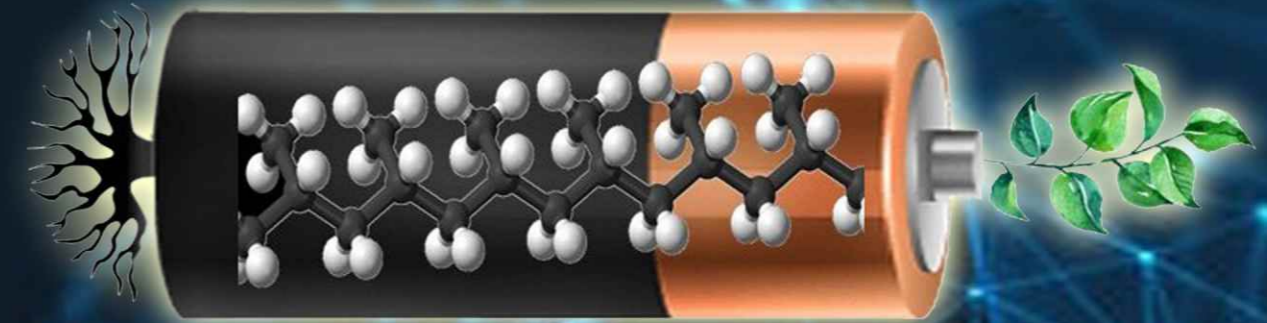


Proceedings of the  
**NATIONAL VIRTUAL  
CONFERENCE ON**

**RECENT TRENDS IN ENERGY MATERIALS  
(RTEM - 2021)**



**RECENT TRENDS IN ENERGY MATERIALS**



**JK PRINTERS PUBLISHERS**  
1/1A, SEKKALAIKOTTAI 2ND STREET,  
THANTHAI PERIYAR NAGAR,  
SEKKALAIKOTTAI,  
KARAIKUDI, SIVAGANGA,  
TAMIL NADU, 630001



*Organized by*



*Department of Physics*  
*Arumugam Pillai Seethai Ammal College*  
*Tiruppattur - 630 211.*  
*rtemapsaphy@gmail.com*

**14<sup>th</sup> & 15<sup>th</sup>  
July, 2021**

NATIONAL VIRTUAL  
CONFERENCE ON  
“RECENT TRENDS IN  
ENERGY MATERIALS”  
(RTEM – 2021)

14<sup>th</sup> & 15<sup>th</sup> July, 2021

*Proceedings*



*Chief Editors*

*Dr.Y.B.Kannan*

*Dr.M.Ramachandran*

*Department of Physics*

*Arumugam Pillai Seethai Ammal College*

*Tiruppattur – 630 211.*

**NATIONAL VIRTUAL CONFERENCE ON “RECENT TRENDS IN ENERGY MATERIALS” (RTEM – 2021)**

**Disclaimer**

**The author(s) are solely responsible for the contents of the abstract compiled in this volume. The editors do not take any responsibility for the same in any manner. Errors, if any, are purely unintentional and readers are requested to communicate such errors to the editors to avoid discrepancies in future.**

**No part of this publication may be reproduced or transmitted in any form by means of electronics, mechanical including photocopy, recording or any information storage and retrieval system, without permission in writing from the copyright owners.**

**Chief Editors**

**Dr.Y.B.Kannan**

**Dr.M.Ramachandran**



Grams : APSAC

College : 04577 - 266142

Residence : 04577 - 266124  
04577 - 266164

E.mail : arumugarajan.n@gmail.com

Website : www.apsacollege.com

## **ARUMUGAM PILLAI SEETHAI AMMAL COLLEGE**

(Established -1965)

Vallal Arumugam Pillai Road, **TIRUPPATTUR - 630 211.**

Sivangai Dist.Tamil Nadu.

**N.ARUMUGARAJAN M.A.,**

Secretary

### **MESSAGE**

India in recent years is now facing a huge challenge in the field of Science and Technology due to the sudden hindrance erupted due to corona outbreak. Despite this annoying situation, various research activities are taking place in all over the world, but in slow pace. To accelerate the research activity, exchange and sharing of new findings must be disseminated among the research community. Now, it is the right time to bring all the research scholars and emerging scholars to pool at one place and establish a conducive environment.

