,  $f(NsgCl(A)) \subseteq NCl(f(A))$ . Hence  $V \subseteq NCl(f(A))$ . Also  $NCl(f(A)) \subseteq V$  implies  $NCl(f(A)) = V$

Hence  $f(A)$  is nano dense in  $(V, \tau_{R'}(Y))$ . Thus a nano continuous function maps nano sg-dense sets into nano dense sets provided it is onto.

Remark:3.13 The family of all nano sg-open sets in  $(U, \tau_R(X))$  is denoted by  $\tau_R^{Nsg}(X)$ .

Theorem:3.14 A function  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous if

and only if  $f : (U, \tau_R^{Nsg}(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano continuous.

Proof: Assume that  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous. Then  $f^{-1}(A) \in \tau_R^{Nsg}(X)$  for

every  $A \in \tau_{R'}(Y)$ . Hence

$f : (U, \tau_R^{Nsg}(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano continuous.

Conversely, assume that

$f : (U, \tau_R^{Nsg}(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano continuous.

Then  $f^{-1}(G) \in \tau_R^{Nsg}(X)$  for every  $G \in \tau_{R'}(Y)$ .

Then  $f : (U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  is nano sg-continuous.

**Remark:3.15** The composition of two nano sg-continuous maps need not be nano sg-continuous and this is shown by the following example.

**Example:3.16** Let  $U = V = W = \{a, b, c, d\}$

with  $\tau_R(X) = \{U, \emptyset, \{a\}, \{a, b, d\}, \{b, d\}\}$

,  $\tau_{R'}(Y) = \{V, \emptyset, \{b\}, \{a, c\}, \{a, b, c\}\}$  and

$\tau_{R''}(Z) = \{W, \emptyset, \{c\}, \{a, b\}, \{a, b, c\}\}$ . Define  $f :$

$(U, \tau_R(X)) \rightarrow (V, \tau_{R'}(Y))$  as  $f(a) = b, f(b) = c, f(c) =$

$d, f(d) = a$  and  $g : (V, \tau_{R'}(Y)) \rightarrow (W, \tau_{R''}(Z))$  be the

identity map. Then  $f$  and  $g$  are nano sg-continuous but

their composition  $g \circ f : (U, \tau_R(X)) \rightarrow (W, \tau_{R''}(Z))$

is not nano sg-continuous because  $F = \{c, d\}$  is nano closed in  $(W, \tau_{R''}(Z))$  but

$(g \circ f)^{-1}(F) = f^{-1}[g^{-1}(F)] = f^{-1}[g^{-1}(\{c, d\})] = f^{-1}(\{c, d\}) = \{b, c\}$

which is not nano sg-closed in  $(U, \tau_R(X))$ . Hence the composition of two nano sg-continuous maps need not be nano sg-continuous.

#### REFERENCES:

- [1] S.P.Arya, and T.Nour,(1990), Characterizations of s-Normal Spaces, Indian J. Pure Appl. Math., Vlo.21, Pp.717-719
- [2] P.Bhattacharyya, and B.K.Lahiri, (1987), Semi-Generalized Closed Sets in Topology, Indian J. Pure Appl. Math., Vol.29, Pp.375-382.
- [3] K.Bhuvaneswari, and A.Ezhilarasi, On Nano semi-generalized and Nano generalized-semi closed sets in Nano Topological Spaces, International Journal of Mathematics and Computer Applications Research, (2014), 117-124.
- [4] M.Caldas Cueva, Semi-Generalized Continuous Maps in Topological Spaces, Portugaliae Mathematica, Vol.52 Fasc.4 - 1995
- [5] R.Devi, H.Maki, and K.Balachandran, (1993), Semi-Generalized Closed Maps and Generalized-Semi Closed Maps, Mem.Fac.Sci. Kochi Uni., (Maths), Vol.14, Pp. 41-54.
- [6] Govindappa Navalagi, Properties of gs-closed sets and sg-closed sets in Topology, International Journal of Communication in Topology, Vol.1 Pp. 31-40.
- [7] M.Lellis Thivagar, and Carmel Richard, On Nano Forms of Weakly Open sets, International Journal Mathematics and Statistics Invention, (2013), 31-37
- [8] M.Lellis Thivagar, and Carmel Richard, On Nano Continuity, Mathematical Theory and Modeling, (2013), no.7, 32-37.
- [9] N.Levine, (1970), Generalized closed sets in Topological Spaces, Rend.Circ.Mat.Palermo, Vol 19, Pp.89-96.
- [10] P.Sundaram, H.Maki, and K.Balachandran, (1991), Semi-Generalized Continuous Maps and Semi- $T_{1/2}$  Spaces, Bull.Fukuoka Univ.Ed.Part-III, Vol.40, Pp.33-40.

