"Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

# Abstract Proceeding of
# Fifth International Conference on Advances in Materials Science (Online) (ICAMS- 2020)
## 06th – 07th June 2020

Shri Swami Vivekanand Shikshan Sanstha's

Post-Graduate Department of Physics and IQAC,

## Raje Ramrao Mahavidyalaya, Jath,

Dist: Sangli, Maharashtra, India

**Dr. Shrikant R. Kokare**
Convenor

**Dr. Sanjay S. Latthe**
Co-Convenor

**Dr. A. K. Bhosale**
HOD, Physics

**Mr. Rajaram S. Sutar**
Secretary

**Dr. Shivaji R. Kulal**
IQAC, Coordinator

**Dr. V. S. Dhekale**
I/C Principal

## Message from Chairman,

## Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

### Prin. Abhaykumar Salunkhe

॥ ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार ॥ - शिक्षणमहर्षी डॉ. बापूजी साळुंखे

Estd. June 1955 Reg.No. K.E.95

**Shri Swami Vivekanand Shikshan Sanstha, Kolhapur**

2130, 'E' Ward, Tarabai Park, Kolhapur - 416003 (Maharashtra State)
Phone No. : (0231) 2654653, 2652720, 2650871

| Shikshanmaharashi Late Dr. Bapuji Salunkhe B.A.B.T.D.Lit. Promoter-Founder | Hon's. Chandrakant (Dada) Patil MLA President | Prin. Abhaykumar Salunkhe M.A. Chairman | Prin.Sou. Shubhangi M. Gawade M.Sc.B.Ed. Secretary |
|---|---|---|---|

Outward No. : २५३ Date : 15 JUN 2020

I am glad to hear that the Post-Graduate Department of Physics, Raje Ramrao Mahavidyalaya, Jath has organized the Fifth International Conference on Advances in Materials Science (Online) (ICAMS-2020) during 06 – 07 June 2020. Now a days, Materials Science is a booming field of research. Majority of the well-known and popular research in 20th century is emerged from Materials Science research. Various materials with varying particle sizes from macro to nano size can be prepared and utilized for various industrial applications.

The conference proposes to cover a wide range of themes which are emerging branches of this important subject. It is a matter of pride that the scientists from Japan, UK, Thailand, China and India have agreed to participate and share their ideas in the conference. It is a matter of pride to the college as well as Shri Swami Vivekanand Shikshan Sanstha, Kolhapur. I am sure that the theme of conference will provide meaningful platform to the researchers and all the participants to exchange their experiences and ideas. The guidance given by eminent researchers will be intellectual treat to the delegates.

I wish an Online International Conference a huge success.

Prin. Abhaykumar Salunkhe,
Chairman,
Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

## Message from Secretary,

## Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

### Prin. Mrs. Shubhangi Gavade

।। ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार ।। - शिक्षणमहर्षी डॉ. बापूजी साळुंखे

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|---|---|---|---|

Outward No. : २५४ Date : 3 JUN 2020

I am very happy to know that the Post-Graduate Department of Physics, Raje Ramrao Mahavidyalaya, Jath has organized the Fifth International Conference on Advances in Materials Science (Online) (ICAMS-2020) during 06 – 07 June 2020. I appreciate the endeavor of the college to shoulder the responsibility of organizing an International Conference. The presence of scientists from Japan, China, UK, Thailand and India is an excellent opportunity to the delegates participating in this Online International Conference.

I hope, the meaningful discussions will take place on the theme and the discussions will be beneficial to the delegates. The conference will serve as a platform for young researchers, faculty members and resource persons for exchanging latest information in Materials Science.

I wish the International Conference a grand success.

Prin. Mrs. Shubhangi Gawade,
Secretary,
Shri Swami Vivekanand Shikshan Sanshta, Kolhapur

## Message from Joint Secretary (Finance),

## Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

## Prof. (Dr.) R. V. Shejwal

"ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार" - शिक्षणमहर्षी डॉ. बापूजी साळुंखे

श्री स्वामी विवेकानंद शिक्षण संस्था, कोल्हापूरचे

**लाल बहादूर शास्त्री कॉलेज**

**ऑफ आर्टस्, सायन्स ॲण्ड कॉमर्स, सातारा**

स्थापना : जून १९६७

१७, मल्हार पेठ, सातारा - ४१५००१ (महाराष्ट्र) फोन : ०२१६२/२३७९८६,फॅक्स :२३८०५०

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▪ Professional Tax R.C.No.27245111910P

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सहकार व सार्वजनिक बांधकाम मंत्री, महाराष्ट्र राज्य

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▪ सेक्रेटरी : मा. प्राचार्या सौ. शुभांगी एस. गावडे

▪ प्राचार्य : डॉ. राजेंद्र व्ही. शेजवळ

संदर्भ क्र. एलबीएससी / 52/2020-21 दिनांक 04/06/2020

To,
The I/C Principal,
Raje Ramrao Mahavidyalaya Jat,
Dist-Sangli.

I am very happy to know that Post – Graduate Department of Physics, Raje Ramrao College, Jath, Dist: Sangli is organizing the Fifth International Conference on Advances in Materials Science (Online) (ICAMS-2020) during 06 – 07 June 2020. When the whole world is facing the epidemic of Covid-19 pandemic, on such circumstances, to conduct such a International Conference is very worthy for the researchers, faculty and especially the students of physics. I am also happy to know that the research papers on the theme of the conference will be published in the regular issue of Emergent Materials (Springer).

I congratulate the Principal and all his colleagues for organizing the consecutive Fifth International Conference on this very important topic. I am sure that the main theme and sub themes will be widely discussed and the participants will have meaningful interaction and exchange of information during the course of the Online International Conference.

I wish the Online International Conference a grant success.

Rshejwal

Prin. Dr. R.V. Shejwal
Joint Secretary (Finance)
Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

## Message from Joint Secretary (Administration),

## Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

**Prof. (Dr.) Y. A. Bhosale**

।। ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार ।। - शिक्षणमहर्षी डॉ. बापूजी साळुंखे

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|---|---|---|---|

Outward No. : २५६ Date : 3 JUN 2020

I am very glad to receive a news of organization of Fifth International Conference on Advances in Materials Science (Online) (ICAMS-2020) during 06 – 07 June 2020 by Post-Graduate Department of Physics, Raje Ramrao College, Jath.

For consecutive two days, scientists, industrialists, and students with different backgrounds and expertise convene to synergistically advance the field of materials science by presenting their latest research, attending stimulating lectures and having lively discussions during breaks and events. I am confident that Online ICAMS-2020 will encourage these activities in the best possible manner.

Grand success to Online Fifth ICAMS-2020.

Prin. Dr. Y. A. Bhosale
Joint Secretary (Administration)
Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

## Message from I/C Principal,

## Raje Ramrao Mahavidyalaya, Jath

## Dr. V. S. Dhekale

Jr. College Recog. No. H.S.C./1077/31029/XII/HS dt.10/06/1977
Jr. College Code No. 22-02-001

Estd : June 1969

"Dissemination of Education for Knowledge, Science & Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha, Kolhapur's
RAJE RAMRAO MAHAVIDYALAYA, JATH
Dist. Sangli (Maharashtra) 416 404
U.G.C. Recognition under 2 F & 12 (B) UGC Act 1956
(Affiliated to Shivaji University, Kolhapur)
NAAC Reaccredited : "B" (Third Cycle)

Shikshanmaharshi Dr. Bapuji Salunkhe Birth Centenary Year 2018-19

Office. : (02344) 246251, Fax : (02344) 246015, Resi.: (02344) 247251 E-mail : rajeramrao@gmail.com, Website : www.rrcollege.org

| Founder | President | Chairman | Secretary | I/c Principal |
|---|---|---|---|---|
| Dr. Bapuji Salunkhe<br>D. Lit. | Hon. Chandrakant Dada Patil<br>Minister of Revenue, Relief & Rehabilitation, Public Works, Govt. of Maharashtra | Prin. Abhaykumar Salunkhe<br>M.A. | Prin. Mrs. Shubhangi Gawade<br>M.Sc., B.Ed | Dr. V. S. Dhekale<br>M.Com., M.B.A., M. Phil., Ph.D. |

**RRMJ/2019-20/369** **Date: 04/06/2020**

### Message

It is a matter of great pride that the Post-Graduate Department of Physics of our college has organized Fifth International Conference on Advances in Materials Science (Online) (ICAMS-2020) during 06 – 07 June 2020. This is consecutive fifth year of International Conference organized by the faculty of Physics Department. I am very happy to place before you the proceedings of this seminar.

I express my sincere thanks to Prin. Abhaykumar Salunkhe, Chiarman, Shri Swami Vivekanand Shikshan Sanstha, who inspired and guided us all the way in organizing this wonderful event. I am also thankful to Prin. Mrs. Shubhangi Gavade, Secretary, Shri Swami Vivekanand Shikshan Sanstha, for her valuable guidance and motivation to undertake this activity successfully. My thanks are due to the resource person, authors of research papers and participants for their valuable contribution in the conference.

RAJE RAMRAO MAHAVIDYALAYA JATH Dist-Sangli

Dr. V. S. Dhekale
I/C Principal
Raje Ramrao Mahavidyalaya, Jath

## *From the Desk of Convenor, Online ICAMS - 2020*

### *Dr. Shrikant R. Kokare*

It is matter of great pleasure to welcome and thank you all for gathering in Fift International Conference on Advances in Materials Science (Online) (ICAMS-2020) organized by Post-Graduate Department of Physics, Raje Ramrao College, Jath. It is very much heartening to see the overwhelming response received for the conference from the research community for its continuous fifth edition. The scientists and researchers from various countries (Japan, China, Thailand, Poland, India and UK) are participating in online ICAMS-2020. A good number of distinguished professors and researchers have also agreed to deliver keynote addresses/invited talks in the conference. Young scholars participating in the conference will immensely benefit from these. Present conference will be dedicated to discuss on newer technologies in materials science and will also try to provide a platform to young researcher for their futuristic academic achievements. I am confident that this conference will provide a concrete platform which will encourage and support scholars, researchers and faculty to carry and accomplish their research goals.

I could see the amount of efforts put in by the faculty in organizing this conference in this institute with minimal infrastructure of its own. The technical program committee chair and team did an excellent job in ensuring acceptance of quality works as part of the conference. The conference received 164 abstracts which will be published in the form of proceedings. We hope that you find the online ICAMS-2020 proceeding rewarding.

I feel fortunate enough for having a strong support from Dr. V. S. Dhekale, I/C Principal, Raje Ramrao College, Jath and Dr. A. K. Bhosale, Head, Department of Physics of the college. Both of them gave me full liberty to carry out the things smoothly.

Once again welcome to online ICAMS-2020.

## *From the Desk of Co – Convenor, Online ICAMS - 2020*

### *Dr. Sanjay S. Latthe*

Heartily welcome to online ICAMS-2020. Post-Graduate Department of Physics, Raje Ramrao College, Jath, Dist: Sangli has organized the Fift International Conference on Advances in Materials Science (Online) (ICAMS-2020) during 06-07 June 2020. This conference aims to provide an opportunity for scientists, researchers and faculty around the world to exchange state-of-the-art research and identify research needs and opportunities in all aspects of Materials Science. The primary objective of this conference is to create opportunities for the next generation researchers to develop their professional skills.

In past, 04 consecutive International Conferences on Advances in Materials Science were successfully organized by the Post-Graduate Department of Physics, Raje Ramrao College, Jath. The online ICAMS-2020 will cover a wide range of current research topics related to Materials Science. It is believed that breakthroughs in Materials Science will change every aspects of human life in diverse areas as, electronic devices, energy, biomedicine, sensing, environment, security and many.

An online ICAMS-2020 will include keynote address, invited talks and contributed oral presentations by the participants from China, Japan, Thailand, Poland, India and UK. ICAMS-2020 will provide opportunities for young researchers to actively engage in research discussions, novel research ideas, and safety issues in nanotechnology. There will be best oral presentation awards for research scholars. All presented papers shall be considered for publication in regular issue of Emergent Materials (Springer).

Enjoy ICAMS-2020.

## *From the Head, Department of Physics, Online ICAMS - 2020*

### *Dr. A. K. Bhosale*

After the grand success of past four International Conferences on Advances in Materials Science we welcome you back for the Fifth International Conference on Advances in Materials Science (Online) (ICAMS – 2020) organized by Post-Graduate Department of Physics, Raje Ramrao College, Jath, Dist: Sangli, Maharashtra, India.

ICAMS-2020 is the best platform for all the researchers working in the field of Materials Science to bring up their research work and present. Widely acclaimed speakers from Japan, China, Thailand, Poland and UK and different parts of India will be gathering in online ICAMS – 2020. This conference will provide an opportunities to meet and associate with the present and potential researchers to investigate more on Materials Science. The scope of the conference and topics covered in it encompass a wide variety of topics in Materials Science. The technical session will consist of key note talks, invited talks, and oral presentations. The research papers received for ICAMS-2020 shall be considered for publication in the regular issue of Emergent Materials (Springer).

Thanks to all the participants to share your expertise knowledge with global platform of Materials Science Community.

Enjoy the online conference.