I am extremely happy to know that Department of Physics is organizing a National Virtual Conference on "Recent Trends in Energy Materials" (RTEM - 2021) on 14<sup>th</sup> and 15<sup>th</sup> July 2021 encompassing wider areas in Physics, that too in this pandemic time. Undoubtedly, this virtual conference on energy materials concentrating on different focal aspects and outcome of this conference will be useful to the stakeholders in research and teaching communities. I am sure the proceedings released on this occasion will be a valuable reference material for all inquisitive readers. I congratulate the Principal, Department of Physics for their efforts in organizing the virtual conference and also offer my best wishes for the success of the seminar.



Grams : APSAC  
Phone: { College : 04577 - 266142  
Personal : 04577 - 266176  
Fax No : 04577 - 266103  
E.mail : principal@apsacollege.com  
Website : www.apsacollege.com

## **ARUMUGAM PILLAI SEETHAI AMMAL COLLEGE**

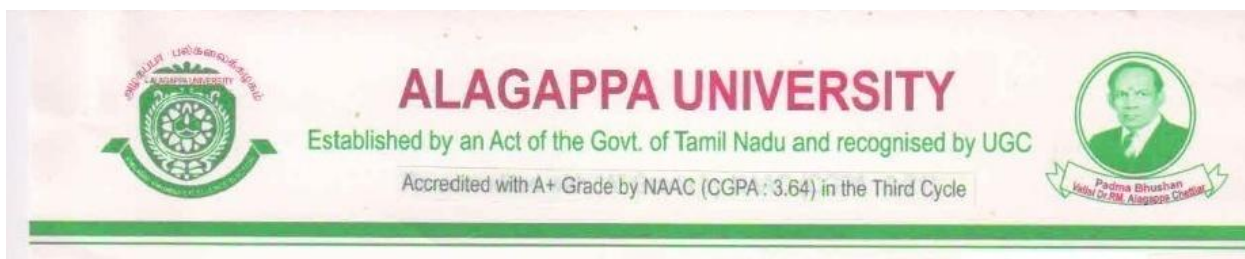
**TIRUPPATTUR - 630 211.**  
Sivagangai Dist. Tamil Nadu.

Dr. (Capt.) **KR.JEYAKUMAR** M.A.,M.B.A.,M.Ed.,M.Phil.,Ph.D.,  
PRINCIPAL

### **MESSAGE**

It is my pleasure to congratulate the Department of Physics for organizing a national virtual conference on 'RECENT TRENDS IN ENERGY MATERIALS' (RTEM – 2021) on 14 and 15 July 2021. Even though many institutes are facing an adverse conditions and uncondusive environment, we can witness a positive sign of research activity taking place in many institutes to uncover their findings. Researchers are now trying to disseminate the core ideas and concepts in the emerging field through virtual mode to break any sought of hindrance to research community. So, this is the need of the hour to share the technical advancement and application aspects with all so that it reaches all the stake holders.

I wholeheartedly appreciate the staff members of Department of Physics for their efforts to bring the intellectuals together to discuss various aspects of physical sciences. This seminar will serve as bridge to pool and disseminate the latest findings among the budding scholars and scientists. I firmly believe that the deliberations during the seminar will throw light on future plans of action in physical science and help in framing suitable policies. At this moment, I extend my warm greetings to the participants and wish the seminar a grand success.



**Prof.C.Sekar, Ph.D.**

**Registrar (i/c).**

It is a matter of immense pleasure that the Department of Physics, Arumugam Pillai Seethai Ammal College is organizing a National Virtual Conference on “Recent Trends in Energy Materials (RTEM – 2021) on July 14 and 15, 2021. The theme of the conference is very appropriate now due to the rapid increases in fuel price. Also, due to COVID-19, research field faced a huge hindrance. This situation was a huge setback for many budding research scholars. To meet these challenges it is very important for researchers to come together and share their views and research findings.

In this situation, Department of Physics, Arumugam Pillai Seethai Ammal College has organized this virtual conference which is a praiseworthy factor. Scientific deliberations on the theme of the conference by eminent scientists would open a new arena for the budding young researchers. I firmly believe and hope that due attention will be given by the invited speakers on current innovative ideas in energy materials. I am sure that the scholars who are participating in the conference will exchange innovative ideas and perception on various issues, dimensions in energy materials.

I wish the organizing team and Department of Physics, Arumugam Pillai Seethai Ammal College for the effort in organizing the national conference. I extend a warm welcome to all the delegates and participants of this conference and wish them all success.