# Improved Medical Image Enhancement Using Mathematical Morphology with Noise Reduction

C. Vaishnavi

**Abstract---** *One of the most common degradations in medical images is their poor contrast quality. This suggests the use of contrast enhancement methods as an attempt to modify the intensity distribution of the image. In this paper, a new edge detected morphological filter is proposed to sharpen digital medical images. The detail of various noise effects on the images and also discusses the methods to remove the noise by using Gaussian filter and to enhance the image quality using bilateral filtering method. The experimental results performed on a set of standard test images for a wide range of noise corruption levels. The present paper also discusses the enhancement of the text images. This work is implemented on the MATLAB Simulation model.*

**Keywords---** *Image Enhancement, Image restoration, Mathematical morphology, MATLAB.*

## I. INTRODUCTION

IMAGES are being used for representation of facts and scenes since centuries. With the evolution of computers the image has been converted in digital format and thus called as Digital Image. The Digital images are being used for both research and general purposes. The color images are being used widely in the industry and entertainment fields along the research areas. The images being used in different eras of life are usually captured by some digital cameras or scanners. Though there are high quality devices are available for the better quality of images but still all the devices are operator and light dependent. Linear operators have been the dominating filter class throughout the history of image processing. This is triggered by the computational efficiency of linear filtering algorithms. Despite the elegant linear system theory, not all image sharpening problems can be satisfactorily addressed through the use of linear filters. Many researchers now hold the view that it is not possible to obtain major breakthroughs in image sharpening without resorting to nonlinear methods [2]. Identifying the edges of low contrast structures is one of the most common tasks performed by those interpreting medical images. Low contrast structures need to be

resolved in all kinds of digital medical images; e.g., X-ray imaging, computed tomography (CT), magnetic resonance (MR), digital mammography, ultrasound, angiography and nuclear medicine [3]. X-rays are the oldest and the most frequently used form of medical imaging. X-ray is a painless medical test, which helps physicians diagnose and treat medical conditions. This medical test involves exposing a part of the body to a small dose of ionizing radiation with the objective of producing pictures for the inside of the body. The bone X-ray makes images of any bone in the body, including the hand, wrist, arm, foot, ankle, knee, leg or spine. X-ray images are maintained as hard film copy or, more likely, as a digital image that is stored electronically. These stored images are easily accessible and are sometimes compared to current X-ray images for diagnosis and disease management [4]. Most medical images contain important structures, which are characterized with low natural contrast with the surrounding structures. To obtain high contrast in the raw image directly from the imaging device is almost always expensive in examination time or X-ray dose to the patient. Thus, the production of these images generally involves a compromise between the need for enhanced contrast and its related costs. In these situations, digital post-processing can play a very important role [3]. Mathematical morphology is the name given to a geometrical branch of nonlinear filters. It offers a unified and powerful approach to numerous image processing problems. One of the most appealing aspects of morphological image processing lies in addressing the image sharpening problem [5]. In this paper, a new method for sharpening low contrast X-ray imaging is proposed. This is utilized by sharpening medical images by extending the edge-detected morphological filter first introduced in [6] for image deblurring. This is done by detecting the positions of the edges and then applying a class of morphological filtering. Since the edge is a prominent feature of an image, it is a vital foundation for medical image sharpening.

## II. PROPOSED ALGORITHM

Earlier studies have proved that the digital images face different type of problem due to the various factors. The factors may include the lesser light in the capturing area, low lens power of the capturing device and operator proficiency. For the betterment of the images, a number of image enhancement methods have been proposed for

C. Vaishnavi, Assistant professor, Department of Computer Science, Annai Khadeeja Arts and Science College for Women, Kandamavayal-Manamellakudi, Pudukkottai (Dt)- 614 620. E-mail: vaishnavithirumaran26@gmail.com

the purpose as discussed above. Classical image enhancement techniques cannot adapt to the varying characteristics of images. The proposed technique works on adaptively and region growing technique jointly. The region grows in the suggested technique on the basis of a threshold value. It evaluates for the pixels connected in the 4-neighbouring. The image is enhanced for the foreground part and clubbed with its original gradient and performs the morphological operations as texture analysis in the end. The detailed steps of the methodology are as below:

Step I. Remove Gaussian noise from the image using median filter.

