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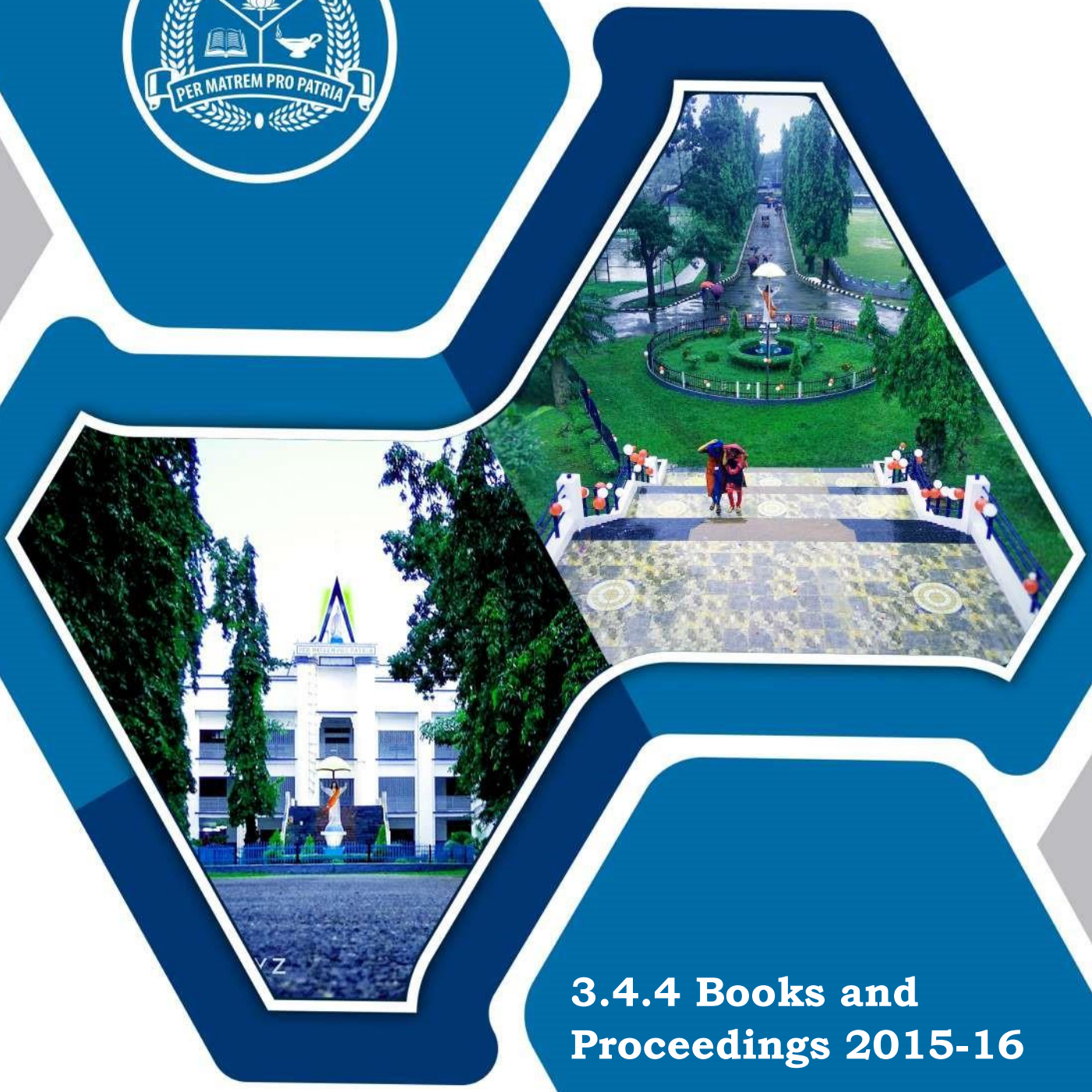

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GENERAL APTITUDE

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1.Number Series

In each series, look for the degree and direction of change between the numbers. In other words, do the numbers increase or decrease, and by how much

1. Look at this series: 2, 1, (1/2), (1/4), ... What number should come next?

A. (1/3) **B.** (1/8)

C. (2/8) **D.** (1/16)

Answer: Option **B**

This is a simple division series; each number is one-half of the previous number.

In other terms to say, the number is divided by 2 successively to get the next result.

4/2 = 2
2/2 = 1
1/2 = 1/2
(1/2)/2 = 1/4
(1/4)/2 = 1/8 and so on.

2. Look at this series: 7, 10, 8, 11, 9, 12, ... What number should come next?

A. 7 **B.** 10

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ഡോ. സുനീത ടി.വി.

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സൈബറിടം എന്ന സങ്കല്പനം

1980-കളിൽ ശാസ്ത്രകഥകളിലൂടെ പ്രത്യക്ഷപ്പെട്ട പദമാണ് സൈബർസ്പേസ് (സൈബറിടം). 1990-കളോടെ ഈ പദം ലോകവ്യാപകമായി സ്വീകരിക്കപ്പെട്ടു. 1980-ന്റെ തുടക്കത്തിൽ അമേരിക്കൻ ശാസ്ത്രനോവലിസ്റ്റായ വില്യം ഗിബ്സൻ കാനഡയിലെ വാൻകൂവറിലുള്ള ഒരു വീഡിയോ ആർക്കേഡിലൂടെ കടന്നു പോവുകയായിരുന്നു. അതിലെ കളിക്കാർ അവരുടെ വീഡിയോ മെഷീനിനുള്ളിലേക്ക് തലകുനിച്ച് അതിശ്രദ്ധയോടെ മറ്റേതോ ലോകത്തെന്നപോലെ കഴിയുന്നത് അദ്ദേഹം കണ്ടു. സ്ക്രീനിനു

സൈബർസംസ്കാരവും നവലോക നിർമ്മിതിയും

ഡോ. എം.ആർ.ഷെല്ലി

ഒരു പരിധിവരെ ഭാഷ മനുഷ്യന് തീർത്ത അതിർവരമ്പുകൾ ഭേദിച്ചുകൊണ്ടാണ് സൈബർസംസ്കാരം ആഗോളപ്രചാരണം നേടിയെടുത്തതും ഓരോമനുഷ്യനെയും അതിന്റെ ഉപഭോക്താവായി മാറ്റിയെടുത്തതും. 'ഉപഭോക്താവ്'എന്ന പദം സൂക്ഷ്മാർത്ഥത്തിൽത്തന്നെയാണ് പ്രയോഗിച്ചിരിക്കുന്നത്. ഇന്ന് ഓരോരുത്തരും ഭുജിക്കുന്നതും ജീവിക്കുന്നതും ഈയൊരു സംസ്കാരത്തിന്റെ വലക്കണ്ണിയിൽ സുഖശയനം ചെയ്തുകൊണ്ടാണെന്നു പറഞ്ഞാൽ അതിൽ തെല്ലും അതിശയോക്തിയില്ല. ഒരർത്ഥത്തിൽ ഭക്ഷണത്തെയും ജലത്തെയും പിന്തള്ളിക്കൊണ്ട് മനുഷ്യജീവിതത്തിന് ഏറ്റവും ആവശ്യമായ ഘടകം എന്ന 'ബഹുമതി' നേടിയെടുക്കാൻ ഇരുപത്തൊന്നാം ശതകത്തിന്റെ ഈ പുതുസംഭാവനയ്ക്കു കഴിഞ്ഞിട്ടുണ്ട്. ഈ അനുപേക്ഷണീയതയിലും ഉപേക്ഷണീയതയുടെ അംശങ്ങൾ ഏറിവരുന്നില്ലേയെന്ന സന്ദേഹം ജനിക്കുമ്പോഴാണ് ഇതിന്റെ പ്രസക്തിയും സാമൂഹികപ്രതിബദ്ധതയും ചോദ്യം ചെയ്യപ്പെടുന്നത്. പരിച്ഛേറിയാനാവാത്ത 'വാണിജ്യസംസ്കൃതിയുടെ ഇത്തിൾക്കണ്ണിയായും ജീവിതത്തെ ആയാസരഹിതമാക്കുന്ന മാന്ത്രികവിദ്യയായും 'സമൂഹമാധ്യമങ്ങളിലെ

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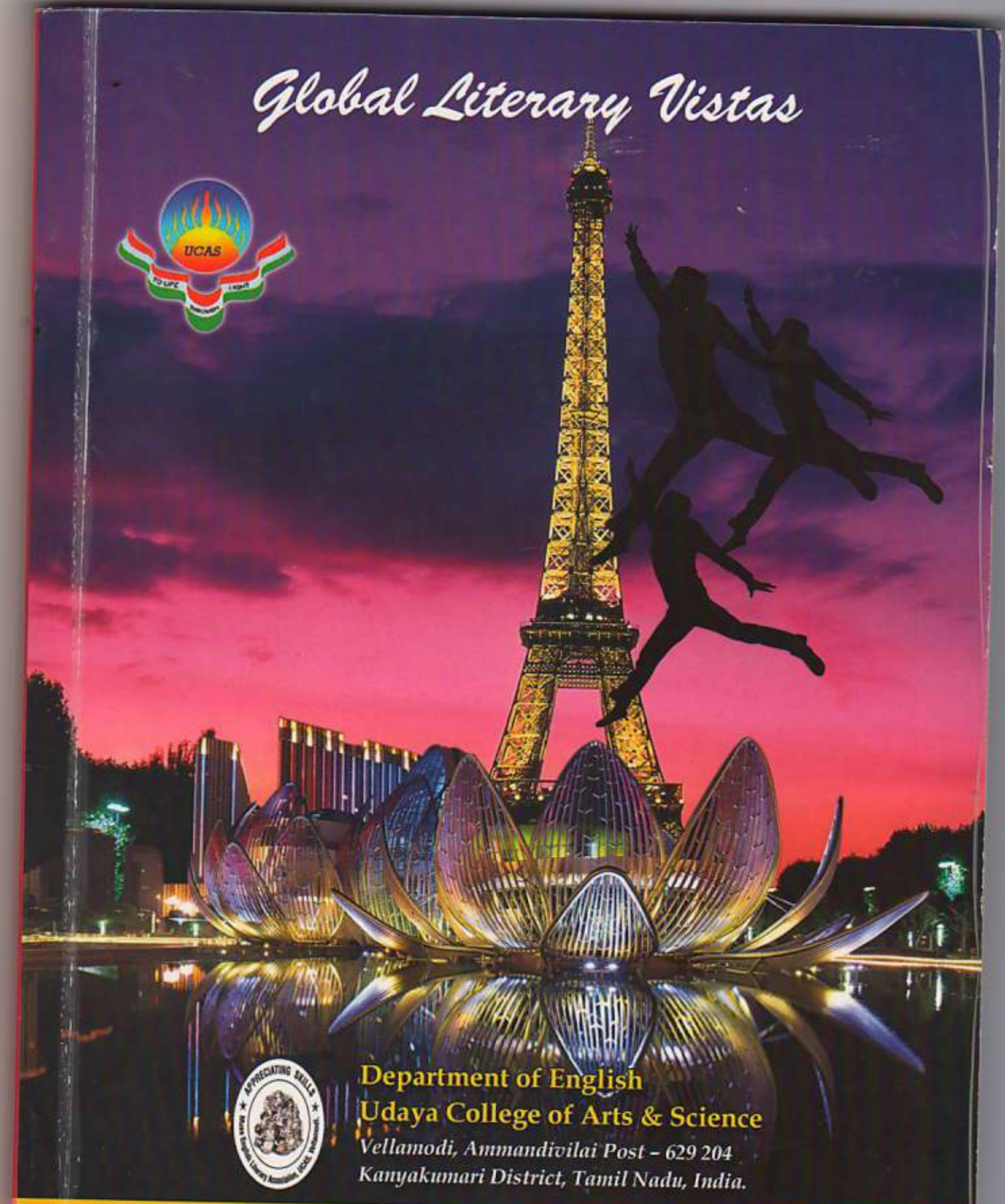

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Vellamodi, Ammandivilai Post – 629 204
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BEING-IN-SITUATION: A SARTREAN STUDY OF ALBERT CAMUS'S *THE PLAGUE*

DR Y. MERCY FAMILA

The choice of authenticity appears to be a moral decision. *Jean-Paul Sartre*

Kierkegaard or Nietzsche, Heidegger or Jaspers, Sartre or de Beauvoir, Marcel or Camus, each in his or her own way was concerned with the 'moral fact.' The fact is that we are awash in obligations and values that are not the logical conclusion of any series of impersonal facts about the world. Albert Camus is different from most existentialist writers in his relatively optimistic assumption that through awareness of the apparent futility of life the individual can transcend nihilism and the vainness of existence. Throughout his novels, plays, essays, and stories, Camus defends the dignity and decency of the individual and asserts that through purposeful action one can overcome the apparent nihilism of the world. Camus in *The Myth of Sisyphus* states: "thus I draw from the absurd three consequences, which are my revolt, my freedom, and my passion. By the mere activity of consciousness, I transform into a rule of life what was an invitation to death, and I refuse suicide" (111). The recognition of the absurd makes Camus to draw three things namely, revolt, freedom and passion and he wishes man to use these to drive away the absurdity. This paper studies how the characters in Albert Camus' novel *The Plague* are inclined to deny the cruelty of their condition and hide themselves in their illusory world governed by habit. Further, using the theories of Sartre it proves that they too, are existentialists.

Humans exist in-situation. To exist in-situation means that we are an integral part of that universe and the cultural world that envelops it. We are less than angels, more than machines. Situation is an ambiguous mixture of what Sartre calls our 'facticity' and our 'transcendence'. 'Facticity' denotes the givens of our situation such as our race and nationality, our talents and limitations, and as well as our previous choices. 'Transcendence' or the reach that our consciousness extends beyond these givens, denotes the takens of our situation, namely how we face up to this facticity. Transcendence functions somewhat like the 'intentionality' of consciousness. Sartre admits that the expression 'situation' is ambiguous in the sense that one cannot measure off the precise contribution of what is given and what is taken in each situation. This ambiguity of the given and the taken pervades our individual and social lives.

Man in general is free to choose his course of action within the physical and social environment in which he finds himself. But, by every act a person changes the environment within which another has to choose. *The Plague* elicits the story of a fight: not a fight against a disease, not a fight against German soldiers, but a fight against the nonchalance in the face of human suffering.

Assistant Professor of English, Fatima Mata National College, Kerala.

Every man in the novel responds to this in his own manner, and this reaches to the heart of the Existential philosophy – it is actions that truly define a man. Camus addresses this insouciance in *The Plague*. The novel is written during World War II, a tumultuous time in history. The devastating events that take place in history prompt Camus to write this novel.

The resident of Oran in the novel does not show any fret or common welfare, and each of them is wrapped up in their own concerns. They are self-centred and heedless of others. It is fitting to observe that the people of Oran have, always, turned their back on the sufferings of other people, so also the city. Dr. Rieux, the narrator, observes: "the town's so is being disposed that it turns its back on the bay, with the result that it's impossible to see the sea, you always have to go look for it" (5-6). The plague however changes the outlook and the attitude of the people. In Oran life for its inhabitants, has lost meaning, the plague offers them a chance to give meaning to their lives. Before the arrival of plague the people in Oran wishes to be an individual, and showed indifference to the problems of the rest of the world.

The moment the disease enters into the city, it takes everyone by surprise. No one is prepared for it. Doctors gather to discuss the matter. They have trouble to name the disease in the beginning, and refuse to accept it. In the beginning, the people try to expunge the disease individually. The doctors strive hard to eradicate the disease but they cannot prevent the death. The numbers of victims have lost to the plague and the number climbs higher and higher. This crucial situation makes the people of Oran to understand the truth that they can fight the disease as a collective force rather than individual. The transition in the people's attitude to the disease is expressed by Sprintzen as, "The Plague does, beyond any possible discussion, represent the transition from an attitude of solitary revolt to the recognition of a community whose struggles must be shared" (Camus 103). Though plague causes havoc on the life of the people, it does an excellent thing by making the people to combat the disease collectively.

Camus's existentialism acts as a key to purge the problem of human suffering in society. In fact, the novel deals with the struggle against nonchalance of the people, also. Though insouciance jugulate his or her life, the novel presents a perfect scenario in which all coalesces together to fight against the callous at one point of time. This ideal situation is not limited to storybooks alone. Every man can give meaning to his life by revolting against the detriments. With these values in mind, Camus's philosophies carry important morals that surpass any amount of explanation. Dr. Rieux is undoubtedly the quintessential rebel because he struggles against the incomprehensible absurdity of existence. Even though the absolute vigilance of the plague prevents Rieux from healing absolutely, he doggedly persists. He refuses to accept that the presence of sickness and death are natural order and he fights against them.

Jean Tarrou, who comes to Oran, just before the epidemic erupts and decides to stay in order to save lives. Though he is an outsider or does not belong to the town, he enervates his life for the welfare of the people. The way in which he renders service to the people during epidemic makes one to view him as a 'hero.' But, he objects to the word strongly, and he expresses his

unwillingness deeply as, " I don't believe in heroism; I know it's easy....What interests me is living and dying for what one loves" (149). Through Father Paneloux, Camus attempts to reconcile existentialism and Christianity. Paneloux is a learned steadfast Christian and a well-respected Jesuit priest. He firmly is of the view that the affliction of the epidemic is God given. He has an influential way of speaking and in his first sermon, he proclaims that the plague is God-sent, to punish evil doers for their sin. He preaches as follows:

> I wish to lead you to the truth and teach you to rejoice, yes rejoice in spite of all that I have been telling you....This same pestilence, which is slaying you, works for your good and points tour path....It reveals the will of God in action, unfailing transforming evil into good. So, when you leave this House of God you will carry away with you not only words of wrath, but also a message, too of comfort for your-hearts. (83)

The trial reaches its utmost when the characters are forced to watch the slow, tormented death of an innocent child. This gruesome incident makes people to raise the question; how could something sent to punish an innocent child? The death of the innocent child started to haunt Paneloux mind. Slowly, he is awakened to the fact only the malediction of the people is responsible for their struggle.

The ravages of the plague in Oran vividly convey the absurdist position that humans live in an indifferent, incomprehensible universe that has no meaning or order. In the face of this metaphysical reality, what must be the response of individuals? Camus's answer is clearly that they should revolt. Choice plays a vital role, which the people of Oran understands and choose to fight the plague collectively.

In Sartre's terminology, human existence is initially that of *en-soi* existence or "being-in-itself"; by giving purpose to one's life through vital, committed action, one achieves *pour-soi* existence or "being-for-itself." Sartre maintains that one is free within one's situation while, at the same time, one is restricted by the situation itself. This means one is free to choose among alternatives within the situation; however, one is not free to choose the situation itself. Transcendence means that one has to rise above the situation in which one finds oneself. In other words, one is free to construct new values and characteristics, which are not in one's facticity. For instance, one cannot change one's biological parents or gender, but one is always free within this facticity to construct the essence or the meaning in one's existence. In *Being and Nothingness*, Sartre states, "Human reality everywhere encounters resistance and obstacles which it has not created, but these resistance and obstacles have meaning only in and through the free choice within human reality" (566).

Any viable response to the existential problem poses by the absurd depends not only on a dialectical relation between lived experience and reflection but, also, on a large social context. Indeed, this is what one sees in the characters of *The Plague*. Whatever our situation, it always includes the possibility of moving beyond it. The mantra of Sartrean humanism is that one can always make something out of what one has been made into because one always transcends

one's facticity. He underscores one's responsibility for the necessarily ambiguous situation in which one live. Thus the characters in the novel being aware of the situation choose to revolt.

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SYNERGY

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In the Land of the Kappiris

1 On the African Soil

It was the morning of the tenth day of our voyage from Bombay. After covering 2500 miles, we had reached Mombasa port, said to be the eastern gateway to the African continent. As I looked out, what I saw first was the figure of a tall, half-naked Kappiri standing on the terrace of a warehouse of the wharf, looking at our ship in amazement. He was the first Negro I set eyes on in the land of the Kappiris. To me, he seemed to represent the entire black race of Africa.

He might have stood similarly wide-eyed when the ship of a few adventurous Norwegian sailors tried to open the doors to the Dark Continent in the eleventh century. He might have stood and stared similarly at Vasco da Gama's sail as it neared the shore in 1497. The passage of centuries has brought no change in his sense of wonderment. That is precisely why he has not made progress even now. Let us take a brief look at his history.

It is being established by research that the human race originated somewhere in south-east Asia; most probably, in India. The Negro subspecies that sprang from the Australoid race is believed to have come into being in south Asia and migrated to India, Malaya, New Guinea, the Pacific Islands, Australia, New Zealand and other countries. A segment of that Negro population moved westwards to Persia, Mesopotamia, Syria and Arabia. From Arabia and Persia they went to North Africa. Centuries passed.

The Caucasians of Asia Minor rose out of their primitive existence, made tools, domesticated animals and started leading a relatively civilized life. Very early on, they

have dedicated themselves and their children to Africa. Their only fear is whether the government of Africa may drive them out sometime in the future. Many among them are *Sanatan* Hindus, preserving all the different rituals of purity, superstitions and primitive customs – attributed to Hinduism – even in the jungles of Africa. Even within India, the ignorance and wrong notions of the north Indians regarding their southern counterparts – especially the 'Madrasis' – are proverbial. But these north Indian Hindus, who left their motherland ages ago and whose knowledge of the geography of India itself is vague and confused, still maintain social distance from south Indians in Africa. Such an attitude of the mind is indeed pitiable. I happened to meet many Gujaratis who sincerely believe that all south Indians are Christians, like the Goans, and that their mother tongue is English. They do not realize how much they harm our national unity by virtually ostracizing their south Indian brethren and treating them as if they are unclean. They put their religious belief above national feelings.

There are linguistic barriers too that come in the way of interaction among Indians in Africa. On the one hand, there are south Indians who cannot speak Hindi or Gujarati. They have to use English in order to speak to the north Indian families. On the other hand, there are Gujarati businessmen, especially their womenfolk, who have absolutely no idea of English. Therefore both groups depend on whatever Swahili they have acquired from their Kappiri servants. Adopting such an undesirable and artificial means for social interaction and communal living within a nation is the major cause of trouble.

[The translator, Radhika P. Menon, is currently the Head, Department of English, FMN College, Kollam. She has translated many significant Malayalam works (articles, poems, short stories, novels, autobiographies, biographies) into English. Chief among them are, *Selected Short Stories: Karoor Neelakanta Pillai*, S. K. Pottekkatt's *Tales of Athiranippadam* (with co-translator) which won the ICWT Award in 2011, Devaki Nilayangode's *Antharjanam*, K. Madhavan's *On the Banks of the Tejaswini* and *A Village Comes to Life*. Her forthcoming translations are N. E. Balakrishna Marar's *A Life with Books* and M. K. Sanoo's *Dr Palpu: The Righteous Karmayogi*.]

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- Quarks
- Multiple choice questions

- **THE NUCLEUS**
- The **atomic nucleus** is the innermost region of the **atom**. It is made up of protons and neutrons.
- Atoms are the building blocks of every part of matter.
- In 1909 Ernest Rutherford led both Hans Geiger and Ernest Marsden through what is known as the Gold Foil Experiments. During the experiments they would shoot particles through extremely thin sheets of gold foil. In 1911 Rutherford came to the conclusion that the atom had a dense nucleus.
- This theory would remove the idea that the atom was structured more resembling plum pudding. The plum pudding model was the most important model of atomic structure until Rutherford's conclusion.