# Technical Session of ICAMS – 2020

| Day & Date | Time | Programme |
|---|---|---|
| Saturday, 06th June 2020 | 10.00 to 10.30 AM | **Day 01** |
| | | **Inaugural Function** |
| | | ***Chief Guest***<br>Hon'ble Prof. (Dr.) Devanand B. Shinde<br>Vice-Chancellor, Shivaji University, Kolhapur, Maharashtra, India. |
| | | ***In the presence of***<br>Hon'ble Prof. (Dr.) Pramod S. Patil<br>Head, Dept. of Physics, Shivaji University, Kolhapur, Maharashtra, India. |
| | | ***In the presence of***<br>Hon'ble Prin. Dr. R.V. Shejwal<br>Joint Secretary (Finance), Shri Swami Vivekanand Shikshan Sanstha, Kolhapur, Maharashtra, India. |
| | | ***President of the function***<br>Hon'ble Prin. Dr. V. S. Dhekale<br>I/C Principal, Raje Ramrao Mahavidyalaya, Jath, Maharashtra, India. |
| | 10.30 to 11.00 AM | **Key Note Address**<br>Resource Person: Prof. Shanhu Liu<br>Topic: "*Spatial Compartmentalization of Cobalt Phosphide in P-Doped Dual Carbon Shells for Efficient Alkaline Overall Water Splitting*"<br>Henan Key Laboratory of Polyoxometalate Chemistry, Henan University, China |
| | 11.00 to 11.30 AM | **Invited Talk – 01**<br>Resource Person: Prof. P. Kanjanaboos<br>Topic: "*Solvent Engineering Techniques for Perovskite Optoelectronics*"<br>Materials Science and Engineering, Mahidol University, Bangkok, Thailand |

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|---|---|---|
| | 11.30 to 12.00 PM | **Invited Talk – 02**<br>Resource Person: Dr. Nanaso Thorat<br>Topic: "*Hybrid Nanoplatforms for Magnetic and Light-activated Cancer Therapies*"<br>Wroclaw University of Science and Technology, Wroclaw, Poland |
| | 12.00 to 02.00 PM | **Oral Presentation (OP 01 – OP 08) & (HP 01 – HP 02)** |
| **Sunday, 07th June 2020** | **Day 02** | |
| | 10.00 to 10.30 AM | **Invited Talk – 03**<br>Resource Person: Dr. H. Enis Karahan<br>Topic: "*Graphene-based Antimicrobial Materials for Biomedical and Environmental Applications*"<br>iCeMS Research Building, Kyoto University, Yoshida Honmachi, Japan |
| | 10.30 to 11.00 AM | **Invited Talk – 04**<br>Resource Person: Dr. Sovann Khan<br>Topic: "*Defect/bandgap engineering for improving photocatalytic activities of TiO2 and ZnS nanoparticles*"<br>Photocatalysis International Research Center, Tokyo University of Science, Japan |
| | 11.00 to 11.30 AM | **Invited Talk – 05**<br>Resource Person: Dr. Bhalchandra Kakade<br>Topic: "*Noble Metal-free Electrocatalysis: A Sustainable Approach towards Energy Conversion*"<br>SRM Institute of Science & Technology, Kattankulathur, Chennai, India. |
| | 11.30 to 12.00 PM | **Invited Talk – 06**<br>Resource Person: Prof. P. Sudhagar<br>Topic: "*Solar Catalysts for Tackling Globally Challenging Issues: Water, Air, Energy*"<br>Group Leader, Multi-functional Photocatalyst & Coatings Group, Swansea University (Bay Campus), Wales, United Kingdom. |

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| | 12.00 to 02.00 PM | **Oral Presentation (OP 09 – OP 16) & (HP 03 – HP 04)** |
| | 02.00 to 02.30 PM | **Valedictory Function** |
| | | ***Chief Guest***<br>Hon'ble Dr. Ashok U. Ubale,<br>Joint Director of Higher Education (Kolhapur Region), Maharashtra, India. |
| | | ***In the presence of***<br>Hon'ble Prin. Dr. Yuvraj A. Bhosale<br>Joint Secretary (Administration), Shri Swami Vivekanand Shikshan Sanstha, Kolhapur, Maharashtra, India. |
| | | ***President of the function***<br>Hon'ble Prin. Dr. V. S. Dhekale<br>I/C Principal, Raje Ramrao Mahavidyalaya, Jath, Maharashtra, India. |

# Technical Session of ICAMS – 2020

## Invited Talk (IT – 01 to IT – 07)

# Abstracts for Oral Presentation (OP – 01 to OP – 16)

| | | | | |
|---|---|---|---|---|
| 12 | Density Functional Theory (DFT) of Bilayer Materials | Aishwarya Vishwakarma and Arvind R. Singh | OP – 12 | 50 |
| 13 | Nitrogen Doped Carbon Dot Threads as a Fluorescent Probe for Permanganate Ions and its Hydrogel Hybrid as a Naked Eye Sensor for Gold (III) Ions | Vaibhav M. Naik, Govind B. Kolekar | OP – 13 | 51 |
| 14 | Piezoelectric Surface Acoustic Phonon Scattering and Power Loss Rate in Graphene | Mohd Meenhaz Ansari | OP – 14 | 52 |
| 15 | Enhanced Mechanical Properties in Ferroelectric Polymer Magnetic Nanocomposites | C.V. Chanmal, J. P. Jog, R. N. Mulik, S. G. Pawar | OP – 15 | 53 |
| 16 | Structural, Dielectric and Magnetodielectric Properties of Ni doped Ba0.7Pb0.3TiO3 Ceramics | S. G. Chavan, D. S. Ghadage, S. G. Dhumal, S. D. Chavan, S. B. Kulkarni, D. J. Salunkhe | OP – 16 | 54 |
| 17 | Efficiency Improvement of Photovoltaic Panel using Active Air Cooling | Vinayak H. Deokar, Rupa S. Bindu **(On Hold)** | HP – 01 | 55 |
| 18 | Green Synthesis of Zinc Oxide Nanoparticles using Flower Extract of Jasminum and their Antifungal Activity | Keshava Joshi, Lokeshwari Navalgund, Udesh, Vinitha, Suvashree, Sangram **(On Hold)** | HP – 02 | 56 |
| 19 | A Composite Analysis of Tungsten Oxide / Reduced Graphene Oxide (WO3/ RGO) for Various Applications | Ayesha khan and Anamika Vitthal Kadam **(On Hold)** | HP – 03 | 57 |
| 20 | Fabrication of Multifunctional Porous TiO2 for Sensitive Carbon Dioxide Gas Sensor and Ultraviolet Photodetector | S. M. Kumbhar, K. Y. Rajpure **(On Hold)** | HP – 04 | 58 |

# Abstracts for Participation (PA – 01 to PA – 139)

| | | | | |
|---|---|---|---|---|
| 12 | Preparation of Nanostructured Cu2SnS3 Photocatalyst by Hydrothermal Route | Archana R. Machale, Shilpa A. Phaltane, Harshad D.Shelke, Lakshman D. Kadam | PA – 12 | 70 |
| 13 | Synthesis and Characterization of Silver Decorated Zinc Oxide Hybrid Structure for Enhanced Photocatalysis for Water Splitting | Arjun Singh, Gunjan Pathania, Y. K. Mathur and J. R. Ansari | PA – 13 | 71 |
| 14 | Five Level Multilevel Inverter as a Dynamic Voltage Restorer | Aruna Ekanath Kore, J. D. Kolhe | PA – 14 | 72 |
| 15 | Synthesis of Calcium Ferrite by Inherent Source for Ethanol Sensor | K. S. Pakhare, B. M. Sargar, P. M. Patil, R. K. Mane, S. B. Wategaonkar | PA – 15 | 73 |
| 16 | Synthesis and Characterization of Vanadium Oxide by Hydrothermal Method | B. M. Babar, A. A. Mohite, V. L. Patil, U. T. Pawar, L. D. Kadam | PA – 16 | 74 |
| 17 | Synthesis and Characterization of CdTe Sintered Thick Films for Photovoltaic Applications | B. Y. Bagul, P. S. Sonawane | PA – 17 | 75 |
| 18 | Synthesis of CuO@SO3H Nanoparticles by Sol – Gel Method | Radhakrishnan M. Tigote, Subiya K. Kazi, Vandana A. Gaikwad, Reshma B. Bhosale, Rajkanya M. Bhore | PA – 18 | 76 |
| 19 | Gas Sensing Properties of Titanium Dioxide Dopped Zinc Oxide Thin Film by Spray Pyrolysis Technique | C. K. Nanhey, K. S. Pakhare, M. K. Bhanarkar and B. M. Sargar | PA – 19 | 77 |
| 20 | Room Temperature Carbon Dioxide Sensor based on Polypyrrole-Polyvinyl Alcohol Composite Films | Dattatray M. Nerkar, Umesh Dilip Patil and Dilip R. Patil | PA – 20 | 78 |
| 21 | Solvent Effects on Fluorescence Quenching of 3HOCE in Different Solvents | Basappa C Yallur, Kalpana Sharma, Raveendra Melavanki and Shivaraj Radder | PA – 21 | 79 |
| 22 | Synthesis, Analysis and Characterization oF y(Ni0.6Co0.2Cd0.2Fe2O4)+ (1-y)Ba0.8Sr0.2TiO3 Magnetoelectric Composites | R. K. Pinjari, N. M. Burange, C. H. Bhosale | PA – 22 | 80 |
| 23 | Photocatalytic Degradation of Malachite Green under Solar Light using Hydrothermally Synthesized Cobalt-doped TiO2 Nanoparticles | R. J. Kamble, P. V. Gaikwad, K. M. Garadkar, S. R. Sabale, V. R. Puri | PA – 23 | 81 |

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|---|---|---|---|---|
| 24 | MAS-NMR and FTIR Studies of Rare Earth Ions Doped Tellurite Based Alkali Borate Glasses | G.V. Jagadeesha Gowda, C. Devaraja and B. Eraiah | PA – 24 | 82 |
| 25 | A Study of NO2 Gas Concentration on Response of Cdo Thin Films Prepared by Novel Reflux Method | P. A. Desai, A. A. Admuthe, B. A. Kalbhor, P. A. Mane, S. D. Bhairannavar, M. M. Tonape, I. A. Dhole | PA – 25 | 83 |
| 26 | Study of Acoustic Parameters of Magnesium Sulphate in Aqueous Solution at Various Concentration and Temperature | Jigiksha D. Zade and Urvashi P. Manik | PA – 26 | 84 |
| 27 | Enhanced Photocatalytic and Dye Degradation of Silver Decorated Molybdenum Disulphide and their Mechanism Insight | Jamilur R. Ansari, Neelam Singh, Satyabrata Mohapatra and Anindya Datta | PA – 27 | 85 |
| 28 | Exploitation of Nanocomposite Tin Oxide - Polyaniline for Solar Cell Application | Kamlesh R.Banarse,Pritesh J. Jadhao, S.P.Yawale, S. S. Yawale, D. S. Yawale | PA – 28 | 86 |
| 29 | Synthesis and Characterization of NixCd1-xFe2O4 by Auto Combustion Method | K. R. Kharat, J. L. Bhosale, T.S. Magdum | PA – 29 | 87 |
| 30 | Biosynthesis of Zinc Oxide Nanoparticles from Biophytum Sensitivum and its Applications | Lekshmi R Babu | PA – 30 | 88 |
| 31 | Synthesis of Nano-structured Vanadium Pentoxide (V2O5) Electrode Material for Pseudocapacitors Application | M. D. Patil, S. D. Dhas, D.N. Godase, S. R. More, A.V. Moholkar | PA – 31 | 89 |
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**Key-Note Talk**

# Spatial Compartmentalization of Cobalt Phosphide in P-Doped Dual Carbon Shells for Efficient Alkaline Overall Water Splitting

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## Abstract

Highly durable and earth-abundant bifunctional catalysts with low cell voltage are desirable for alkaline overall water splitting in the industrial fields. Herein, novel carbon-based CoP hybrid with spatial compartmentalization of CoP nanoparticles (NPs) in P-doped dual carbon shells is achieved via a cheap Co-glycerate-template strategy. Benefitted from the uniform atomic blending of Co2+ ions in the Co-glycerate precursors, CoP NPs in situ formed in the confined space with NaH2PO2 as phosphorus source during the annealing process; meanwhile, glycerate suffered carbonization and transformed into P-doped dual carbon shells during the annealing process, including interior thin carbon coating closely encircled CoP NP and peripheral hollow carbon sphere loading a lot of CoP NPs. Spatial compartmentalization of CoP NPs not only avoids the aggregation and exposes more active sites, but also P-doped dual carbon shells improve the conductivity and durability of the catalyst. As expected, the optimized hybrid exhibits outstanding electrocatalytic activities in alkaline media, such as HER overpotential of 101 mV, OER overpotential of 280 mV and a low cell voltage of 1.66 V to deliver a current density of 10 mA cm-2. Moreover, durability and stability are greatly improved under harsh electrochemical conditions. The current strategy shades new insight into the development of carbon-based TMP catalysts for electrocatalysis applications.

**IT-01**

# Solvent Engineering Techniques for Perovskite Optoelectronics

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## Abstract

Perovskite materials have gained tremendous attention for various applications in optoelectronics due to their charge/photon conversion capability and simple fabrication via solution processing i.e. spin coating, spray coating, dipping coating, and roll-to-roll printing. As precursor inks are in liquid form, doping and compositional tuning are facile. Due to the fact that precursor inks solidify into perovskite thin films, solvent engineering techniques, which affect perovskite nucleation and growth during deposition and crystallization processes, become an important tool to achieve desired properties for specific applications. In this talk, we will discuss a number of solvent engineering techniques developed at our laboratory at Mahidol University like repeated cation doping, swift cation doping, mixed cation doping, vacuum-assisted deposition, vacuum-assisted crystallization, sequential spray deposition, and solvent tuning and explore how these novel techniques could help unleash full potentials of perovskite thin films for solar cells and LEDs.


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**IT-02**

# Hybrid Nanoplatforms for Magnetic and Light-activated Cancer Therapies

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## Abstract

**IT-03**

# Graphene-based Antimicrobial Materials for Biomedical and Environmental Applications

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## Abstract

Nanocarbons emerged as a new family of antimicrobial agents over the last two decades, with implications for biomedical and environmental research. Especially, graphene-family materials (GFMs) are deemed promising for fighting against the escalating threat of antibiotics- as well as metal-resistant bacteria. However, GFMs are not yet mature for real-life applications, partly because the majority of early studies focused disproportionately on the role of physical and/or chemical properties (e.g., dimensions, surface charge). To start filling the gaps, we first systematically explored the roles of environmental parameters on the antibacterial activity of graphene oxide (GO).[1] We found that GO is more effective when cells are challenged with low and high osmotic stresses, exerted by reducing salinity level or introducing a high concentration of block copolymeric stabilizer, respectively.1 We later uncovered the crucial role of cellular physiology on the antibacterial activity of GO nanosheets.2 We found physiologically mature bacterial cells are considerably more resistant against GO as well as GO-polymer dispersions.[2,3] These findings helped us construct structure-property-activity relationships for the antimicrobial activity of GFMs.[4] Besides, we also recently developed GFM-based point-of-use filters for water disinfection.[5] In this presentation, I will introduce our findings and explain their implications for future research on selected biomedical [6] and environmental [7] applications.

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**IT-04**

# Defect/bandgap Engineering for Improving Photocatalytic Activities of TiO2 and ZnS Nanoparticles

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## Abstract

Activated by light-energy, semiconductor photocatalyst was considered as promising material to harvest the abundant energy from solar light. Among semiconductor materials, TiO2 and ZnS are among outstanding photocatalysts, which were widely used for various reactions. However, due to large bandgaps, which can be activated under UV light only, these photocatalysts allow only a very small fraction (~5%) of solar energy to be utilised. Another barrier that limits the efficiency of the photocatalytic activities of those semiconductor materials is the rapid recombination rate between light-generated electrons and holes, which are active species in photocatalytic reactions. In this presentation, I will summarize my recent works on development of synthesized methods for mass productions of TiO2 nanoparticles by gas phase methods (e.g. Chemical Vapor Synthesis, Flame Spray Pyrolysis and Plasma Synthesis). Furthermore, several challenges to improve activities of TiO2 and ZnS photocatalysts based on defect engineering (doping) and polymorphic structures will be also discussed.

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**IT-05**

# Noble Metal-free Electrocatalysis: A Sustainable Approach towards Energy Conversion

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## Abstract

The conversion of oxygen (O2) to other form, by breaking O-O bond, is valuable to many fields such as energy conversion, corrosion and biology.[1] Oxygen reduction reaction (ORR) is one the sluggish processes in low temperature fuel cells, where substantial focus is needed so as to compete with challenging state of the global consumption of energy. Fuel cell devices can generates electricity via electrochemical reduction of oxygen and oxidation of hydrogen fuel. As mentioned earlier, usually the reduction of oxygen dominates the activation overpotential even in presence of the most active electrocatalyst Pt/C (platinum on carbon) that would convert oxygen into water (H2O).[2] In contrast, employing Pt/C furnishes lot of drawbacks including higher cost, less abundance and sensitive to impurities that affects the large scale application of Fuel cell devices as sustainable energy sources.