Step II. Analyze the entire image statistically and select a pixel in the input image that will work as the seed point.

Step III. Repeat Step-IV to Step-VI for RGB color components of input image individually.

Step IV. Perform seeded region growing in the image for respective color component to generate Foreground and Background on the basis of 4-connectivity and threshold value of 0.4

Step V. Apply Block Analysis on the foreground region to enhance contrast of foreground layer.

Step VI. Apply morphological processing (Erosion & dilation) on background layer according to Texture Analysis.

Step VII. Combine the foreground and background layer.

Step VIII. Combine all enhanced outcomes of 'Red', 'Green' & 'Blue' to form the enhanced RGB image.

Step IX. Perform Texture refinement and Edge enhancement on the image obtained from Step VII.

Step X. Display the final enhanced image of Step IX.

### III. IMAGE ENHANCEMENT USING MATHEMATICAL MORPHOLOGY

#### 3.1 Erosion

The erosion of the color image  $A$  by the structuring element  $B$  is defined by:

$$A \ominus B = \{z \in E | B_z \subseteq A\} \quad \dots\dots\dots(1)$$

where  $B_z$  is the translation of  $B$  by the vector  $z$ , i.e.,

$$B_z = \{b + z | b \in B\} \quad , \forall z \in E \quad \dots\dots\dots(2)$$

When the structuring element  $B$  has a center (e.g.,  $B$  is a disk or a square), and this center is located on the origin of  $E$ , then the erosion of  $A$  by  $B$  can be understood as the locus of points reached by the center of  $B$  when  $B$  moves

inside  $A$ . For example, the erosion of a square of side 10, centered at the origin, by a disc of radius 2, also centered at the origin, is a square of side 6 centered at the origin. The erosion of  $A$  by  $B$  is also given by the expression:

$$A \ominus B = \bigcap_{b \in B} A_{-b} \quad \dots\dots\dots(3)$$

Example application: Assume we have received a fax of a dark photocopy. Everything looks like it was written with a pen that is bleeding. Erosion process will allow thicker lines to get skinny and detect the hole inside the letter "o".

#### 3.2 Dilation

The dilation of  $A$  by the structuring element  $B$  is defined by:

$$A \oplus B = \bigcup_{b \in B} A_b \quad \dots\dots\dots(4)$$

The dilation is commutative, also given by:

$$A \oplus B = B \oplus A = \bigcup_{a \in A} B_a \quad \dots\dots\dots(5)$$

If  $B$  has a center on the origin, as before, then the dilation of  $A$  by  $B$  can be understood as the locus of the points covered by  $B$  when the center of  $B$  moves inside  $A$ . In the above example, the dilation of the square of side 10 by the disk of radius 2 is a square of side 14, with rounded corners, centered at the origin. The radius of the rounded corners is 2.

The dilation can also be obtained by:

$$A \oplus B = \{z \in E | (B^s)_z \cap A \neq \emptyset\} \quad \dots\dots\dots(6)$$

where  $B^s$  denotes the symmetric of  $B$ , that is,

$$B^s = \{x \in E | -x \in B\} \quad \dots\dots\dots(7)$$

Example application: Dilation is the dual operation of the erosion. Figures that are very lightly drawn get thick when "dilated". Easiest way to describe it is to imagine the same fax/text is written with a thicker pen.

#### 3.3 Opening

The opening of  $A$  by  $B$  is obtained by the erosion of  $A$  by  $B$ , followed by dilation of the resulting image by  $B$ :

$$A \circ B = (A \ominus B) \oplus B \quad \dots\dots\dots(8)$$

The opening is also given

$$A \circ B = \bigcup_{B_x \subseteq A} B_x \quad \dots\dots\dots(9)$$

by which means that it is the locus of translations of the structuring element  $B$  inside the image  $A$ . In the case of the square of side 10, and a disc of radius 2 as the structuring element, the opening is a square of side 10 with rounded corners, where the corner radius.