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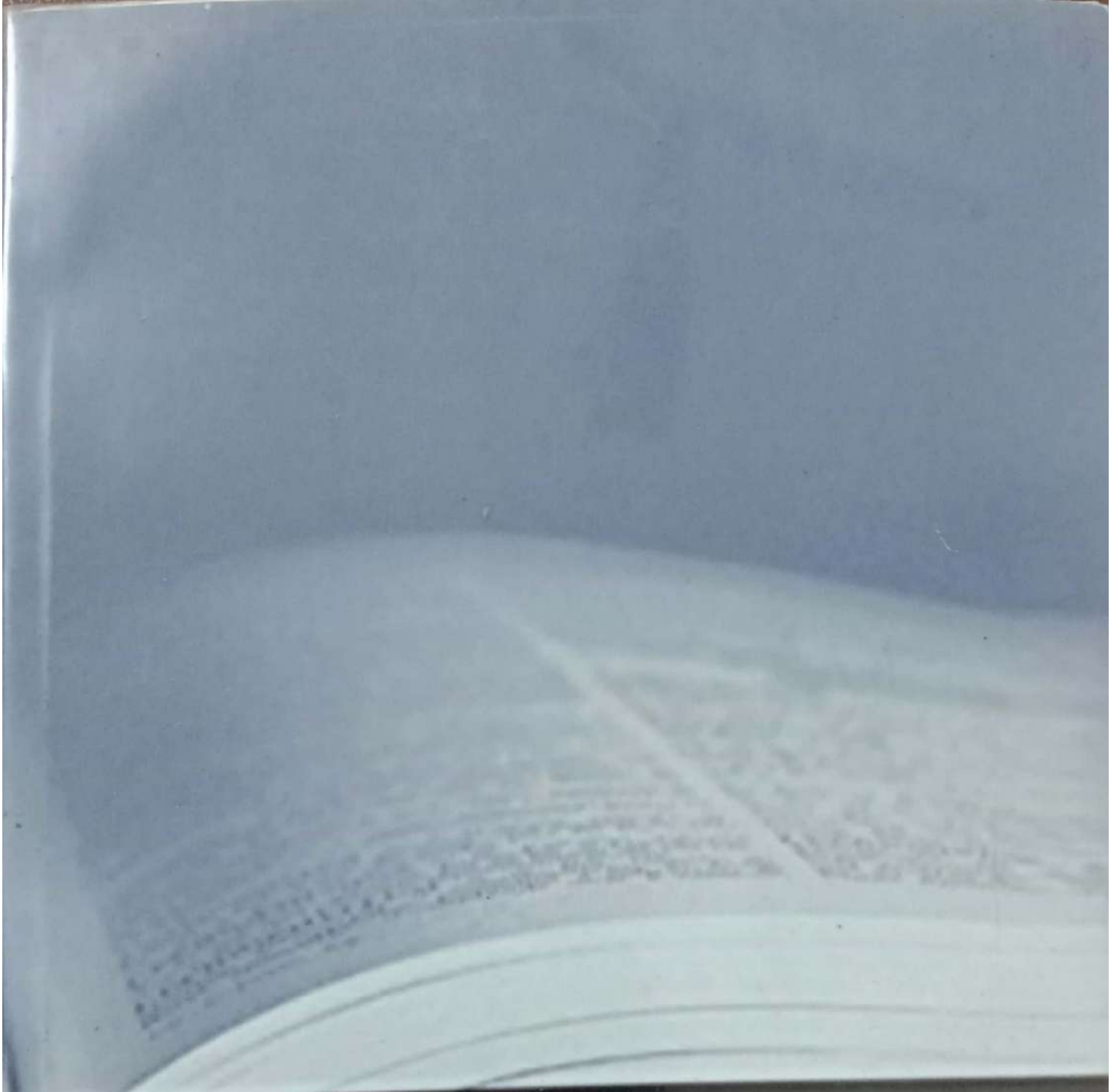

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CONTENTS

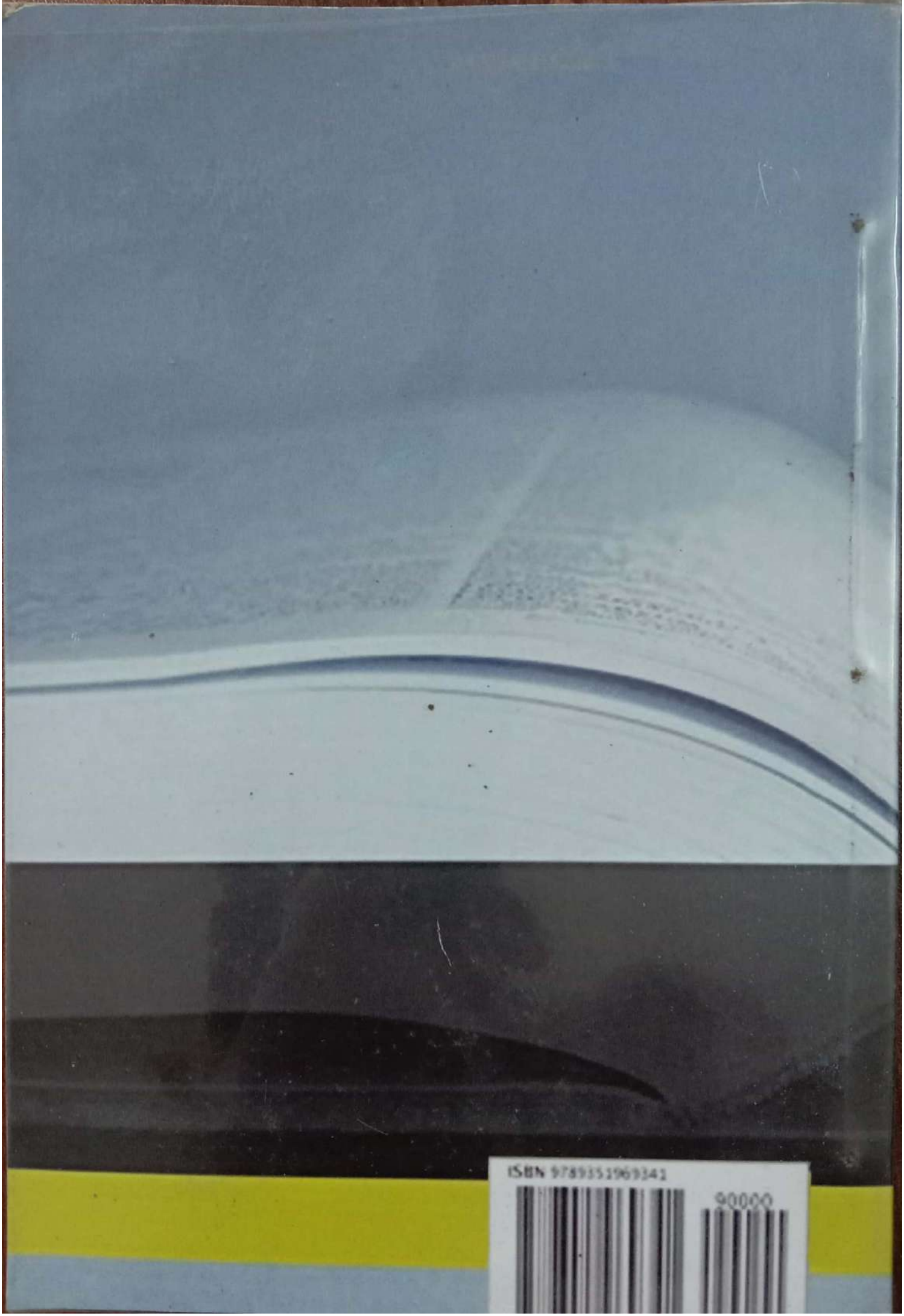
- Clipping
- Clamping
- Rectifier
- Transistor
- Amplifier
- FET
- Operational amplifiers

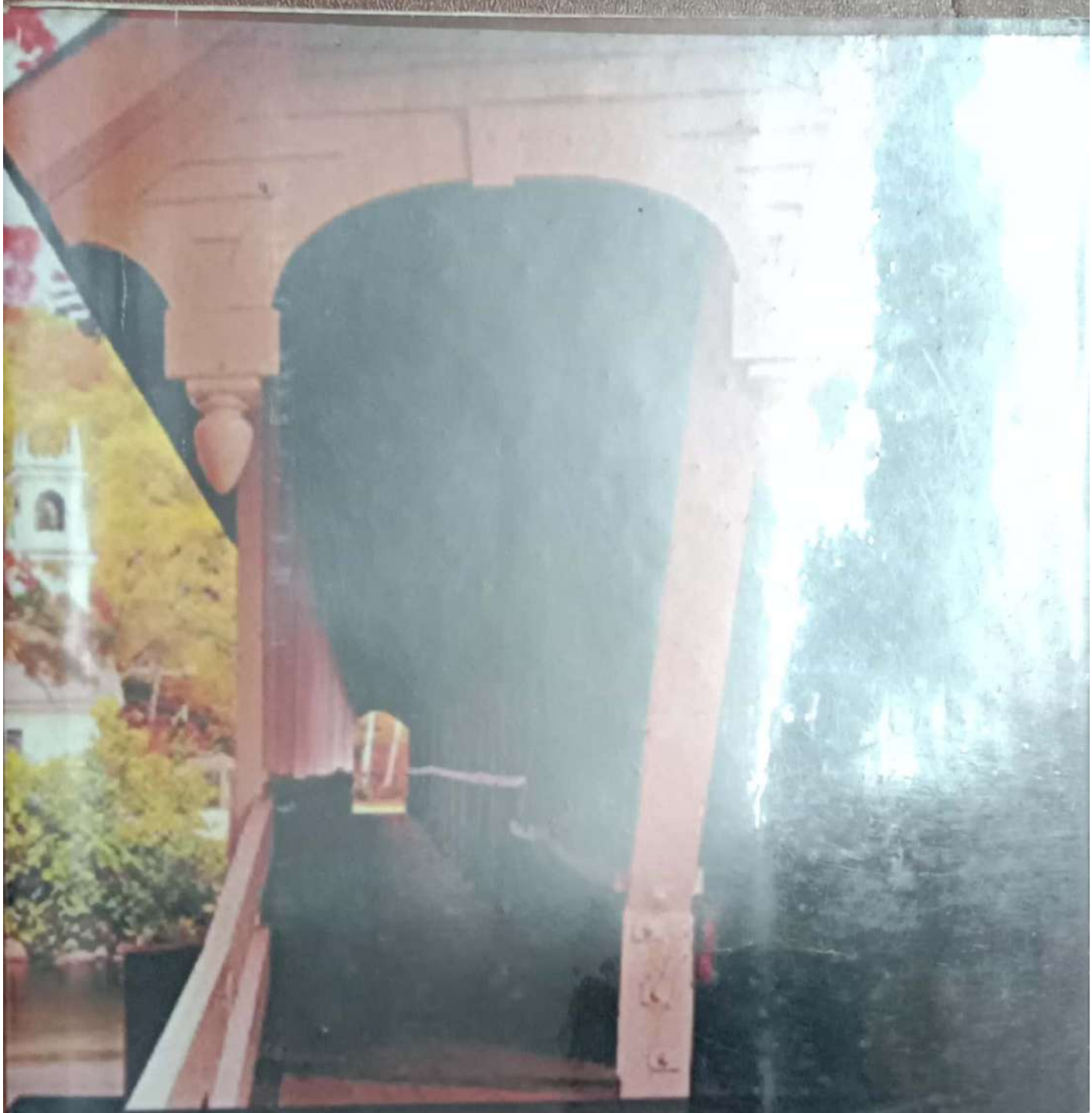
Statistical mechanics

Statistical physics

Introduction

- Level of hotness is called the temperature.
- Heat is the energy responsible for hotness.
- Kinetic theory was put forward by Bernoulli, Clausius, and Maxwell.
- According to kinetic theory molecules are in a state of continuous agitation with kinetic energy proportional to the absolute temperature. Heat is the energy of this agitation.
- Internal energy is energy transferred across a boundary due to a difference of temperature between the two sides of the boundary.
- The C.G.S unit of heat is the 'calorie'
- One calorie is the heat that raises the temperature of 1 gm of water by 1^0c
- SI unit of heat is Joule.





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C.Spin orbital interaction

D. LS coupling

E.jj coupling

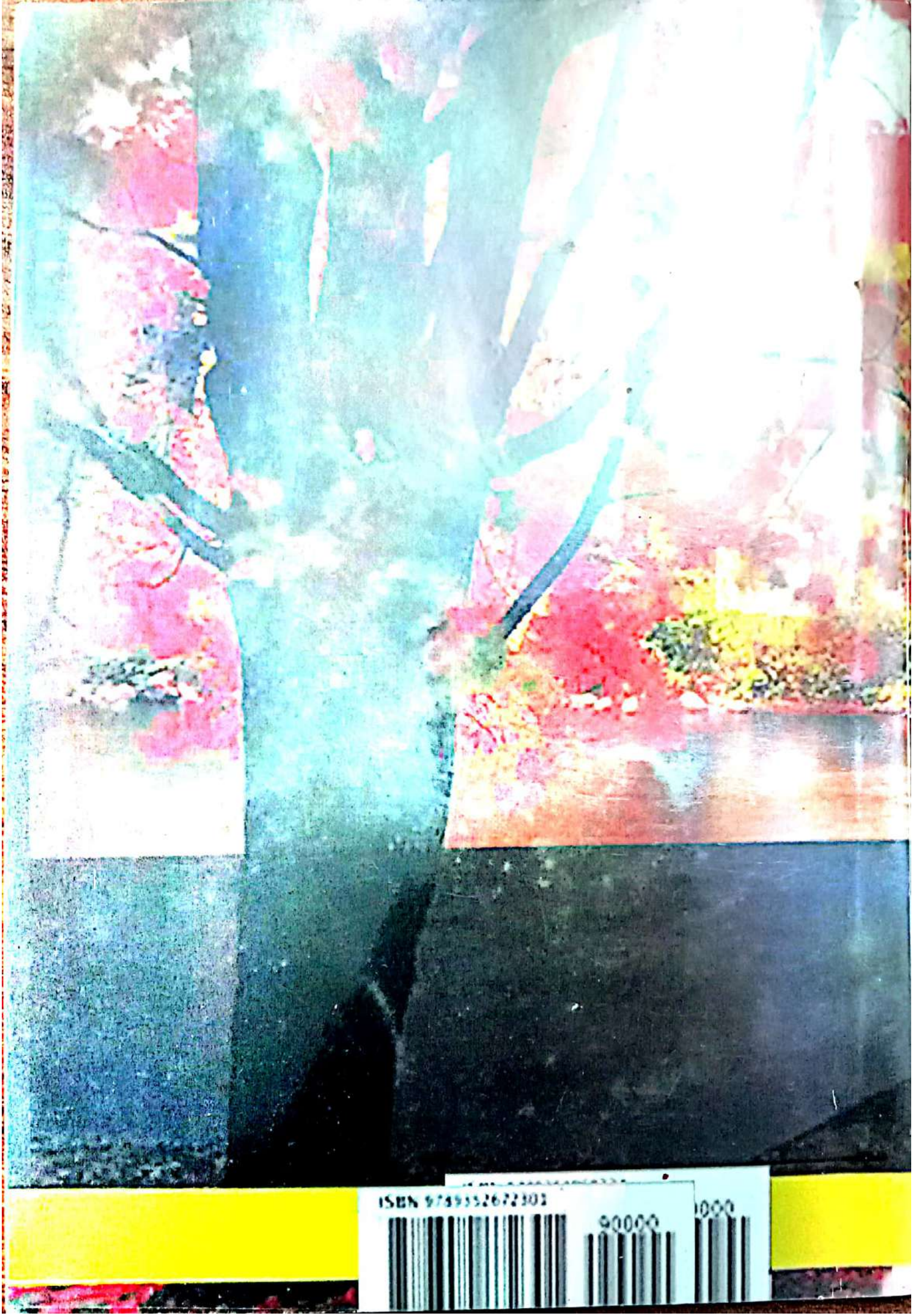
F.Laser

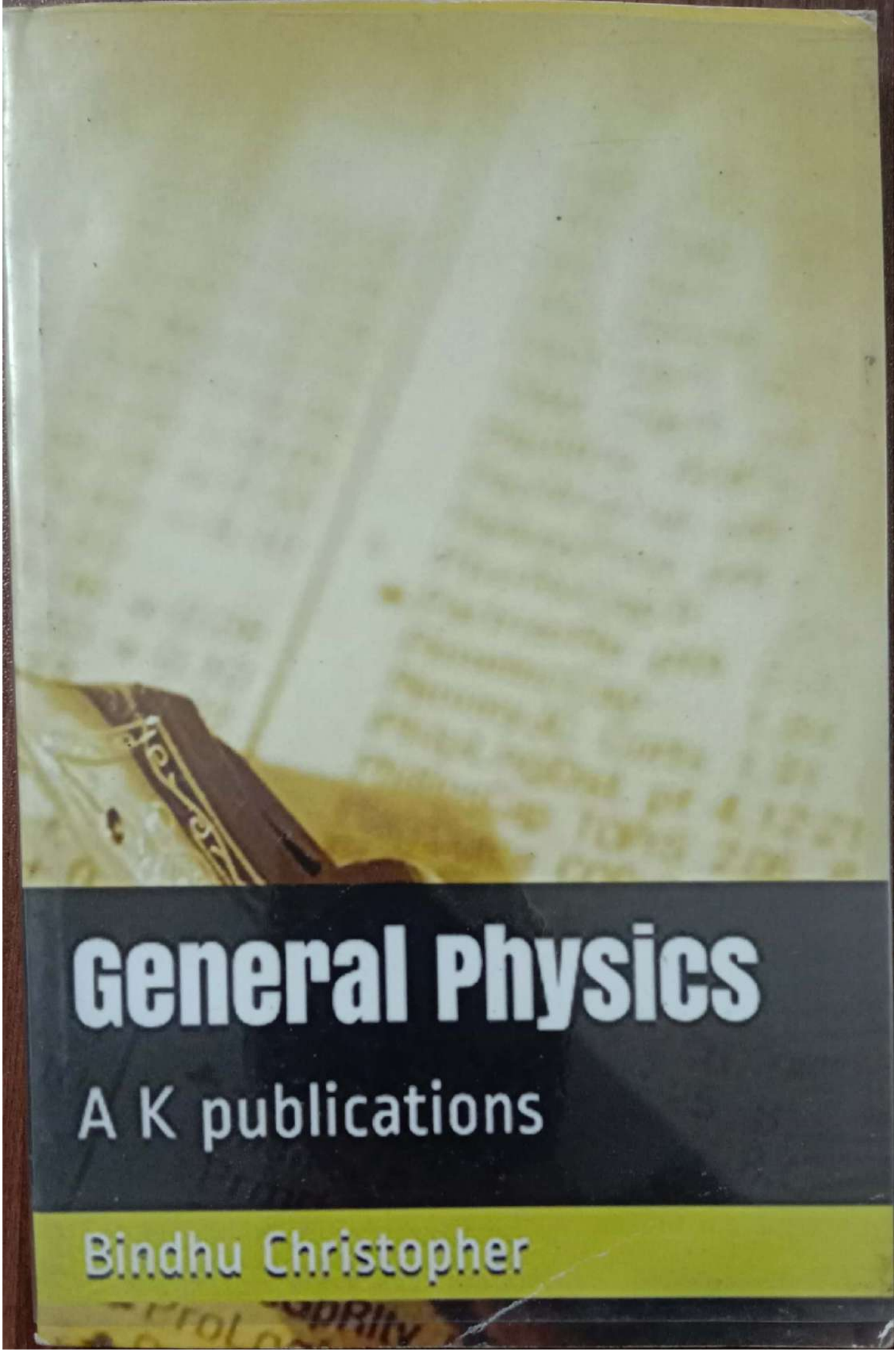
G.Atomic Spectroscopy

H.Molecular spectroscopy

A. Black body radiation

1. Quantum mechanics deals with the study of atoms ,nuclei and elementary particles
2. Inadequacy of classical mechanics
    - Classical mechanics fail to explain the stability of the atom
    - Classical mechanics fail to explain the spectrum of hydrogen
    - Classical mechanics fail to explain phenomena like black body radiation, Compton effect, photo electric effect etc
3. Black body- a body which absorb all the radiation incident on it and the radiation emitted by such body is known as black body radiation.





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GENERAL PHYSICS

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General physics

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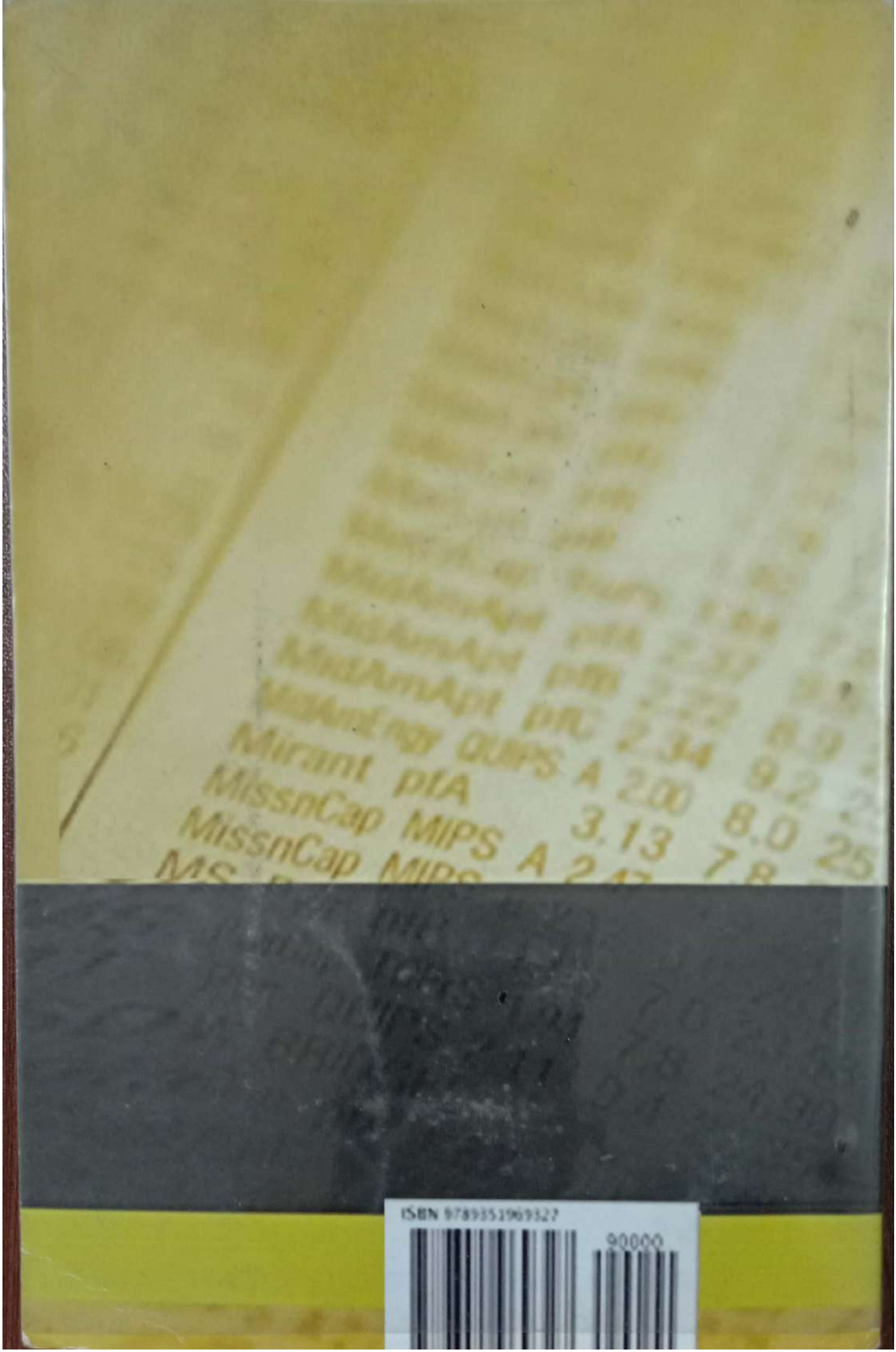
1. What is meant by Physics?
   - physics is the branch of science which deals with the study of nature and natural phenomena.

2. What are the Fundamental units?
   - the SI unit of measurement of seven physical quantites is called fundamental units.
     - They are-
     - Meter(m) for length
     - Kilogram (kg) for mass
     - Second (s) for time
     - Ampere (A)for electric current
     - Kelvin (K) for temperature
     - Candela (cd) for luminous intensity
     - Mole for amount of substance



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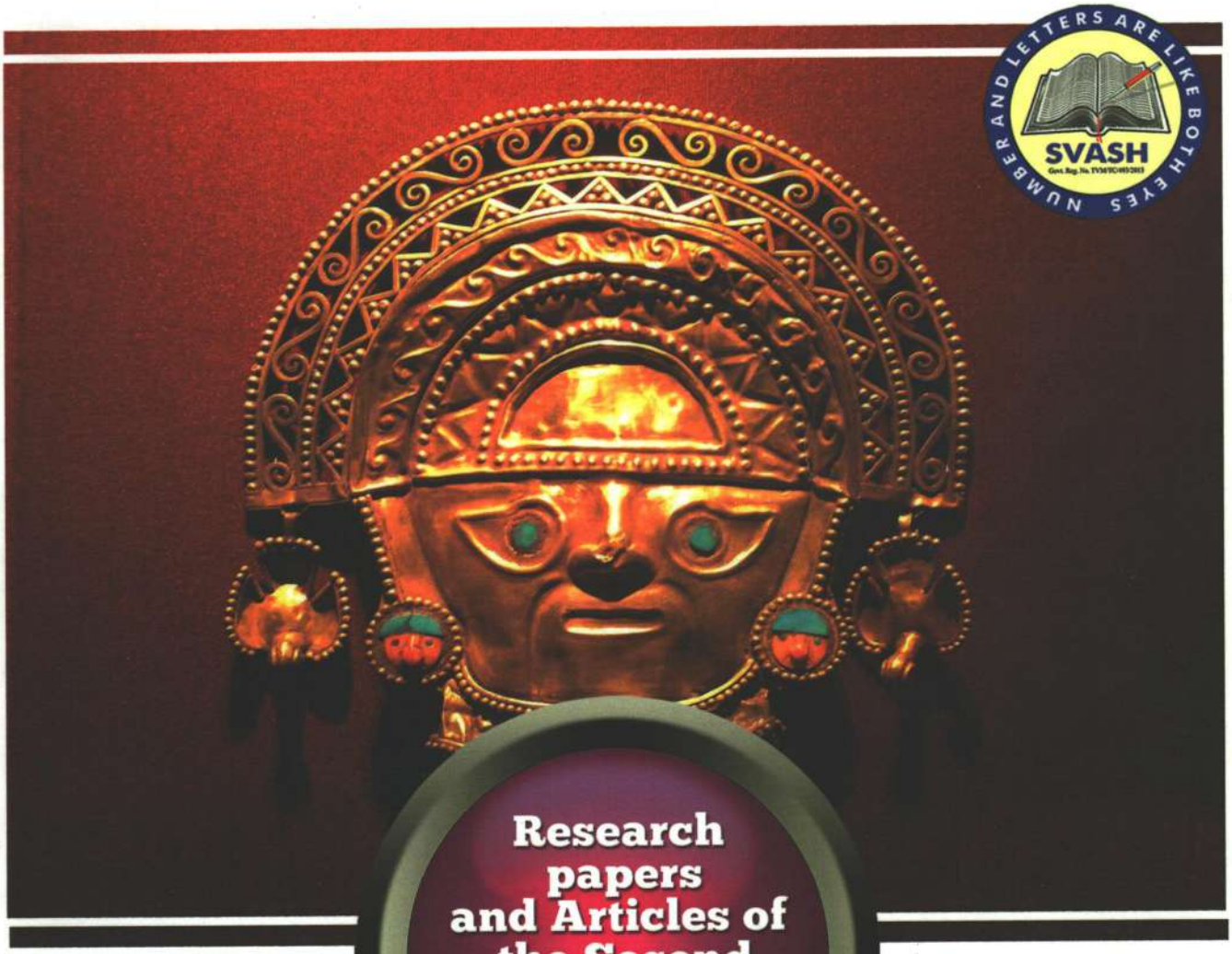

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SVASH 2015

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Editors: Dr.Balu.B & Dr. O.K Praveen

PREFACE

***S**wamy **V**ikananda **A**ssociation of **S**cience and **H**umanities **(SVASH),** was formed in the year 2013. It is a multi-Disciplinary Researchers' Forum which is committed to promote Equality Research and Academic Excellence, especially among college and university teachers and researchers. The svash has taken upon itself, as its mission, the serious propagation of this endearing ideal among researchers, teachers and students. Our attempt is to make assemble global research scholars under one shelter to print, present and publish their research solutions in the **ISBN** proceedings, co-ordinated in different volumes. The blossomed output of this research is stored and propagated into the world of Science and Humanities.*

The spiritual effervescence of svash is predominant in the glitter of charitable activities. As part of this organization, we arranged some charitable acts like Blood Donation and Eye Donation (Covered more than 300 people) .The global sector revitalized in the prism of social and charitable diagnosis. The grief stricken world is stimulated in the ray of hopes and aspirations. Svash is aimed to reshape the attire of man and map of universe. The International seminars of SVASH regenerate the spirit and essence of everlasting liberty and lasting global friendship and social harmony. The dynamic progress on the international affairs reflects in the research work of scholars from different walks of life.