<https://www.linkedin.com/in/drchandramohan>  
[https://www.researchgate.net/profile/Rathinam\\_Chandramohan](https://www.researchgate.net/profile/Rathinam_Chandramohan)



## Sree Sevugan Annamalai College

Devakottai – 630303, Sivaganga District, Tamilnadu, India

[www.sreesevuganannamalaicollege.org.in](http://www.sreesevuganannamalaicollege.org.in)

*Dr.R.Chandramohan M.Sc., B.Ed., Ph.D, Post Doc (Taiwan)*

*Principal (Retd)*

[Rathinam.chandramohan@gmail.com](mailto:Rathinam.chandramohan@gmail.com),9894391443

01-07-2021

### Message

Dear Dr. Caption Jeyakumar, I am glad that under your able guidance, the department of physics, Arumugam Pillai Seethai Ammal College is organizing a National Virtual Conference on “Recent Trends in Energy Materials”. The Topic is most relevant one and covers a wide range of materials, techniques and advances. Recently the energy materials choices has grown in multi-dimensional way. The advent of excotic 1D, 2D materials for energy harvesting applications, ability to grow crystals of any size by novel growth methods and novel structures that can improve energy storage, this topic has emerged as one of the most sought multi disciplinary one . The energy applications transform the advanced nations preferences and the measure of efficient non emmissive processes available in energy applications is becoming a new measure of advancement. I understand that eminent personalities from all over our country are presenting their works in this national level meet. Also many research scholars are presenting their ongoing research works in this virtual meet. I am confident that the virtual deliberations will not only benefit the research communities during this pandemic time but also may come out with new ideas that may shape our countries future enegy policies by bringing novel valuable insights. I wish the deliberation, virtual interaction and resulting publication a grand success.

With Kind Regards

(Dr.R.Chandramohan)

## **PREFACE**

The Corona virus (COVID-19) disease brings the curtain down all around the world irrespective of technological power, location or status of the nations on the planet Earth. Though the lockdown all around the world helps in bringing down the noise, water, sound pollution etc., to some extent but at the same time the lockdown has its own disadvantages in all fields, particularly in the field of education. Through the various measures adopted by the Governments as suggested by scientists, NGOs etc., the world is limping slowly towards the normalcy. One such measure to interact in the education field is “Virtual”. Hence, the Department of Physics of Arumugam Pillai Seethai Ammal College decided to conduct National Virtual Conference on “RECENT TRENDS IN ENERGY MATERIALS” (RTEM – 2021) on 14<sup>th</sup> and 15<sup>th</sup> July 2021 with the sole aim of creating a platform to motivate the researchers, scientists, academicians and students during this pandemic period. The objective of the virtual conference was to uncover the thrust areas, share technical expertise, open venue for young researchers and establish functional coordination with the researchers in the field of Physics and Chemistry.

We circulated the conference invitation through email and various social media and in response to the circulation of invitation, 235 participants were registered in the virtual conference. Out of which 106 were Assistant Professors, 13 Associate Professors, 7 Professors, 84 Research Scholars and 25 were students. Participants were from all over the states like Mizoram, Karnataka, Kerala, Kashmir, Pondicherry, Maharashtra, Punjab, Delhi, Uttar Pradesh and Gujarat. We received eleven (11) full papers and sixty (60) abstracts from states like Delhi, Mizoram and almost all leading institutions in Tamil Nadu. After careful evaluations by the expert committee, the accepted full length articles and abstracts were published in this proceeding. Eight invited talks from eight eminent professors were scheduled over the two days of the virtual conference.

We express our deep sense of gratitude to Mr.N.Arumugarajan, Secretary, Arumugam Pillai Seethai Ammal College for his never-ending encouragement for this virtual conference. We record our sincere thanks to Dr.(Capt).KR.Jeyakumar, Principal, Arumugam Pillai Seethai Ammal College for his motivation and advice.



We are very much thankful to Prof.C.Sekar, Registrar (i/c), Alagappa University for his valuable inaugural speech and Prof. R.Chandramohan, Research advisor, Vidhyaa giri College of Arts and Science, Puduvayal, Karaikudi, Tamil Nadu, India for his encouraging valedictory speech.

Our sincere thanks are due to

- Dr.M.Sivakumar,  
Energy Materials Lab, Department of Physics, Alagappa University, Karaikudi, Tamil Nadu, India.
- R. Ilangovan  
National centre for Nanoscience and Nanotechnology, University of Madras, Chennai, Tamil Nadu, India
- Dr.K.Dinakaran  
Department of Chemistry, Thiruvalluvar University, Vellore, Tamil Nadu, India.
- R. Subadevi  
Energy Materials Lab, Department of Physics, Science Block, Alagappa University, Karaikudi, Tamil Nadu, India.
- Nygil Thomas  
Department of Chemistry, Nirmalagiri College, Kannur, Kerala, India.
- RM. Gnanamuthu  
Department of Chemistry, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India

for extending their support and their invited talk.