Example application: Let's assume someone has written a note on a non-soaking paper and that the writing looks as if it is growing tiny hairy roots all over. Opening essentially removes the outer tiny "hairline" leaks and restores the text. The side effect is that it rounds off things. The sharp edges start to disappear.

### 3.4 Closing

The closing of  $A$  by  $B$  is obtained by the dilation of  $A$  by  $B$ , followed by erosion of the resulting structure by  $B$ :

$A \bullet B = (A \oplus B) \ominus B$ . The closing can also be obtained by  $A \bullet B = (A^c \circ B^s)^c$ , where  $X^c$  denotes the complement of  $X$  relative to  $E$  (that is,  $X^c = \{x \in E | x \notin X\}$ ).

The above means that the closing is the complement of the locus of translations of the symmetric of the structuring element outside the image  $A$ .

The dilation is associative, i.e.,

$$(A \oplus B) \oplus C = A \oplus (B \oplus C)$$

Moreover, the erosion satisfies

$$(A \ominus B) \ominus C = A \ominus (B \oplus C) \quad \dots\dots\dots(10)$$

Erosion and dilation satisfy the duality

$$A \oplus B = (A^c \ominus B^s)^c \quad \dots\dots\dots(11)$$

Opening and closing satisfy the duality

$$A \bullet B = (A^c \circ B^s)^c \quad \dots\dots\dots(12)$$

Opening is anti-extensive, i.e.,  $A \circ B \subset A$ , whereas the closing is

$$\text{Extensive, i.e., } A \subset A \bullet B. \quad \dots\dots\dots(13)$$

## IV. SARAN ALGORITHM FOR DIGITAL NOISE IMAGE ENHANCEMENT

The Saran mean filtering operation yields a restored image based on the expression.

$$f(x,y) = \frac{\sum_{(s,t) \in S_{xy}} g(s,t)^{Q+1}}{\sum_{(s,t) \in S_{xy}} g(s,t)^Q}$$

..... (16)

Where  $Q$  is called the order of the filter. This filter is well suited for reducing or virtually eliminated the effects of salt and pepper noise.

For positive values of  $Q$  the filter eliminates pepper noise. For negative values of  $Q$  it eliminates salt noise. Contra- harmonic filter reduces to the arithmetic mean filter if  $Q=0$  and to the harmonic mean filter if  $Q=-1$

Image enhancement, which transforms digital images to enhance the visual information within, is a primary operation for almost all vision and image processing tasks in several areas such as computer vision, biomedical image analysis, forensic video/image analysis, remote sensing and fault detection [2, 4].

The filtered images from Saran smoothing algorithms are fused to obtain a high quality denoised image. Order-static filters are nonlinear filters whose response is based on the ordering (ranking) the pixels contained in the image area encompassed by the filter, and then replacing the value of the center pixel with the value determined by the ranking result. The best known filter in this category is the median filter, which as the name implies, replaces the value of the pixel by the median of the intensity values in the neighborhood of that pixel defined in (3). The pixel with the median magnitude is used to replace the pixel in the signal.

Table 1 Comparison of image enhancement time simulation of various methods

No	Algorithms	Image Format	Time Simulation
1	Saran Algorithm	Digital Image	1.2 nsec
2	Image Histogram	Grayscale Image	1.9 nsec
3	Median filter	Digital Image	2.1 nsec

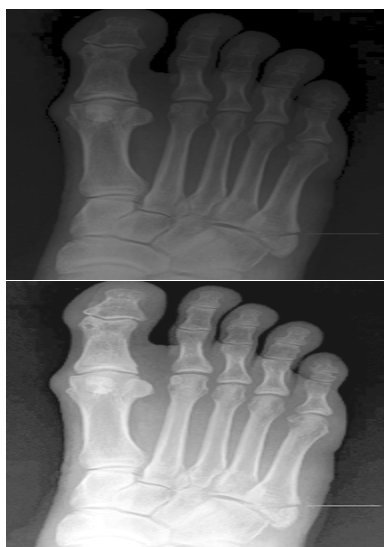


Figure 1 - (a) Low-contrast foot X-ray image  
Figure 2 (b) Histogram equalization