The Organizing Committee sincerely hopes that, it has offered its best in providing a challenging platform to scholars, from all disciplines, in sharing their findings and exchanging notes with fellow scholars in their research endeavors. The Editorial Board also earnestly believes that, it has done a good job in getting all the research papers well-edited, and got them ready for release on the very day of the seminar itself.

In this time of happiness and merriment, I thank all Participants, Delegates, Paper Presenters and Members of Organizing Committee and Editorial Board who toil and moil to make this Second International Seminar, a grant success.

Dr.M.JAYA PRKASH
President SVASH

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EDUCATIONAL VIEWS OF SWAMI VIVEKANANDA

Betty Sunny, Research scholar in Philosophy, Kerala University Library and Research Center, Kerala University, Thiruvananthapuram.

"Education is a manifestation of perfection that is already exist in man"

Swami Vivekananda

Introduction

Swami Vivekananda is a great thinker and reformer of India, embraces education, which for him signifies "man-making", as the very mission of his life. Vivekananda realizes that humankind is passing through a crisis. The tremendous emphasis on the scientific and mechanical ways of life is fast reducing man to the status of a machine. Moral and religious values are being undermined. The fundamental principles of civilization are being ignored. Vivekananda seeks the solutions of all these social and global evils through education.

Swami Vivekananda called the education of his times as merely negative and told people "you regard that man to be education that obtains some degrees, has passed out of some examinations, is able to deliver fluent lectures but this is not real education. Real education is that which prepares a man for struggle of existence. It prepares a man for social service, develops his character and finally imbues him with the sprit and courage of a lion, any other education is worse than useless". He condemned the education of his times as wicked, useless and artificial, because it promoted only bookish learning and rot memory. It is very clear from the above discussion that Swami Viveananda's angle of vision about education was very broad, he also emphasized that after the attainment of independence, our country should learn from western technology and provides as much as possible for industrial and technical education to the citizens. This is very essential for the industrial development of the country, which will result in national progress in all fields of human activity. Condemning the theoretical and academic education, he spoke emphatically for practical and experimental education.

Vivekananda's Educational Thoughts

- **Meaning of Education:**

Education is not the tidbits of knowledge or information inserted into the minds of children by force. According to swamijee if education means information only, then libraries could be the greatest saints of the world and encyclopedia had become seers and rishis. "Education is actually the manifestation of perfection already reached in a man". Education is that process which prepares a man for struggle of existence by making him self-reliant and by developing his character and intelligence. It is in fact, a lifelong process.

- **Aims of Education**
  - Making a man perfect
  - Moral and spiritual development of the child
  - Character formation
  - Development of faith and shraddha in God and oneself
  - Development of oneness feeling

SOCIAL - MATURITY AND SELF- ESTEEM AMONG CHILDREN WHO ARE STUDYING IN KENDRIYA VIDYALAYA AND STATE-RUN PUBLIC SCHOOLS

Fresnal Das Research scholar in Psychology, University of Kerala, Kariavattom campus
Raju S Associate Professor in Psychology, University of Kerala, Kariavattom campus.

Abstract

The present study was designed to investigate the difference in the level of Social - Maturity and Self- Esteem among children who are studying in Kendriya Vidyalaya and who are studying in State - Run Public Schools. It also investigated the inter relationship between Social - Maturity and Self - Esteem. For this purpose a total sample of 120 students aged from 12 to 14 was taken using purposive sampling method from 4 schools of Kerala. In order to collect the data, Indian adaptation of Vineland Social - Maturity Scale (VSMS) by Malin (1965) and Self- Esteem Inventory by Rosenberg (1965) were administered to the participants. Statistically significant differences on Social - Maturity and Self- Esteem were found between children studying in Kendriya Vidyalaya and in State - Run Public Schools. The results of correlational analysis showed statistically significant positive relationship between Social - Maturity and Self- Esteem

Keywords: Children, Kendriya Vidyalaya, Self-esteem, Social - Maturity, VSMS.

The fast and radical changes occurring in the world at all levels have affected the life style and family pattern of the Indian society. Today this world is operating on a capitalistic structure to a great extent, with even parents applying the investment-returns theory to their children. The facilities that a lower primary student of today receives are much more compared to that of a doctorate scholar ten years before. And so has the expectations changed. Putting it across in a funny way, more is expected of a lower primary student too in terms of the returns. The paradigm shift that occurred can be seen in the race by parents to get the best for their children, be it education, or care, or the facilities that are provided. It appears that many parents believe that private education provides a more holistic approach to education than public schools (Beavis, 2004), and an increasing number of parents are choosing to send their children to private schools (Denniss, 2004). It is most often considered that the CBSE Boards of high school/higher secondary education happen to be better than the state Board. This claim is usually countered by the marks scored by students of state syllabus schools, which happens to be comparatively higher than that of CBSE board students. But one factor to be looked out for is whether the comparison happens on the basis of marks or some other element/attribute all together, and that happens to be a query that cannot be completely answered. This study examines the effect of school system on selected psychological faculties of the students, namely Social - Maturity and Self Esteem.

Social - Maturity is the level of social skills and awareness that an individual has achieved relative to particular norms of the society in which he is a member. It is a measure of the development competence of an individual with regard to interpersonal relations, behavior appropriateness, social problem solving and judgment. It is also a personal commitment that each individual must make as an attitude that will influence his/her daily lives. Individuals can

opt for the socially immature attitude of self-centeredness or they can opt for the socially mature attitude of genuine concern for the total wellbeing of each other.

Self- Esteem is a widely used concept both in popular language and in psychology. It refers to an individual's sense of his or her value or worth, or the extent to which a person values, approves, appreciates, prizes, or likes himself or herself (Blascovich&Tomaka,1991).The most broad and frequently cited definition of Self- Esteem is Rosenberg's (1989), who described it as a favorable or unfavorable attitude toward the self.By considering all these factors, the present study was designed to compare the Social - Maturity level and Self- Esteem among children who are being educated in Kendriya Vidyalaya and in State - Run Public Schools. Efforts were also made to analyze the degree of relationship between Social - Maturity and self-esteem.

METHODS

Hypotheses

There were 3 hypotheses formulated to explore the difference on Social - Maturity and Self-Esteem and degree of relationship between Social - Maturity and Self- Esteem between children who are studying in Kendriya Vidyalaya and in State - Run Public Schools

1. There will be statistically significant difference between Social - Maturity of children who are studying in Kendriya Vidyalaya and in State - Run Public Schools.
2. There will be statistically significant difference between Self- Esteem of children who are studying in Kendriya Vidyalaya and in State - Run Public Schools
3. There will be significant relationship between Social - Maturity and Self- Esteem of children who are studying in Kendriya Vidyalaya and in State - Run Public Schools.

Participants and Procedure

Participants of the present study were taken based on purposive sampling technique from 5 different schools in Kollam, (a district in Kerala, India). A total of 120 participants were taken for the study, among which, 60 were children who are studying in Kendriya Vidyalaya and the remaining 60 were children from State - Run Public Schools. Their age ranged from 12 to 14 years. Children who are studying in Kendriya Vidyalaya and in State - Run Public Schools, children who can speak and understand English or Malayalam, children who are free from any congenital, developmental or behavioral disorders were selected for the study. Children who are studying in state aided and private schools were excluded from this study.

Permission was taken from the parents and school authorities in order to conduct this study. Informed consent was also collected from the participants. Personal and demographic data were collected using socio-demographic data sheet from each of the participants followed by the administration of the psychological tools.

Measures

Two psychological measures were used in this study to assess the Social - Maturity and Self- Esteem of the participants.

Table : 1

Data and results of the t-test for the variables purpose in life and alienation

Variable	Group	N	Mean	SD	t-value	Significance
Purpose in life	Institutionalized	30	91.43	19.13	2.84	0.05
	Non-institutionalized	30	104.80	17.22		
Alienation	Institutionalized	30	163.10	28.86	3.44	0.01
	Non-institutionalized	30	140.70	20.92		

For the variable Purpose in Life, the mean scores for institutionalized elderly persons were 91.43 and non – institutionalized elderly persons were 104.80 and their corresponding Standard Deviation was found to be 19.13 and 17.22 respectively. The t-value obtained from this was 2.84 which is statistically significant at 0.05 level. This indicate that there was significant difference between the scores of the institutionalized and non – institutionalized elderly persons for the variable Purpose in Life. From this, it is clear that the institutionalized elderly persons have low level of Purpose in Life compared to the non- institutionalized elderly persons.

For the variable, Alienation, the mean scores for institutionalized and non – institutionalized elderly persons were 163.10 and 140.70 and their corresponding Standard Deviation was 28.86 and 20.92 respectively. The t-value is found to be 3.44 which is statistically significant at 0.01 level. This shows that the institutionalized elderly persons are suffering from alienation and they experiences more symptoms of loneliness than non – institutionalized elderly persons. These results indicate that institutionalized elderly persons rarely found any meaning in their lives and are suffering from alienation.

Conclusion

Old age is known to bring physical, psychological and sociological changes of an undesirable nature. the elderly persons are more vulnerable to various psychosomatic problems, and they like to live with their family members. But the situation is more vulnerable when they are away from their family and spending their lives in old age homes. In old age, maintaining purpose in life may become very difficult. It is more difficult, when the elderly persons are in old age homes. Older people are vulnerable to loneliness and isolation also, and the vulnerability is more affected to those who are residing in old age homes. From the study we concluded that the purpose in life of institutionalized elderly persons are very low compared with those who are living in their families, and in the case of alienation also, the score is high among institutionalized elderly persons.

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SOCIAL INTELLIGENCE AND SELF-ESTEEM AMONG CHILDREN WITH AND WITHOUT SIBLINGS

Sijin K. S Research scholar in Psychology, University of Kerala, Trivandrum

Anil Jose P. S Assistant Professor in Psychology , Fatima Mata National College, Kollam

Dr.Anjana R Assistant Professor in psychology, Sree Narayana College, Chempazhanthy

The present study was designed to investigate the difference in the level of social intelligence and Self - Esteem among children with and without siblings.It also investigated the inter relationship between social intelligence and self-esteem. For this purpose a total sample of 120 students aged from 12 to 14 was taken using purposive sampling method from 5 schools of Kollam District of Kerala. In order to collect the data,Social Intelligence Scale (SIS) by Chadda and Usha (2005) and Self-esteem Inventory by Rosenberg (1965) were administered to the participants. Statistically significant differences on social intelligence level and self-esteem were found between children with and without siblings. The results of correlational analysis showed statistically significant positive relationship between social intelligence and self-esteem.

Keywords: Children with siblings, Children without siblings,Social Intelligence, Self - Esteem,SIS.

INTRODUCTION

Family atmosphere has a great role in the behavioral and social development of individuals. Usually almost all types of learning beginning from the family and family environment have a significant role in developing the personality of the child.Family has a great responsibility in promoting social skills, providing fundamental knowledge, modifying behavior, developing language etc. Parents, grant parents, siblings and relatives have their own role in this developmental process. In most of the cases siblings are usually children's playmates, intimate friends, protectors, enemies, competitors, confidantes and the role models. They are an important source of support. During this time siblings are not only companions but also help with difficult tasks and provide comfort during emotional stress.Siblings who are close in age often argue more but also develop closer bonds. Children who have siblings tend to work very well with peers.(Dunlap, 2004).

The fast and radical changes occurring in the world at all levels have affected the life style and family pattern of the Indian society.A few years back only males were considered as the bread winners of the family and females were supposed to take care of the children and other responsibilities in the home. Now the scenario is totally changed and it is almost mandatory for both the parents to play the vital role of bread winners for the healthy sustenance of the family.The emergence of women as workforce set in many changes in family structure. The question whether to have single child or more is getting many disputes between the generations. The young generation is not ready to take responsibility of more than one child as

EMERGING OPPORTUNITIES AND CHALLENGES OF GREEN MARKETING IN INDIA.

Carmel Thomas Research scholar in commerce

Dr. Joseph James. V, Head of the Commerce Department, Fathima Matha National College,Kollam

Abstract

The present study aims to ascertain emerging opportunities and challenges of Green Marketing in India. Green marketing has emerged as an important concept in India as in other parts of the developing and developed countries in the world. There is a growing interest among the consumers all over the world regarding the protection of environment. As a result of this green marketing has emerged which speaks for growing market for sustainable and socially responsible products and services. Many companies have started realizing that they must behave in an environment-friendly fashion. They set themselves environmental objectives as well as corporate and profit objectives. This paper aims at finding out what actually green marketing and how can a business firm be more competitive by using green marketing strategies.

Introduction

Green has traditionally been associated with hope and growth and it also represents the nature. Green marketing may be broadly refer to an environment friendly wholistic marketing. As resources are limited and human wants are unlimited, it is important for the marketers to utilize the resources efficiently without waste as wells as to achieve the organization, objective. For a durable and sustainable system of marketing an environment friendly marketing system green marketing is inevitable.

Green marketing is becoming more important to business because of the consumer's genuine concerns about our limited resource on the earth. By implementing green marketing measures to save the earth's resources in production, packaging and other related operations, business are showing consumers that they also share the same concerns that boost their credibility.

According to the American marketing association, green marketing is the marketing of products that are presumed to be environmentally safe. Thus it incorporates a broad range of activities, including product modification, changes to the production process, packing changes, as well as modifying advertising. Green marketing refers to holistic marketing concept wherein the production, marketing consumption and disposal of products and services happen in a manner that is less detrimental to the environment with growing awareness about the implications of global warming, non-bio degradable solid waste, harmful impact of pollutants etc… Both marketers and consumers are becoming increasingly sensitive to the need for switch over to green products and service.

Research Problem

In the light of the above, the present study attempts to make a descriptive enquiry regarding the various aspects of green marketing. The study is oriented towards the need for reiterating the importance of implementation of a green

marketing system in all respects. The study is oriented towards the need for environment friendly product and modes of services for a life friendly sustained environment.

Need of Green Marketing

There is a growing interest among the consumers all over the world regarding the protection of environment. World wide evidence indicates that people are concerned about the environment and are changing their behavior. As a result of this, green marketing has emerged which speaks for growing market for sustainable and socially responsible products and services. Thus the growing awareness among the consumers all over the world regarding production of the environment in which they live, people do want to bequeath a clean earth to their offspring. Various studies by environmentalists indicates that people are concerned about their environment and are changing their behavior pattern so as to be less hostile towards it. Now we see that most of the consumers, both individual and industrial, are becoming more concerned about environmental greedily products and services. Now is the era of recyclable, non-toxic and environment friendly goods. This has become the new mantra for marketers to satisfy the need of consumers and earn better profits.

Objectives

In the context of the research problem the study attempts to cover the following objectives.

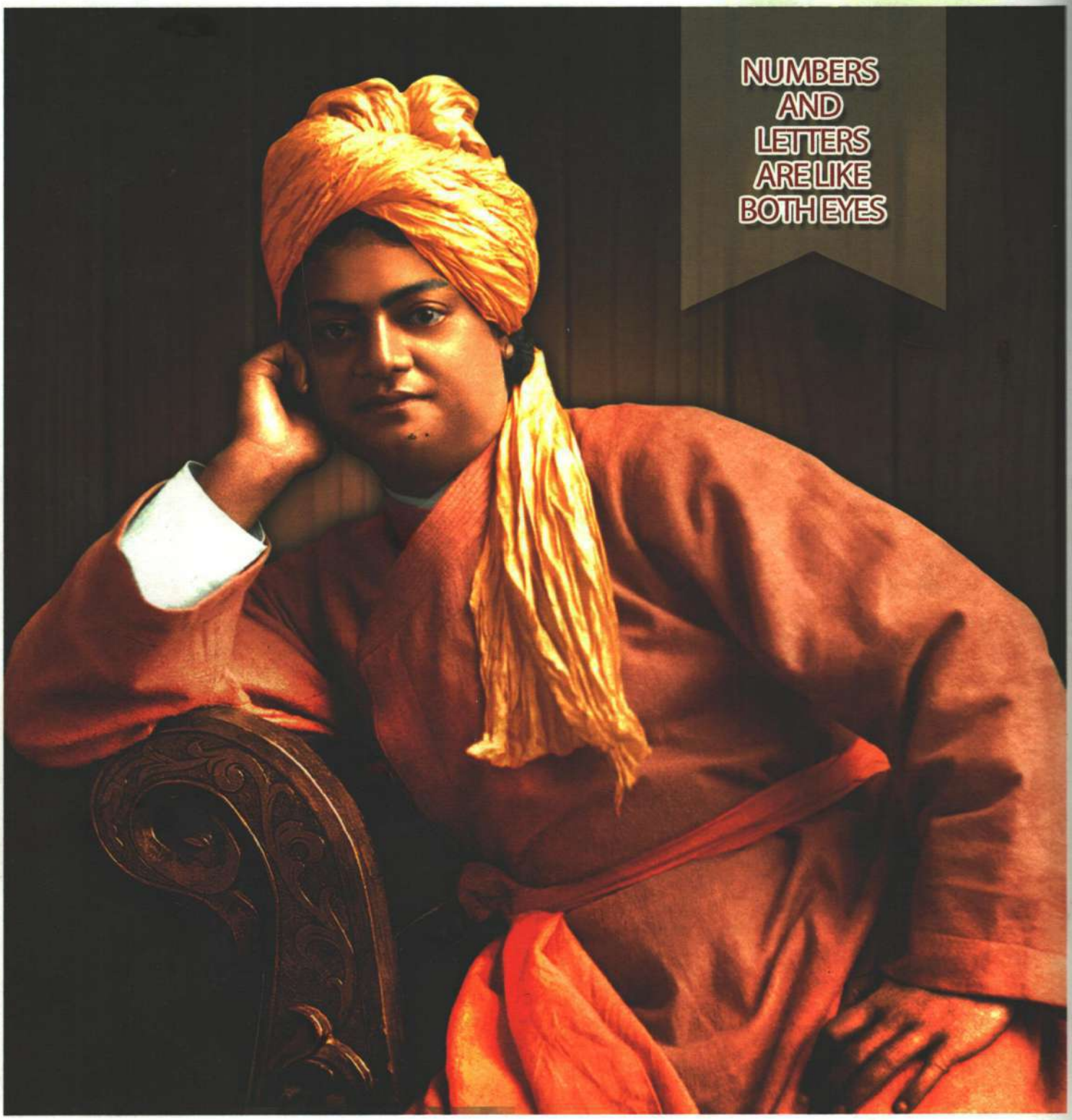
1) To establish responsibilities of the government and business in creating and maintaining an eco-friendly system of business and other activities.
2) To establish the need for public awareness regarding protection of environment and green consumerism.
3) To show the growing importance of green marketing for sustainable business.
4) To evaluate the present position of green marketing in India.

Method of Study

In the light of the above objectives the study proceeds through the evaluation of social responsibilities of business entities and of the government. It also covers the importance of protection of environment in marketing of products in its broadest sense. It also deal with the need for green consumerism for sustainable development of business.

Government Responsibility

Various regulations are framed by the Government to protect the society. This led to the adoption of green marketing as compulsion rather than a choice. For example the ban of plastic bags and prohibition of smoking in public areas etc., The Government of India has developed a framework of legislations to reduce the production of harmful goods. To assit consumers to judge the validity of companies environmental claims, eco labeling programmers run by governments. Eco-labeling is labeling of products and materials to indicate their environmental quality – including how they have been produced and their impact on the environment. Eco-labeling schemes there, help consumers make decisions about the products they buy and whether they are environmentally friendly. They there are several existing eco label schemes around the world, including the German Green spot, the Nordic swan and the US Green seal. In India the ministry of environment



SECOND INTERNATIONAL SEMINAR OF
SVASH 2015

SWAMI VIVEKANANDA ASSOCIATION OF SCIENCE & HUMANITIES

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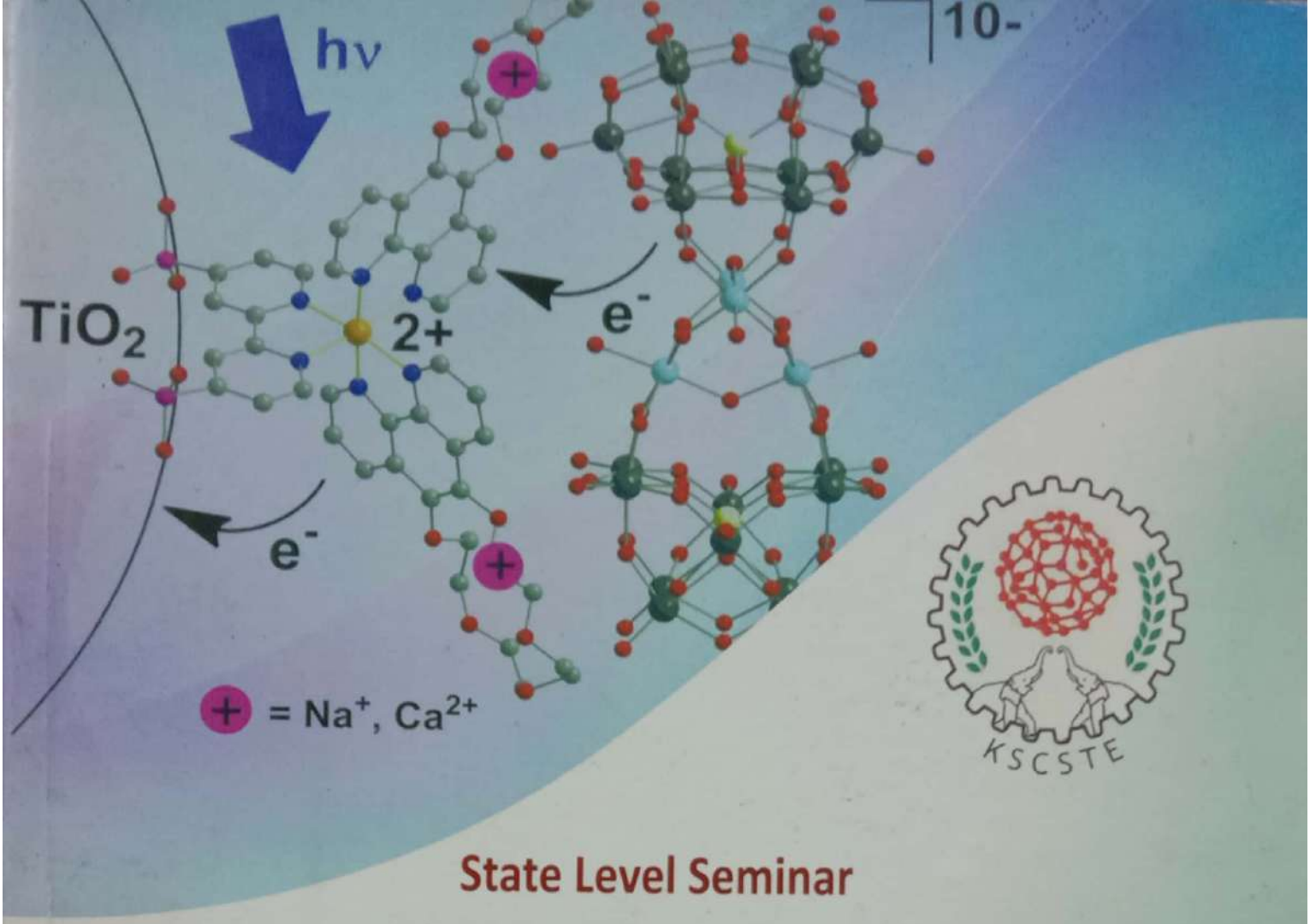

State Level Seminar

Solar Photochemistry- Fundamentals and Applications

Date: 28.01.2016

PROCEEDINGS

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Contents

Molecular Photocatalytic Systems for Solar Water Splitting

Dr. Ajayakumar G

Department of Chemistry, Govt. College for Women, Thycaud P O., Vazhuthacaud, Thiruvanathapuram-14.
Email:gajayakumar@gmail.com

The ever increasing demand for energy resources and the issue of environmental pollution underlines the urgent need of clean fuels to substitute the fastly depleting reserves of carbonaceous fuels.[1] Among the various alternatives, hydrogen[2] has great importancedue to three major reasons: (1) hydrogen has a high calorific value as a fuel (H_2+ ½ O_2 → H_2O + 56.7 kcal mol^{-1}), (2) water, the primary raw material for generating hydrogen, is cheap and it is available in plenty on earth, and more importantly, (3) hydrogen produces only water upon combustion i.e., it is an ideal fuel which satisfies the mandate of clean emission. Extensive studies have been carried out in search of new and improved strategies for generating hydrogen from water. Among such efforts, the approach of 'solar light-induced water splitting'[3] has been given the top priority on a conceptual ground, due to the perpectual availability of sunlight on earth. It is thus promising to develop practically applicable artificial photosynthetic devices,capable of driving solar light-induced water splitting.