At the same time, the success of nanomaterials in energy conversion and storage applications has multidimensional aspects. Nano-designing of materials is being key in controlling the electrochemical performance including charge transfer and storage mechanisms, such as surface ion adsorption, pseudocapacitance and diffusion controlled intercalation processes. The development of various layered 2-dimensional materials like graphene, h-BN, MXenes etc. and their composites show interesting redox properties in order to develop the electrode materials for high power next-generation energy sources and storage materials.

Accordingly, noble metal-free or metal-free catalysts pay much attention for replacing the Pt/C catalyst on fuel cell devices (to solve above issues). Thus, in present talk, a brief survey of the research development of noble metal-free electrocatalysts in our laboratory and possible technology scopes will be discussed.

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**IT-06**

# Solar Catalysts for Tackling Globally Challenging Issues: Water, Air, Energy

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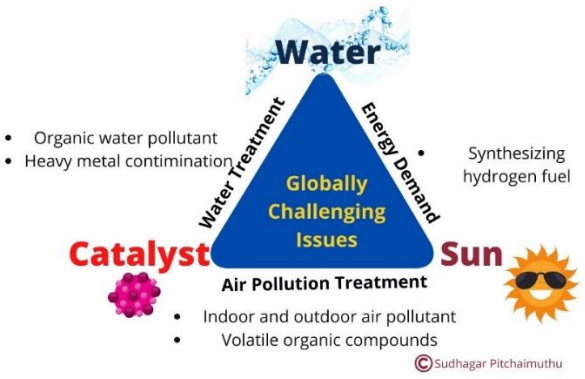
## Abstract

The population of the world is constantly growing with the expectation that by 2050 there will be 9.5 billion people on the planet. This increased population will create high pollution of water and air as well as energy demand. Therefore, we need to develop a sustainable tool for tackling these globally challenging issues in affordable cost. Solar energy is green, sustainable, and abundant in nature, which can help us to sort out these issues. Recently, the visible light semiconductor is receiving profound attention to drive catalysis reactions by solar energy [1]. Briefly, nature Sunlight-driven semiconductor catalyst materials produce photo charge carriers (electron and hole) which produce reactive oxygen species (ROS). This powerful ROS is degrading organic water pollution, as well as organic volatile components in the air [2,3]. Also, photoelectron carriers from solar catalysis reaction will reduce protons into molecular hydrogen gas from the water-splitting reaction. This solar catalysis synthesized hydrogen is clean and can be applied as zero-carbon emissive carrier in transport systems [4]. Therefore, solar catalysis will be a promising route to tackle the water/air pollution and energy demand. However, poor understanding of inter-relationship between semiconductor catalysts, and solar energy as well as the water/semiconductor and gas/semiconductor interfaces limit their industrial deployment. This talk covers the fundamentals of solar photocatalysis and how it can be applied in environmental clean-up (water and air) and energy demand, independently or simultaneously.



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**OP-01**

# Antibacterial Textile Application of Copper-Bismuth Nanocomposites

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## Abstract

There is an increasing demand for antibacterial materials. These materials have great significance in case of therapeutic treatments. The nanocomposite of copper-bismuth oxides (CuO-Bi2O3) was synthesized through chemical route with the 1:1 mole ratio. The Average particle size of CuO and Bi2O3 nanoparticles (NPs) from XRD ananlysis was found to be 21 and 35 nm respectively, which was very well reflect in SEM ananlysis The textile samples were prepared in association with fabric dye. These samples were used for antibacterial study against E. coli and S. aureus bacteria. The antibacterial activity of textile samples as (zone of inhibition) ZOI against E. coli and S. aureus bacteria was found to be 11 mm and 13 mm respectively. F-Test in CuO and Bi2O3 NPs shows the lower variance in E. coli as compared in S. aureus.

**Keywords:** copper oxide; bismuth oxide; antibacterial textile

**OP-02**

# Investigation of Mechanical Strength of Fly Ash and Honeycomb Core Sandwiched Composite Material

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## Abstract

Sandwich composites due to their high stiffness and strength to weight ratios, are widely employed in modern design, not only in field of aeronautical constructions, where they have initially been developed, but also in fields of land transport and marine constructions. Proposed work consists of set of two facing of glass fiber face sheets separated by core material used due to features such as high strength-to-weight and stiffness-to-weight ratios. While offering unique advantages, regardless of tensile or compressive loading on the sandwich panels, there will be stress variation in the sandwich structure. The composite with varied fraction of glass fiber were prepared by hand lap techniques. The properties such as tensile behavior, flexural behavior and stress-strain behavior were studied. The objective of the study was for better understanding of stress distribution in the face sheet and change in core and also mode of failure under different loading conditions of both the fly ash and honeycomb sandwich. The test specimens are prepared as per the ASTM standards to conduct the tests. The result showed that fly ash and honey comb sandwiched with glass fiber exhibited better mechanical properties that the unfilled composite.

**Keywords:** Flexural, Glass fiber, Epoxy resin, density, failure mode.

**OP-03**

# Crystal and Molecular Docking Studies of Biscyclohexyl Diols with Focal Adhesion Kinase Inhibitors

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## Abstract

In the present study crystal structure of 3-hydroxy-2-((2-hydroxy-4, 4-dimethyl-6-oxocyclohex-1-enyl) (4-methoxyphenyl) methyl)- 5, 5-dimethylcyclohex-2-enone was determined using single crystal X-ray diffraction. Cyclohexane is a non planar molecule the shape of which vaguely resembles a chair. The conformation of cyclohexane molecule is constantly changing, with the atom on the left which is currently pointing down flipping up, and the one on the right flipping down. Further the structural feature was extrapolated to molecular docking studies with focal adhesion kinase (FAK) domain using Autodock to study its anticancerous property. The compound exhibited considerable bacterial inhibition of lower to moderate concentrations. We conclude that these derivatives can be used in medicine and have enormous potential as pharmaceutical agents due to their biological activities. The above titled receptor gain functional and structural insights into their mechanism of inhibition and explore its potential as an anticancer agent.

**Keywords:** Bis cyclohexyl diols, Docking, Focal adhesion kinase

**OP-04**

# Structural, Ferroelectric, Dielectric and Fatigue Free behavior of Hf modified BaTiO3 Lead Free Ceramics

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## Abstract

Lead free solid solutions of (BaTi1-xHfx)O3 with x = 0, 0.04, 0.08 (abbreviated as BT, BHT-1 and BHT-2) were prepared by solid state reaction method and studied their structural, ferroelectric, dielectric and fatigue properties. X-ray diffraction and Raman spectra study confirms the formation of pure phase having tetragonal symmetry with space group P4mm. SEM images show the granular dense microstructure with decrease in grain size. The BHT-1 ceramic shows improved ferroelectric, properties due to its uniform grain size and highly dense structure with moderately high remnant polarization (Pr ~ 9,03 µC/cm2) and lower coercive field (Ec ~ 3.44 kV/cm) compared to other ceramics. The Fatigue free nature i.e. stability under cyclic electric field loading which studied for all synthesized ceramics. All the samples show usual dielectric dispersion and decreased dielectric loss compared to BT. The BHT-1 ceramic shows the higher value of dielectric constant and lower dielectric loss. The above results signifies that Hf substituted BaTiO3 ceramic system may be promising candidate for environmental friendly high frequency and energy harvesting applications.

**OP-05**

# Preparation and Structural Properties of $Al^{3+}$ Substituted Copper-Nickel-Zinc Spinel Ferrite

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## Abstract

Al3+ Substituted Copper- Nickel-Zinc Spinel Ferrites synthesized by Co-precipitation method. Precursor powders calcinated at 600oC. The EDAX pattern confirmed the homogeneous mixing of the elements in samples with desired stoichiometry. XRD pattern confirmed single cubic spinel phase without any secondary phase. Infrared spectra were recorded at room temperature in the range of 200–800 cm-1, indicate two major absorption bands. The low frequency band ν2 observed around 456 cm-1 is assigned octahedral site and high frequency band ν1 observed around 565 cm-1 assigned tetrahedral site. The obtained average crystallite size is within 15 to 25 nm confirmed from TEM analysis. The microstructure of the calcinated sample investigated by SEM and TEM indicates porous and crystalline nature.

**Keywords:** Spinel Ferrite, Co-precipitation, XRD, Microstructure.

**OP-06**

# Structural and Cyclic Voltammetric Properties of Electrodeposited $MnO_2$ Thin Films

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## Abstract

The current work deals with the deposition of manganese oxide (MnO2) thin films by easy and price-effective electrodeposition on stainless steel substrate. We have prepared MnO2 thin films by using manganese acetate as source and then it utilized for cyclic voltammetry (CV) measurement. The obtained thin films were annealed at 500oC to form MnO2. The synthesized thin film was characterized by X-ray diffraction (XRD) to illustrate the crystal structure as well as crystallite size. Energy storage devices with excellent CV and reasonably high specific capacitance are becoming an ideal solution towards the modern requirement. Therefore, this type of thin films could be efficiently employed for the relevance of energy storage devices – super capacitor.

**Keywords**: MnO2 thin films; electrodeposition; XRD; CV.

**OP-07**

# High-performance Metal–Semiconductor–Metal UV Photodetector based on ZnO Nanorods

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## Abstract

Zinc oxide (ZnO) based metal–semiconductor–metal (MSM) ultraviolet photodetectors at different deposition time were fabricated on glass substrates by economical chemical bath deposition technique and its UV photoresponsivity was measured at room temperature. The samples were characterized with respect to their structural, morphological, and optical properties using various methods such as X-ray diffraction (XRD), scanning electron microscopy (SEM), Transmission electron microscopy (TEM), UV-VIS spectroscopy, transmittance, reflectance etc. The synthesized ZnO thin films were c-axis oriented with hexagonal crystal structure as confirmed from XRD. All deposited films were specular and show high transmittance (~85%) in visible region with steep fall off at 375 nm. The photoconductive MSM UV photodetector showed relatively high photocurrent and fast switching. ZnO thin films exhibited high photoresponsivity (988 A/W) with cut of wavelength ~375 nm signifying their application as UV detector.

**OP-08**

# Superhydrophobic $TiO_2$ NPs/PMHS Coating for Self-cleaning Application

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## Abstract

In the present research work, we have adopted simple and inexpensive spray deposition method for the fabrication of superhydrophobic coating on glass slide using TiO2 nanoparticles and polymethylhydrosyloxane (PMHS) composite. The prepared superhydrophobic coating exhibited hierarchical surface structure due to different micro – and nano – scaled grains of TiO2 NPs/PMHS Composite. The water drops difficult to rest on the superhydrophobic coating and rolls off the surface at sliding angle (SA) of 6° due to high water contact angle of 163 ± 2º. As a result the prepared superhydrophobic coating showed excellent self-cleaning property. The mechanical durability of the prepared superhydrophobic coating examined by water jet, water drop impact, adhesive tape peeling and sandpaper abrasion tests. This coating approach can be applied to the substrates of any size and shape.

**Keywords:** Superhydrophobic, self-cleaning, nanocomposite and Durability.

**OP-09**

# Switchable Optical and Electrochromic Properties of Copper Oxide Thin Films Prepared by Vacuum Evaporation Technique

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## Abstract

Electrochromism (EC) is a phenomenon related to persistent and reversible change in optical property, by the application of electric voltage. EC device have many potential applications such as smart window can offer enormous energy saving, as well as EC display such as mobile phones, smart cards and price labels, due to their low power consumption and high energy efficiency. Cuprous oxide (Cu2O) a p-type semiconductor with unique optical and electric properties has potential applications in solar energy conversions, catalysis, gas sensing and electrode materials in lithium ion batteries. It has recently found that the Cu and Cu2O thin films exhibit electrochromism.

Copper thin films were deposited by vacuum evaporation technique on both glass and F.T.O coated glass substrates.During deposition the pressure is mainted in between 10-4 to 10-5 mbar. copper foil was used as starting material. Cu2O thin film obtained by annealed the copper film at 2000 C for 5 hr in oxygen atmosphere. In this work we present the electrochromic properties of copper and Cu2O thin films.EC oxide films operating via lithium ion inseration are well known. The present investigation deals with the copper metallic materials converted to semiconductor that is its swiching from the as-deposited mirror state to a transparent state achived by the intercalation or deintercalation of lithium ions. At the colored state the Cu sample oxide into Cu2O, and It confirmed by FT-Raman spectrum. The change of the transmittance at 630 nm laser light during linear cyclic voltage change between -0.4 to 1.4 mV vs SCE. The copper thin film shows 45.98% reversibility and 22cm2/c coloration efficiency. Electrochemical characterizations were carried out using cyclic voltammetry, chronoamperometry and chronoculometry.

**Keywords:** cuprous oxide (Cu2O), Copper(Cu), X-ray diffractometer (XRD), Scanning Electron Microscopy (SEM), FT-IR and FT-Raman Spectrophotometer.

**OP-10**

# Room Temperature Liquefied Petroleum Gas Sensor based on n-Bi2S3/p-PEDOT: PSS Heterojunction

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## Abstract

We are investigated the combination of inorganic semiconducting nanocrystalline material with most stable organic polymer layer can leads to diverse effect towards gas sensor activity. Hence, room temperature liquefied petroleum gas (LPG) sensor has been developed based on the heterojunction between chemically synthesized n-Bi2S3 and spin coated p-PEDOT: PSS thin layers deposited at room temperature. Both this methods are facile, low cost and suitable for large area deposition. Furthermore, this heterostructure (bi-layer) assembly has characterized using XRD, EDX, and SEM, cross sectional studies. Finally, we achieved the 64.7 % gas response at 800 ppm concentration of LPG at room temperature (27oC). The response and recovery time was calculated as 170 s and 80 s, respectively. Since, the results are designated that this heterostructure are capable for LPG sensing at room temperature (27oC).

Keywords: Room temperature, LPG Sensor, Heterojunction, n-Bi2S3/p-PEDOT: PSS.

**OP-11**

# Conducting Polymer Doped with Metal Oxides for Gas Sensing Application

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## Abstract

Polypyrrole (PPy) - zinc oxide (ZnO) and polypyrrole - cadmium oxide (CdO) hybrid nanocomposites are synthesized using addition polymerization in presence of zinc oxide and cadmium oxide. The nanocomposites were characterized by scanning electron microscope (SEM), X-ray diffraction (XRD) and Fourier transform infrared microscopy (FTIR) showed that there is good interaction between polypyrrole and metal oxides. The nanocomposites were used for gas sensing of NO2, NH3 and H2S gases at room temperature. The results showed that PPy - ZnO and PPy - CdO with different weight ratios of metal oxides could detect NO2 gas with higher selectivity and sensitivity when compared to pure polypyrrole. PPy - ZnO and PPy - CdO composites detected NO2 gas even at very low concentration of 5 ppm. The sensing ability of these composites was presumed to be the result of p-n junction formation.