We thankfully acknowledge the service of the members of Advisory Committee without them we may not have successfully organized this virtual conference. We also remember and forward our sincere thanks to faculty, staff and students who volunteered and extended all possible support. Our sincere thanks to Dr.S.Jeyavel, Director of Physical Education, Arumugam Pillai Seethai Ammal College for his excellent service in designing and typesetting the abstracts, proceedings related to this seminar.

Tiruppattur – July 2021.

Chief Editors  
Dr.Y.B.Kannan  
Dr.M.Ramachandran.

CHIEF PATRON

**Thiru N.ARUMUGARAJAN, M.A.**

Secretary, Arumugam Pillai Seethai Ammal College.

Patron

**Dr.(Capt). KR.Jeyakumar**

Principal, A.P.S.A. College.

Conveners

**Dr.Y.B.Kannan**

Assistant Professor

**Dr.M.Ramachandran**

Assistant Professor

Co-Conveners

**Dr.N.S.Saravanan**

Associate Professor & Head

**Dr.M.Ravikumar**

Associate Professor

Organizing Secretaries

**Dr.S.Marikkannu**

Assistant Professor

**Dr.R.Premarani**

Assistant Professor

Advisory Committee

**Dr.P.Murugan**, CSIR – CECRI, Karaikudi, TN.

**Dr.M.Sivakumar**, Alagappa University, Karaikudi, TN.

**Dr.S.Asath Bahadur**, KARE, Krishnankovil, TN.

**Dr.R.Chandramohan**, VCAS, Pudukkottai, Karaikudi, TN.

**Dr.V.Sabarinathan**, MS University, Tirunelveli, TN.

**Dr.R.V.Jeba Rajasekhar**, Govt.Arts College, Melur, Madurai, TN.

**Dr.M.Karunakaran**, Alagappa Govt. College, Karaikudi, TN.

**Dr.B.Natarajan**, Govt. Arts & Science College, Sivakasi, TN.

**Dr.N.Sivakumar**, Chikkaiah Naicker College, Erode, TN.

**Dr.P.Sivakumar**, Arignar Anna Govt.Arts College, Namakkal, TN.

## **About the College**

Thiru. N.T.S. Arumugam Pillai, our founder, hailing from Tiruppattur, a socially and educationally backward area, migrated to Malaysia to earn his fortune and became a business magnet and rose to eminence in Malaysia. The King of Malaysia honored him with the highest title of the country, namely AMN in recognition of his generosity and philanthropy. Holding the conviction that education is the key to open the doors of upliftment, he started this College in July 1965 and thereby brought the unknown and unheard Tiruppattur in the educational map of Tamil Nadu.

## **About the Department**

This Department of Physics came into existence with the establishment of the college in 1965 to offer Pre-University course under University of Madras. Then, from the academic year 1966-67, B.Sc. Physics was started with Mathematics and Chemistry as ancillary subjects, affiliated to Madurai Kamaraj University. From 2004, this institution comes under Alagappa University. The Department aims to provide academic excellence to students. Many university rank holders were produced by this department. Around 50 articles were published in Scopus/UGC care listed journals by the faculty members.

## **About the Conference**

Research is the only way to arrive at solutions to the problems faced by the people all over the world. Nowadays, there is a focused research impetus in Energy related materials. Hence, this National Virtual Conference on “Recent Trends in Energy Materials” will be very useful and also provide an excellent opportunity to the budding researchers and students to interact with the Scientists and Academicians in this field during this lockdown period.

PROGRAM SCHEDULE  
DAY – 1 14 07 2021  
9.00 am to 9.30 am  
INAUGURAL FUNCTION

Welcome address and Theme of the conference	Dr.Y.B.Kannan Convener, RTEM -2021.
Presidential address	Dr.(Capt).KR.Jeyakumar Principal, A.P.S.A.College.
Felicitation	Thiru N.ARUMUGARAJAN, M.A. Secretary, A.P.S.A. College.
Inaugural address	Dr.C.Sekar Registrar (i/c) Alagappa University, Karaikudi.
Vote of Thanks	Dr.M.Ramachandran Convener, RTEM-2021.