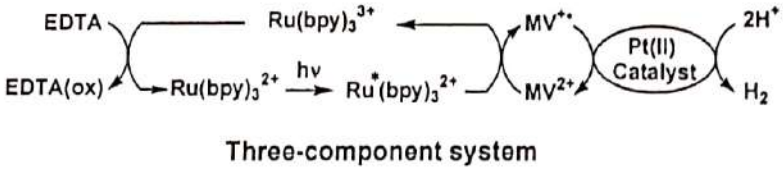


Fig. 1. Schematic representation of three-component system for photochemical H_2 evolution from water.

Photocatalysis based on (a) semiconductor systems[4] and (b) molecular assemblies are the two widely practiced approaches in solar light-induced water splitting. The exploration of molecular systems capable of generating molecular hydrogen started in the late 1970s.[5] In those studies, tris(2,2'-bipyridyl)ruthenium(II) (*i.e.*, $Ru(bpy)_3^{2+}$) was used as a photosensitizer along

A comparative study of Cerium(IV) Phosphomolybdate and its Composite Acrylamide Cerium(IV) Phosphomolybdate

A P Apsara[a] and B Beena[b]

[a] *Department of Chemistry, FMN College, Kollam, Kerala*

[b] *Department of Chemistry, D B College, Sasthamcotta, Kollam, Kerala*

Abstract: A hybrid cation exchanger Acrylamide Cerium (IV) Phosphomolybdate has been synthesized by co-precipitation method. Ceric sulphate, ammonium heptamolybdate, disodium hydrogen phosphate and acrylamide (10-500 mmoles) were mixed to obtain a material of optimum sodium exchange capacity. The selected material was characterized by ICP-AES, CHN analysis, FTIR, XRD, TGA/DTA in addition to chemical stability and ion exchange studies. Ion exchange capacities for different alkali and alkaline earth metals were determined. The effect of heat on ion exchange capacity was also studied for the exchanger.

Key words: Tetravalent metal acid salts, Derivatized TMA salts, Ion exchange capacity

Introduction: Composite materials which consist of inorganic-organic counterparts are of profound interest owing to their unexpected, synergistically derived properties. These hybrid materials sometimes lead to new properties, which are not exhibited by individual compounds. Tetravalent metal acid (TMA) salts can be derivatized by organic moieties bearing ionogenic groups such as –OH, -COOH, $-SO_3H$ etc which also act as ion exchangers. These compounds are known as inorgano-organic ion exchangers or derivatized TMA (DTMA) salts[1, 2]. Interest in the DTMA salts stems from the fact that the inorganic backbone provides a stable and relatively inert anchor for the organic moiety. DTMA salts have the added advantage of both their counterparts in terms of thermal and chemical stability and ion exchange capacity[3].

In the present study we have selected the inorganic component of the hybrid material as Cerium (IV) Phosphomolybdate (CPM), an inorganic ion-exchange material based on cerium. This material belongs to the class of TMA salts having structural hydroxyl protons responsible for the ion exchange behaviour. CPM is functionalized with acrylamide so as to obtain a hybrid material with robust properties. The present work deals with the structural characteristics and ion exchange properties of Acrylamide Cerium(IV)Phosphomolybdate (AACPM)

Experimental

Synthesis: A number of samples of the hybrid material have been synthesized by co-precipitation method.Equimolar solutions of ceric sulphate, ammonium heptamolybdate and disodium hydrogen phosphate in the volume ratio 1:1:2 were mixed with acrylamide solution containing 10 to 500 mmoles with very slow and continuous stirring.The resultant slurry obtained for each composition was kept overnight, filtered, washed with conductivity water till free of sulphate ions and dried at 40^0C.The samples thus obtained were converted to hydrogen form using 1M HCl with occasional shaking and intermittently replacing the supernatant liquid with fresh acid. Finally the samples were washed with demineralised water till free of chloride ions, dried at 40^0C and sieved to obtain particles of 50-70 mesh size. The maximum sodium exchange capacity was observed for a sample obtained by adding 200 mmoles of acrylamide. This sample AACPM was selected for further studies.

Chemical stability: 500 mg of the exchanger was kept separately in 50ml of different solvents and the change in colour and weight were noted.

Apparatus: Elemental analysis of the compound was obtained from Thermo Electron IRIS Interpid II XSP Duo, ICPAES Spectrometer and Elementar Vario ELIII CHNS Analyzer X-Ray diffractograms were taken from Bruker D8 Advance diffffractometer using Cu K_α radiation. FT-IR spectrum was recorded on a Perkin Elmer Fourier Transform Spectrometer. Thermograms were taken with Perkin- Elmer Diamond Thermo Gravimetric Analyzer.

Ion Exchange capacity(iec) of the material was determined by column method [4].The effect of heat on ion exchange capacity of the sample was studied at different temperatures .

Results and discussion: Acrylamide Cerium(IV)Phosphomolybdate was obtained as yellow powder. Chemical stability studies showed that the material is stable in demineralised water, solutions of metal chlorides, acid media(7N HCl, 7N HNO_3, 5M H_2SO_4, glacial acetic acid) and organic solvents as evidenced by no change in colour, form or weight of the sample.It is however unstable in bases like NaOH and KOH. Elemental analysis by ICP-AES showed that the material contains 10.36% Ce, 51.3% Mo and 3.62% P. From CHN analysis, the material was found to contain 0.44% C, 1.55% N and 0.73% H.

The XRD of CPM and AACPM confirmed the presence of nanocrystallites.

Figure 1. XRD of CPM

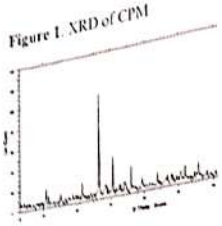
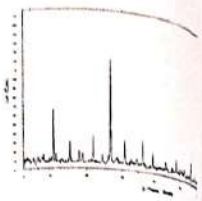


Figure 2. XRD of AACPM



The Debye- Scherrer formula has been used to calculate the crystallite size and it was found to be 33nm for AACPM.

The binding of acrylamide with Cerium (IV)Phosphomolybdate exchanger was confirmed by their IR spectra (Figures 3 and 4). A broad band around 3200cm^{-1} is observed in both the inorganic material and the hybrid which are attributed to the symmetric and asymmetric –OH stretching vibrations[5]. The appearance of two new absorption bands, one at 1614cm^{-1} attributed to N-H vibrations of primary amide group and another sharp intense absorption band at 1412cm^{-1} due to C-H stretching vibrations of the $-CH_2$ group of the acrylamide group confirms the presence of organic moiety. A sharp peak at 1062cm^{-1}, attributed to P=O stretching vibrations is observed in both the spectra. A band centered at 961cm^{-1} indicating the bending mode of P-O-P and a combination of bands around 850-450cm^{-1} attributed to metal-oxygen vibrations are found in both the spectra.

Figure 3. FT-IR spectrum of CPM

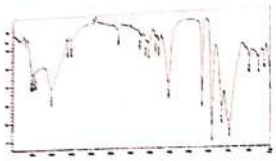
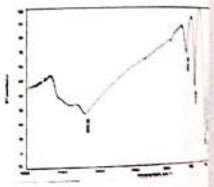


Figure 4. FT-IR spectrum



of AACPM

The O-H stretching peak at 3606 cm^{-1} of the inorganic material is lowered in intensity by the sorption of acrylamide as evident from Figures 3 & 4. This reveals that there is bonding between surface hydroxyl group of CPM and acrylamide molecule. A broad peak is observed in the region 3600 - 3200 cm^{-1}, which is attributed to overlapping of NH and OH stretches. In addition to this, the NH_2 of acrylamide takes part in hydrogen bonding, which brondens the peak. The peak representative of C=O group, of free acrylamide moiety[6], is observed at 1686 cm^{-1}. A shift of the C=O stretching band to lower wave number region is seen in the spectrum of AACPM, which suggests that C=O is involved in hydrogen bonding.

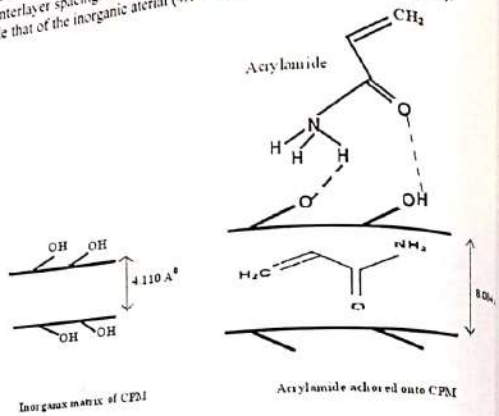
Table 1- Analysis of XRD of CPM

2θ	FWHM	% Relative intensity	d- spacing(A^0)	hkl
21.602	0.244	20	4.110	100
26.458	0.310	100	3.366	110
30.666	0.232	40	2.913	110
36.125	0.234	25	2.484	210
55.806	0.193	20	1.646	211

Table 2- Strong peaks in the X-ray diffractogram of AACPM (In the sequence of intensity)

2θ	FWHM	Relative intensity(%)	Interlayer spacing d(A^0)	hkl
26.687	0.251	100	3.337	211
10.935	0.255	85	8.084	100
15.405	0.211	58	5.747	110
21.767	0.275	27	4.079	200
36.346	0.282	25	2.892	220
17.909	0.231	23	4.948	111
39.593	0.209	20	2.274	320
55.951	0.333	19	1.642	422
49.554	0.211	2	1.838	331

On the other hand, the analysis of the XRD data[7] reveals that, there is a regressive increase in the basal spacing corresponding to d(100) reflection. The interlayer spacing of AACPM was found to be 8.084 A^0 which is almost double that of the inorganic aterial (4.110 A^0) as evident from (Table 1 & 2).



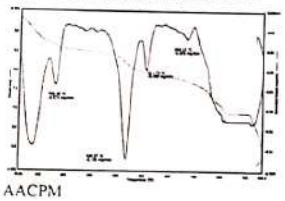
Scheme showing the binding of acrylamide on CPMThis is attributed to the effect of acrylamide within the interlayers. However, the presence of acrylamide increases the stacking order of the layers of CPM, as revealed by both both sharpening and increase in intensity of (100) reflection. The probable interaction of acrylamide on CPM is represented in Scheme.

The binding of organic material with the exchanger is also confirmed by thermogravimetric analysis [8] (Figure 5 and 6).It is apparent from the curves that the inorganic material suffers a weight loss of 7.5% and the hybrid material shows a decrease in weight of 7% in the temperature range 100-200^{0}C due to loss of moisture/hydrated water.On further increasing the temperature(400-500^{0}C), CPM shows a weight loss of 2.4% which is attributed to the condensation of structural hydroxyl groups.The hybrid material suffers a weight loss of 4.4% in the same temperature range, which may be due to the degradation of the organic moiety as well as condensation of structural –OH groups. The complete decomposition of the organic moiety predominates the condensation of structural hydroxyl groups which is observed as a sharp weight loss beyond 700^{0}C. The DTA of the organic-inorganic composite material shows a sharp endothermic peak at 531^{0}C which

indicates that some structural changes occur in the material on heating. A similar endothermic peak is observed for CPM also around 511^{0}C. Based on the elemental analysis by ICP-AES and CHN analysis, AACPM has been formulated as ($2CeO_2$. $14MoO_3$. 3/2 P_2O_5 . 1/3CH2: $CHCONH_2$) . $10H_2O$

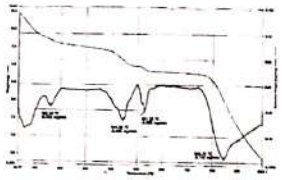
The value of n was found to be 10 using Alberti and Torraca formula[9].

Figure 5. TGA/DTA curves of CPM



AACPM

Figure 6.TGA /DTA curves



The Na^+ exchange capacity of the material is found to be 7.30 $meqg^{-1}$ which is higher compared to its inorganic counterpart (7.00 $meqg^{-1}$).The selectivity sequence for alkali metals is in the order Na^+(7.30) > Li^+(5.11) > K^+(3.29) and for alkaline earth metals the observed order of preference is Mg^{2+}(10.32) > Ba^{2+}(9.49) > Ca^{2+}(8.30) > Sr^{2+}(6.13). The selectivity sequence do not follow the order of ionic radii or hydrated ionic radii.

The iec ($meqg^{-1}$) of the samples calcined in the temperature range of 100 to 500^{0}C are found to be 7.42(100^{0}C); 8.37(200^{0}C); 8.88(300^{0}C); 2.02(400^{0}C); 10.25(500^{0}C).The initial increase in the iec value at 100^{0}C could be attributed to loss of moisture adhered to it, thereby activating the exchanger. An increase in iec value at 300^{0}C is attributed to the decomposition of organic moiety, leading to the formation of active carbon, as evidenced by the change in colour of the heated samples to bluish black. A drastic decrease in iec at 400^{0}C is attributed to the condensation of structural hydroxyl groups. Further an increase in iec at 500^{0}C may due to complete decomposition of organic moiety and formation of activated carbon[10].

Conclusion: The hybrid exchanger possess good chemical resistivity and thermal stability and high ion exchange capacity.The presence of the organic moiety improves the ion exchange capacity of Cerium(IV)Phosphomolybdate.The high Na^+ exchange capacity shows the potential application of the material in desalination technique based on electro-deionization.

Acknowledgements: This work was supported by UGC (FIP PlanXI)

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EFFECT OF SOLUTION pH ON ADSORPTION BEHAVIOR OF BASIC DYE ONTO GLYCIDYL METHACRYLATE GRAFTED AGRICULTURAL RESIDUE

Noeline B. Fernandez*, Manohar D. Mullassery, Surya R.

Department of Chemistry, Fatima Mata National College, Kollam, Kerala.

Email: fernandeznoeline@gmail.com

ABSTRACT: The aim of this work is equilibrium study of the sorption of Basic red-22 (BR) from aqueous solutions under different experimental conditions using an adsorbent glycidyl methacrylate grafted banana stem (GM-BS). Microwave (MW) irradiation has gained a great deal of attention owing to the molecular level of heating. Banana stem is grafted with glycidyl methacrylate under microwave irradiation. The adsorbent has been characterized using IR. The effects of pH for the removal of BR was studied. The optimum pH for BR adsorption was found to be 10.0. Desorption of BR from the sorbed clay was achieved by eluting with 0.01 M HCl.

Key words: banana stem, adsorption, kinetics, regeneration

Introduction

Presence of numerous dyestuffs with various chemical properties and adverse effects in surface and underground waterways has been concern of public people and government all around the world. The discharge of dye-bearing wastewater into environment natural waterway from textile, paper, leather, tannery, plastics and cosmetics is the first contaminants that are recognized. Due to the colour and turbidity associated with dyes, they are highly visible and cause damage to aesthetic nature of the environment [Robinson et al. 2002; Mohan et al 2002; Nigam et al. 2000]. Also these dyes may drastically affect photosynthetic phenomenon in aquatic life due to reduced light penetration [Ramakrishna and Viraraghavan 1997; Garg et al. 2004]. As a result, the removal of colour from waste effluents has become environmentally important [Sanghi and Bhattacharya 2002; Malik 2003; Arami et al 2003]. Dyes may also be problematic if they are broken down anaerobic in the sediment, as toxic amines are often produced due to incomplete degradation by bacteria [Weber and Wolfe 1987]. Direct discharge of dyes laden wastewater into municipal wastewater plants or environment may cause the formation of toxic carcinogenic breakdown product. Today more than 9000 dyes are incorporated in colour index belonging to various

chemical application classes. Water soluble anionic group of dyes are one of the most important group of dyes used in the textile dyeing industries, are used to dye fabrics like wool, nylon and silk. Various techniques have been employed for the removal of dyes from wastewaters. Due to low biodegradability of dyes a conventional biological treatment process is not very effective. Among other methods adsorption has been found to be superior to other techniques for wastewater treatment in terms of low cost, simplicity of design, and ease of operation and insensitive to toxic substances [Meshko et al 2001; Kannan and Sundaram 2001]. Several wastes and residues have been investigated for the adsorption of dyes with varying success [Annadurai et al 2002; Dorgan et al 2004; Shawabkeh and Tutunji 2003; Acemioglu 2004]. Therefore a new and promising class of adsorbent is needed for alleviating the problems caused by textile dyes. Considering the eco friendly and cost effective methods, biopolymers prove to be a viable and affordable alternative for the adsorption of dye due to its low cost, easy availability, possibility of enhanced adsorbabilities by surface modification. Banana stem was another commonly available and abundant natural material. Besides its utility in preparing banana fibre with good strength and lustre, any attempt to find a better alternative for the use of banana stem it would be another milestone in our march towards economic development.

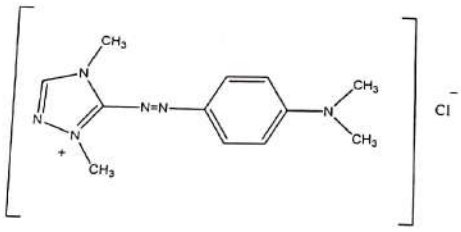
Microwave irradiation has acquired a great deal of attention in domestic, industrial and medical applications. MW is highly effective for improving the efficiency of many chemical reactions compared to the traditional thermal heat source. MW effects cannot be achieved by conventional heating. In the present study a new adsorbent material prepared from banana stem was employed for the removal of BR from wastewater. The main objective of this study was to investigate the feasibility of using glycidyl methacrylate grafted banana stem by microwave irradiation in removing BR from water and wastewater.

2. MATERIALS AND METHODS

2.1 Reagents

The starting material banana stem, BS (pseudo stem of Musa Paradisiaca L.) for the preparation of adsorbent was obtained locally. All the chemicals used to prepare reagent solutions were of analytical reagent grade. The Basic red-22 (BR) was purchased from Aldrich-Sigma Chemie (Germany). The monomer glycidyl methacrylate and dimethyl formamide (DMF) were obtained from Sisco Research Laboratories, India.

The experiments were conducted over a range of pH from 1.0 to 10.0 using 0.1 mol L^{-1} HCl and 0.1 mol L^{-1} NaOH. A stock solution of 1000 mg L^{-1} of BR was prepared by dissolving weighed quantity of BR in 1000 mL of solution.



Scheme-1 Structure of Basic Red-22

2.2. Preparation of the adsorbent

Weighed quantity of banana stem and 15 mL of DMF and 0.046 moles of glycidyl methacrylate were taken in a RB flask and irradiated in a (IFB-India) domestic microwave oven for 2 minutes. The separated GM-BS was washed repeatedly to remove the water soluble particle and was filtered using Whatmann No. 42 filter paper. The product was dried at 70 °C for 24 h and was sieved between the particle size 80 and 230 mesh (average particle size 0.096 mm).

3. Results and Discussion

3.1. Adsorbent Characteristics

FTIR spectra of BS and GM-BS (400-4000 cm^{-1}) were plotted in Fig. 1 and Fig. 2. The strong asymmetric absorption band at 3340 cm^{-1} for BS was attributable to the sum of the contribution from adsorbed water and hydroxyl groups from polyphenols originally present in BS.

The IR exhibited weak absorption peak at 2923 cm^{-1}, characteristic of the C-H stretching vibrations of the cellulose and hemicellulose.

The strong bands at 1519 cm^{-1} and 1209 cm^{-1} were due to the aromatic C=O and C-O stretching vibrations of the lignin component, respectively. The band characteristic to β-glycosidic linkage appeared at 885 cm^{-1}.

The FTIR spectrum of glycidyl methacrylate grafted cellulose adsorbent (Fig. 2) shows characteristic peaks of cellulose O-H, C-O glycosidic linkages and a distinct peak at 1714 cm^{-1} due to C=O group in the glycidyl methacrylate monomer. Another three bands at 1321, 816, and 694 cm^{-1} could be attributed to epoxy ring [16].

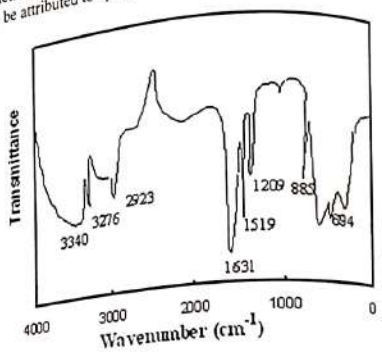


Fig 1. The FTIR spectra of banana stem

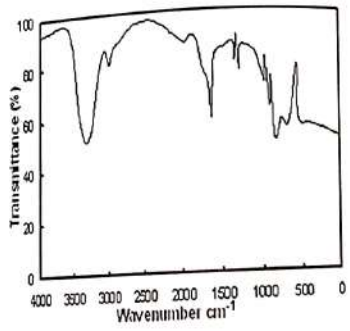


Fig 2. The FTIR spectra of Glycidyl methacrylate polymerized banana stem

The zero point charge pH_{ZPC} is defined as the pH at which surface charge density (σ_o) is zero. The value of σ_o as a function of pH was calculated using the equation

$$\sigma_0 = \frac{F(C_A - C_B + [OH^-] - [H^+])}{A} \quad (1)$$

Where F is the Faraday's constant, C_A and C_B are the concentrations of strong acid strong base after each addition during titration. $[H^+]$ and $[OH^-]$ are the equilibrium concentrations of H^+ and OH^- ions respectively are bound to the suspension surface. 'A' is the surface area of suspension.

The plots of σ_o versus pH for BS and GM-BS (Figure not shown) gave the point of intersection of σ_o with the pH curves gives the pH_{zpc} value of 4.3 and 7.4 for BS and GM-BS respectively. The increase in pH_{zpc} after polymer grafting treatment indicates that GM-BS becomes more positive and organophilic.

3.2. Effect of pH

When the pH of the solution increases from 2.0 to 10.0, the percentage of adsorption of BR increases from 29.0 to 98.5% for an initial concentration of 500 mg/L whereas for 1000 mg/L the percentage of adsorption increases from 20.0 to 92.5%. The adsorption of BR onto the adsorbent surface is primarily influenced by the surface charge on the adsorbent, which is influenced by the solution pH_{PZC}. The zero point charge (pH_{zpc}) of GM-BS was found to be 4.3, below this pH, the surface charge of GM-BS is positive. At pH value below pH_{ZPC}, the GM-BS has net positive charge and would therefore, be prone to electrostatic repel cation. BR, is a cationic basic dye and it is attracted by an anionic adsorbent. At pH above 4.3 surface charge of the adsorbent becomes negative and it facilitated the electrostatic interaction with the cations of the dyes. There is another possibility of penetration of cationic dyes into the surface layers GM-BS. The possibility of interlamellar adsorption depends on the size of the molecule, polarizability and solubility of dye of which solubility is an essential property [Kumar et al 2013]. However, dyes will associate in acidic medium forming large molecules; such large molecules will not have an easy penetration through the surface layers of GM-BS. This process will be assisted if the dye is ionic and the sorbent carries an opposite charge.

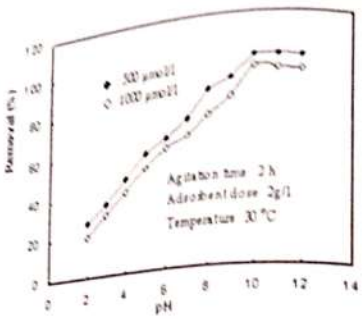


Fig. 3. Variation of percentage of adsorption of Basic red as a function of pH

3.3. Desorption and regeneration studies

To make the adsorption process more economical, it is necessary to regenerate the spent adsorbent.