**Keywords:** Polymerization, gas sensing, selectivity, sensitivity, p-n junction

**OP-12**

# Density Functional Theory (DFT) of Bilayer Materials

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## Abstract

We investigated the structural and electronic transport properties Bilayer materials; Phosphorene (black phosphorous) and Graphene by performing ab – initio calculations (computational based DFT Approach).The transport properties of these bilayer depends on various parameters like number of layers, stacking between the layers, fragmentation of the layer with different materials, torsional strain amongst the layers with respect to each other. Each of these parameters can be varied to get the desired property as per the requirement in technological applications. To obtain the results and develop proper understanding of these materials, different functionals such as Local Density Approximation(LDA), Generalised Gradient Approximation (GGA) and others were employed for calculation and the resulting structure was optimized using statistical algorithms.

The Band Structure and Density of States plots of these materials were studied extensively. The results suggests that the bandgap of bilayer materials can be tuned by different ways; either by doping or changing the number of layers or by introducing the strain in the layers (as in the case of graphene), or by stacking the layers (ABAB, ABCABC, etc.). The results obtained are obtained are in agreement with the theoretical prediction.Thus, the bilayers of 2D materials are of potential application as their bandgaps are tunable. Also, Phosphorene-based field-effect transistors (FETs) exhibit high on/off ratio (~105) and relatively high carrier mobility (up to 1000 cm2 /V/s) and hence can be used widely.

**OP-13**

# Nitrogen Doped Carbon Dot Threads as a Fluorescent Probe for Permanganate Ions and its Hydrogel Hybrid as a Naked Eye Sensor for Gold (III) Ions

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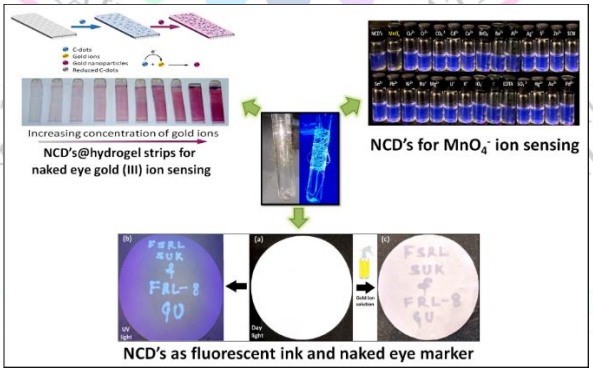
## Abstract

In this article, highly fluorescent nitrogen doped carbon dot (NCD) threads were synthesized via simple pyrolysis of citric acid, p-hydroxy-benzoic acid and ammonia. The NCD's show excitation independent behavior with maximum excitation and emission wavelengths of 350 nm and 435 nm, respectively. The developed probe was used as a turn-off fluorescent sensor for the selective and sensitive determination of permanganate ions in aqueous media while its hydrogel hybrid displayed beautiful purple color demonstrating its potential as a naked eye sensor for gold detection.[1] The ratiometric sensor exhibited excellent selectivity towards permanganate ions over 27 other ions with a detection limit of 0.17 µM having a linear regression value (R2) of 0.9944. Similarly, the limit of detection for gold ions is 1.285 µM. In addition to this, the synthesized NCD's were used as a fluorescent ink as well as a naked eye marker in association with a gold solution demonstrating its forensic and anti-counterfeiting applications.[2]




Scheme 1: Mechanistic view of NCD's as gold sensor, permanganate ion sensor and fluorescent ink.

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**OP-14**

# Piezoelectric Surface Acoustic Phonon Scattering and Power Loss Rate in Graphene

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## Abstract

Due to the novel transport properties of graphene, the scattering mechanisms has been one of the major area of investigation in graphene both theoretically and experimentally. Fascinated by this, we have numerically determined the electron–phonon power loss rate due to scattering from piezoelectric surface acoustic phonon modes in graphene as a function of carrier temperature, concentration and substrate distance using the Boltzmann transport approach. The numerical results are reduced to analytical results in high and low temperature regime separately and corresponding power dependency of the loss rate is obtained. We find that power loss rate increases linearly at higher temperatures and have T3 dependence at lower temperatures. A comparison is also made with the other relevant phonon modes in the considered temperature regimes.

**OP-15**

# Enhanced Mechanical Properties in Ferroelectric Polymer Magnetic Nanocomposites

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## Abstract

Polymer nanocomposites are important class of material wherein the properties of individual components are combined to achieve enhanced properties. The present work reports the fabrication of ferroelectric polymer loaded with magnetic Fe3O4 nanoparticles. The polyvinylidene fluoride (PVDF) is used as the polymer matrix. A simple melt mixing method is used to fabricate the PVDF/Fe3O4 nanocomposites. The morphology of Fe3O4 nanoparticles were studied using transmission electron microscopy (TEM). The structural characterization of Fe3O4 nanoparticles indicates the spinel cubic structure of the nanoparticles. The morphology of polymer nanocomposites showed uniform dispersion of nanoparticles in the polymer matrix. It was found that, addition of nanoparticles doesnot affect crystalline structure of polymer matrix. The thermal properties of nanocomposites showed a decrease in the crystallinity of nanocomposites. The storage modulus of the polymer nanocomposites was significantly improved with the increasing content of filler. Finally, the magnetic property study indicated a linear increase in saturation magnetization with filler loading. Overall, the excellent properties of polymer nanocomposites can have potential applications in recording media devices and electromagnetic shielding materials.

**Keywords**: PVDF, polymer nanocomposites, magnetic properties, storage modulus.

**OP-16**

# Structural, Dielectric and Magnetodielectric Properties of Ni doped Ba0.7Pb0.3TiO3 Ceramics

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## Abstract

We have synthesized Ni-doped Ba0.7Pb0.3[Ti(1-x)Nix]O3 (x=0 to0.15) samples by hydroxide co-precipitation method. X-ray diffraction reveals that the system exhibits the single-phase tetragonal crystal structure. The Curie temperature (Tc) is decreased from 274 0C to 162 0C with increase in Ni doping Concentration. The observe value Magnetodicapacitance (MC) increases with Ni doping concentration and highest value found to be -2.86% at x=0.15

**Keywords**: Ceramics; Hydroxide co-precipitation; Dielectric properties; Magnetocapacitance Properties.

**HP-01**

# Efficiency Improvement of Photovoltaic Panel using Active Air Cooling

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## Abstract

Solar energy is available abundantly at free of cost on earth which is alone capable to fulfill the human energy demand. It is naturally replenished on a human time scale and 1000 times more than the world's energy needs. Photovoltaic cells are the most popular devices for conversion of the solar energy to electrical energy directly. Solar cells are made up of semiconducting material silicon which exhibits the photovoltaic effect. Solar cells after connected in series sandwiched between upper toughened glass and polymer back sheet to make the photovoltaic panel. The efficiency of the solar panel is about 16 % which largely gets hampered due to a cell operating temperature rise than standard testing condition (STC). At STC Irradiation are 1000 W/m2 and cell operating temperature 25 0 C. For every rise of 10 C in cell operating temperature than the 250 C efficiency of the solar panel gets decreased by 0.5%. Except for cold region countries without using external source it is impossible to keep the cell operating temperature at low as it is directly proportional to falling irradiation. By keeping aim as lowering the cell operating temperature this paper explains the active air cooling method using steel chips and thermal grease. Forced air flowed over the back surface of Photovoltaic panel because of which heat was taken away and released in ambiance. By using this technique temperature of the photovoltaic panel was decreased by 150 C than the un-cooled panel which resulted in output voltage improvement from 37.4 V to 40 V. The electrical efficiency of the photovoltaic panel was improved by 6 %.

**HP-02**

# Green Synthesis of Zinc Oxide Nanoparticles using Flower Extract of Jasminum and their Antifungal Activity

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## Abstract

The objective of the present research was to exhibit the novel cost effective, nontoxic green synthesis of Zno nano particle. Zinc oxide (ZnO) has broad applications in various areas. Green synthesis is an alternative to conventional physical and chemical methods. Green synthesis of nanoparticles is gaining importance due to its cost-effectiveness, reduction of toxic chemicals and extensive antimicrobial activity. In the present work, we have discovered synthesis of zinc oxide nanoparticles (ZnONPs) using flower extract of Jasminum. Synthesized ZnONPs were evaluated for their purity, particle size, morphological structure, using UV–visible spectroscopy, Fourier transforms infrared spectroscopy, X-ray diffraction and scanning electron microscope analysis. However, nanoparticles gain low crystallite size, they seemed to be uneven structures like spongy like and flower shaped particles. The nano powder synthesized was stored in a dry place and was stable for around 5 months. Obtained Zno nanoparticles exhibited good antimicrobial activity and showed minimum inhibitory concentration of 1000 µg/mL against E Coli and hence a promising application in biomedical field. This research leads to develop a new way of cost-effective synthesis of Zno nano particles and reducing usage of chemicals in further studies.

**HP-03**

# A Composite Analysis of Tungsten Oxide / Reduced Graphene Oxide (WO3/ RGO) for Various Applications

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## Abstract

Pairing tungsten oxide (WO3) and derivatives of graphene to create heterojunction could be an exceptionally promising technique to achieve the improved effectiveness in photocatalysis, energy storage, medical, electrochromism and energy conversion. In addition, the efficiency of WO3/RGO heterojunction performs significantly better than either of the individual materials due to their well-matched band edge positions, efficient charge separation, and light harvesting abilities. In this review, the noteworthy endeavors and exceptional turning points accomplished utilizing WO3/RGO heterojunction for different applications. The different components that impact the proficiency of WO3/RGO heterojunction incorporate the nanostructure morphology, charge carrier's elements, layers of WO3 and WO3, utilize of catalysts and doping, etc. Conclusively, the scope of future research work to design the heterojunction with high efficiency utilizing WO3 and RGO is explored.

**Keywords**: tungsten oxide, reduced graphene oxide, photocatalysis, gas sensor, electrochromism.

**HP-04**

# Fabrication of Multifunctional Porous $TiO_2$ for Sensitive Carbon Dioxide Gas Sensor and Ultraviolet Photodetector

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## Abstract

Multifunctional TiO2 thin films with high sensitivity toward carbon dioxide and highly responsive in ultra-violet region were fabricated by using inexpensive, eco-friendly dip coating method. The effect of different deposition cycles on physiochemical, gas sensing and UV sensing properties were studied. The gas sensing study of porous TiO2 was carried out at different operating temperatures. The fabricated sensor shows selectivity towards CO2 gas. The maximum gas response of 27.15% is obtained for optimized film at 200°C towards 200 ppm CO2. The obtained response and recovery times of sensor are 13s and 178s respectively toward 200 ppm CO2. The fabricated metal-semiconductor-metal (MSM) photodetector shows high photoresponsivity and fast optical switching characteristics. The fabricated detector shows good I-V characteristics with maximum photoresponsivity of 2.15 A/W under 365 nm UV illumination and 5V bias. The fast rise and fall times obtained for fabricated device are 17s and 19s respectively. This study reveals that TiO2 is considered as promising material for environmental monitoring due to its multifunctionality.

**Keywords:** Titanium dioxide; dip coating; gas sensor; UV photodetector

**PA-01**

# Enhanced Photocatalytic and Dye Degradation of Silver – Silver Sulphide Nano-Particles and their Mechanism Insight

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## Abstract

Silver- silver sulphide (Ag-Ag2S) nano structure was synthesized by simple soft chemical route by varying the concentration of sulphur varied from 5 M to 10 M and used sodium sulphide as a sulphur source. The formation of Ag-Ag2S NPs was confirmed using various characterizations like PL, TEM/HRTEM, UV- Vis absorption spectroscopy, AFM. UV-Vis absorption spectra show there is a blue shift in Ag-Ag2S NPs. There is an enhancement of photoluminescence intensity of Ag-Ag2S NPs when sulphur ions were added to the Ag NPs. XRD pattern revealed that Ag-Ag2S have crystal phase and monoclinic silver sulphide peaks. And peaks confirmed the formation of Ag NPs and Ag-Ag2S NPs. AFM images showed that Ag NPs and Ag2S NPs have uniform 7 nm thickness. TEM images shows that synthesized silver NPs are almost spherical in shape. The histogram confirms the average diameter is 7nm. Because of the adsorption of sulphur on the surface of Ag NPs, there was a strong damping of surface Plasmon resonance band induced and shows a blue shift which shows that Ag-Ag2S NPs is formed and it is confirmed by XPS and EDX analysis. The synthesized NPs exhibited enhanced photo catalytic property upon MB dye.

**Keywords**: Ag-Ag2S; Hybrid nanostructures; methylene blue; photo-catalysis; electron-hole pairs

**Acknowledgements**: Gunjan Pathania is thankful to the PDM University and GGSIPU for providing research facilities. JRA is thankful to GGSIPU for FRGS grant.

**PA-02**

# Electrospun Polymer Nanofiber Mats for Advanced Sensor Development

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## Abstract

Electrospinning is a powerful technology for the production of new generation of nanofibers mats with diversified compositions, structures, and properties, and also it is a unique technique to fabricate polymeric as well as metal oxide nanofibers mats. Research on electrospun nanofibers is a very active field in material science owing to their novel applications in diverse domains. Fiber structures with nanoscale diameters offer many fascinating features, such as excellent mechanical properties and high specific surface areas, making them attractive for many applications. The main focus of this research paper is to provide an insight into electrospninng technique by understanding the working principle, influencing parameters and applications of polymer nanofibers mats.

The most advanced applications of nanofibers mats produced by Electrospinning technique in the areas like sensor development, “smart” mats, filtration membranes, catalytic supports, energy harvesting/conversion/storage components, and photonic and electronic devices, as well as decontamination, biomedical and catalysis etc. Details on the industrial scale development of electrospinning technique, current scenario and future developments are also covered in this paper.

**Keywords**: Polymer nanofibers mats; fabrication; electrospinning; morphology; application of nanofibers mats

**PA-03**

# AC Conductivity of Conducting Polyaniline doped with SrO Nanocomposites

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## Abstract

Conducting Polyaniline(PANI) doped with Strontium Oxide (SrO) hybrid nanocomposite with a diameter 45 to 55 nm was prepared by Self propagating low temperature combustion method of SrO through in situ chemical polymerization of aniline using ammonium persulphate as an oxiding agent at 0 -5°C. Different weight percentages of SrO (10%, 20%, 30%, 40% and 50%) were added during polymerization. The resulting nanocomposite material was characterized by different techniques such as X-ray diffraction (XRD), Scanning electron Microscopy images (SEM) provided information regarding the morphology of nanocomposite materials and distribution of metal particles in the nanocomposite material. SEM observation showed that the prepared SrO nanoparticles were uniformly dispersed and highly stabilized throughout the macromolecular chain that formed a uniform metal- polymer nanocomposite material. The AC conductivity of nanocomposites are measured as a function of frequency in the range 5Hz to 35MHz at room temperature. It found that as frequency increases the AC conductivity remains constant upto 105 Hz and afterward it increases due to hopping of charge carriers in the nanocomposites. The result obtained for these composites are of scientific and technological interest for variety of applications such as in batteries, microelectronics displays, antistatic coatings, electromagnetic shielding materials, sensors and actuators. Its good environmental as well as thermal stability and electrical conductivity tunable by appropriate doping make polyaniline an ideal active material.