TECHNICAL SESSION – 1  
9.30 - 10.30 am

Introduction of Chief Guest	Dr.N.S.Saravanan Asso.Prof. & Head Dept. of Physics, A.P.S.A.College.
Plenary Address	Dr.C.Sekar Registrar (i/c) Alagappa University, Karaikudi

## PROGRAM SCHEDULE

DAY – 1 14 07 2021

FORENOON SESSION CHAIR – Dr.NSS & Dr.YBK.

Introduction of Chief Guest	<b>Dr.M.Ramachandran</b> Convener, RTEM – 2021. Asst. Prof., Dept. of Physics.
<b>Technical session 2</b> 10.30 – 11.30 am Invited Lecture	<b>Dr.M.Sivakumar</b> Asso. Prof., Energy Materials Laboratory, Dept. of Physics Alagappa University, Karaikudi.
Tea Break 11.30 – 11.45 am	
Introduction of Chief Guest	<b>Dr.N.S.Saravanan</b> Asso. Prof., & Head Dept. of Physics.
<b>Technical session 3</b> 11.45 – 12.45 pm Invited Lecture	<b>Dr.R.Ilangovan</b> Professor, National Center for Nanoscience and Nanotechnology, University of Madras, Chennai.
Introduction of Chief Guest	<b>Dr.Y.B.Kannan</b> Convener, RTEM – 2021. Asst. Prof., Dept. of Physics.
<b>Technical session 4</b> 12.45 – 1.45 pm Invited Lecture	<b>Dr.Nygil Thomas</b> Asst. Prof., Dept. of Chemistry Nirmalagiri College, Kerala.
Lunch Break 1.45 – 2.30 pm	

Day 1 – After noon session – 2.30 – 5.00 pm

Chair – Dr.MRK & Dr.MRC

Oral Presentations (virtual) by participants

## PROGRAM SCHEDULE

DAY – 2 15 07 2021

FORENOON SESSION CHAIR – Dr.SM & Dr.RP.

Introduction of Chief Guest	Dr.M.Ravikumar Asso. Prof., Dept. of Physics.
Technical session 1 10.00 – 11.00 am Invited Lecture	Dr.K.Dinakaran Director – Research Tiruvalluvar University, Vellore.
Tea Break 11.00 – 11.15 am	
Introduction of Chief Guest	Dr.S.Marikkannu Asst. Prof., Dept. of Physics.
Technical session 2 11.15 – 12.15 pm Invited Lecture	Dr.R.Subadevi Asst. Prof., Energy Materials Laboratory, Dept. of Physics Alagappa University, Karaikudi.
Introduction of Chief Guest	Dr.R.Premarani Asst. Prof., Dept. of Physics.
Technical session 3 12.15 – 1.15 pm Invited Lecture	Dr.Rm.Gnanamuthu Research Prof., Dept. of Chemistry SRM-IST, Chennai.
Lunch Break 1.15 – 2.00 pm	

Day 2 – After noon session 2.00 pm – 3.30 pm  
Chair – Dr.MRK & Dr.MRC

Oral Presentations (virtual) by participants

PROGRAM SCHEDULE  
DAY – 2 15.07.2021

Introduction of Chief Guest	<b>Dr.M.Ravikumar</b> Asso.Prof. Dept. of Physics, A.P.S.A.College.
Technical session 4 3.30 – 4.30 pm Invited Lecture	<b>Dr.R.Chandramohan</b> Professor & Research Advisor, Vidhyaa giri College of Arts and Science, Puduvayal, Karaikudi.
<b>VALEDICTORY FUNCTION</b> 4.30 – 5.00 pm	
Welcome address and achievement of the conference	<b>Dr.M.Ramachandran</b> Convener, RTEM -2021.
Presidential address	<b>Dr.(Capt).KR.Jeyakumar</b> Principal, A.P.S.A.College.
Felicitation	<b>Thiru N.ARUMUGARAJAN, M.A.</b> Secretary, A.P.S.A. College.
Valedictory address	<b>Dr.R.Chandramohan</b> Professor & Research Advisor, Vidhyaa giri College of Arts and Science, Puduvayal, Karaikudi.
Vote of Thanks	<b>Dr.Y.B.Kannan</b> Convener, RTEM-2021.