Desorption studies of the adsorbed BR from spent adsorbent were also studied. The GM-BS loaded with maximum amount of sorbates were tested using 0.1 M HCl solution. The results of the multiple adsorption/desorption cyclic test to investigate the suitability of the GM-BS are presented in Table 1.

An efficiency of 94.2% desorption for BR obtained using 0.01 M HCl and is therefore suitable for regeneration of sorbate from spent GM-BS. The recovery percentage reduced to 88.9% for BR at the end of fourth cycle. The small fraction of adsorbed solute not recoverable by regeneration, presumably represent the species, which is bound through strong interaction, and, as a result, sorption capacity is reduced in successive cycles.

Table 1. Four cycles of BR adsorption-desorption with 0.01 M HCl as the desorbing agent.
(Adsorbent dose = 2 g L^{-1}, pH = 3.0, Equilibrium time = 6 h; Temperature = 30 °C, Initial concentration = 500 mg L^{-1})

No of cycles	Adsorption		Desorption	
	mg/g	%	mg/g	%
1	24.98	99.9	23.05	94.2
2	24.15	96.6	21.52	89.1
3	23.42	93.7	20.51	89.0
4	22.38	89.5	19.56	88.9

Conclusions

- Water pollution is not only a public concern, but also an economic one as well. Therefore the removal and recovery of these pollutants such as dye by cost-effective methods before discharging the industrial effluents into the nearby water bodies is important.
- A number of methods have been developed over the years to remove dyes from industrial wastewaters such as, chemical precipitation, electrochemical processes, membrane technology, ion exchange and adsorption.
- Most of these methods suffer from drawbacks like high capital and operational cost and problems in disposal of the residual pollutants.
- Adsorption is a process by which dissolved substances are removed from solution to the surface of the solid that is in contact with the solution. Adsorption is found to be very effective in concentrating the pollutants from the solution to the adsorbent surface, from there they can be recovered by suitable eluents.
- The main advantage of adsorption over other methods is that, adsorbate in minute concentrations in the solution can be concentrated effectively onto the adsorbent.
- The main objective of this study was to investigate the feasibility of using glycidyl methacrylate grafted banana stem in removing BR from water and wastewater.
- The adsorption has been found to be pH dependent and maximum adsorption occurs at a pH of 10.0. An efficiency of 94.2% desorption for

BR obtained using 0.01 M HCl and is therefore suitable for regeneration of sorbate from spent GM-BS.

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Synthesis, Analysis and Magnetic behavior $(MPB)_2CuCl_4$ (MPB = 2-(4-methoxyphenyl benzothiazole)

Sarau Devi.A[1] and Reena Ravindran[2]

1. Department of Chemistry, Fatima Mata National College, Kollam
2. Department of Chemistry, S.N College, Chempazhanthy, Thiruvananthapuram
Email: sarayuterry@gmail.com

Introduction

The framework compound of the category $A_2[MX_4]$, where A is an organic cation, usually a protonated base such as alkyl amine or heterocyclics such as morpholines, pyridines or pyrimidines, M is a transition metal ion and X is a halide, has specific structural, magnetic, conductive and optical properties [1]. Generally the structure of these compounds can be described as ionic and covalent layers interconnected by hydrogen bonding, π-anion and π-π stacking interactions, which play a vital role in building the entire structure in a three dimensional crystal lattice .

The frameworks based on benzothiazole moiety has because benzothiazoles are biologically and industrially important compound with wide applications. It shows anticancer, antimicrobial, photosensitizing, antidiabetic, antioxidant and HIV inhibiting properties [2]. Depending on the efficiency of chromophore in the aryl system some benzothiazole derivatives have interesting photochemical properties like luminescence or fluorescence[3]. In this paper we report the synthesis, spectral and magnetic properties of a new inorganic-organic complex compound comprising square planar $CuCl_4^{2-}$ anion and almost planar 2-(4-methoxyphenyl)benzothiazolium, ($mpbH^+$) cation.

Experimental

Refluxing methanolic solution of 2-(4-methoxyphenyl)benzothiazole, mpb (2mmol, 0.482g) with methanolic solution of $Cu(NO_3)_2.3H_2O$ (1mmol, 0.241g) for 15 minutes and further acidified with HCl yielded green crystals suitable for X-ray diffraction (Scheme -1). Yield-90%. Elemental Analysis- Calculated: C, 48.74; H, 3.50; N, 4.06; S, 9.29; Cl, 20.55; Cu, 9.21. Found: C, 48.22; H, 3.42; N, 4.00; S, 9.18; Cl, 20.25; Cu, 9.11.

$$2\,C_{14}H_{11}NOS + Cu(NO_3)_2\,3H_2O + 4HCl \xrightarrow[\text{Reflux/1h}]{\text{MeOH}} (C_{14}H_{12}NOS)_2CuCl_4 + 2HNO_3$$
[mpb] $[(mpbH)_2CuCl_4]$

Scheme-1

Results and discussion

Spectroscopic characterization

In the IR spectrum the bands in the 1600-1380 range is due to overall ring skeletal (benzene and thiazole ring) stretching mode. Bands in the region 1308-962cm^{-1} correspond to the CH- in plane deformation while out of plane deformation are observed in the range of 860-726cm^{-1} (4). In the complex no significant variation in frequencies of important bands are noticed, but new broad band in 3400-3300cm^{-1} indicate the formation of N-H bond on acidification of benzothiazole ring nitrogen and subsequent H-bonding with Cl- of $[MCl_4]^{2-}$. Important IR bands and its assignment is give in the table below.

Table-1 Important IR bands and its assignment

compound	ν(N-H)	ν(C=N)	ν(C=S)	ν(OCH_3)	ν(benzothiazole ring)
L1		1597	687	1021,434	1600-1380
$(C_{14}H_{12}NSO)_2CuCl_4$	3439	1594	687	1021,434	1600-1380

The solid state electronic spectrum of the complex shows poorly resolved peaks at 620nm, 660nm and 740 nm corresponding to $^2B_{2g} \leftarrow {}^2B_{1g}$, $^2A_{1g} \leftarrow {}^2B_{1g}$ and $^2E_g \leftarrow {}^2B_{1g}$ transitions in a square planar complex having D_{4h} symmetry. The electronic spectrum of the compound in acetonitrile exhibit four absorption bands at 256, 294, 357 and 476nm. Strong band at 357 nm (ε = 2576) corresponds to Cl → Cu LMCT transitions and a weak broad band at 476nm (ε = 407) corresponds to Cu→Cl MLCT and intra-ligand CT transitions. The UV portion of the spectrum is characterized by intense π-π* transitions of substituted benzothiazole ligand at 256nm (ε = 1806) and 303 nm. It is noticed that dissolution of $(mpbH)_2CuCl_4$ in acetonitrile is accompanied by a change in the green colour of the solid complex to yellow. This may be due to a change in the geometry of solid square planar $CuCl_4^{2-}$ ion to commonly observed distorted

tetrahedral geometry in solution. The appearance of weak peaks at 1030nm(ε = 385) and 1265 nm (ε = 100) corresponding to $^2B_1 \leftarrow {}^2B_2$, $^2E \leftarrow {}^2B_2$ transitions of D_{2d} geometry support this observation.

The compound exhibits thermochromism. Thermochromic compound change colour on heating and revert to the original colour on cooling. On heating to around 180°C, the green colour of the solid $(mpbH)_2CuCl_4$ changes to yellow and revert to green colour on cooling. It is most likely that the green to yellow thermochromic transition corresponds to a $D_{4h} \rightarrow D_{2d}$ distortion of the $CuCl_4^{2-}$ ion due to a change in its trans angle, thereby changing the hydrogen bonding network of the entire crystal. This property gives ample scope for the application of this novel compound in optical memory storage devices

Magnetic study

Inorganic-organic frameworks exhibit interesting magnetic behavior, shows abnormal magnetic moments [5]. Therefore, magnetic moment measurement is an important tool in the characterization of these category.

Compound $(mpbH)_2CuCl_4$ have a room temperature magnetic moment of 1.15 BM. Such low magnetic moment is usually observed in complexes with low-dimensional antiferromagnetic exchange pathway due to irregular stacking or having some sort of molecular association through direct Cu-Cu interaction and/or magnetic exchange through bridging ligands. But single crystal data and electronic spectrum rule out any possibility of direct Cu-Cu interaction in this compound. Therefore, low magnetic moment may be due to variations in the spin alignment of $CuCl_4^{2-}$ units due to irregular stacking, which are encapsulated between layers of $mpbH^+$ cations interconnected by bifurcated hydrogen bonding, short contacts and π-interactions resulting in antiferromagnetic exchange pathways.

The typical temperature dependence of the magnetic moments investigated in a field strength of 0.4 Tesla over the temperature range 20–300 K for $(hpbH_2)_2CuCl_4$), shown in Figure 1. The magnetic moments are found to increase with decrease in temperature following a fluctuating mode. This investigation reflects the critical fluctuations in magnetic moments with increase in temperature due to structural phase transitions *via* rearrangement of hydrogen bonds within the crystal lattice

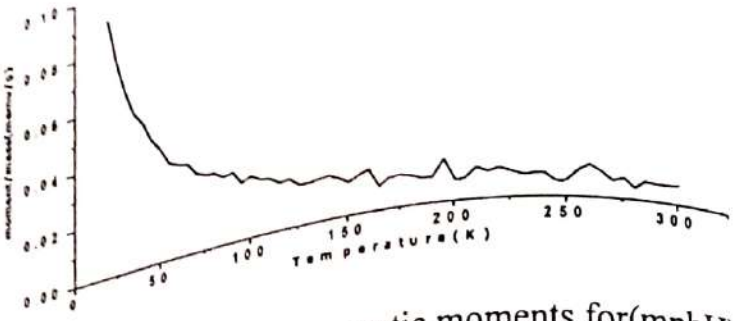

Figure 1. Temperature dependence of magnetic moments for $(mpbH)_2CuCl_4$ in a field strength of 0.4 Tesla between 20K and 300K.

Conclusion

We have reported the synthesis, spectroscopic and magnetic properties of a thermochromic, green 2-(4-methoxyphenyl) benzothiazolium tetrachlorocuprate(II), $(C_{14}H_{12}NSO)_2CuCl_4$. The magnetic moment fluctuations of Cu(II) hybrids may be due to variation in spin alignment. This property gives ample scope for the application of this novel compound in optical memory storage devices.

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LENGTH WEIGHT RELATIONSHIP AND MORPHOMETRIC CHARACTERS OF FRESH WATWER MURREL *CHANNA STRIATA*

Suja.S *, Lekshmi Priya.V, Fiona Paulose and Sherly Williams.E

Environmental sciences, Aquaculture and Fish biotechnology unit, Department of zoology, Fatima Mata National College, Kollam, Kerala, India.
E mail: sujasschnr@gmail.com

INTRODUCTION

Channa striata, a snakehead species is very economic important on both cultures and captures throughout southern and southeastern Asia.They mainly inhabits in ponds, streams and rivers, preferring stagnant and muddy water of plains (Menon, A.G.K. 1999). Found in swamps, but also occurs in the lowland rivers and very common in freshwater plains (Tirant, G. 1929). They survives dry season by burrowing in bottom mud of lakes, canals and swamps as long as skin and air-breathing apparatus remain moist (Davidson, 1975) and subsists on the stored fat (Rahman, 1989). They mainly feeds on fish, frogs, snakes, insects, earthworms, tadpoles and crustaceans (Allen, 1991). Fishes of size 60 - 70 cm are very common.

Length-weight relationship (LWR) is of great importance in fishery assessments (Goncalves *et al.*, 1996). Length and weight measurements can give information on the stock composition, life span, mortality, growth and production (Moutopoulos and Stergiou, 2002). To estimate the biomass of length distribution or to obtain indices of condition length-weight relationships of fishes are often used. Further length-weight relationships are useful in fishery management for both applied and basic use (Pitcher and Hart, 1982). The assessment of length-weight relaionship in various species of Channa were carried out by Ebanasar and Jayaprakash (2005), Froese and Pauly (2012) and many others.

Morphometric characters are important for identifying fish species and their habitat as well as ecological criteria in any stream, lake or sea. It is common to use morphometric measurements to identify and classify fishes (Begenal and Tesch, 1978). Morphometric investigations of an animal species revealed the inter

relation between the various bodily parameters like length, weight, fecunditiy etc. Some works were carried out in channa species to study their morphometric characters (Rahim *et al*, 2009 and Elani *et al*, 2012). Diagnostic characters of *Channa striata* were body subcylindrical,head depressed and caudal fin rounded. The dorsal surface, sides are dark, mottled with a combination of black and ochre whereas white on the belly. A large head reminiscent of a snake's head, deeply-gaping, fully toothed mouth, very large scale The present study was conducted to find out the length weight relationship of male and female *Channa striata*, Morphometric characters of male and female *Channa striata* with special emphasis to the fins of fishes were also analysed.

MATERIALS AND METHODS

Moderate sized (15-30 cm in length) *Channa striatus* fishes were collected from West Kallada region in the month of October, November and December - 2014. The males and females were sorted out by opening their gut and thereby observing their gonads and ovaries. A sum total of 90 fishes were examined in order to study the length weight relationship. The fishes were cleaned and excess water was removed by blotting paper. the fishes were weighed up by a digital balance. The total length was measured from tip of the snout to the end of longer lobe of caudal fin. The length of the fishes were measured in cms using a standard scale. The weight of the fishes were estimated in grams. A one month morphometric study in the month of December was also done. A total of 10 morphomeric parameters with special emphasis to the fins of fishes were analysed using morphometric divider and a scale.

RESULT AND DISCUSSION

Table: 1

Length relationship of Male and Female *Channa striata* (October 2014)

NO: OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14
MALE	26.3	27.2	23.5	25.4	27	21.4	24.3	25.1	20.4	23.7	20.5	20.5	24.4	22.3
FEMALE	18.9	22.4	18.5	20.8	23.1	24.5	20.4	23.7	21.2	22.1	17.1	22.1	19.2	17.8

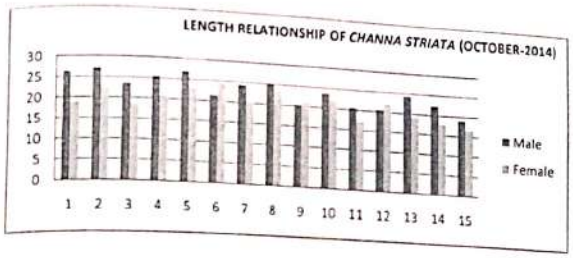

Table: 2

Length relationship of Male and Female *Channa striata* (November 2014)

NO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MALE	22	23.5	15.4	21.9	22.5	16.3	24.3	20.1	25.1	20.4	17.3	20.5	24.4	22.3	24.1
FEMALE	19.4	22.4	18.5	22.8	23.1	24.5	20.4	17.7	18.2	22.1	16.9	19.2	21.3	18.8	20.5

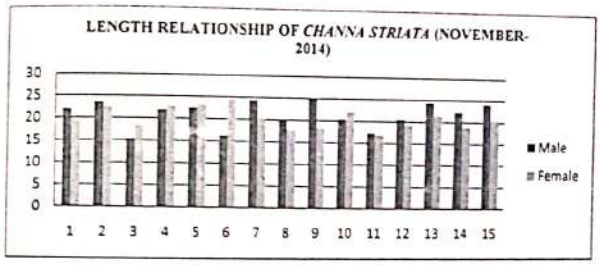

Table: 3

Length relationship of Male and Female Channa striata (December 2014)

NO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14
MALE	23.2	28.4	15.4	22.5	21.9	16.9	23.4	15.6	24.5	18.6	17.3	23.6	26.5	19.9
FEMALE	15.2	18.1	21.5	23.2	17.3	19.4	20.6	14.9	17.6	19.5	21.8	25.1	23.4	19.2

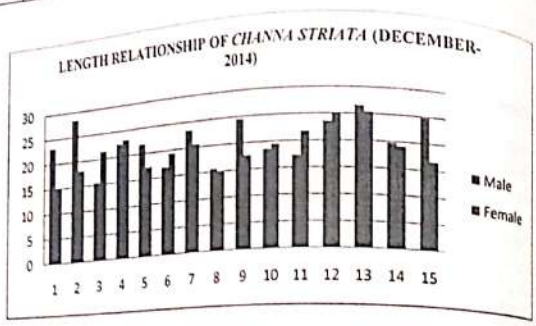

Table: 4

Weight relationship of Male and Female *Channa striata* (October 2014)

NO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13
MALE	187.8	119.1	152.0	158.3	97.5	172.1	175.1	100.5	164.5	152.4	175.5	142.5	160.4
FEMALE	115.7	125.4	152.7	116.5	135.4	98.2	124.2	86.9	117.4	156.2	92.1	121.6	114.8

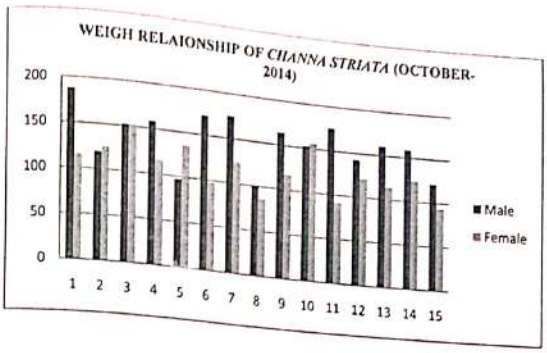

Table: 5

Weight relationship of Male and Female *Channa striata* (November 2014)

NO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MALE	96.2	101.3	74.1	83.9	112.6	81.8	122.9	120.6	132.7	91.3	84.5	119.7	132.4	110.5	132.4
FEMALE	82.5	108.3	79.7	112.8	129.6	130.4	117.2	82.4	89.3	118.1	82.4	89.1	92.4	86.5	96.7

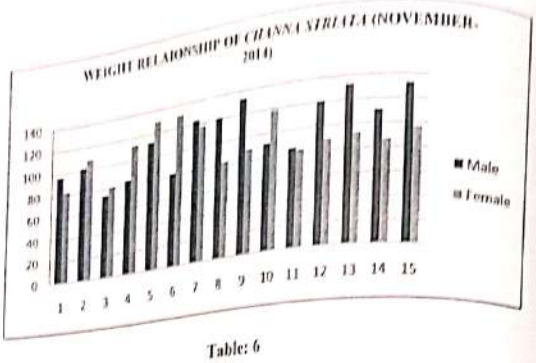

Table: 6

Weight relationship of Male and Female *Channa striata* (December 2014)

NO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14
MALE	124.1	146.2	76.3	120.6	119.7	81.3	122.4	77.1	135.7	89.8	79.2	139.1	145.6	106.7
FEMALE	73.5	88.7	113.9	122.1	76.4	120.1	62.2	79.6	89.2	96.5	142.3	149.6	101.2	81.2

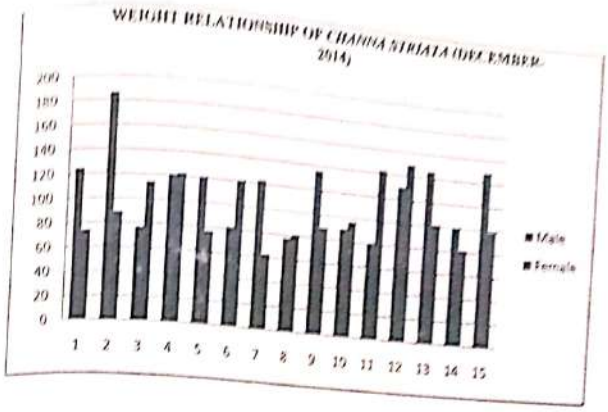

Table: 7

Morphometric parameters of male *Channa striata* (December 2014)

SO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Pre-pectoral fin length	8.9	7.1	7.9	8.4	7.3	8.9	7.3	7.4	8.5	7.5	7.4	7.2	7.8	8.2	7.2
Pectoral fin length	3.9	3.0	4	3.6	3.5	3.9	4.6	3.2	4.1	4.0	3.8	3.4	3.9	4.6	3.6
Pre-pelvic fin length	8.5	8.1	8.6	8.9	7.4	8.5	8.4	6.2	8.9	8.6	8.3	7.9	8.4	8.2	7.8
Pelvic fin length	2.6	2.4	3.2	3.1	2.4	2.6	3.0	2.3	3.0	2.8	2.8	2.4	3.0	2.9	3.0
Pre-dorsal fin length	8.6	8.1	8.4	8.5	8.0	8.6	7.6	8.3	8.3	7.9	8.1	7.9	8.2	7.4	7.8
Dorsal fin length	17.0	15.0	14.9	15.4	14.1	17.0	16.3	16.2	17.1	15.9	15.8	16.3	14.6	16.0	14.8
Pre-anal fin length	13.1	12.4	13.2	14.1	12.7	13.1	13.2	12.6	13.5	13.2	12.9	13.0	13.0	14.3	13.0
Anal fin length	10.0	10.4	10.7	11.3	9.5	10.0	10.5	10.8	11.4	10.1	8.2	9.4	10.4	11.0	10.6
Pre-caudal fin length	24.8	21.9	24.1	24.3	23.0	24.8	23.0	24.0	24.8	23.5	23.1	23.1	21.7	22.4	24.0
Caudal fin length	4.1	4.0	4.0	4.0	3.8	4.3	4.5	3.8	4.1	4.2	4.3	3.9	3.8	3.7	4.0

Table: 8

Morphometric parameters of female *Channa striata* (December 2014)

NO OF FISHES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Pre-pectoral fin length	3.2	3.5	3.5	3.4	3.4	3.4	3.6	3.5	3.5	3.4	3.3	3.3	3.5	4.6	3.0
Pectoral fin length	3.0	3.4	3.3	3.6	3.6	3.4	3.6	3.6	3.2	3.0	3.5	3.4	3.0	4.6	3.0
Pre-pelvic fin length	3.0	3.4	3.3	3.6	3.6	3.4	3.6	3.6	3.2	3.0	3.5	3.4	3.0	4.6	3.0
Pelvic fin length	2.0	2.3	2.2	2.0	2.0	1.8	2.2	2.4	2.0	2.0	2.1	2.0	2.4	3.2	2.0
Pre-dorsal fin length	2.0	2.3	2.2	2.2	2.2	2.4	2.4	2.5	2.0	2.4	2.8	2.4	3.0	2.9	3.0
Dorsal fin length	2.0	2.2	2.4	2.2	2.2	2.4	2.4	2.5	2.0	2.4	2.8	2.4	3.0	2.9	3.0
Pre-anal fin length	7.0	8.0	7.0	7.3	7.3	7.4	7.0	7.2	6.4	7.6	8.1	7.0	8.2	7.4	7.8
Anal fin length	12.1	11.1	13.5	13.7	13.7	14.2	13.9	14.1	10.9	15.4	15.8	16.3	14.6	16.0	14.8
Pre-caudal fin length	11.8	11.1	11.3	11.6	11.6	11.3	11.1	11.0	10.8	12.2	12.9	13.0	13.0	14.1	13.0
Caudal fin length	8.1	7.3	8.3	10.9	10.9	10.1	9.2	9.5	7.2	10.1	8.2	9.4	10.4	11.0	10.6
	19.9	19.8	19.2	22.4	22.4	21.3	19.2	20.6	19.7	21.5	23.1	23.1	21.7	22.4	24.0
	3.2	4.0	3.9	4.0	4.0	4.2	4.5	4.0	3.8	4.0	4.3	3.9	3.8	3.7	4.0

The present study revealed that there were variations the measurements of male and female fishes with respect to the length and weight. The total length of all samples ranged from 15 to 29 cm and total weight of all samples ranged from155 to162 gm. The mean length of the male *Channa striata* in October is 23.71 and female is 20.84. In the month of November the mean length of the male *Channa striata* is 21.14 and female is 20.37. The mean length of the male and female *Channa striata* in December is 21.25 and 19.91 respectively. This study shows that the length of male fishes were significantly higher than that of females (Table 1, 2 and 3). The mean weight of male and female fishes in the month of October is 151.17 and120.0 respectively. In the month of November the mean

weight of the male *Channa striata* is 106.46 and female is 99.82. The mean weight of the male *Channa striata* is December is 115.83 and female is 99.67 . An overall out look of three months data revealed that weight of male fishes were significantly higher than that in females (Table 4, 5 and 6).

The present study showed significant variations in the morphometric measurements of fins of fishes. These variations can be clearly noticed within both sexes of fish. The mean Pre-pectoral fin length , pectoral fin length , Pre-pelvic fin length, pelvic fin length, Pre-dorsal fin length, dorsal fin length, anal fin length, Pre-caudal fin length and caudal fin length of male fishes were 7.62, 3.76, 8.18, 2.76, 8.11, 15.82, 13.14, 10.28, 23.5, and 4.03 respectively (Table 7). Similarly the morphometric parameters of female fishes are 7.18, 3.58, 7.65, 2.46, 7.46, 14.27, 11.98, 9.41, 21.35 and 3.95 respectively (Table 8).