**Keywords:** Polyaniline, Strontium oxide, nanocomposite, XRD, SEM, Conductivity

**PA-04**

# Thermal and Magnetic Properties of Mg Substituted Manganese Chromate Spinel

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## Abstract

Spinel oxides materials and minerals are anions having cubic close pack and cation present in tetrahedral and octahedral position in the crystal lattice. The degree of disorder due to cation present at definite site can be explored by inversion parameter leads to normal and inverse spinel structure [1]. The variation in chemical composition of cations and its charge pave the way toward formation versatile compounds having wide range of optimized physicochemical properties. Recently, polycrystalline chromite is explored in field of magnetic, thermal and electric resources [2]. Manganese substituted magnesium chromate spinel structure with composition Mg1-xMnxCr2O4 (where x= 0.0, 0.25, 0.50, 0.75 and 1.0) were prepared by sol-gel combustion method. Thereafter, the polycrystalline powder was characterized using XRD, TGA/DTA, SEM/EDAX, TEM, and FTIR spectroscopy. Analysis of XRD pattern is disclosed that the samples are single cubic spinel structure without any additional peak and lattice constant increases as increasing manganese content. Thermal analysis reveals decomposition organic moieties at different steps and stability of spinel structure. Furthermore, SEM measurement shows grain size lies in between 1.74 to 3.17 µm and EDAX measurement shows stoichiometry according to its composition. TEM shows the average particle size around 20 nm. FTIR spectroscopy shows the definite stretching and bending vibration modes of spinel structure. The coercive force and remnant magnetization are decreases as concentration of manganese increases and saturation magnetization increases as the concentration of manganese increases.

**Keywords:** Magnetism, Spinel Chromate Nanocrystals, Thermal properties

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**PA-05**

# New Diamine Containing Preformed Amide and Flexible Linkages; Synthesis and Characterization

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## Abstract

Aliphatic and aromatic diamines are mostly used as monomers for the synthesis of polyamides, polyimides, polyurethanes etc. Worldwide efforts have been devoted to modify chemical structure of polymers to improve their solubility and processability without remarkable deterioration in their thermal stability. To lower the glass transition temperature and to improve the solubility of polymers, the monomer unit should contain the flexible linkages. With this objective, synthesis of a new aromatic - aliphatic diamine bis-[4-(4'(4"-amino) phenoxybenzyl) benzamide] ether (BAPBE), containing preformed amide linkage, and flexible ether and methylene linkages has been performed. The aromatic diamine BAPBE was characterized by FT-Infrared (FT-IR), nuclear magnetic resonance (NMR) and mass spectroscopy. The novel diamine can be used as a building block for the preparation of a series of organosoluble and thermally stable polyamides.

**Keywords**: Diamine, Flexible linkages, Organosoluble, Polyamides.

**PA-06**

# Photocatalytic Degradation of Rhodamine B by ZnFe2O4 Catalyst Synthesized by Sol-gel Autocombustion Method

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## Abstract

Nanocrystalline zinc ferrite (ZnFe2O4) was synthesized by simple cost efficient sol-gel method. The X-Ray diffraction (XRD) and transmission electron microscopy (TEM) analysis were performed to investigate different structural parameters. The XRD pattern showed formation of single cubic spinel phase only with crystallite size 26 nm. Magnetic property of the sample was studied by using vibrating sample magnetometer (VSM). The purity and morphological behavior of the sample was carried out by using energy dispersive X-Ray analysis (EDAX) and scanning electron microscopy (SEM) respectively. Photocatalytic performance of the prepared sample was studied towards degradation of the aqueous Rhodamine B dye solution. The effect of different parameters such as irradiation time of UV light, palladium doping and kinetic parameters of photocatalysis with ferrite was studied systematically. The two component coupling reaction of aryl halide and phenyl boronic acid was performed by nickel ferrite catalyst. The effect of solvent, Temperature and palladium loading on the material was also discussed

**Keywords**: Sol-gel auto combustion, XRD, SEM, TEM, VSM and Catalysis

**PA-07**

# Analysis of Solvent Effects on Fluorescence Quenching of 3MOCE in Different Solvents

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## Abstract

The fluorescence quenching of 3-[2-(8-methoxy-2-oxo-2H-chromen-3-yl)-2-oxo-ethylidene]-1,3-dihydro-indol-2-one (3MOCE) coumarin by aniline has been studied in different solvents of dimethylformide (DMF), dimethylsulfoxide (DMSO), toluene (TL) and butanol (BL) at room temperature. The quenching is found to be appreciable and a positive deviation from linearity was observed in the Stern– Volmer (S–V) plot in all the solvents. Various parameters for the quenching process have been determined by sphere of action static quenching model and finite sink approximation model. The magnitudes of these rate parameters indicate that positive deviation in the S–V plot is due to both static and dynamic processes.

**Keywords:** 3MOCE; Fluorescence quenching; Diffusion limited; Static and dynamic quenching; Finite sink approximation

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**PA-08**

# Magnetic Properties of $La^{3+}$ Substituted Mg-Zn Nanoparticle Ferrites

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## Abstract

Nanoparticles of Lanthanum substituted Magnesium Zinc ferrites with general formula Mg0.6Zn0.4La2yFe2-2yO4 (where y = 0.00, 0.05, 0.10, 0.15, 0.20 and 0.25) have been synthesized by co-precipitation technique. Weight loss of the sample with endothermic and exothermic reactions was studied with thermo gravimetric and differential thermal analysis (TG-DTA). Phase formation was investigated using X-ray diffraction and Infrared absorption technique. FTIR analysis confirms spinel structure of the prepared samples. The energy dispersive analysis by X-ray (EDAX) shows the presence of exact proportion of all the metals ions in the composition as that of precursors used for preparation of samples. Magnetic properties of the samples are investigated by using Vibrating Sample Magnetometer (VSM). The effects of La3+ on both structural and magnetic properties are studied.

**PA-09**

# Transparent Hydrophobic Zirconia Films using Glycerol as DCCA by Spin Coating Technique

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## Abstract

The experimental results in this work represent the transparent hydrophobic zirconia films using glycerol as DCCA by spin coating technique. It was observed that DCCA helps to sustain the porous structure reducing the cracking probability during drying and improving the optical transmission of the materials. Therefore, zirconia films were prepared by adding glycerol in the sol during the sol-gel process via spin coating technique. The influence of varying molar ratio of GLY:Zr4+ (0 to 2.15) on the characteristics of zirconia films was studied. During the synthesis of zirconia films the molar ratio of Zirconium propoxide: PrOH: Acac.: H2O was kept fix for 1:79.8:0.615:35.08 respectively with 0.1 M HCl. The chemical bonding analysis, morphological, optical and hydrophobic properties studies of zirconia films have been carried out using fourier transform infrared (FTIR) spectroscopy, X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM), UV-VIS spectroscopy and contact angle (CA) measurement. The porous nature of the film was confirmed by calculating the refractive indices of zirconia films. It was observed that addition of glycerol reduces the refractive indices of zirconia films manifesting the enhancement in their porosity. These optically transparent porous zirconia films can be applied as active waveguide sensors and optical filters in UV to IR spectral region.

**Keywords:** Glycerol, Sol-gel, Spin coating, Zirconia films, Transparent, Hydrophobic

**PA-10**

# Pervaporation Dehydration of Isopropanol-water Mixture using Modified Poly(vinyl alcohol) Membranes

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## Abstract

Using sol-gel technique, modified poly(vinyl alcohol) membranes were developed by cross linking the membranes with Glutaraldehyde and filled with NaY zeolite to bring both physical and chemical change among the membrane. The physico-chemical properties of the resulting membranes were studied by Fourier transform Infrared Spectroscopy (FTIR), wide-angle X-ray diffraction (WAXD), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA) and scanning electron microscopy (SEM). The mechanical properties of the membranes were studied using universal tensile machine (UTM). Further, membranes were studied for separation of water-isopropanol mixtures by pervaporation in the temperature range of 30-50 °C. The experimental results demonstrated that the membrane containing 15 mass% of crosslinking agent showed the highest separation selectivity of 3,452 with a flux of 3.51 x 10-2 kg/m2h at 30 □C for 10 mass% of water in the feed. From the temperature dependency of diffusion and permeation values, the Arrhenius activation parameters were estimated and discussed in terms of membranes efficiency. The activation energy values obtained for water permeation (Epw) were significantly lower than those of isopropanol permeation (EpIPA), suggesting that the developed membranes have higher separation efficiency for water-isopropanol system.

**Keywords:** modified-poly(vinyl alcohol), maleic acid, Glutaraldehyde, Pervaporation, Selectivity, Activation energy.

**PA-11**

# Synthesis and Enhanced Photocatalytic Performance of Silver Decorated $SiO_2/TiO_2$ Nano-composites

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## Abstract

We have successfully synthesized silver doped silicon dioxide (SiO2) and titanium di oxide (TiO2). SiO2 with TiO2 after silver nanoparticles doped has been synthesised by the hydrothermal method. TiO2 nanoparticles (NPs) with diameter 100 nm were mounted on SiO2 spheres having diameter around 300 nm. Thus, SiO2@TiO2 NPs without Ag coating show less degradation efficiency as compared to silver doped SiO2@TiO2 nano-composite. Ag-SiO2@TiO2 nano-composites degrade almost all the phenol and methylene blue dye under ultra-violet light irradiation within 30 minutes. This experiment shows that concentration rate of mass is just 6% and it has highest photocatalytic activity under UV light irradiation on SiO2@TiO¬2 nano-composites because of oxides involve in the transport of holes and electrons. Ag-SiO2@TiO2 nano-composite were characterized by and UV-Vis absorption spectroscopy, X-ray Diffraction (XRD), Scanning Electron Microscope (SEM), and Transmission Electron Microscope (TEM).

**Keywords**: Ag-SiO2@TiO2; nano-composites; methylene blue; photo-catalysis; electron-hole pairs

**Acknowledgements**: Akhil Mathur is thankful to the PDM University and GGSIPU for providing research facilities. JRA is thankful to GGSIPU for FRGS grant.

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**PA-12**

# Preparation of Nanostructured Cu2SnS3 Photocatalyst by Hydrothermal Route

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## Abstract

Ternary copper tin sulphide (Cu2SnS3) has been successfully synthesized by hydrothermal method. The crystal structure, composition, surface morphology and optical properties of the prepared sample have been characterized. XRD pattern of synthesized CTS shows the triclinic structure. The SEM image shows the uniform spherical grain like structure which are clustered. A photocatalytic activity of the as synthesized Cu2SnS3 was tested under visible light irradiation by measuring the degradation of Rhodamine-B (Rh-B), basic textile dye. CTS show a broad absorption in the visible and the IR region. The optical band gap of 1.5eV has been determined. A more realistic mechanism for the photocatalytic activity of CTS is proposed in this work.

**Keywords:** Cu2SnS3, hydrothermal, Photocatalyst, dye degradation, Rh-B

**PA-13**

# Synthesis and Characterization of Silver Decorated Zinc Oxide Hybrid Structure for Enhanced Photocatalysis for Water Splitting

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## Abstract

We have successfully synthesized silver (Ag) doped zinc oxide (ZnO) nanoparticles (NPs) by sol-gel method. Doping with Ag NPs leads to highly degradation of Azo dye rather than any doped-particles. Ag doped ZnO NPs have high degradation rate when methylene blue (MB) was used as compared to undoped ZnO NPs under light exposure. As the concentration of AgNPs increased on coating of ZnO NPs the degradation rate observed was very quick. We attributed the enhancement of MB dye by silver doping with ZnO NPs because of the electron transfer rate. Highly pure Ag NPs perfectly dopes with ZnO decreases the recombination of electron-hole pairs during MB degradation. The structural and optical characterization of Ag-ZnO hybrid nanostructures were confirmed by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and photoluminescence (PL) spectroscopy, while the photo-catalytic behavior of Ag-ZnO NPs were studied by UV-Vis absorption spectroscopy.

**Keywords**: Ag-ZnO; hybrid nanostructures; methylene blue; photo-catalysis; electron-hole pairs

**Acknowledgements**: Arjun Singh is thankful to the PDM University and GGSIPU for providing research facilities. JRA is thankful to GGSIPU for FRGS grant.

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**PA-14**

# Five Level Multilevel Inverter as a Dynamic Voltage Restorer

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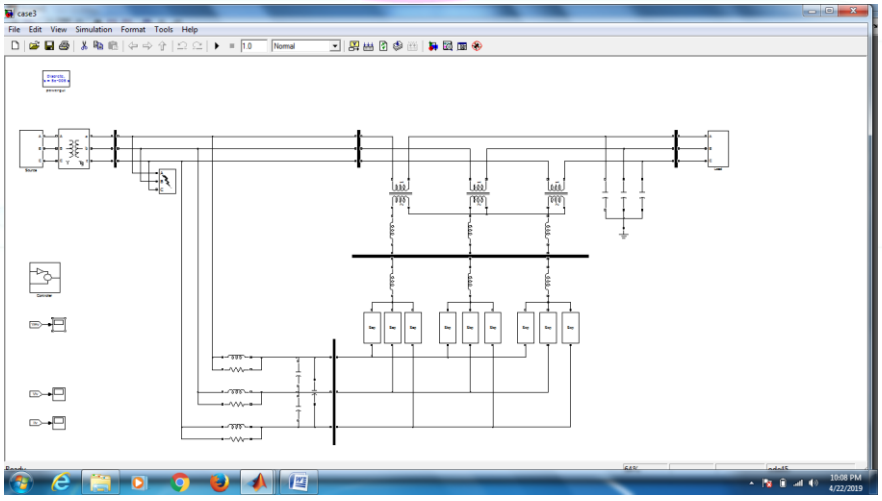
## Abstract

In this project cascaded H-bridge 5 level based multilevel inverter is presented. Use of high voltage with nonlinear load is considerably increased in industry and elimination of harmonics in HV system has become an important aspect. Mainly focused on the design and implementation of new topology with carrier shift technique. There are various modulation techniques used for multilevel inverters (MLI) among carrier phase shift pulse width modulation (CPS-PWM) technique is superior.

This project presents a modern industrial device are mostly based on electronic devices such as programmable logic controllers and electronic drives. The electronic devices are very sensitive to disturbances and become less tolerant to power quality problems such as voltage sags, swells and harmonics. In this multi-level inverter is used because to improve output voltage like Voltage Profile and Reduce Total Harmonic Distortion compared to voltage source inverter, Due to the power quality issues like voltage sag, voltage swell, unbalanced voltage, voltage flickering, Interruptions etc. load side voltage is not constant. The main requirement of any system is to maintain load side voltage constant. Among the entire power quality issues, voltage sag and voltage swell occupy a major role. So, our project deals with compensating different power quality issues at load side using 5-level multi-level inverter as a Dynamic Voltage Restorer.