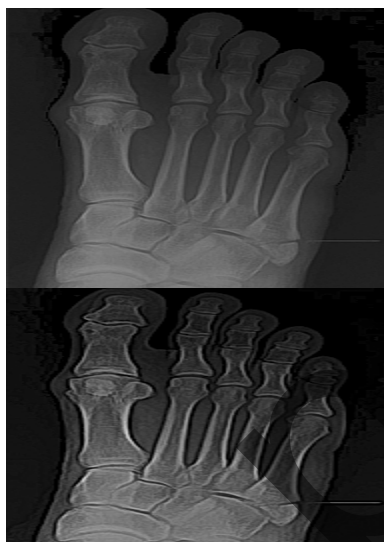


Figure 3 (c) Modified high-pass  
Figure 4(d)proposed edge-detected morphological filter

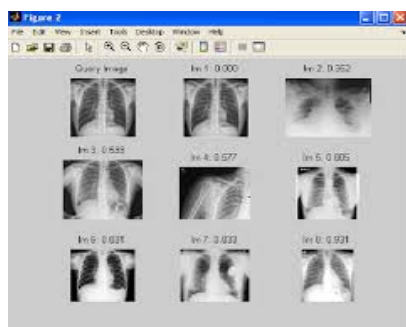


Figure 5 (e)proposed edge-detected image

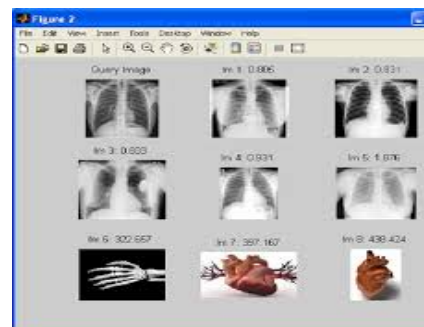


Figure 6 (f) more edge-detected images

#### 4.1 Noise Detection

It is an application of mathematical morphology in image processing, by using this technique we can detect and can even remove the noise introduced in the binary image. [2] Morphological image processing emphasizes on geometry structure of an image. Which detects an image by use of a structuring element? Here fundamental operations of mathematical morphology dilatation, erosion, opening and closing are used. One of the simplest uses of erosion is for eliminating irrelevant detail (in terms of size) from an original image. It is helpful to eliminate these small noises and objects that are not interested in after segmentation. Dilation expands an image and erosion shrinks it. Based on the two operations, opening and closing are another two important smoothing operations.

$$g(x, y) = \frac{1}{m} \sum f(x, y) \exp[-((x - i)^2 + (y - j)^2) 2\sigma^2] \dots\dots\dots (17)$$

#### V. CONCLUSION

This paper introduced a new enhancement filter for digital medical images. In the proposed scheme, the edge detected guided morphological filter succeeded in enhancing low Contrasted medical images. This was done by accurately detecting the positions of the edges through threshold decomposition. The detected edges were then sharpened by applying morphological filter using Harmonic mean method. By utilizing the detected edges, the scheme was capable to effectively sharpening fine details whilst retaining image integrity. The visual examples shown have demonstrated that the proposed method was significantly better than many other well-known sharpener-type filters in respect of edge and fine detail restoration.

**Future scope:**For future prospective the work can be extended using Neural network. The images can be tested



with different noise with different parameters. Further the work can be included the part of mathematical calculations including different parameters.

#### REFERENCES

- [1]. K.Sreedhar and B.Panlal , Enhancement of images using morphological transformation .IJCS&IT, vol. 4, no. 1, 2012.
- [2]. K.Narasimhan, C.R.Sudarsan, NagarajanRaju A Comparision of contrst Enhancement Techniques in poor illuminated gray level and color images, in IJCA ,vol.24.no.2 , 2011.
- [3]. I.R. Terol-Villalobos, Morphological image enhancement and segmentation with analysis,P. W. Hawkes, Ed. New York: Academic, 2005, pp. 207–273.
- [4]. Muhammad shahzed and shiraz latif, efficient image enhancement Techniques,IJ&CT, vol. 3, pp. no.1, 2009.
- [5]. Aloksingh,UmeshGhanekar, An efficient image salt and pepper noise detector IJAN&A vol. 2,ISSUE 5, 2011
- [6]. TarekA.Mahmoud,Stephenmarshall.Medical image enhancement using threshold decomposition driven adaptive morphological filter.16th European processing conference (EUSIPCO 2008),Lausanne,Switzerland,august 25-29,2008,Copyright by EURASIP .
- [7]. Ashamdeepsingh and Navdeepkanwal Spatial image enhancement of color images using texture analysis.International journal of application or innovation in engineering and management (IJAIEM) .Volume2,issue 6,june -2013.
- [8]. A. K. Jain, Fundamentals of Digital Images Processing. Englewood Cliffs, NJ: Prentice-Hall, 1989.
- [9]. J. Short, J. Kittler, and K. Messer, A comparison of photometric normalization algorithms for face verification, presented at the IEEE Int. Conf. Automatic Face and Gesture Recognition, 2004.
- [10]. C. R. González and E.Woods, Digital Image Processing. Englewood Cliffs, NJ: Prentice Hall, 1992.





























