Length weight relationship and morphometric studies for some fishes were documented in some recent reviews. Very few studies are available on the length weight relationship of snake head fishes from India, and especially so from Western Ghats and the southern states (Froese and Pauly 2012). There is only one other report on the LWR of *C. diplogramma* from Tamil Nadu (Ebanasar and Jayaprakash 2005), while there is no information on the LLR of the species. There are several reports on the LWR of *C. marulius* and *C. striata* from other parts of their distribution but no information on their LLR. Except for a study by Senguttuvan and Sivakumar (2010) indicating that *C. striata* in Ukkadam Lake, Coimbatore showed fast growth (without any information on LWR), there is no other information on the LWR of *C. striata* from southern India to compare our results. The present study showed variations in the morphometric measurements of fishes, these variations differed within each and across fish species.

CONCLUSION

The present study highlights the length-weight relationships and morphometry of male and female fish of *Channa striata*. Length-weight relationship (LWR) is an important tool in fishery management; its importance is pronounced in estimating the average weight at a given length of a fish. Length weight regressions have been used frequently to estimate weight from length because direct weight measurements can be time consuming in the field. The morphometric relationships between fish individuals and to determine possible differences between length and weight can be used to assess the well being of separate stocks of the same species. LWR is important in fisheries management

for comparative growth studies it provides valuable information on the aquatic habitat and in aquatic ecosystem modeling. It is often used as an indication of fatness and general well being, in gonad development of fish and in the estimation of standing stock biomass and comparing the ontogeny of fish population from different regions. It is a useful source of information in fisheries management, especially in fish sampling programs, to estimate growth rates, length and age structures and other components of fish population dynamics and fish stock assessment.

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Seed mediated growth syntheses of branched Gold nanoparticles

Sheena Mary Y[a], Teena Paul[b] & Shibu Joseph S. T[b]

[a]Department of Physics, Fatima Mata National College, Kollam, Kerala, India
[b]Department of Chemistry, Fatima Mata National College, Kollam, Kerala, India

Abstract: A comparatively simple two step synthesis of branched Au nanoparticles is demonstrated here. The first step involves the the synthesis of seed nanoparticle, followed by a growth step. Branched Au nanoparticles were prepared in aqueous phase via the surfactant- directed, seed-mediated growth method. Synthesized particles are found to be quite stable. The characterization was done by UV Vis absorption spectrophotometrically and Transmission electron microscopy.

Introduction

The optical properties of metal nanoparticles are of great importance for applications in the fields of photonics, electronics, sensing, and various other biochemical uses. It has been demonstrated that the presence sharp edges and tip provides a very high sensitivity to local changes in the dielectric environment, as well as larger enhancements of the electric field around the nano particles. These features constitute the basis of localized surface Plasmon resonance (LSPR)or Surface Enhanced Raman Scattering (SERS)analysis. For this reason an increasing number of synthetic procedures are being developed, aiming at a simultaneous control of the size and shape of the metal nano particles, among which the production of gold nano-spheres, nano rods, or even nano platelets with a certain degree of control of the size-shape distribution can almost be considered as routine experiments. Other more sophisticated geometries have been seldom reported and are often limited by a low yield of the morphology of interest, by a poor control of particle size and high polydispersity, or by ill-defined properties. Herein we report a simple strategy for the controlled synthesis of branched Au nano particles with well-defined optical response.

The size-and shape – dependent physical properties of inorganic nano particles provide tunable materials with broad potential application[1], and the fabrication of structurally complex nanoparticles further enhances their functionality. For example, the synthesis of semiconductor nanowires with core/shell heterostructures creates electronic junctions within the nanowire that can act as tunable nanoplasmonics light emitting diodes[2]. The synthesis of branched quantum dots[3] could enable studies of entangled quantum states and quantum

information processing within individual nano particles[4]. Metallic nanoparticles also benefit from the formation of complex structures. Magnetic "barcode" nanowires that contain periodic domains of Ni/Au/Cu[5] and Pt/Cu[6] offer tunable magnetic properties. Noble metal nanoparticles exhibit localized surface Plasmon resonances resulting in strong optical extinction at visible wavelengths. The localized surface plasmon resonance (LSPR) enables applications including biological and chemical sensing[7-9], biological imaging labels[10-12], and nanoscale optical waveguides[13]. The formation of more complex metal nano structures such as metallodielectric gold nanoshells[14] and gold nanocages[15], shifts the LSPR resonance to the near – infrared (NIR) enabling significant diagnostic and therapeutic biomedical applications[16,17]. Here we describe the synthesis and optical properties of branched gold nanoparticles.

Due to the symmetric face centered cubic lattice of gold nanoparticles, the formation of anisotropic structures requires a selective capping agent during growth. For example, room temperature synthesis of gold nanorods with 97% yield has recently been demonstrated by seed-mediated growth directed by the surfactant cetyltrimethylammonium bromide (CTAB)[18,19] and the process can be scaled up to 100 mL batches[20]. In addition to nanorods, a variety of anisotropic gold nanoparticle shapes, including cubes, prisms, and branched nanoparticles, can be fabricated using surfactants[21-23] or other capping agents[24]. In seed-mediated, surfactant directed nanorod growth, surfactant-stabilized seed nano particles are synthesized through the reduction of gold chloride by sodium borohydride and then added to a gold chloride growth solution that also contains surfactant. It have been found that when the surfactant-stabilized seed is replaced by a commercially available colloid, 100 nm star shaped gold nano particles are formed under the exact growth conditions that normally produce gold nanorods.

LITERATURE REVIEW

As a consequence of reducing the size and the dimensionality of a material, its electronic properties change drastically as the density of states and the spatial length scale of the electronic motion are reduced with decreasing size. The energy eigen states are now determined by the system's boundaries, and therefore surface effects become very important. A transition from the bulk band structure to individual localized energy levels occurs in clusters of subnanometer to anometer size,and the detection of quantum size effects has been of great interest to scientists and technologists in the search for novel materials with exciting new properties[25]. Possible future applications of nanoparticles include the areas of ultrafast data communication and optical data storage[26,27] solar energy

conversion[25], and the use of metallic nanoparticles as catalysts [29] because of their high surface-to-volume ratios and different shapes.

Closely related to size-induced changes in the electronic structure are the optical properties of nanoparticles. Spectroscopic methods probe the energy differences between two states for allowed transitions as well as the lifetimes of excited states and their respective energy relaxation channels using time-resolved techniques. The size effect on the optical absorption spectra of metallic nanocrystals is probably best known for the noble metal nanoparticles. Indeed, metallic nanoparticles have fascinated scientists since the middle Ages because of their colorful colloidal solutions. Gold nanoparticles were used as a pigment of ruby-colored stained glass dating back to the seventeenth century. Faraday first recognized this phenomenon, and Mie was able to explain it theoretically in 1908 by solving Maxwell's equation.

The physical origin of the strong light absorption by noble metal nanoparticles is the coherent oscillation of the conduction band electrons induced by interaction with an electromagnetic field. These resonances are known as surface plasmons and are a small particle as well as a surface effect because they are absent in the individual atoms as well as in the bulk. Their extinction coefficient scales with the volume of the particles and can reach values several orders of magnitude larger compared to common organic dye molecules. Whereas the knowledge of the electronic and optical properties of a collection of individual well-separated particles is of fundamental scientific interest, the even greater flexibility in designing tailored properties of organized nanostructures has stimulated research for building new materials and devices with nanoparticles or artificial atoms as their building blocks. The overall properties of the new material are determined by the properties of the individual particles as a function of their size and shape as well as their collective behavior. The latter is controlled by the interparticle separations, which can be changed by the size of the stabilizing ligands (capping material) protecting the particles against aggregation. Both parameters can now be manipulated by chemists in an ever-increasing degree, opening the possibilities for a bottoms-up approach toward the fabrication of new materials.

The Surface Plasmon Resonance

The intense color of colloidal noble metal particles in stained glass windows is caused by the surface plasmon resonance. The surface plasmon resonance can be thought of as the coherent motion of the conduction-band electrons caused by interaction with an electromagnetic field. In a classical

description, the electric field of an incoming light wave induces a polarization of the electrons with respect to the much heavier ionic core of a spherical nanoparticle.

A net charge difference is only felt at the nanoparticle surface, which in turn acts as a restoring force. This creates, in the simplest case, a dipolar oscillation of all the electrons with the same phase. When the frequency of the electromagnetic field becomes resonant with the coherent electron motion, a strong absorption in the spectrum is seen, which is the origin of the observed color. The frequency and width of the surface plasmon absorption depend on the size and shape of the metal nanoparticle as well as on the dielectric constant of the metal itself and of the medium surrounding it. The plasmon resonance is strongest and shifted into the visible part of the electromagnetic spectrum for the noble metals [copper, silver, and gold], which is the reason why the noble metals have historically fascinated scientists dating back as early as Faraday. Most other transition metals only show a broad and poorly resolved absorption band in the ultraviolet. This difference can be attributed to the strong coupling between the Plasmon transition and the interband excitation and to the fact that the conduction-band electrons of the noble metals can be well approximated by the Drude free-electron model. This model assumes that the conduction-band electrons can be treated independently from the ionic background and can move "freely," whereas the ions only act as scattering centers. This in turn gives the electrons in the noble metals a higher polarizability, thereby shifting the plasmon resonance to lower frequencies and also giving rise to a sharp bandwidth.

EXPERIMENTAL SECTION

$HAuCl_4$ was purchased from Aldrich and used without further purification. $NaBH_4$, ascorbic acid, $AgNO_3$ Trisodium citrate and Cetyl trimethyl ammonium bromide (CTAB) were locally purchased and used without further purification.

PREPARATION OF SEED:

A 20 mL aqueous solution containing 2.5×10^{-4} M $HAuCl_4$ and 2.5×10^{-4} M tri-sodium citrate was prepared in a conical flask. Next, 0.6 mL of ice cold 0.1 M $NaBH_4$ solution was added to the solution all at once while stirring. The solution turned pink immediately after adding $NaBH_4$, indicating particle formation. The particles in this solution were used as seeds within 2-5 h after preparation. The average particle size measured from the transmission electron micrograph was 10 ± 2 nm (Some irregular and aggregated particles were also

observed that were not considered for determining the size distribution. Here, citrate serves only as the capping agent since it cannot reduce gold salt at room temperature (25 °C).

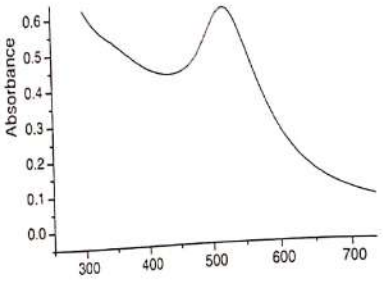

Fig 1. UV-Vis absorption spectrum of Gold nanoparticle seed. The peak at 520 nm is due to the plasmon resonance of pure Gold colloid.

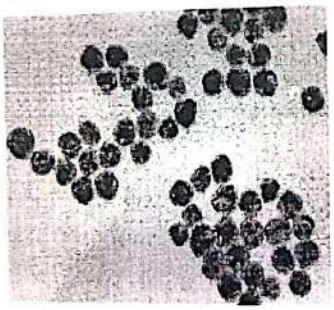

Fig 2. Transmission electron microscopic (TEM) images of gold nanoparticle seed with an average diameter of 10 nm.

Branched gold nanoparticles were prepared in aqueous phase via the surfactant- directed, seed-mediated growth method. Growth solution was prepared by adding 45 ml of 0.1M CTAB to 2ml of 0.01M $Haucl_4H_2O$ in a plastic test tube while gently mixing. To this solution, 3 combinations of $AgNO_3$, ascorbic acid & gold nano seed were added.

Combination 1: 0.3 ml 0.01 M $AgNO_3$ was added. After mixing, the colour of the solution becomes brownish yellow. Then 0.32 ml of 0.1 m ascorbic acid was added, resulting in a colorless solution. Finally, 0.1ml of 10-nm seed solution was added.

Combination 2: 0.3 ml 0.01 M $AgNO_3$ was added. After mixing, the colour of the solution becomes brownish yellow. Then 0.32 ml of 0.1 m ascorbic acid was added, resulting in a colorless solution. Finally, 0.1ml of 10-nm seed solution was added.

Combination 3: 0.3 ml 0.01 M $AgNO_3$ was added. After mixing, the colour of the solution becomes brownish yellow. Then 0.32 ml of 0.1 m ascorbic acid was added, resulting in a colorless solution. Finally, 0.1ml of 10-nm seed solution was added.

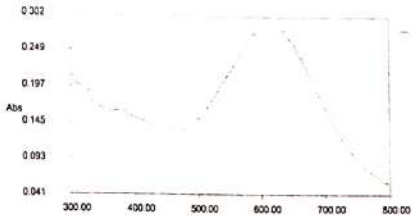

Fig 3: The UV Vis spectrum of branched gold nano particle, combination 1 alone.

After gentle mixing, the solution was kept in a water bath at room temperature undisturbed for 3 h. The eventual blue-purple color of the growth solution indicates that combination 1 & 2 have the formation of branched gold nanoparticles. But the blue-purple color of the combination 2 fades with in a time of 4 hours, while that of combination 1shows a a very good long lasting Plasmon absorption band with λ_{max} at 650 nm . Figure 3 shows the UV-Vis absorption spectrum of combination 1 and Figure 4 shows the UV-Vis absorption spectrum of combination 1 & 2.

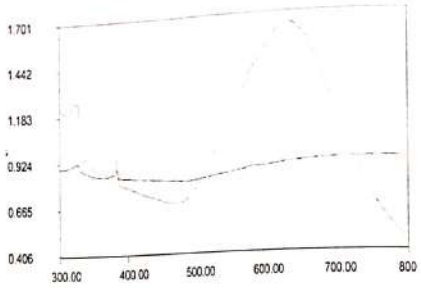

Fig 4: The UV Vis spectrum of branched gold nano particle, combination 1 & 2 alone.

CHARACTERIZATION

A Hitachi transmission electron microscope (TEM) operating at an accelerating voltage of 100kV was used for magnification imaging. For TEM measurements, the sample were centrifuged (3500rpm) and redispersed in water, so as to remove excess surfactant, which otherwise makes TEM observations very complicated . UV-vis spectra were measured with Systronics UV-Vis Spectrophotometer.

RESULTS AND DISCUSSION

Ascorbic acid is too weak to reduce gold salt in the presence of CTAB and in the absence of seed, as judged by the absence of a gold plasmon band under these conditions. However, gold salt reduction occurs very fast in the presence of seed particles, indicated by the solution turning blue in color. It is possible to grow the seeds into larger particles, depending on the ratio of seed to metal salt.

However, when this method was used to make branched nano particles of gold Nm, rodlike particles were also observed. This observation suggested that branched gold nanoparticles could be prepared by carefully controlling the growth conditions. For making branched gold nanoparticles, a one step seeding growth method was used. A typical transmission electron microscopy (TEM)

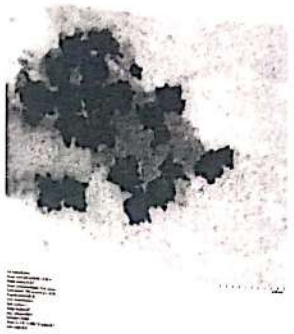

Fig 5. Transmission electron microscopic (TEM) images of branched gold nanoparticle with a dimension range of 60-80 nm

images of well-formed branched Au nano particles are presented in Figure 5, It is believed that it consists of multiple crystal domains. The defects are similar to those found in gold nanorods, where poor CTAB binding to twin defects is thought to be a source of growth anisotropy. Since branched Au nano particle growth is directed by CTAB surfactant, it follows that the branched Au nano particle tips may also grow due to poor CTAB binding. The nucleation of growth anisotropy at multiple sites on the branched Au nano particle could be due to a high defect density caused by rapid growth. Finally the particles have dimension in the range of 60-80 nm. Synthesized particles are quiet stable and can store in ordinary laboratory condition.

CONCLUSION

In conclusion, we have demonstrated syntheses of branched Au nanoparticles in a comparatively simple manner. Branched Au nanoparticles were prepared in aqueous phase via the surfactant- directed, seed-mediated growth method. Synthesized particles are quiet stable.

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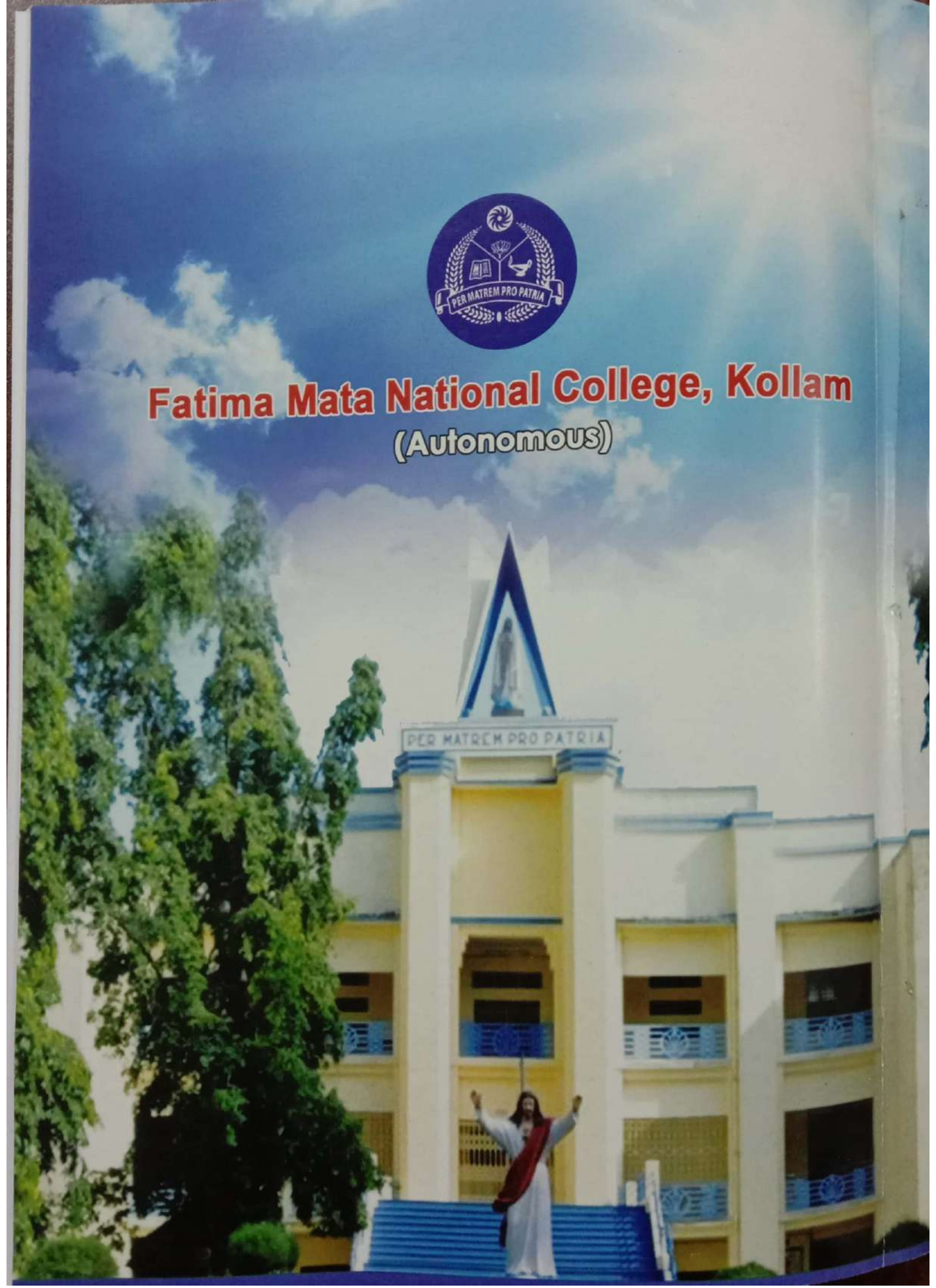

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CONTENTS

IV ABSTRACTS

PHARMACODYNAMICS IN DRUG DESIGNING

Dr. D.T. Mahajan

Department of Chemistry, Vidya Bharati Mahavidyalaya, Amravati, Maharashtra, India-444602

The responsibility of a chemist is to design and synthesize a drug structure that has the maximum desired effects with a minimum of side effects along with high synthetic accessibility. Most of the drugs act at their target site either by inhibiting the formation of cell membranes and walls or by blocking ion channels, or disrupting the structure of the cell membranes and walls or stimulating a biological process with, expectantly, favorable results to the patient.

To carry out these changes, the drug must attach to the target site; hence, its potency varies with its ability to bind to that site. This binding could be either reversible or permanent. In the former case, weak electrostatic bonds such as hydrogen bond, hydrophobic interactions and van der Waals' forces are responsible for the bonding. The binding takes the form of a dynamic equilibrium with the drug molecules repeatedly binding to and being released from their target site (see section 8.6). Consequently, in this instance, a drug's duration of action will depend on how long it remains at the target site. Permanent binding usually requires the formation of strong covalent bonds between the drug and its target. In this case, the duration of action will depend on the strength of the bond. However, in both cases, the drug structure must contain appropriate functional groups in positions that correspond to the appropriate structures in the target site.

Pharmacokinetics is the study of traveling of the drug inside the body, which includes time course of drug absorption, distribution, metabolism, and excretion. Pharmacodynamics refers to the connection between drug concentration at the site of action and the resulting pharmacological effect, including the time course and intensity of the therapeutic and adverse effects. The effect of a drug present at the site of action is determined by that drug's binding with a receptor. Pharmacokinetics and pharmacodynamics are key issues that must be dealt with utmost precautions for a drug to become successful drug.

BATCH ADSORPTION STUDIES FOR THE REMOVAL AND RECOVERY OF TOXIC METAL IONS FROM AQUEOUS SOLUTION BY CARBONIZED BANANA STEM

***D.M. Manohar, B.F. Noeline, Surya R.**

Department of Chemistry, Fatima Mata National College, Kollam, Kerala, 691001, India

ABSTRACT

The aim of this work is kinetic and equilibrium study of the sorption of chromium(VI) from aqueous solutions under different expermental conditions using carbonized banana stem (CBS) derived from agro waste materials such as banana stem. Activation of banana stem was done by treating dried and powdered banana stem with calculated quantity of concentrated H_2SO_4 and kept in an oven at 200 °C for 24 h. The original BS and CBS were characterized with the surface area analyzer, infrared spectroscopy (IR) and scanning electron microscopy (SEM). Surface charge density of the samples as a function of pH was investigated using potentiometric titrations. The effects of pH and effect of temperature for the removal of chromium(VI) were studied. The optimum pH for Cr(VI) adsorption was found to be 2.5. The applicability of the data was analyzed by Langmuir isotherm equation. Desorption of Cr(VI) from the sorbed carbon was achieved by eluting with 0.1 M NaOH.

*Corresponding author

Dr. Manohar D. Mullassery

e-mail: mdmullassery@gmail.com

phone: +919447110857

INTRODUCTION

The presence of heavy metals in the industrial effluents creates a major problem to their discharge in the surface water. Some metal ions do not degrade to harmless end product. Heavy metals like mercury, lead, cadmium, copper, chromium and nickel are toxic even in extremely minute quantities. Chromium is one of the toxic metals, is used in a variety of applications including steel production, electroplating, leather tanning, nuclear power plant, textile industries, water cooling and chromate preparation [1]. chromium occurs in

aqueous system in both trivalent (Cr^{3+}) and hexavalent (Cr^{6+}) forms. The trivalent form is an essential nutrient on the other hand hexavalent form is toxic, carcinogenic and mutagenic in nature [2]. It is highly mobile in soil and aquatic system and also a strong oxidant capable of being absorbed by the skin [3]. The hexavalent form is 500 times more toxic than trivalent form [4]. Acute exposure to chromium(VI) causes nausea, diarrhea, liver and kidney damage, dermatitis, internal hemorrhage and respiratory problems [5]. Inhalation may cause acute toxicity, irritation and ulceration of nasal septum [6]. Because of high toxicity the chromium content of the effluent should be reduced to below allowable limits before their discharge into surface waters. The allowable limit of hexavalent chromium in surface water is 0.05 mg/l [7]. *Author to whom all correspondence should be addressed. E-mail: mdmullassery@gmail.com

A broad spectrum of effluent treatment technologies has been described in the literature. Various techniques have been employed for the treatment of pollutants, such as chemical precipitation [8], reverse osmosis [9], electrocoagulation [10], ion exchange [11] and adsorption [12] etc. Among the numerous techniques of pollutant removal, adsorption has been found to be superior to other techniques in terms of initial cost, simplicity of design and ease of operation. The removal of pollutants from industrial wastewaters using different adsorbents is currently of great interest and is becoming more important with the increasing of industrial activities.

The commercially available activated carbon in granular form is effective for the removal of various heavy metal ions. Due to the high cost of activated carbon prevent its use in developing countries like India. So there is a need to develop low cost and easily available adsorbent for the removal of heavy metal ions from wastewaters. An abundant source of potentially metal-sorbing biomass is cellulosic agricultural wastes. More recently, these byproducts have been shown to have potential as precursor material in the manufacture of activated carbon [13]. Such carbons may have the potential to replace existing carbons especially coal-based carbon used in many industrial applications.