**Keywords**: Dynamic voltage restorer, MATLAB, Multilevel Inverter.

**PA-15**

# Synthesis of Calcium Ferrite by Inherent Source for Ethanol Sensor

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## Abstract

In this work Gas sensing properties of the p-type orthorhombic CaFe2O4 are demonstrated. CaFe2O4 were successfully synthesized with natural source of precursors by the milling method. The formation of orthorhombic CaFe2O4 compound was confirmed by X-ray diffraction, scanning electron microscopy shows agglomerated porous crystalline type morphology. Photoluminescence spectra showed CaFe2O4 absorbs visible regain at wavelength 584nm. The synthesized CaFe2O4 compound showed p-type gas sensing behaviour and high gas response towards ethanol 38.4% at 225˚C operating temperature at concentration of 120 ppm ethanol gas.

**Keywords**: Nanostructures, XRD, SEM, PL Gas sensor

**PA-16**

# Synthesis and Characterization of Vanadium Oxide by Hydrothermal Method

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## Abstract

High-quality self-assembled Vanadium Oxide (V2O5) nanostructures have been prepared via a simple and direct hydrothermal method using ammonium metavanadate as a vanadium precursor along with oxalic acid. The structural, morphological, chemical bonding and optical properties of V2O5 nanostructure have been investigated through different characterization techniques like XRD, FTIR, SEM and UV-Visible Spectroscopy respectively. The structural analysis revealed that orthorhombic V2O5 phase formation. The SEM images revels that cluster of nano particles. The band Gap of prepared material were calculated by using UV- Visible Spectrophotometer and it is about 2.0 eV. The prepared calculated product is beneficial in various applications such as Gas sensor, Dye Degradation, Solar cell, etc.

**Keywords:** Hydrothermal method; Thin film; Vanadium oxide; ;

**PA-17**

# Synthesis and Characterization of CdTe Sintered Thick Films for Photovoltaic Applications

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## Abstract

The II-VI semiconductors are of great importance due to their applications in optoelectronics, solar cells, integrated optics and electro-optic devices. Cadmium telluride is a suitable material for the fabrication of photovoltaic devices. We have prepared cadmium telluride films in air atmosphere by screen-printing method and studied their applications in photovoltaic devices. The energy band gap of these films was found to be 1.76 eV by absorption spectra in wavelength range 675-875 nm. The X-ray analysis of these films confirms the polycrystalline nature of prepared films having wurtzite (hexagonal) structure .The Schottky junction of cadmium telluride using silver was made and the photosensitivity and photoresponsitivity of it were determined by using current-voltage characteristics. The DC conductivity and activation energy of films were also measured in vacuum by two-probe technique. Screen-printing followed by sintering is a very simple and viable technique compared to other costly methods. It is less time consuming, less pollutant and ensures maximum material utility and offers a suitable method for preparing films on large area substrates.

**Keywords**: CdTe, Sintering, Screen printing, XRD, Electrical properties.

**PA-18**

# Synthesis of CuO@SO3H Nanoparticles by Sol – Gel Method

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## Abstract

Newly designed with the Sol – gel method, the nanoparticles CuO@SO3H were synthesized. Nanocrystaline has been researched for the synthesized nanoparticles and their other properties. UV – The visible wavelength spectrometer of 320 nm was used to study the optical properties of the synthesized nanomaterial. Using the X-Ray diffraction method, the particle size was calculated at 56 nm.

**Keywords**: CuO Nanoparticles, Sol- Gel method.

**PA-19**

# Gas Sensing Properties of Titanium Dioxide Dopped Zinc Oxide Thin Film by Spray Pyrolysis Technique

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## Abstract

Zinc oxide (ZnO) and titanium dioxide (TiO2) materials are much important with their physical and chemical properties as well as due to the wide scope for the development of novel solutions in sensor technology. Both materials are widely useful for industrial, technological and sensors applications. TiO2 dopped ZnO thin films are obtained by using advanced spray pyrolysis technique. Thin films are obtained with high transparency. Structural analysis and gas sensing properties of TiO2 dopped ZnO thin films are studied.

**Keywords**: Gas sensor, Advanced spray pyrolysis, Zinc oxide and titanium dioxide.

**PA-20**

# Room Temperature Carbon Dioxide Sensor based on Polypyrrole-Polyvinyl Alcohol Composite Films

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## Abstract

The present paper describes the results of experiments carried out to examine the Carbon Dioxide (CO2) gas sensing performance of Polyvinyl Alcohol-Polypyrrole (PVA-PPy) composite film sensors prepared by the in-situ chemical polymerization method. PVA-PPy composite films were characterized by Scanning Electron Microscopy (SEM), Fourier transform infrared Spectroscopy (FTIR) and X-Ray Diffraction (XRD). These characterization techniques revealed morphology, bonding structure and crystallinity of the composite films. The gas-sensing performance of the sensor for CO2 gas was studied by recording changes in resistance of the films with respect to time at room temperature. The films displayed response of 6. 99 % at 100 ppm with a response time of 222 s and a recovery time of 144 s. The concentration of test gas when increased by steps up to 800 ppm, then the films exhibited a response of 9.4 % at 800 ppm with a response time of 1294 s and recovery time of 184 s. It was observed that sensor shows the tendency of saturation for gas concentration higher than 800 ppm. The prepared sensor could detect a low concentration level of 100 ppm with a reasonable response of 6.99 %. Excellent repeatability, fast response and recovery behaviour of the gas sensors are achieved. The experimental results show the inexpensive PVA-PPy composite flexible and self-supported films are promising sensing material for the detection of CO2 gas at room temperature.

**Keywords**: Conducting polymer, Composite films, Gas sensor, Carbon dioxide, Response and recovery time

**PA-21**

# Solvent Effects on Fluorescence Quenching of 3HOCE in Different Solvents

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## Abstract

The fluorescence quenching of 3-hydroxy-3-[2-oxo-2-(2-oxo-2H-chromen-3-yl)-ethyl]-1,3-dihydro-indol2-one (3HOCE) coumarin by aniline has been studied in different solvents of dimethylformide (DMF), dimethylsulfoxide (DMSO), toluene (TL) and butanol (BL) at room temperature. The quenching is found to be appreciable and a positive deviation from linearity was observed in the Stern– Volmer (S–V) plot in all the solvents. Various parameters for the quenching process have been determined by sphere of action static quenching model and finite sink approximation model. The magnitudes of these rate parameters indicate that positive deviation in the S–V plot is due to both static and dynamic processes.

**Keywords**: 3HOCE; Fluorescence quenching; Diffusion limited; Static and dynamic quenching; Finite sink approximation

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**PA-22**

# Synthesis, Analysis and Characterization oF y(Ni0.6Co0.2Cd0.2Fe2O4)+ (1-y)Ba0.8Sr0.2TiO3 Magnetoelectric Composites

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## Abstract

y(Ni0.6Co0.2Cd0.2Fe2O4)+(1-y)Ba0.8Sr0.2TiO3 ME composites (with y=0.00, 0.15, 0.30, 0.45 and 1.00) were prepared by standard double sintering ceramic method. In the present work structural, electric, dielectric, magnetic and magnetoelectric properties of ME composites were studied by varying composition of ferrite phase. XRD analyses were carried out for confirmation of the existence of constituent phases in the synthesized composites. SEM micrographs are used to investigate microstructure and for calculation of average grain size of the composites. The variation of D.C resistivity with temperature were studied for confirmation of semiconducting nature of the composites. The variations of dielectric properties with frequency and temperature were also studied. Magnetic properties of composites were studied by Alternate Gradient Magnetometer (AGM) at room temperature. Magnetoelectric coupling coefficients for composites were measured as a function of D.C magnetic field. The highest magnetoelectric coefficient of 759 µV/cm.Oe was observed for 0.15(Ni0.6Co0.2Cd0.2Fe2O4)+0.85(Ba0.8Sr0.2TiO3).

**Keywords:** Multiferroics; Synthesis; Characterization; Magnetoelectric Properties.

**PA-23**

# Photocatalytic Degradation of Malachite Green under Solar Light using Hydrothermally Synthesized Cobalt-doped $TiO_2$ Nanoparticles

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## Abstract

The pristine TiO2 and Co2+-TiO2 nanoparticles (NPs) were synthesized simplest hydrothermal technique. The synthesized NPs are characterized by various structural, optical, morphological and compositional properties. The XRD analysis confirms polycrystalline nature for all Co2+-TiO2 photocatalyst. The crystallite size was evaluated by TEM lies between 7 to 11 nm for Co-TiO2 NPs with irregular, agglomerated and non-circular particles (ideal for 1.61 wt. %). Raman peaks at 398, 516.89 and 640 cm-1 affirmed anatase Co2+-TiO2 NPs and XPS analysis reveals substitution of Ti4+ with Co2+ ions in TiO2 NPs. The optical study indicates shifting of absorption edges towards longer wavelengths (visible region) with doping of Co2+ ion in TiO2. The change in composition and surface morphology in 1.61 wt% Co-TiO2 lead to achieve 82% photocatalytic degradation of malachite green (MG) under direct sunlight in 180 minutes and mineralization of the MG determined by chemical oxygen demand.

**Keywords**: Co doped TiO2; Hydrothermal method; Nanomaterials; Photocatalysis; Malachite green.

**PA-24**

# MAS-NMR and FTIR Studies of Rare Earth Ions Doped Tellurite Based Alkali Borate Glasses

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## Abstract

Tellurite and europium ions activated alkali borate glasses are synthesized by the conventional melt quenching method. For prepared glass characterizations were done by employing X-ray diffractometer (XRD) studies, Fourier transform infrared spectroscopy (FTIR) measurements, and MAS-NMR studies. XRD analysis reveals the amorphous nature of the ready glasses. FTIR studies imply that the bound structure of the obtained glass system depends on BO3 and BO4 entities insertion into an unusual structural group and also by interlaced TeO3 and TeO4 units. 11B MAS-NMR spectra illustrates characteristic features of borate network and compositional dependence inclination as a function of Na2O/PbO /B2O3 concentration. The dispersant cause of the glass structure was believed to endorse the better distribution of the rare-earth ions in the matrix and decreased the concentration quenching between them. The results have been analyzed in connection with the modified borate glass network. An addition of Eu3+ ions into the glass is involved in the appearance of BO4 and TeO3 structural units of glass, even though it is not directly evident.

**Keywords**: Alkali borate glass, Tellurite, FTIR, MAS-NMR

**PA-25**

# A Study of NO2 Gas Concentration on Response of Cdo Thin Films Prepared by Novel Reflux Method

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## Abstract

In present study, using simple and inexpensive novel reflux method, Cadmium Oxide (CdO) thin films were successfully deposited on glass substrate at 600C. Here to deposit CdO on glass substrate, Cadmium Chloride (CdCl2) was used as a source of Cd+ ions, while ammonia was taken as complexing agent. Structural analysis and surface morphology of prepared CdO thin film was analyzed by X-ray diffraction and scanning electron microscopy respectively, Also wettability test was done by using goniometer which showed hydrophilic nature of deposited CdO thin film.

Optical properties of CdO thin film was completed by using UV-Visible spectroscopy which revealed that deposited CdO thin film has direct band gap about 2.01eV. NO2 gas sensing properties like sensitivity, response recovery & response time of prepared CdO sensor was determined by using Keithley gas sensing unit. In present work effect of concentration of NO2 gas on response of CdO sensor was studied and it was cleared that as NO2 gas concentration increases (25 ppm-100ppm), the response of CdO sensor was also increases & it becomes maximum i.e. (57%) for 100 ppm of NO2 with optimized temperature of 2000C. Variation of response and recovery time with NO2 gas concentration was studied and it was concluded that as concentration of NO2 gas increases, response time increases while recovery time decreases.

**PA-26**

# Study of Acoustic Parameters of Magnesium Sulphate in Aqueous Solution at Various Concentration and Temperature

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## Abstract

The study of thermodynamic parameter has been carried out at different concentration and temperature at 283.15K, 288.15K, 293.15K. Using measured values of velocity, density, viscosity and various thermoacoustic parameters such as adiabatic compressibility, acoustic impedance, free length, relaxation time, relative association, ultrasonic attenuation, free volume evaluated. The variation of this parameters with respect to the molarities has been explained on the basis of solute-solvent interaction and structure forming tendency of solute in the solvent.

**Keywords**: magnesium sulphate, water and various acoustical parameter

**PA-27**

# Enhanced Photocatalytic and Dye Degradation of Silver Decorated Molybdenum Disulphide and their Mechanism Insight

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## Abstract

Hybrid nano-structure consisting of silver nanoparticles decorated on two dimensional MoS2 sheets were prepared by soft chemical route, show highly enhanced photocatalytic activity. The photocatalytic activities of these hybrid structures were studied by sun light-driven photocatalytic degradation of methylene blue (MB). The results showed that Ag-MoS2 hybrid nanostructures exhibit highly enhanced photocatalytic activity towards degradation of MB. The Schottkey junction between the metal and semiconductor leads to formation of sink for photo-excited electron, which leads to improved photocatalytic activity of the hybrid systems. The possible mechanisms that contribute to the improvement of the visible light driven photocatalytic performance for the nano-composite are proposed. The structure, chemical composition and morphology were further established by combination of UV-Vis spectroscopy, X-ray Photoelectron Spectroscopy and TEM/HRTEM analysis.

**Keywords**: Ag-MoS2; hybrid nanostructures; methylene blue; liquid exfoliation; photo-catalysis

**Acknowledgements:** J.R. Ansari is thankful to the GGSIPU, New Delhi for providing financial assistance in the form of STRF. AD is thankful to GGSIPU for FRGS grant.

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**PA-28**

# Exploitation of Nanocomposite Tin Oxide - Polyaniline for Solar Cell Application

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## Abstract

The conducting polymer polyaniline (PANI) doped with Tin oxide (SnO2)nanocomposites are prepared by in-situ chemical oxidative polymerization method. Synthesis is done with ammonium persulphate as an oxidant in aqueous solution under constant stirring at room temperature (303 K). SnO2(15 wt.%) is usedas dopant in polyanilinefor preparing PANI-SnO2nanocomposite. The prepared samples were characterized by X-ray diffraction (XRD)to know the nature of the sampleand determination of particle size. The morphological studywasdone by using Scanning electron microscopy (SEM). The partly crystalline samples show particle size of the order of 30 nm. Thermal properties of pure PANI and PANI doped with SnO2 are studied using Thermogravimetric-Differential Thermal Analysis (TG/DTA) over wide temperature range from 00C to 7000C.Weight loss and thermal stability of the prepared nanocomposite was studied. A thin film solar cell device was fabricated with thin film layers as Ag/PANI-SnO2/ITO/Glass. Short circuit current (Isc) and open circuit voltage (Voc) was measured and it is found to be 60 mA and 0.51 V respectively. I-V characteristics was studied to calculate the Fill factor and efficiency of the prepared photovoltaic cell. Efficiency was found to be 2.55%.