# An Achromatic Number and b-chromatic Number of Some Star related Graphs

K. P. Thilagavathy and A. Santha

**Abstract---** In this research paper, we have discussed the structural properties of Fire Cracker graph the b-chromatic number of central graph of Fire Cracker graph. We have discussed the Structural properties of Double Star graph and Triple Star Graphs and we have made a comparative study between the achromatic number and b-chromatic number of central graph of Double Star graph and Triple Star graph.

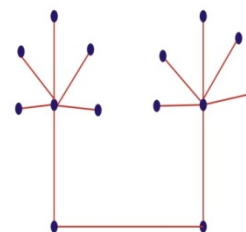
**Key Words---** Fire Cracker graph, Double Star graph, Triple Star graph, achromatic number, B-chromatic number

## I. INTRODUCTION

Let  $G$  be a finite undirectional graph with no loops and multiple edges. The central graph [10]  $C(G)$  of a graph  $G$  is obtained by subdividing each edge of  $G$  exactly once and joining all the non adjacent vertices of  $G$ . An achromatic colouring is a proper vertex colouring such that each pair of colours is adjacent by at least one edge. The largest possible number of colours in an achromatic colouring of  $G$  is called the achromatic number and it is denoted by  $\psi(G)$ . The b-chromatic number [4]  $\phi(G)$  of a graph  $G$  is the largest integer  $k$ , such that  $G$  admits a proper  $k$  - colouring, and every colour class has a representative vertex adjacent at least to one vertex in each other class. This type of colouring is called b-colouring. This concept of b-chromatic number was introduced by Irving & Manlove

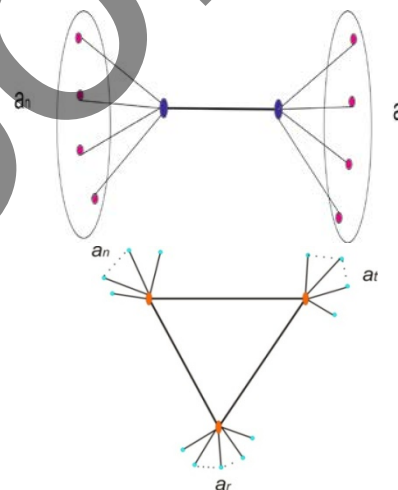
A Star graph  $a_n$  is the bi partite graph  $K_{1,n}$ . A  $K$  - star is the star graph  $a_{n-1} = K_{1,n-1}$ .

A  $(n, k)$  fire cracker [2] is a graph obtained by the concatenation of  $n, k$ -stars by linking one leaf from each.



$F(2,7)$

The multi star graph [7]  $K_m(a_n, a_r, \dots, a_t)$  is formed by having the root vertices of  $a_n, a_r, \dots, a_t$  as the  $m$ -nodes of  $K_m$ . For example  $K_2(a_n, a_r)$  is the double star graph and  $K_3(a_n, a_r, a_t)$  is the triple star graphs as shown below.



Double Star Graph  $K_2(a_n, a_r)$   
Triple Star Graph  $K_3(a_n, a_r, a_t)$

## II. THE B-CHROMATIC NUMBER OF CENTRAL GRAPH OF FIRE CRACKER GRAPH

*The Structural Properties of Fire Cracker Graph*

1. The number of vertices in the graph  $F(n, k)$  is  $p = nk$
2. The number of edges in the graph  $F(n, k)$  is  $q = nk - 1$
3. The Maximum degree in the graph  $F(n, k)$  is  $\Delta = k - 1$

K. P. Thilagavathy, Assistant Professor, Kumaraguru College of Technology, Coimbatore, Kp\_thilagavathy\_22@yahoo.com

A. Santha, Associate Professor, Kumaraguru College of Technology, Coimbatore, Santha\_jsk@yahoo.co.in