Banana stem is a commonly available and abundant natural material. It is commonly used in preparing banana fibre with good strength and lusture. Present study explores the

use of banana stem precursor for activated carbon production. Their adsorption ability for pollutants in industrial wastewater such as Cr(VI) ions was tested in a batch reactor.

EXPERIMENTAL

Materials and methods

All the chemicals used were of analytical grade. The stock solution Cr(VI) (1000 mg /l) was prepared by dissolving a weighed quantity of the $K_2Cr_2O_7$ in distilled water. All solutions for adsorption and analysis were prepared by appropriate dilution of freshly prepared stock solution.

The pseudo stem of Musa paradisiaca L. was used for the preparation of the adsorbent. The material was washed several times with distilled water to remove surface impurities and dried at 80 °C. Banana stem contains α-cellulose, hemicellulose and lignin. Activation of banana stem was done by treating one part of the material with 1.8 parts by weight of concentrated H_2SO_4 and held in an oven at 200 °C for 24 h. The carbonized material obtained was washed with distilled water several times to remove free acid and dried at 100 °C. This material was used for adsorption experiments. The dried carbonized sample (CBS) was sieved and the fraction with average particle diameter of 0.096 mm was collected and used for all experiments.

The FTIR spectra of the adsorbent was obtained by using the pressed disc technique in a Schimadzu FTIR model 1801. A Systronics microprocessor pH meter (model μ 362, India) was used to measure the potential and pH of the suspension. For batch adsorption studies a Labline temperature controlled water bath shaker with a temperature variation of ± 1.0 °C was used. The amount of Cr(VI) was quantified spectrophotometrically using Systronics (model 117, India).

Batch adsorption experiments

Batch adsorption experiments were conducted to determine the pH range at which the maximum adsorption of Cr(VI) would take place on CBS. To a series of 100 ml flasks, each containing 0.1 g of the adsorbent, added 50 ml aqueous solution of Cr(VI) of desired concentration. The initial pH was adjusted to values ranging from 2.0 to 9.0 using 0.1 M NaOH and O.1 M HNO_3. The flasks were shaken at 200 rpm for 2 h using a temperature controlled water bath shaker. The contents of the flasks were filtered through filter paper and the filtrate was analyzed for final Cr(VI) concentration spectrophotometrically by diphenyl-carbazide method [14]. The amount of Cr(VI) adsorbed was calculated by the following equation

$$q_t \propto \frac{(C_o - C_t)V}{w} \qquad (1)$$

Where C_o and C_e are initial and concentrations at different time intervals of Cr(VI) respectively. V is the volume of the solution and m is the amount of adsorbent used.

Adsorption isotherm experiments were performed by agitating 0.1 g of the adsorbent with 50 ml of varying concentrations of Cr(VI) (50-700 mg/l) at 30 °C. The initial pH of suspension was adjusted to 2.5, the optimum pH. After shaking for 2 h, the contents of the flasks were filtered and the filtrate is analyzed for Cr(VI) concentration. Kinetic studies were carried out at pH 2.5 with an initial concentration range from 50 to 200 mg/l, samples were withdrawn at regular intervals to show the amount adsorbed versus time.

Desorption experiments

To make the adsorption process more economical it is necessary to regenerate the spent adsorbent and to reuse it. Desorption of the adsorbed Cr(VI) from spent adsorbent was also studied after adsorption experiments with 100 mg/l Cr(VI) at 0.1 g of adsorbent in 50 ml, the Cr(VI) loaded adsorbent were separated by filtration and washed with distilled water to remove any unadsorbed Cr(VI). The CBS loaded with maximum amount of Cr(VI) was placed into desorption medium containing 0.1 M NaOH and the amount of

Cr(VI) desorbed in 24 h was measured. The adsorbent sample thus regenerated was reused for adsorption purposes.

RESULTS AND DISCUSSION

Adsorbent characterization

Infrared analysis permits spectrophotometric observation of the adsorbent surface in the range at 400-4000 cm^{-1} and serves as a direct means for the identification of organic functional groups. The IR spectrum of carbonized banana stem (CBS) showed weak and broad peak at 453 cm^{-1} (Figure 1). Analysis of IR spectrum indicated the presence of carboxyls, carbonyls, lactones and phenols etc. The band at 1606 cm^{-1} was associated with the C=O stretching mode in carboxylic acids, carbonyls and lactones. Peaks at 3420, 3425 cm^{-1} which can be assigned to the O-H stretching vibration mode of hydroxyl functional groups including hydrogen bonding. The presence of peaks in the range of 2930 and 2860 cm^{-1} indicate the presence of aliphatic C-H stretching. The band between 1400 and 1300 cm^{-1} can be assigned to the O-H bending vibration and indicate the presence of phenols.

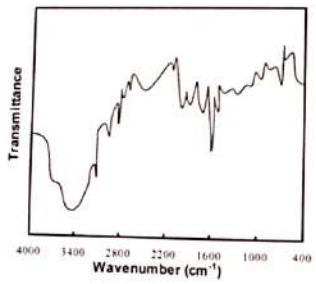

Figure 1. FTIR spectra of Carbonized banana stem

Effect of pH

Figure 2 presents the removal of Cr(VI) as a function of solution pH. The removal of Cr(VI) was found to be pH dependent, it was observed that the maximum removal of Cr(VI) occurred over the pH range of 2.0-3.0. Above this pH adsorption gradually decreased with increase in basicity of the medium. The maximum removal of 99.8% and 95% were observed at pH 2.5 for an initial concentration of 50 and 100 mg/l respectively and below this pH no significant increase in adsorption was observed. The sorption behavior of chromate depends very much on metal ion species and sorbent surface charge. The zero point charge (pH_{zpc}) of CBS was found to be 3.5, below this pH, the surface charge of CBS is positive. Dominant form of Cr(VI) at pH of 2.5 is $HCrO_4$ [15,16] and therefore electrostatic attraction occurred between the positively charged adsorbent and negatively charged $HCrO_4$. In contrast, the decrease in adsorption at higher pH values was apparently due to the competitiveness of the Cr(VI) species CrO_4^{2-} and OH^- ions in the bulk [17,18]. The adsorbent surface above pH 3.5 is negatively charged. Thus the electrostatic repulsion between the negatively charged Cr(VI) species and negatively charged adsorbent particles is increased. This led to a decrease in the Cr(VI) adsorption.

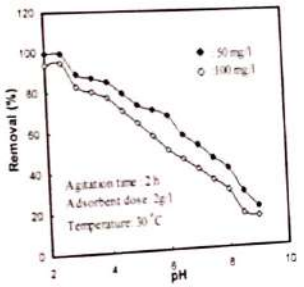

Figure 2. Effect of pH on the adsorption of Cr(VI) onto CBS.

Effect of agitation time and initial concentration

The amount of chromium(VI) adsorbed (mg/g) increased with increase in Cr(VI) concentration and remained constant after equilibrium time (Fig. 3). The equilibrium time was found to be 120 min for 50, 100, 150 and 200 mg/l. The amount of Cr(VI) adsorbed at equilibrium increased from 24.97 to 80 mg/g as the concentration was increased from 50 to 200 mg/l, the plots are single, smooth and continuous, leading to saturation, suggesting the possible monolayer coverage of Cr(VI) on the surface of the adsorbent. The adsorption process is a fast process as evident from the figure, since 95% removal was completed with in a short time of 90 minutes. The rest 5 to 10% Cr(VI) removal takes place with in a period of 90 minutes. Not much change in adsorption was observed after a time period of 120 min. So equilibrium time of 2 h was given in all the other experiments.

The variation in the extent of adsorption may be due to the fact that initially all sites on the surface of adsorbent were vacant and the solute concentration gradient was relatively high. Consequently the extent of Cr(VI) uptake decreases significantly with the increase of contact time depending on the decrease in the number of vacant sites on the surface of the adsorbent.

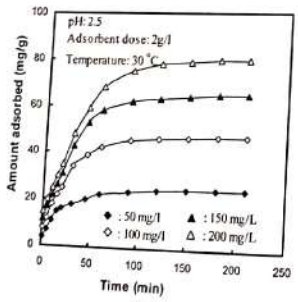

Figure 3. The variation of amount adsorbed as a function of time for different initial concentration at 30 °C

Adsorption isotherm

The adsorption isotherms have been of importance in the water purification by adsorption technique as it provides approximate estimation of the adsorption capacity of adsorbent. All the experimental results for the adsorption isotherms, q_e (mg/g) versus C_e (mg/l) plots of Cr(VI) show the type *L* behaviour, according to the classification of Giles et al. [19] similar to them are shown in Figure 4. In this classification, type *L* assumes a monolayer formation in the active sites of the surface, and all the adsorption sites are supposed to be equivalent. The equilibrium isotherm data at controlled temperatures were correlated using the Langmuir adsorption model.

$$\frac{C_e}{q_e} = \frac{1}{Q^\circ b} + \frac{C_e}{Q^\circ} \qquad (3)$$

The linear form of Langmuir model can be represented by equation (3), where Q° and b are Langmuir constants related to maximum monolayer adsorption capacity and affinity constant or energy of adsorption respectively. The values of Q° and b at different temperatures were calculated using the least square methods through a regression analysis and are given in Table 1 with their coefficients of correlation (r^2). The Langmuir constants Q_{max} and b increased with temperature showing that adsorption capacity and intensity of adsorption are enhanced at higher temperatures. The Langmuir constants for the adsorption of Cr(VI) by other adsorbents reported in the literature are presented in Table 1.

Table 1.
Isotherm constants and regression coefficients for the adsorption of Cr(VI) onto CBS

Isotherm constants	Temperatures (°C)			
	30	40	50	60
Langmuir				
Q° (mg/g)	110.05	120.20	136.84	143.8
b (l/mg)	0.090	0.096	0.098	0.102
r^2	0.996	0.999	0.998	0.999

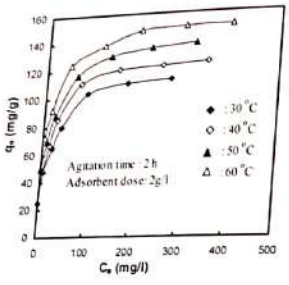

Figure 4. q_e versus C_e plots for the adsorption of Cr(VI) onto CBS

Desorption studies

Application of CBS for the removal and recovery of Cr(VI) from aqueous solutions may require that the adsorbent be regenerated efficiently so that the adsorbent can be reused. In the present study, attempts were made to regenerate the adsorbent as well as desorbed Cr(VI) from the spent adsorbent using NaOH. The total desorbed amount was calculated and compared to the initial sorbent amount. Desorption increased (34.1-96.1%) with increase in concentration of NaOH (0.001 to 0.1 M), the results clearly show that the quantitative removal of Cr(VI) from CBS and regeneration of the adsorbent can be done efficiently at higher pH. The results also indicate that Cr(VI) is adsorbed by the adsorbent through physisorption. The results of the multiple adsorption/desorption cyclic test to investigate the suitability of the CBS are presented in Table 2. An efficiency of 96.1% desorption of Cr(VI) was obtained using 0.1 M NaOH. The recovery percentage reduced to 82.1% at the end of fourth cycle. The small fraction of adsorbed metal ions not recoverable by regeneration, presumably represent the metal ions, which is bound through strong interaction, and, as a result, sorption capacity is reduced in successive cycles.

Table 2

Four cycles of Cr(VI) adsorption-desorption using 0.1 M NaOH as desorbing agent. Initial concentration 50 mg/l, adsorbent dose 2g/l, pH 2.5, equilibrium time 2 h, temperature 30 °C.

Cycles	Adsorption, mg/g (%)	Desorption, mg/g (%)
1	24.8 (99.6)	24.2 (96.1)
2	24.5 (98.4)	23.1 (94.5)
3	23.4 (93.7)	21.3 (91.0)
4	21.7 (87.1)	19.3 (82.1)

CONCLUSIONS

Removal of poisonous hexavalent chromium from solutions was possible using CBS. Chromium removal was highly dependent on pH, initial chromium concentration and contact time. An initial pH of 2.5 was to be optimum for maximum Cr(VI) removal. The kinetic and equilibrium studies were carried out for the adsorption of Cr(VI) from aqueous solutions onto CBS in the concentration range of 50-700 mg/l. The equilibrium isotherm data were well described by Langmuir isotherm model. The process of adsorption was found to be endothermic in nature. The spent adsorbent can be regenerated by 0.1 N NaOH and can be reused. Additional efforts are planned to investigate the adsorption potential of the adsorbent using real industrial wastewater and also with other toxic metals.

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EQUILIBRIUM DATA, ISOTHERM PARAMETERS AND PROCESS DESIGN FOR THE REMOVAL OF TEXTILE DYE FROM WASTEWATERS USING Fe-TREATED CARBONIZED BANANA STEM

*** B.F. Noeline, D.M. Manohar, R. Surya**

Department of Chemistry, Fatima Mata National College, Kollam, Kerala, 691001, India

*Corresponding author: fernandeznoeline@gmail.com

ABSTRACT

The performance of an adsorbent Fe-impregnated carbonized banana stem (Fe-CBS) prepared from banana stem (BS), for the removal of Methylene Blue (MB) from aqueous solutions has been evaluated in this study. The adsorbent (Fe-CBS) containing Fe was prepared by the reaction of potassium permanganate pretreated carbonized banana stem (BS), with hydrated ferrous sulphate. Fe-CBS was characterized by Tunneling electron microscopy (TEM). Surface charge density of the samples as a function of pH was investigated using potentiometric titrations. Maximum removal of MB of 97.3% obtained for an initial concentration of 100 mg/L at pH of 10.0 and an adsorbent dose of 2g/L. The equilibrium isotherms were determined using Langmuir equation. Adsorbed MB can be recovered by treating with 0.1 M HCl solution.

INTRODUCTION

Dyes are one of the major constituents of the wastewater produced from many industries related to textile, paint and varnishes, ink, plastics, pulp and paper, cosmetics, tannery etc, and also to the industries, which produce dyes. Dyes in water affect the nature of the water, inhibiting sunlight penetration into the stream and reducing the photosynthetic reaction [1]. Methylene blue is important basic dye widely used for printing calico, dyeing, printing oxidation-reduction, and dyeing leather and in purified zinc form, it is used as an antiseptic and for other medicinal purposes [2].

The presence of methylene blue an organic dye, in discharged water is hazardous for human beings [3-5]. Various treatment technologies like photodegradation, coagulation flocculation, chemical oxidation, electrochemical oxidation, biological

process are available for the removal of dye from wastewater [6]. Many of the above mentioned processes are not cost effective and hence are not suitable for being applied in developing countries. In response to concern regarding the health risks associated with the use of dyes, adsorption is, by far, the most versatile and widely used technique for the removal of dyes from aqueous solution.

Many adsorbents have been tested on the possibility to lower dye concentrations from aqueous solutions, such as activated carbon [7], peat [8], saw dust [9], soil [10] and other. However the amount of dyes adsorbed on the above adsorbents are not very high. To improve the efficiency of the adsorption processes, it is essential to develop the more effective and cheaper adsorbents with higher adsorption capacities.

Lignocellulosic agricultural residues have undoubtedly been the most popular adsorbents for the removal of pollutants from aqueous solutions and are widely used in wastewater treatment applications. Many agricultural wastes are of little or no economic value, and some, such as banana stem, which are available in large quantities, is often presenting a disposal problem. To enhance the capability and efficiency of agricultural residues for adsorption process, chemical modification/pretreatment of agricultural residues may be required. the carbon derived from agricultural wastes is gaining importance as it is inexpensive and are perfectly suitable for the removal of organic and inorganic pollutants from wastewater [11]. Present study explores the possibility of using Fe impregnated carbonized banana stem (Fe-CBS) as a potential adsorbent for the removal of MB from industrial effluents.

EXPERIMENTAL

MATERIALS AND METHODS

All the chemicals used were of analytical grade. The stock solution MB (1000 mg /L) was prepared by dissolving a weighed quantity of the MB in distilled water. All solutions for adsorption and analysis were prepared by appropriate dilution of freshly prepared stock solution.

The pseudo stem of Musa paradisiaca L. was used for the preparation of the adsorbent. The material was washed several times with distilled water to remove surface impurities and dried at 80 °C. Banana stem contains α-cellulose, hemicellulose and lignin.

Activation of banana stem was done by treating one part of the material with 1.8 parts by weight of concentrated H_2SO_4 and held in an oven at 200 °C for 24 h. The carbonized material obtained was washed with distilled water several times to remove free acid and dried at 100 °C. This material was used for adsorption experiments. The dried carbonized sample (CBS) was sieved and gently mixed with 1000 mL of $KMnO_4$ for 15 min. the permanganate pre treated media was then washed with water several times. Then the media was treated with 1000 mL of 1M $FeSO_4$ $7H_2O$. A Systronics microprocessor pH meter (model μ 362, India) was used to measure the potential and pH of the suspension. For batch adsorption studies a Labline temperature controlled water bath shaker with a temperature variation of ± 1.0 °C was used. The amount of MB was quantified spectrophotometrically using Systronics (model 117, India).

Batch Adsorption Experiments

Batch adsorption experiments were conducted to determine the pH range at which the maximum adsorption of MB would take place on Fe-CBS. To a series of 100 ml flasks, each containing 0.1 g of the adsorbent, added 50 ml aqueous solution of MB of desired concentration. The initial pH was adjusted to values ranging from 2.0 to 10.0 using 0.1 M NaOH and O.1 M HNO_3. The flasks were shaken at 200 rpm for 2 h using a temperature controlled water bath shaker. The contents of the flasks were filtered through filter paper and the filtrate was analyzed for final MB concentration spectrophotometrically. The amount of MB adsorbed was calculated by the following equation

$$q_t = \frac{(C_o - C_e)V}{w} \quad (1)$$

Where C_o and C_e are initial and concentrations at different time intervals of Cr(VI) respectively. V is the volume of the solution and m is the amount of adsorbent used.

Adsorption isotherm experiments were performed by agitating 0.1 g of the adsorbent with 50 ml of varying concentrations of MB (100-1000 mg/l) at 30 °C. The initial pH of suspension was adjusted to 10, the optimum pH. After shaking for 2 h, the contents of the flasks were filtered and the filtrate is analyzed for MB concentration.

Desorption Experiments

To make the adsorption process more economical it is necessary to regenerate the spent adsorbent and to reuse it. Desorption of the adsorbed MB from spent adsorbent was also studied after adsorption experiments with 500 mg/l MB at 0.1 g of adsorbent in 50 ml, the MB loaded adsorbent were separated by filtration and washed with distilled water to remove any unadsorbed MB. The Fe-CBS loaded with maximum amount of MB was placed into desorption medium containing 0.1 M HCl and the amount of MB desorbed in 24 h was measured. The adsorbent sample thus regenerated was reused for adsorption purposes.

Adsorbent Characterization

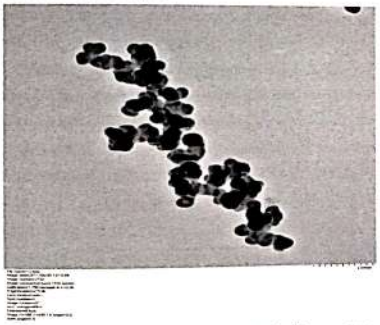

Figure 1. TEM image of Fe-impregnated carbonized banana stem

TEM image of Fe-CBS (Figure 1) of the adsorbent revealed the presence of berry like nano particles inside pores of CBS.

Effect of pH on the Adsorption of MB

The influence of pH on the MB adsorption onto Fe-CBS was studied while the shaking time and amount of adsorbent were fixed at 3 h, 2 g/L respectively. The variation of the adsorption of dyes was studied in the pH range 2-12, and the results are shown in

Figure 2. It is clear from the plots that as the pH increases the adsorption also increases and reaches a maximum value at range 8-10. No significant increase in the pH was observed above pH 10.

When the pH of the solution increases from 2.0 to 10.0, the percentage of adsorption of MB increases 39.6 to 97% respectively for an initial concentration of 200 mg/L. The adsorption of MB onto the adsorbent surface is primarily influenced by the surface charge on the adsorbent, which is influenced by the solution pH_{PZC}. The zero point charge (pH_{zpc}) of Fe-CBS was found to be 3.0, below this pH, the surface charge of Fe-CBS is positive. At pH value below pH_{ZPC}, the Fe-CBS has net positive charge and would therefore, be prone to electrostatic repel cation. MB, is a cationic basic dye and it is attracted by an anionic adsorbent. At pH above 3.0 surface charge of the adsorbent becomes negative and it facilitated the electrostatic interaction with the cations of the dyes. There is another possibility of penetration of cationic dyes into the surface layers Fe-CBS. The possibility of interlamellar adsorption depends on the size of the molecule, polarisability and solubility of dye of which solubility is an essential property. However, dyes will associate in acidic medium forming large molecules; such large molecules will not have an easy penetration through the surface layers of Fe-CBS. This process will be assisted if the dye is ionic and the sorbent carries an opposite charge.

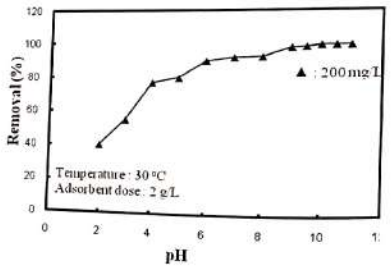

Figure 2. Effect of pH on the adsorption of MB onto Fe-CBS.

Adsorption Isotherm

Adsorption isotherms are important for the description of how adsorbates will interact with an adsorbent and are critical in optimizing the use of adsorbent. Thus, the correlation of equilibrium data using either a theoretical or empirical equation is essential for adsorption data interpretation and prediction. Several models have been applied to describe the experimental data of adsorption isotherms. Most widely used form is the Langmuir isotherm equation. The isotherm data were analysed according to the linear forms of these isotherms. The goal of this part to apprehend the interactions cationic dye-Fe-CBS through the validity of the model.

The Langmuir model is given by the following relation:

$$\frac{C_e}{q_e} = \frac{1}{Q^\circ b} + \frac{C_e}{Q^\circ} \qquad (2)$$

Where Q° and b are the Langmuir constants related to adsorption capacity and intensity of adsorption respectively [12]. A plot of C_e/q_e vs C_e would give Q° and b. The Langmuir equation assumes that there is no interaction between the sorbate molecules and that the sorption is localized in a monolayer. It is then assumed that once a dye molecule occupies a site, no further adsorption take at that site. Theoretically, therefore a saturation value is reached, beyond which no further sorption can take place (Figure 3). Figures 3 shows the plot of q_e vs C_e for the adsorption of the dye on Fe-CBS at different temperatures. The amount of dyestuff adsorbed on Fe-CBS increased with increase in the concentration of the dye. MB shows a monolayer adsorption capacity of 294.11 mg/g at 30 °C and with increase in temperature the value increases to 333.33 mg/g at 60 °C (Table 1). From the above data it is clear that adsorption capacity increases with increase in temperature.

Table 1. Isotherm constants and regression co-efficients for the adsorption of methylene blue onto Fe-CBS

Isotherm constants	Temperatures (°C)			
	30	40	50	60
Langmuir				
Q_o (mg/g)	285.11	297.03	308.50	329.33
b (L/mg)	0.046	0.052	0.057	0.059
r^2	0.998	0.999	0.999	0.999

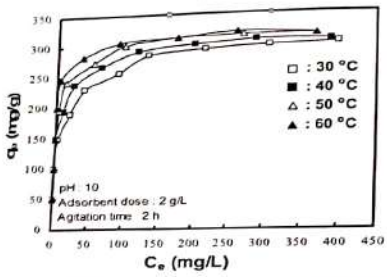

Figure 3. Isotherms for the adsorption of MB onto Fe-CBS at different temperatures.

Desorption and Regeneration Studies

To make adsorption process more economical, it is necessary to regenerate the spent adsorbent. Desorption of the adsorbed MB from spent adsorbent were also studied. The Fe-CBS loaded with maximum amount of MB was placed into desorption medium containing 0.1 M HCl and the amount of MB desorbed in 24 h was measured. The results of the multiple adsorption/desorption cyclic test to investigate the suitability of the Fe-CBS are presented in Table 2. An efficiency of 98.3% desorption of MB was obtained using 0.1 M HCl and is therefore suitable for regeneration of MB from spent Fe-CBS.

The recovery percentage reduced to 86.1% at the end of fourth cycle. The small fraction of adsorbed MB not recoverable by regeneration, presumably represent the MB, which is bound through strong interaction, and, as a result, sorption capacity is reduced in successive cycles. Further study is required to know whether HCl has the ability to rupture the structure of the adsorbent.

Table 2. Four cycles of MB adsorption-desorption using 0.1 M HCl as desorbing agent. Initial concentration 200 mg L^{-1}, adsorbent dose 2g L^{-1}, pH 10.0, equilibrium time 24 h, temperature 30 °C.

Number of cycles	Adsorption, (%)	Desorption, (%)
1	99.5	98.3
2	98.1	94.5
3	93.7	91.0
4	87.1	86.1

CONCLUSIONS

Dyes and pigments represent a problematic group, they are emitted into wastewater from various industrial branches, mainly from the dye manufacturing, textile finishing and also from food colouring, cosmetics, paper and carpet industries.