**Keywords**: Polyaniline; SnO2, XRD; SEM; TG-DTA; Photovoltaic cell.

**PA-29**

# Synthesis and Characterization of NixCd1-xFe2O4 by Auto Combustion Method

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## Abstract

In the present study NixCd1-xFe2O4 (x=0.0 to 0.5) ferrite prepared by auto combustion method. The prepared samples were characterized by X-ray diffraction for structural investigation, scanning electron microscopy for surface morphology, FT-IR spectroscopy for qualitative information. The X-ray diffraction study confirms that the prepared samples exhibit spinel cubic crystal structure. The crystallite size and lattice constant increases with increase in Ni content in CdFe2O4. FE-SEM study shows that the all the samples exhibits porous structure. The presence of two characteristic absorption bands around 586 cm- 1 and 394 cm-1 in the IR spectra confirms the formation of single phase NixCd1-xFe2O4. The major peak shifting towards higher frequency side in observed with increase in Ni content.

**PA-30**

# Biosynthesis of Zinc Oxide Nanoparticles from Biophytum Sensitivum and its Applications

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## Abstract

Biological methods can be used for the greener synthesis of nanoparticles. Biosynthetic routes provide nanoparticles of better defined size and morphology and are often clean, safe and cost effective. Biological systems include natural compounds which play essential and versatile role in the synthesis of nanoparticles and act as capping agents to stabilize them therefore nanoparticles synthesized from plant extracts are more stable. Among various nanoparticles, zinc oxide nanoparticles (ZnO NPs) are versatile semiconductors that display significant optical transparency and luminescent properties in UV-Visible regions. Zinc oxide nanoparticles (ZnO NPs) have become important in recent years due to their excellent chemical and thermal stability. In this project, zinc oxide nanoparticles were synthesized from the leaves of Biophytum sensitivum using 0.05M Zn(NO)3 solution. A white coloured powdered material was obtained as a result of synthesis. The synthesized nanoparticles have shown absorption peak at 360nm under the spectral analysis. The detailed analysis of the synthesised nanoparticles in the context of size, morphology and structure were studied using various techniques like scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD) and FT-IR. The study of antimicrobial activity of biosynthesised nanoparticles against gram positive and gram negative bacterial strains are in the stage of progress . The application of Zinc oxide nanoparticles as nanofertilizers in the field of agriculture will be investigated to address the fertility issues of soil.

**Keywords:** Zinc oxide nanoparticles (ZnO NPs) , Biophytum sensitivum, UV-Visible spectroscopy ,SEM , TEM ,XRD , FT-IR , gram positive and gram negative bacterial strains, nanofertilizers

**PA-31**

# Synthesis of Nano-structured Vanadium Pentoxide (V2O5) Electrode Material for Pseudocapacitors Application

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## Abstract

In the present work, a simple and scalable approach has been reported for V2O5 powder by thermal decomposition of vanadium precursor, vanadyl oxalate, which is produced by reacting commercial V2O5 with oxalic acid and annealed at 6000c. Structural and morphological properties of V2O5 powder were investigated first, subsequently followed by a detailed investigation of the electrochemical properties of powder deposited on carbon cloth. From the XRD spectrum confirm the polycrystalline nature of V2O5 phase with an orthorhombic lamellar crystal structure. FESEM micrograph revealed non-uniform large clusters agglomerated on the surface. The electrochemical properties of active V2O5-carbon cloth electrode showed pseudocapacitive nature, which exhibits specific capacitances 41 Fg-1 at the scan rate 5 mVs-1 in KOH electrolyte with three-electrode system. The maximum values of specific power and specific energy were 200 Wkg-1 and 0.26 Whkg-1, respectively, at a current density of 1 mAg-1 with coulombic efficiency 92%. In addition, impedance measurements show that V2O5 is the promising material for supercapacitor application.

**Keywords**: Carbon cloth, KOH electrolyte, V2O5, electrochemical properties.

**PA-32**

# Bos Taurus Urine Mediated Synthesis of Gold Nanoparticles and Comparision of its Bioactivity with Comertially Available Swarnabhasma

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## Abstract

The method of biosynthesis of nanomaterials is day by day becoming popular among nanotechnologists. In the present study, the synthesis of gold nanoparticles at room temperature using cow urine was carried out. The synthesized nanoparticles have been found to be stable for several months. The nanoparticles were characterized by UV- Visible, XRD, FTIR, FE-SEM equipped with EDS. The UV- Visible spectrophotometric analysis was carried out to ensure the formation of gold nanoparticles. Swarnabhasma is procured from Dhootpapeshwar Ltd. X-ray diffraction pattern of reaction product and that of commercial sample confirms the presence of gold nanoparticles. agglomerated particles were observed using field emission scanning electron microscopy. Elemental studies showed the presence of Au and O elements. The synthesized nanoparticle and commercial sample is multi-applicative and showing potential efficacy against bacterium like Pseudomonas aeruginasa and Staphylococcus aureus. The results showed that the cow urine is very good bio-reductant for the synthesis of gold.

**Keywords**: Green-synthesis; cow urine; XRD; Antimicrobial Activity.

**PA-33**

# Effect of Iron Doped on XRD, FT-IR and EPR Studies of Calcium Borophosphate (CaBP) Nano Phosphors

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## Abstract

Novel inorganic phosphor luminescent materials are widely used in various optoelectronic devices such as field emission displays, plasma display panels, solid state lasers, cathode-ray tubes and tricolor white light emitting diodes. Structural and luminescence properties of calcium borophosphate phosphors with different Fe3+ oncentrations using solid state reaction technique have been investigated. X-ray powder diffraction reveals that all samples exhibited a triclinic system of CaBP and lattice parameter analysis indicated the dopant ions may be substituted into the lattice position of the parent atom. From FTIR Spectra, with the increase in the concentration of the dopant Fe2O3, the intensity of the band due to Fe2O3 units are observed to decrease. The band observed at 584 cm-1 is attributed to B-O bending vibrations. The band observed at 612 cm-1 is due to the bending motion in BPO4. which indicates the presence of a P-O-P bridging band. From EPR spectra, EPR studies which shows a strong resonance signal at around 2.03 which is another evidence of Fe3+ in octahedral symmetry.

**Keywords**: Calcium borophosphate, Nano phosphor, Solid state reaction method, Distorted octahedral and EPR Spectra.

**PA-34**

# Synthesis and Characterization of Nitrogen doped Graphene/V2O5 Nanocomposite by In-Situ Microwave Method

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## Abstract

In this work, a facile approach for synthesis of Nitrogen doped Graphene/V2O5 nanocomposites by in-situ microwave irradiation method. This approach aims to realize a partial reduction of Graphene oxide and a growth of V2O5 nanoparticles on reducing Graphene sheets. All these procedures were carried out in aqueous medium at room atmosphere. The structural properties and the crystalline behavior of the prepared V2O5 were determined by using X-ray diffractometer studies. The surface morphology and growth kinetics were analyzed by Scanning electron microscope (SEM). The vibrational and structural properties of the materials were investigated by using Raman studies. Functional groups and thermal behavior of the nanocomposites were analyzed by using FT-IR and TG-DTA analysis respectively. The prepared Nitrogen doped Graphene/V2O5 nanocomposite was utilized for fabricating supercapacitor electrode and the electrochemical studies was investigated intensively.

**Keywords**: In-situ, Graphene, Nitrogen, In-situ microwave, electrodes.

**PA-35**

# Study of A C Conductivity properties of x(CoMn0.2Zn0.2Fe1.6O4 ) + (1-x) BaTiO3 Composites

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## Abstract

Ferromagnetic-ferroelectric particulate composites of xCoMn0.2Zn0.2Fe1.6O4 + (1-x) BaTiO3 were prepared by conventional ceramic method using composition x=0.0, 0.25, 0.50, 0.75, 1.00. The presence of two phases in composites was confirmed by XRD technique. The results of XRD pattern shows cubic spinel structure for ferrite phase and tetragonal perovskite structure for ferroelectric phase. The lattice constant(s) for mixed ferrite and ferroelectric phase are in good agreement with the reported data. Study of the variations of dielectric constant (ε") with frequency in the range of 20Hz–1MHz at room temperature was done. AC conductivity (ζAC) is frequency dependent and is related to the dielectric relaxation caused by localized electric charge carriers. The AC conductivity of the sample was estimated from the dielectric parameters. Pure charge transport mechanism is the major contribution to the loss mechanism. AC conductivity plot gives the information about the conduction mechanism in ceramic composites. The AC conductivity data was derived from dielectric constant and loss tangent measured using the relation σAC=εε0ωtanδ,Where ω =Angular frequency, ε' = dielectric constant. ε0 = Permittivity of the free space, tanδ = dielectric loss tangent.

**Keywords**: Ferrite ferroelectric composite, Dielectric constant (ε"), magnetoelectric effect.

**PA-36**

# Synthesis of SnO2 Nanoparticles using Mushroom Extract by Sol-Gel Method

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## Abstract

This paper reports a simple method to synthesize and characterization of SnO2 nanoparticles via simple sol-gel method by using mushroom extract. The samples were characterized by x-ray diffraction (XRD), scanning electron microscopy (SEM). The XRD results confirmed the formation of a SnO2 phase with tetragonal rutile structure. The particle sizes of the SnO2 powder were found to be 3.47, 3.96, 4.6, 3.35 and 3.86nm for the sample calcined at 3000C for 2h. For application of effect of SnO2 nanoparticles on chick embryos, these nanoparticles showed better result in both the toxic effect and UV protection. Hence these nanoparticles gaining huge attention of cosmetics due to their useful applications.

**Keywords**: SnO2, Sol-gel, XRD, SEM, Etc.

**PA-37**

# Green Synthesis of Silver Nanoparticles from Leaf Extract of Lantana Camara, Characterization and Antimicrobial Activity

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## Abstract

Nanotechnology is one of the branches of applied science, where numerous area of research has been exposed. Nanomedicine is one of them, in that Silver nanoparticles (AgNPs) are miraculous. It consists of silver particles associated with various other chemicals. Antibacterial role of silver known to man even before birth of antibiotics. Dilute solution of silver nitrate as a source of silver was used in place of antibiotics as potential antimicrobials. Nowadays use of antibiotic has been dominated in most of the chemotherapy, but it has limitations of overdose. Pathogen becomes resistant to its overdose. To get rid of this problem, AgNPs came to its rescue. AgNPs can be prepared by chemical method using reducing agent. Chemical method is less efficient, requires high energy & complicated machinery for purification and above all it is not eco-friendly with nature. Hence, more convenient method is green synthesis, where biological material is used to prepare AgNPs. In biological material microorganism, plant or animal material are used to synthesize AgNPs. Again, use of animal material particularly mammals is issue of ethical constraints. Use of microorganism is laborious and requires more storage system. Hence in the present study, an attempt has been made to prepare AgNPs from leaf extract of Lantana camara, a medicinal plant (Ghaneri in Marathi). Synthesized AgNPs were characterised by UV-Visible and FTIR analysis. Its antimicrobial activity was studied on two strains of bacteria namely Gram positive Staphylococcus aureus and gram negative Escherichia coli. Results obtained were interesting, which increased further curiosity of research.

**Keywords**: Silver nanoparticles, Lantana camara, Green synthesis, Characterisation, antimicrobial activity.

**PA-38**

# Electrical and Thermal Properties of Polyaniline – Cadmium Sulphide Nanocomposite with Photovoltaic Application

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## Abstract

Nanocomposites of conducting polyaniline with CdS nanoparticles have been synthesized by insitu polymerization method. A series of the nanocomposites have been synthesized by varying the weight percentage of CdS. DC conductivity of the pure PANI polymer and doped with different wt. % of CdS was measured in the temperature range 308 to 328K by using Ohms law.Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity. Impedance spectroscopy (AC Conductivity) is widely used for investigating the electrical behaviour of material over the wide range of frequency and temperature. This helps to separate the real and imaginary component of electrical parameter.The impedance of polyaniline doped with different wt. % of CdS samples was measured at various temperatures over a wide range of frequencies from 0.1-200 KHz.Thermal properties of pure PANI and PANI- CdS nanocomposite were evaluated by TG/DTA in the temperature range 0 oC to 500 oC. The PANI-CdS composite based thin film solar cell device structure consists of glass/ITO/PANI-CdS/Ag. The I-V characteristics is studied to calculate efficiency of the solar cell.

**Keywords**: Polyaniline, CdS, TG/DTA, DC, Impedance Spectroscopy, Photovoltaic Cell

**PA-39**

# Nanoparticles of Transition Metal Oxides Cozo for Antibacterial Application

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## Abstract

Nanoparticles (NPs) of transition metal oxides, copper oxide and zinc oxide (COZO) have unusual properties due to the unique nature of outer d-electrons. Nano COZO have played significant role in antibacterial applications. In this study, the NPs of zinc and copper were prepared by one pot chemical synthesis method. The nanocomposites of COZO was prepared in presence of acetone organic media with 1:1 mole ratio at room temperature. The particle size was found in the range of 20-40 nm from XRD analysis which was very well reflect in SEM analysis. The antibacterial activity of COZO NPs was examined on two microorganisms, E. coli and S. aureus by means of the agar well diffusion test. Results of antibacterial activity of COZO nanocomposites shows higher zone of inhibition (ZOI) towards S.aureus as compared to E.coli.

**Keywords**: nanoparticles; copper; zinc; antibacterial activity

**PA-40**

# Electrodeposited Cobalt Oxide Thin Films for Electrochemical Study

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## Abstract

In the present study interconnected nanoflakes of cobalt oxide Co3O4 as thin film were deposited potentiostatically (Bulk electrolysis) at -1.1V and for time 2 minutes on stainless still (SS) substrate using CH instrument. Structural and Morphological properties were studied by X-ray diffraction (XRD), Fourier transformation infrared spectrometer (FT-IR), Energy-dispersive X-ray spectroscopy (EDS), Field emission scanning electron microscopy (FE-SEM), etc. The electrochemical properties were studied in 1M KOH using cyclic voltammetry (CV), galvanostatic charge-discharge (GCD) technique, and electrochemical impedance spectroscopy (EIS). The Co3O4 nanoflakes deposited at -1.1V for 2-minute exhibit specific capacitance of 136 Fg-1 at the current density of 1mA.

**Keywords**: Cobalt oxide, electrodeposition, Supercapacitor, CV, GCD, EIS.

**PA-41**

# Density Functional Theory Based Investigation of Allantofuranone and related γ-lactone - containing Compounds

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## Abstract

The structure of Allantofuranone and related γ-lactone containing compounds were optimized with Density Functional Theory (DFT) using B3LYP method with 6-31G (d,p) basis set. The molecular geometry, bond lengths, bond angles, atomic charges and HOMO-LUMO energy gap have been investigated. Structural parameters have been compared with the available experimental results, and structure-activity relationship was also studied. In general good agreement between the calculated and experimental structural parameters have been observed.

**PA-42**

# Spray Deposited Bi2WO6 Thin Films for Photocatalytic Application

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## Abstract

The Bi2WO6 thin films are synthesized by simple and cost-effective chemical spray pyrolysis technique. The effect of substrate temperature on Bi2WO6 thin films have been studied. The crystalline study confirmed that Bi2WO6 films exhibits orthorhombic crystal structure with P21ab space group. The optical study suggested that the bang gap energy is affected by deposition temperature. The PEC, morphological and photocatalytic properties will be studied for photodegradation of various organic pollutants under solar irradiation.