# CONTENTS

## INVITED TALKS

S.No.	PAPER TITLE	Page No.
1	PSEUDO SPIN-LADDER CaCu <sub>2</sub> O <sub>3</sub> NANOSTRUCTURES AS POTENTIAL ELECTRODE FOR ASYMMETRIC SUPERCAPACITOR <b>R. Govindan, G. Veerapandi, C. Sekar</b>	1
2	SYNTHESIS OF NANOPHOSPHORS AS ENERGY MATERIALS <b>Rathinam Chandramohan</b>	2
3	RECENT TRENDS IN ENERGY STORAGE MATERIALS AND THEIR ALTERNATIVES <b>M.SIVAKUMAR</b>	3
4	GREEN SYNTHESIS OF METAL NANOPARTICLES FOR BIOMEDICAL APPLICATIONS <b>V. Subha, R. Ilangovan</b>	4
5	RECENT DEVELOPMENTS OF CATHODE MATERIALS IN LITHIUM-SULFUR BATTERIES <b>R. SUBA DEVI</b>	5
6	DENDRITE-FREE NANO-STRUCTURED MATERIALS FOR LITHIUM-ION BATTERIES <b>RM. Gnanamuthu</b>	6
7	ULTRA FAST SYNTHESIS OF NANOCRYSTALLINE OXIDES, SPINEL FERRITES AND PEROVSKITES BY SOLUTION COMBUSTION METHOD: INFLUENCE OF FUEL TO OXIDIZER RATIO ON STRUCTURAL AND ELECTROCHEMICAL PROPERTIES <b>Nygil Thomas</b>	7
8	RECENT DEVELOPMENTS IN PROTON EXCHANGE MEMBRANE FUEL CELL <b>Dr.K.Dinakaran</b>	8
<b><u>CONTRIBUTORY PAPERS</u></b>		
1	ELECTROCHEMICAL TESTS ON THE EFFICACY OF THIOACETAMIDE IN PREVENTING CORROSION ON OIL PIPELINES <b>M. MATHUSUDHAN, C.SANGEETHA, P.BALA, P. DEEPARANI, S. SELVARAJ</b>	1
2	Nano carbon and <i>Datura Stramonium</i> extract coated energy material : Preparation, characterization and photo thermal applications <b>J.MERCILINE LEONORA, R.JESINTHA RANI, R.V. JEBA RAJASEKHAR</b>	9
3	INVESTIGATIONS ON NANO GRAPHITE COATINGS FOR ENHANCED HEAT TRANSFER IN SOLAR COLLECTOR <b>P.JEYASANKAR, R.V. JEBA RAJASEKHAR</b>	15



4	Density Functional Theory studies of (3 <i>E</i> ,5 <i>E</i> )-6-phenyl-3,5-hexadien-2-one <b>V RAGAVENDRAN</b>	20
5	Quantum mechanical computations of buphedrone <b>V RAGAVENDRAN</b>	24
6	DENSITY FUNCTIONAL THEORY STUDIES OF 3,4,5-TRIMETHOXY BENZALDEHYDE <b>V Ragavendran and B.Gayathri</b>	28
7	NATURAL BOND ORBITAL ANALYSIS OF 4-HYDROXY-3-METHOXY-5-NITROBENZALDEHYDE <b>V Ragavendran and V.R.Kumanan</b>	31
8	VIBRATIONAL SPECTRAL ANALYSIS OF 1,2,4-TRIMETHYL BENZENE USING DENSITY FUNCTIONAL THEORY <b>V Ragavendran and K.Priyadharshini</b>	35
9	VIBRATIONAL SPECTRAL CHARACTERIZATION OF 2-HYDROXY-3-METHOXY-5-NITROBENZALDEHYDE <b>VRagavendran and S.Vasanthi</b>	38
10	Synthesis and characterization of pure and Cu & Zn DOPED CDO thin films using spray pyrolysis technique for optoelectronic devices <b>S.J.Helen, R. Chandramohan, A.Sherlin, G.Jeyasudha</b>	41
11	Preparation and Characterization of pure MnS and Cd Doped MnS Thin Films using Chemical Bath Deposition (CBD) <b>B. Sankavi S.J. Helen, R. Chandramohan</b>	48
2	EXPERIMENTAL INVESTIGATIONS ON STRUCTURAL VARIATIONS OF BARIUM TITANATE <b>R.JESINTHA RANI, R.V. JEBA RAJASEKHAR</b>	56
13	BIOSYNTHESIS OF GOLD NANOPARTICLES USING SOLANUM LYCOPERSICUM <b>M.UMAYAVALLI, P.KOKILA</b>	59
14	Nanoparticles for the application in textile materials <b>T.S. Vijayapreetha, S. Otchadevan, P.Kokila*, M.Umayavalli</b>	64
15	EVALUATION OF HEAVY METAL TOXICITY IN RIVER MOLLUSC SAMPLES <b>Dr. J. Eugin shaji</b>	68