Adsorption has been found to be superior to other techniques for water treatment due to low cost, flexibility and simplicity of design, ease of operation, insensitivity to toxic pollutants and avoiding the formation of secondary pollutants. There is a need for investigation and developing new adsorbent materials, which are inexpensive, and posses a high capacity for adsorbing pollutants. In this study iron impregnated carbonized banana stem (Fe-CBS) has been utilized as the adsorbent for the removal of MB.

When the pH of the solution increases from 2.0 to 10.0, the percentage of adsorption of MB increases from 20 to 97% respectively for an initial concentration of 1 200 mg/L. The adsorption of these charged dyes group onto the adsorbent surface is

primarily influenced by the surface charge on the adsorbent, which is influenced by the solution pH_{PZC}. The pH_{PZC} value for Fe-CBS was found to be 3.0. At pH value below pH_{PZC}, the Fe-CBS has net positive charge and would therefore, be prone to electrostatic repel cations. The equilibrium isotherm study of MB was studied at 30, 40, 50 and 60 °C using Langmuir isotherm equation. The dye showed a strong affinity for Fe-CBS. The adsorbent shows a monolayer adsorption capacity of 285.11mg/g at 30 °C and with increase in temperature the value increases to 329.33 mg/g at 60 °C. The spent adsorbent can be reused by recovering adsorbed MB by treating with 0.1 M HCl solution.

ACKNOWLEDGEMENTS

The authors are thankful to the Head, Department of Chemistry, Fatima Mata National College, Kollam, for providing laboratory facilities.

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Fatima Mata National College, Kollam, Kerala
Postgraduate & Research Department of Botany

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PREFACE

India is one of the mega biodiversity countries of the world and nurtures enormous plant diversity. However, this treasure is under serious threat mainly due to human interferences in the environment like population growth and resource consumption, climate change and global warming, habitat conversion and urbanization, invasive alien species, over-exploitation of natural resources and environmental degradation. The rapid decline in plant diversity and the growing awareness of the importance of preserving the diversity have given an unprecedented impetus for conservation. A variety of approaches and techniques both *in situ* and *ex situ*, have been proposed and implemented for conservation of plant resources. Still, the present conservation strategies does not appear to coincide with the existing pace in destruction of species. Conservation approaches on rare, endangered and exotic species have to be planned in consideration of the reproductive specialties of them. Association of other plants, animals, microorganisms etc. with the reproductive cycle of the plants undergoing restoration need to be identified for providing special care if needed. Problems often arise in acclimatization efforts done for *ex-situ* conservation due to the drastic change in environment. It may disrupt the close association of the plants and their dependent animals resulting in decoupling of reproductive cycles. Hence, study of reproductive features need to be considered as an integral part of all conservation projects. Since we find so many endemic plants in tropical vegetation, there is an urgent need for integration or coordination between plant systematics and reproductive biology. Taking this into consideration, research forefront in plant diversity has come up with new ideas to explore the reproductive specialties on conservation point of view. In this context, this seminar is an attempt to arrange a platform to discuss and disseminate the latest ideas and concepts on various aspects of Plant Reproductive Biology and Plant Systematics.

Chief Editor

ABOUT THE COLLEGE

Fatima Mata National College was established in1951 by His Excellency Rt. Rev. Dr. Jerome Fernandez, the first native Bishop of Quilon. The college is run by the Roman Catholic Diocese of Kollam, under the leadership of His Excellency Rt. Rev. Dr. Stanley Roman, Bishop of Kollam. It is an autonomous institution imparting instruction in Sciences, Humanities and Commerce. Fatima College pursues the task of preparing young men and women for life, by providing value based education, and by inculcating in them a scientific temper and a firm commitment to spiritual and moral values, with a view to improving their lives, their homes and the world around them.

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Department of Botany was established in 1952. Under Graduate course in Botany was started in 1952 and the Post Graduate course in1961.Department is supported by DST, Govt. of India through FIST programme. The University of Kerala has recognized the department as its research centre in the year 2015.

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Dr. Shaiju P.N.
Assistant Professor

Dr. Sinilal B.
Assistant Professor

Mrs. Siji V.
Guest Lecturer

Ms. Sayoojia K.
Guest Lecturer

LIST OF ABSTRACTS

Ethnopharmacological Investigations at Jawaharlal Nehru Tropical Botanic Garden and Research Institute

Latha P.G.

Jawaharlal Nehru Tropical Botanic Garden and Research Institute
Palode, Thiruvananthapuram- 695562

ABSTRACT

Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI) was found in 1979 by Prof. A. Abraham with the objective of conservation and sustainable utilization of the plant genetic resources of India particularly of Kerala State for the wellbeing of the people. The Ethnomedicine and Ethnopharmacology Division of JNTBGRI was started in 1992, with a view to scientifically validate the important ethnomedicinal claims of the tribal and traditional healers of Kerala, by modern ethnopharmacological methods. Our major research activities include ethnomedico-botanical survey, inventorization and systematic documentation of Traditional Knowledge related to plants used for food and medicine, preparation of database on Ethnomedicine/Traditional Knowledge associated with plants used for food and medicine. Since then, a continuing programme of ethnopharmacological screening of important Indian medicinal plants has been going on at the Division. Over the last 20 years we have scientifically validated several Indian medicinal plants for their anticancer, hepatoprotective, antiulcer, anti-inflammatory, analgesic, wound healing, immunomodulatory, anti-diabetic, antiallergic, aphrodisiac, anti diarrhoeal, antistress and antimutagenic activities. The salient findings of our studies will be presented during the lecture.

DNA barcoding for species discrimination in plants

Deepu Mathew

Centre for Plant Biotechnology and Molecular Biology, Kerala Agricultural University, Vellanikkara, Thrissur - 680 656, E-mail: deepu.mathew@kau.in

ABSTRACT

DNA barcoding is a taxonomic strategy designed to provide rapid and accurate species identification using short, standardized genomic regions as species tags. In addition to assigning specimens to known species, DNA barcoding will accelerate the pace of species discovery by allowing taxonomists to rapidly sort specimens and by highlighting divergent taxa

that may represent new species. The DNA barcodes for 7 Indian species of *Momordica* (*M. charantia* L. cv. *charantia*, *M. charantia* cv. *muricata* (wild) Chakrav, *M. dioica* Roxb., *M. sahyadrica* Joseph and Antony, *M. balsamina*, *M. cochinchinesis* Spreng. (Gac.), *M. subangulata* Blume ssp.*renigera* (G. Don) de wild and *M. cymbalaria*.) were developed at KAU, using the chloroplast *matK* gene sequences. The universal primers were employed to amplify the matK gene from 25 *Momordica* and 2 *Luffa* accessions and based on the multiple sequence alignment of the sequences, the primers for DNA barcoding in this genus were proposed. Based on the *matK* sequences, the barcodes were generated at BOLD systems, barcode gaps for species discrimination were identified and phylogenetic relations were worked out. *M. charantia, M. subangulata* ssp. *renigera*, *M. cochinchinensis* and *Luffa* have yielded definite *matK* barcode gaps and other species requires supplementation with additional loci. *M. charantia* cv. *muricata* is proposed to be the progenitor for the different *Momordica* species in India.

Recent trends in crop improvement

Wilson D.

Department of Plant Breeding and Genetics, College of Agriculture,
Vellayani, Thiruvananthapuram-695522, Kerala Agricultural University

ABSTRACT

The fundamental discoveries of Darwin and Mendel established the scientific basis for plant breeding and genetics at the turn of the 20th century. Similarly, the recent integration of advances in biotechnology, genomic research, and molecular marker applications with conventional plant breeding practices has created the foundation for molecular plant breeding, an interdisciplinary science that is revolutionizing 21st century crop improvement.

Plant breeding describes methods for the creation, selection, and fixation of superior plant phenotypes in the development of improved cultivars suited to needs of farmers and consumers. Primary goals of plant breeding with agricultural and horticultural crops have typically aimed at improved yields, nutritional qualities, and other traits of commercial value.

Plant breeding has a long history of integrating the latest innovations in biology and genetics to enhance crop improvement. Despite the immediate recognition among some plant breeders of the importance of Mendelian genetics, full integration was delayed for nearly 20 years until quantitative genetics reconciled Mendelian principles with the continuous variation observed for most traits considered important by most plant breeders.

Subsequent advances in our understanding of plant biology, the analysis and induction of genetic variation, cytogenetics, quantitative genetics, molecular biology, biotechnology, and, most recently, genomics have been successively applied to further increase the scientific base and its application to the plant breeding process.

The plant biotechnology era began in the early 1980s with the landmark reports of producing transgenic plants using *Agrobacterium* . Molecular marker systems for crop plants were developed soon thereafter to create high-resolution genetic maps and exploit genetic linkage between markers and important crop traits. By 1996, the commercialization of transgenic crops demonstrated the successful integration of biotechnology into plant breeding and crop improvement programs. Introgression of one or a few genes into a current elite cultivar via backcrossing is a common plant breeding practice. Methods for marker-assisted backcrossing were developed rapidly for the introgression of transgenic traits. During the past 25 years, the continued development and application of plant biotechnology, molecular markers, and genomics has established new tools for the creation, analysis, and manipulation of genetic variation and the development of improved cultivars.

Anatomy as a supplementary tool in the systematics of the genus *Sesamum*L. (Pedaliaceae)

Akhila H and S Suhara Beevy

Department of Botany, University of Kerala, Kariavattom, Thiruvananthapuram-695581
s.beevy@rediffmail.com

ABSTRACT

Anatomical characterization of 37 accessions in six species of *Sesamum* was carried out to assess the interrelationships in the genus. The study examined the stem, leaf and petiole anatomy and considered 11 quantitative and 17 qualitative traits for one-way ANOVA, Kruskal-Wallis test, cluster analysis and PCA. It was found that the shape of the stem, leaf and petiole were species specific. The shape of the stem ranged from quadrangular with ridges and furrows in *S. indicum, S. radiatum, S. malabaricum* and *S. alatum* to square shaped (*S. laciniatum*) with slightly quadrangular nature in *S. prostratum.* The c.s of the leaf was C-shaped in the mid rib region with glands and hairs seen more on the adaxial surface except in *S. alatum.* The leaf petiole showed horse-shoe shaped structure

with deeply furrowed upper region with varied number of vascular bundles ie., from 4 (*S. alatum*) to 10 (*S. malabaricum* and *S. radiatum*). Analysis of quantitative data revealed an increase in the size of tissues in *S. radiatum,* while *S. alatum* showed the least value. ANOVA revealed significant variations at the inter- as well as intra-specific levels. Kruskall-Wallis test displayed significant variations in the characters, such as shape of stem in c.s, surface of the stem, hairs in adaxial and abaxial surface, petiolar surface, nature of bundle sheath in petiole and petiolar trichomes. PCA and cluster analysis suggested the same. A taxonomic key prepared in the study emphasized the significance of anatomical data in the systematics of the genus *Sesamum.*

Keywords: *S.indicum, S.radiatum, S.malabaricum, S.laciniatum, S.prostratum, S.alatum,* anatomy, Kruskal-Wallis test, ANOVA, PCA.

Reproductive biology and seed germination studies in *Gynochthodes umbellate* (L.) Razafim. & B. Bremer (Rubiaceae)

Anjusha S., Gangaprasad A.* and Radhamany P. M.

Plant Tissue Culture and Molecular Biology Lab, Department of Botany, University of Kerala, Kariyavattom, Thiruvananthapuram, Kerala, India-695 581
*Email: *gp@keralauniversity.ac.in*

ABSTRACT

Reproductive biology studies of plants are important and crucial for establishing the appropriate measures for their conservation and for predicting their survival capacity. *G. umbellata* is a medicinally important woody climber belongs to the family Rubiaceae. The distribution of this plant is limited and restricted to some areas like sacred grooves and have some reproductive problems. Present study carried out to analyse the floral morphology, pollen viability and seed germination studies in detail. From the present study it reveals that *G. umbellata* have pistillate and staminate plants separately. Flowers of staminate plant have 4-5 stamens and a style and stigma is completely absent but the pollen produced in this plant shows a high percentage of viability. Whereas flowers of pistillate plant have a style with two stigmatic lobe and 4-5 stamens but here the viability of pollen grains are very low. The seed viability and seed germination percentage is

very low so alternative propagation methods were standardized for the propagation and conservation of this important medicinal plant.

Stylar lobe micromorphology in *Thottea duchartrei* Sivar., Babu & Indu, and *Thottea idukkiana* Pandura. & Nair- two medicinal undershrubs from Western Ghats.

Athira M. and Shaiju P.N.

Post Graduate and Research Department of Botany, Fatima Mata National College, Kollam-1
shaiju@fatimacollege.net

ABSTRACT

Thottea is an Indo-Malayan genus represented in the Western Ghats by eight species. Two among them – *T. duchartrei* and *T. idukkiana* are sharing most of the common vegetative and floral characters except some significant differences in the gynostemium. The present study envisages the detailed micromorphology of the stylar lobes in these two species in order to characterize the stigmatic tissue in this component of the highly complex gynostemium. The light, stereo and scanning electron microscopic studies on the morphology and anatomy of the stylar lobes in these two species clearly differentiate the specific stigmatic portion with characteristic properties. But the present study do not offer any evidences to separate these two species based on their stylar micromorphology.

Wild ornamental plants of Agasthyamalai Biosphere Reserve endemic to the Western Ghats of the Peninsular India

Jgadeesan R[1], Gangaprasad A.*[1], Sam P. Mathew[2] and Santhoshkumar E.S[2]

1. *Department of Botany, University of Kerala, Kariyavattom, Thiruvananthapuram, Kerala 695581*
2. Jawaharlal Nehru Tropical Botanic Garden and Research Institute Palode, Karimankode P.O., Thiruvananthapuram, Kerala 695562.
**Email: agangaprasad@yahoo.com*

ABSTRACT

The tropical rainforests occurring on the slopes of the Western Ghats are one of the remarkable strongholds of plant genetic resource in the

country. According to an official estimation, this biogeographical region is the abode of around 5000 species of Angiosperms which include approximately 1500 endemics also. Wild ornamental species of the Western Ghats are one of the lesser-known groups of plants having incredible potential in the field of floriculture and commercial landscaping approaches during future decades. The indigenous ornamental plant wealth of the Western Ghats proclaims with quite a lot of lesser-known wild proto types of several domesticated, semi-domesticated and popular horticultural species of the modern ornamental botanical entities. It is obvious that all present day ornamental species have come from the wild germplasm during the medieval period of human civilization. The wild proto types of these ornamental species have much relevance to the field of floriculture for the varietal improvement as well as genetic modifications of significant ornamental plants. The glimpses on history of wild ornamental plants in the Indian Subcontinent has key role with European invasion in India. European botanists and amateur horticulturists of those days have extensively and intensively explored the Northwest Himalayan forests for popular wild ornamentals like Rose, Primula, Rhododendron, Orchids and other beautiful unknown Indian wild herbs, shrubs and trees for domestication in their home gardens and also to introduce at several European gardens. Burkill (1870-1965), recorded that the famous 'Assam Tea Delegation' of the British regime consisting of Wallich, Griffith and Mc Cleand brought to knowledge on several interesting wild ornamental plants from Northeast India, apart from establishing the wild tea pants. As regards to the Southern Western Ghats, there are no detailed studies on endemic wild ornamentals except a preliminary investigation by JNTBGRI in 1993. The present paper describes outstanding wild endemic ornamental species for domestication in home gardens and landscape practices from the Agasthyamalai Biosphere Reserve. Agasthyamalai Biosphere Reserve, one of the Indian 'hot spots' of biodiversity, located between 8° 8' to 9° 10' North Latitudes and 76° 52' to 77° 34' East Longitudes which cover an area of 3,500.36 km^2 in Kerala and Tamilnadu States. The methodology of the study includes herbarium collection, plant identification and passport data documentation with relevant photographs of as primary phase of the studies in the Kerala region of Agasthyamalai Biosphere Reserve.

Calotropis (L) R. Br. (Apocynaceae) diversity

Abdul Kader S. and Chellakumar M.

Department of Plant Biology & Plant Biotechnology
Presidency College (Autonomous) Chennai, Tamil Nadu – 600 005.
E-mail: sakfri@rediffmail.com

ABSTRACT

Since ambiguity exist between *C. gigantea* and *C. procera* in the name of Vellerukku among Siddha practitioners in Tamil Nadu, we have undertaken taxonomical and anatomical studies during 2012-2014 not only to document the distribution of different *Calotropis* L. species (Apocynaceae) in South India particularly in Kerala and Tamil Nadu but also to confirm their correct identity. Measurements on morphological characters (both vegetative and reproductive characters) were taken. For anatomical studies and herbarium preparation, specimens were collected and photographs taken. Data were also gathered from the literature. The present study document 3 species of *Calotropis* in India *viz.*, *C. acia* Buch.-Ham., *C. gigantea* (L.) Dryand. and *C. procera* (Aiton) Dryand. Of these, only *C. gigantea* (L.) Dryand. is found in Kerala and Tamil Nadu. *C. acia* Buch.-Ham. is found only in Sikkim Himalayas. In Karnataka, Andhra Pradesh and Telangana both *C. gigantea* (L.) Dryand. and *C. procera* (Aiton) Dryand. are found. The confusion arose due to the inclusion of *C. procera* (Aiton) Dryand in the '*Flora of the Presidency of Madras*' by J. S. Gamble and C. E. C. Fischer (1915–1938). It should be noted that while publishing this flora the then Madras Presidency comprises the present 5 southern States namely, Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, and Telangana. Again, the Siddha system of medicine is originated and widely practiced in Tamil Nadu. It is practiced in some parts of Kerala too. Since *C. procera* (Aiton) Dryand is not found in Tamil Nadu and the Siddha system of medicine is purely of Tamil origin, we therefore conclude that the local name Vellerukku mentioned in Siddha Materia Medica is the white variety of *C. gigantea.* The present study reveals that all the 3 species are distinct taxonomically. An intended Key is prepared for easy identification.

Diversity of floral morphological characters with special emphasis on stigma features in the family Bromeliaceae

Kalarani V.S and Radhamany P.M.

Department of Botany, University of Kerala
Kariavattom,Thiruvananthapuram, Kerala-695581

ABSTRACT

The taxonomy of Bromeliaceae is currently in flux and certain aspects of classification are being refined. The understanding of floral morphology and pollination biology is one of the prerequisites to lead to a correct classification of the genus and species. Until recently, characteristics of the gynoecium and androecium have been little utilized in systematic studies Bromeliaceae. The present study aimed to analyse the role of morphological characters with special emphasis on stigma features on the classification of the family Bromeliaceae. For these sixteen taxa (eight genera) under three tribes (Pitcairnioideae, Bromelioideae and Tillandsioideae) were investigated for the present study. The plants used in the present investigation were obtained from the Botanic Garden, Department of Botany, University of Kerala, Kariyavattom, Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Palode and different parts of Thiruvananthapuram. Polypetalous condition and polysepalous condition present in all the members of the sub family Bromelioideae and Tillandsioideae except *Guzmania lingulata*. *Guzmania* has gamopetalous and gamosepalous condition. *Dyckia bravifolia* (Pitcairnioideae) has gamopetalous and gamosepalous condition.All the species observed have six stamens arranged in two series; three towards petal and three towards sepal. *Guzmania lingulata has* epipetalous stamens. All the species have dorsifixed stamens. Stigma characters also show great variation. *Aechmea fulgens, Aechmea* species 1, genus *Billbergia ,Ananas* and *Neoregelia* have spirally arranged conduplicate stigma . But *Aechmea bracteata* has free stigma lobes. Also *Cryptanthus, Tillandsia and Guzmania* genus have free stigma lobes. Genus *Aechmea, Cryptanthus, Ananas, Neoregelia, Dyckia* etc.lack hairs on their surface of stigma. But hairs are present in the genus *Billbergia,Tillandsia*, and *Guzmania.* The present study concludes that there is a correlation of stigma morphology with pervious classification the family Bromeliaceae into three sub families. More detailed analysis of stigma characters will contribute to resolving the problems in the phylogeny and classification of the family Bromeliaceae.

Floral morphogenesis in Coccinia grandis (L.) Voigt (Cucurbitaceae)

Raseena N.R. and Suhara Beevy S.

Department of Botany, University of Kerala, Kariavattom-695581
raseenanrnn@gmail.com

ABSTRACT

Floral morphogenesis is a complex process which depends on many environmental and developmental signals and the striking diversity of vegetative and floral morphologies in angiosperms raises the question of how development of these traits happened. The candidate species, *C. grandis*, is a eudicot belonging to the family Cucurbitaceae with a strong dioecy and heteromorphism of sex determination. Present investigation was focused on the floral morphogenesis of male and female flowers using both macroscopic and microscopic methods. The study noticed a concentric pattern of flowering in the species. Scanning electron microscopic observations revealed that the developmental events are almost identical in both the sexes at the early stages and the differences were observed in the later stages of development. The study suggests that reproductive characters of the species may be regulated by genetic factors and these genetic and developmental mechanisms govern transitions to functional dioecy in the species.

Biochemical evaluation and estimation of anacardic acid in different extracts of *Anacardium occidentale* L.

Sija.S.L[1*], Potty.V.P[2] and Santhoshlal.P.S[1]

[1]PG and Research Department of Botany & Biotechnology,
Sree Narayana College, Kollam-691 001, Kerala, India
[2] The CEPCI Laboratory & Technical Division, kollam-691 001, Kerala, India
[*]E-mail: sijasl007@gmail.com

ABSTRACT

Cashew (*Anacardium occidentale* L.) is one of the economically and medicinally important tropical horticultural crop belongs to the family Anacardiaceae. It is much known for its commercially valuable kernals and also bioactive compounds like polyphenols. In recent times there is more attention towards them; due to the presence of bioactive compounds especially anacardic acid and they have a dynamic role in prevention of various human diseases. The present study was carried out to evaluate

the presence of anacardic acid, total phenolic compound, antioxidant activity and antibacterial activity in methanolic extract of *in vitro* developed callus and various plant parts such as young leaves, flower, shoot and cotyledon in order to discover and to improve the knowledge of traditional medicine. Methanol extract of flower showed the maximum phenolic content (260.8 ± 5.543 mg/g) whereas the methanol extract of cotyledon (16.2 ± 3.284 mg/g) showed the lowest total phenolic content. Total phenolic contents were measured by the Folin-Ciocalteau method using gallic acid as standard compound. The action of 1,1-diphenyl-2-picrylhydrazyl (DPPH) on radical scavenging effect of the extracts was determined spectrophotometrically using ascorbic acid as standard compound. All extracts exhibited a DPPH radical scavenging activity and among the extracts, *A.occidentale* flower demonstrated greater antioxidant potential with a low IC_{50} (206.312 ± 0.38µg/ml) in comparison with those of the other extracts. Total phenolic contents showed positive correlations with the DPPH radical scavenging activity ($r = 0.979$; $p<0.01$) and negative correlations with IC_{50} ($r = -0.984$; $p<0.01$). The antibacterial capabilities of various extracts were also examined against two common human pathogens of clinical importance, *Escherichia coli* and *Staphylococcus aureus*. Presence of anacardic acid in various extracts was also estimated by using HPTLC method.

Keywords: *Anacardiumoccidentale*, 2, 4-D, BAP, Callus, Total phenolic contents, Folin-Ciocalteu reagent, Antioxidant activity, Antibacterial activity, DPPH, HPTLC.

Diversity of Staminodes in the Genus Cassia Linn.

Anitha B. and Shaiju P.N.

Post Graduate and Research Department of Botany, Fatima Mata National College, Kollam-1
shaiju@fatimacollege.net

ABSTRACT

The androecial diversity with particular reference to the morphology and distribution pattern of staminodes was analyzed in eight South Indian species of the genus Cassia. The morphological characters of staminodes are studied at different levels such as the arrangement of stamens, shape, size and attachment of stamens within the filaments, etc.The study points out the great staminodal diversity in Cassia which has been explained as the diversity number, position, arrangements and nature. Most of the data

available in the present study is found taxonomically significant to characterize different species of Cassia. The extreme diversity in the nature, arrangement, number, position and developmental mechanism noticed in the present study can be utilized as a foundation for more extensive phylogenetic analysis within the genus.

Diversity, Distribution and status of the genus Sida L (Malvaceae) in South India

Navas M., Mathew Dan and Latha P.G.

Jawaharlal Nehru Tropical Botanic Garden and Research Institute,
Palode P O, Thiruvananthapuram (District), Kerala, India
e-mail: navastbg@yahoo.com

ABSTRACT

The genus *Sida* L. of Malvaceae is represented by about 200 species, widely distributed in the tropical and subtropical regions. In India, there are 20 species of *Sida*, of which 19 are present in South India. *S. beddomei*, *S. cuneifolia*, *S. fryxellii* and *S. ravii* are endemic to south India. Thiruvanananthapuram district showed maximum diversity in the genus *Sida*, representing 14 species. Most of the *Sida* species are very similar in morphological as well as floral characters, creating confusion even to taxonomists. Some of the species of *Sida* are medicinally important and due to the close morphological similarity between the species and in order to fulfill the great demand as a drug, several *Sida* species are being harvested in bulk. Thorough explorations were conducted to different regions, located the species and subjected to morphological characterisation. Diversity in habit, habitat, distribution and phenology are discussed.

Key Words: endemic, morphology, South India, *Sida*

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