**Keywords**: Bi2WO6 thin film photocatalyst; Structural and optical properties

**PA-43**

# Synthesis & Characterization of Fe3O4 Magnetic Nanoparticles Using Chemical Coprecipitation Method

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## Abstract

In this work we have synthesised magnetite nanoparticles by facile chemical route by optimizing various preparative parameters viz. pH of the solution, reaction temperature and stirring time. The ferrite nanoparticles with good control over its particle size can be obtained at pH equal to 8, temperature at about 80 degrees and vigorously stirring for about half an hour. The chemical coprecipitation method is low cost and fast method over others to get Fe3O4 nanoparticles. Further study reveals that the use of sodium hydroxide shows better result than ammonium chloride to adjust pH of the solution to achieve coprecipitation.

The powdered sample was characterized by X-ray diffraction and Fourier Transform Infra-Red techniques. Result shows formation of single-phase spinel structure of the sample. The particle size is about 10 nm. The sample shows negligible strain obtained by Williamson-Hall method. The IR studies confirm different bonds in the Fe3O4.

**Keywords**: Chemical Coprecipitation, Ferrite, Magnetite, Nanoparticles, X-ray diffraction.

**PA-44**

# Efficacy of Galvanostatically Electrodeposited Cobalt Oxide Electrode for Supercapacitor Application

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## Abstract

The present research work is an analytical report of electrodeposited Cobalt oxide electrode, deposited on stainless steel substrates, at room temperature using Cobalt acetate as the precursor solution by galvanostatic route. The as-deposited electrode annealed at 500°C, was analyzed by X-ray diffraction technique for structural analysis and by SEM for morphological analysis. Electrochemical analysis of the as-deposited Cobalt oxide thin film electrode was conducted in aqueous 1M Na2SO4 electrolyte by performing cyclic voltammetry and galvanostatic charge-discharge analysis to investigate supercapacitive behavior of the electrode material. The thin film Cobalt oxide electrode showed maximum Specific capacitance of 295 Fg-1 at 5mVs-1 scan rate in 1M aqueous Na2SO4 electrolyte with specific energy 4.9 Whkg-1, Specific Power 4 kWkg-1. The experimental analysis and evaluated parameters recommended that, Cobalt oxide is rising electrode material that can be used in supercapacitor application.

**Keywords**: Thin film, Supercapacitor, Cobalt oxide, Electrodeposition, Cyclic voltammetry, Charge–discharge.

**PA-45**

# Enhancement in Electrical Properties of Al/Al2O3/TiN MIM Capacitor on Si Substrates

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## Abstract

This work explores the Metal-Insulator-Metal (MIM) capacitors with TiN as a top metal layer and Al2O3 of about 20 nm as an insulating layer were fabricated to address low leakage current in the range of nanoampere and capacitance in the range of femtofarad of capacitors for RF and secondary power supply applications. Plasma enhanced atomic layer deposition system is used to deposit Al as a bottom metal layer and Al2O3 high-k oxide layer to guarantee a good composition and thickness control and Sputtering was used to deposit TiN-top metal layers. The impact of the deposition process and post deposition annealing treatment conditions on the MIM capacitor's leakage current and capacitance are studied.

**Keywords**: MIM Capacitor, High-k Dielectric, RF, PEALD.

**PA-46**

# Uniform Excellent Adherent Zinc Oxide Thin Films by CBD method

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## Abstract

Zinc oxide (ZnO) nanoparticles offers excellent structure property correlation making it highly researched nanomaterial among the semiconducting materials. The Zinc oxide material is also extensively used in industrial products such as paints, cosmetics, rubber and solar energy devices. The Zinc oxide thin films can be prepared by number of techniques including physical and chemical methods. In the present work, the zinc oxide thin films were prepared by simple chemical bath deposition (CBD) method. The process parameters of chemical bath deposition are so adjusted to get uniform well adherent thin films on glass substrate. The prepared Zinc oxide thin films were characterized by X-ray diffraction and FTIR analysis. The X-ray diffraction pattern confirms hexagonal crystal structure of the nanoparticles without any impurity. The average crystallite size was determined using Debye Scherrer's Formula. The FTIR analysis carried in ATR mode revealed characteristic signature peaks of ZnO nanoparticles indicating the formation of nanoparticles. The ZnO nanoparticles obtained by chemical bath deposition shows the potential applications of the films in the solar cell applications.

**Keywords**: Chemical bath deposition, Zinc Oxide, thin films, XRD, FTIR.

**PA-47**

# Synthesis and Characterization of Silver Decorated TiO2 Nano-Particles for Enhanced Photocatalytic Activity

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## Abstract

Ag decorated TiO2 NPs was synthesized by sol-gel technique. Transmission electrons microscope image reveals size of plate shape granules of anatase form of TiO2 NPs in the range 50-100 nm and Ag NPs shapes find to be in spherical form. The photocatalytic activity is studied by degradation of methylene blue (MB) in ultra violet rays which reveals silver doped on TiO2 enhances the photocatalytic activity of TiO2 in methyl blue degradation in UV-radiation, because of effective e-s trap by silver. We also observed that due to the presence of silver on the surface of TiO2 the degradation rate was fast as compared to bare TiO2. Scanning electron microscope image of Ag-TiO2 reveals agglomerate of particles of small spherical size and silver distribution on TiO2 surface is non-uniform. The prepared Ag coated TiO2 NPs dispersions shows a surface plasmons band, which was red shift at 418 nm in comparison with the bare silver. Ag-TiO2 was characterized by the analytic technique like, UV Vis absorption spectra, X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM),

**Keywords**: Ag-TiO2, methylene blue, photo-catalysis; hybrid nanostructures; electron-hole pairs

**Acknowledgements**: Vijay is thankful to the PDM University and GGSIPU for providing research facilities. JRA is thankful to GGSIPU for FRGS grant.

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**PA-48**

# Study of Different Natural Dyes for Dye Sensitized Solar Cell

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## Abstract

Dye sensitized solar cell (DSSC) converts visible light into electricity. Now a day's most of the researchers have focused their attention on dyes extracted from natural resources. Application of natural dyes is a promising development in the field of this technology. In this paper extract of beet root, black berry and pomegranate was used as a natural dyes to study the performance of this dyes on the DSSC. From the overall study of natural dyes it was observed that the solar cells sensitized with beetroot dye gives maximum efficiency as compared to natural dyes. The common element among all the Dyes is that they increase absorption of the cell in the visible region.

**Keywords**: Dye synthesized solar cell; X-ray powder diffraction; working electrode; counter electrode; cell fabrication.

**PA-49**

# Biosynthesis of Zinc Oxide Nanoparticles from Biophytum Sensitivum and its Applications

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## Abstract

Biological methods can be used for the greener synthesis of nanoparticles. Biosynthetic routes provide nanoparticles of better defined size and morphology and are often clean, safe and cost effective. Among various nanoparticles, zinc oxide nanoparticles (ZnONPs) are versatile semiconductors that display significant optical transparency and luminescent properties in UV-Visible regions. Zinc oxide nanoparticles (ZnONPs) have become important in recent years due to their excellent chemical and thermal stability . In this project, zinc oxide nanoparticles were synthesised from the leaves of Biophytum sensitivum using 0.05 M Zn(NO3)2 solution . A white coloured powdered material was obtained as a result of synthesis .The synthesized nanoparticles have shown absorption peak at 360nm under UV Visible spectroscopy. The detailed analysis of the synthesised nanoparticles in the context of size , morphology and structure were studied using various techniques like scanning electron microscopy (SEM) , transmission electron microscopy (TEM) , X-ray diffraction (XRD) and FT-IR. These biosynthesised nanoparticles have also shown antimicrobial activity against gram positive and gram negative bacterial strains , which were carried out using agar well diffusion method . These Zinc oxide nanoparticles can also be used as a nanofertilizers in zinc deficient soil .

**Keywords**: Zinc oxide nanoparticles (ZnONPs), Biophytum sensitivum, UV-Visible spectroscopy, SEM, TEM, XRD, FT-IR, gram positive bacterial strains, gram negative bacterial strains, nanofertilizers.

**PA-50**

# A Facile Synthesis of Cr doped WO3 Nanocomposites and its Effect in Enhanced Current-Voltage and Impedance Characteristics of Thin Films

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## Abstract

In this study we report the enhanced impedance and current-voltage (I-V) characteristics of Cr doped WO3 in different % wt. (5 wt. %, 8 wt. %, 15 wt. %) ratio synthesized by co precipitation method using surfactants. The nanostructures were characterized by cyclic voltammetry (CV), scanning electron microscopy (SEM), X-ray diffraction (XRD), UV-Visible (UV-Vis) spectroscopy, pelletized samples performed I-V and impedance measurements. The impedance results reveal that the pelletized samples of highest doped Cr showed remarkable increase in admittance with respect to the biased voltage. I-V characteristics of the highest doped Cr showed enhanced surface conductivity as compared with the resistance applied current. The output power considerably increases for the 15 wt. % of Cr doped WO3 and as the doping percentage of Cr increases surface conductivity, power output, admittance considerably enhances in the material matrix. This work demonstrated that Cr doped WO3 has more sensitivity towards current and voltage and impedance value considerably varies with the applied bias voltage. The nanostructure can be a versatile material for superconductor, sensing of various gases as its greater value of impedance can help in its use in electronic devices stimulus detection of various gases and super capacitor applications.

**PA-51**

# Magnetodielectric and Magnetoelectric Effects in LSMO and BCZT Composites

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## Abstract

Ba0.925Ca0.075Ti0.925Zr0.075O3 (BCZT) is a ferroelectric material known to possess ferroelectric transition temperature Tc in the vicinity of room temperature is chosen to investigate their possible magnetoelectric (ME) and magnetodielectric (MD) applications. The La0.67Sr0.33MnO3 (LSMO) is selected to be ferromagnetic phase. Here hydroxide co-precipitation route is adopted so as to synthesize of LSMO of 23.55 nm crystallite size and ceramic synthesis route is adopted for the synthesis of BCZT of 55.44 nm crystalline size. Starting with the LSMO and BCZT powders, the composites yLSMO + (1-y)BCZT = yLBCZT are synthesized for y = 0.10, 0.15 and 0.20. The parent composition of LSMO as well as the BCZT are characterized for dielectric and magnetic properties to confirm the formation of the desire ferroelectric and magnetostrictive phases. The composites are investigated for the structural and microstructural analysis, dielectric, magnetoelectric and magnetodielectric properties. The results show that the composite La0.67Sr0.33MnO3 - Ba0.95Ca0.05Ti0.925Zr0.075O3 exhibit excellent ME and MD properties simultaneously. The results on the ME and MD properties are understood in terms of the stress induced variations in polarization and dielectric constant respectively.

**Keywords**: BCZT, LSMO, Ferroelectric, Magnetoelectric, Magntodielectric.

**PA-52**

# Spectroscopic Studies on Concentration Dependent Europium Ions Doped Alkali Lead Boro Tellurite Glasses

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## Abstract

To study the concentration dependency on spectroscopic properties, the stable and transparent alkali lead boro tellurite with a small variation of europium oxide glass samples were prepared with a conventional melt quenching technique. For the obtained glasses characterizations and analysis are made with tools like X-ray diffraction, Fourier transform infrared spectroscopy (FTIR), Raman spectrometer, MAS-NMR spectrometer and scanning electron microscopy (SEM). Non-crystalline nature was proved by XRD and also the scanning electron microscope (SEM) technique. FTIR measurements specify the bound structure of the obtained glass system depends on BO3 and BO4 entities insertion into unusual structural groups and also by interlaced TeO3 and TeO4units. Presence of boroxol rings was confirmed by the Raman spectra analysis. The achieved data for prepared glasses reveal the information that modifications in glass structure due to insertion of europium into the glass matrix.

**Keywords**: Lead boro tellurite glass; FTIR; Raman spectra; MAS-NMR.

**PA-53**

# Self-cleaning Photocatalytic $TiO_2$ Coating on Marbles

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## Abstract

Mostly white marbles are prone to damage by air and water pollution. The continuous degradation of monuments due to organic pollutants may soon become irreversible. A transformation of surface wettability of TiO2 film into superhydrophilic state and subsequent decomposition of organic pollutants by UV exposure leads to self-cleaning phenomena. Herein, photocatalytic, superhydrophilic self-cleaning TiO2 films were applied on white marbles through dip coat technique. A silica sol was prepared by sol-gel processing of TEOS using nitric acid as catalyst. The TiO2 nanoparticles (20 to 100 mg) were dispersed in silica sol and the marble piece were dip coated with different deposition times (1 to 10 min). The silica-titania films exhibited smooth surface morphology with contact angle less than 10° after 2 hr of UV irradiation confirming excellent photocatalytic activity.

**Keywords**: Self-cleaning, TiO2 coating and photocatalytic.

**Acknowledgements**: The authors are grateful to the Sakura Exchange Program in Science, Japan Science and Technology Agency (JST), S. S. Latthe is grateful to the Department of Science and Technology (DST).

**PA-54**

# Electrochemical Non-Enzymatic Hydrogen Peroxide Reduction

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## Abstract

We have synthesized highly stable metal free tyramine functionalized graphene (T-GO) based electrocatalytic system. The surface functionalization of tyramine on graphene were carried out by using chemical route and these sheets were further characterized by using scanning electron microscopy (SEM), X-ray diffraction (XRD), Raman and FT-IR spectroscopy, and UV-visible spectral analysis. More significantly, the combined results morphological and structural studies reflect few layer graphene formations (200 nm) with effective functionalization by tyramine on large scale. As a metal-free electrocatalyst, the as-synthesized T-GO showed good electrocatalytic activity towards reduction of H2O2 with the sensitivity of 0.105 mM −1 cm−2 confirmed by using cyclic voltammetric (CV) and linear sweep voltammetric (LSV), amperometric (i-t) measurements. The lower onset potential (-0.23 mV vs SCE), lower detection limit, wider concentration range (10 mM to 60 mM) with higher electrochemical current and potential stability demonstrates novel, non-enzymatic and cost-effective T-GO based electrocatalytic system towards reduction of hydrogen peroxide.

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**PA-55**

# A Preliminary Study of Tropospheric Ozone Concentration over Pune by using Eva Spectrometer

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## Abstract

Tropospheric ozone is also commonly known as ground-level air pollutants which are produced due to the fast development of the economy and society around the world. In our modern society ozone is considered a substance that touches on our society in many ways. [1] This work aims to use the EVA spectrometer for estimation of the ozone concentration over Pune. It consists of input variables such as relative humidity, temperature, the concentration of ozone, the concentration of nitrogen dioxide obtained from routine monitoring, and the data recorded. The preliminary findings show that the meteorology conditions and emission patterns play an important part in influencing the ozone concentration. However, a single network is sufficient enough to estimate the concentration despite any circumstances. Thus, it can be concluded that the EVA spectrometer is able to give reliable and satisfactory estimations of ozone concentration. [3]

**PA-56**

# Terminalia Catappa Fruit Shell Derived Activated Carbon Adsorbent for Removal of Dyes

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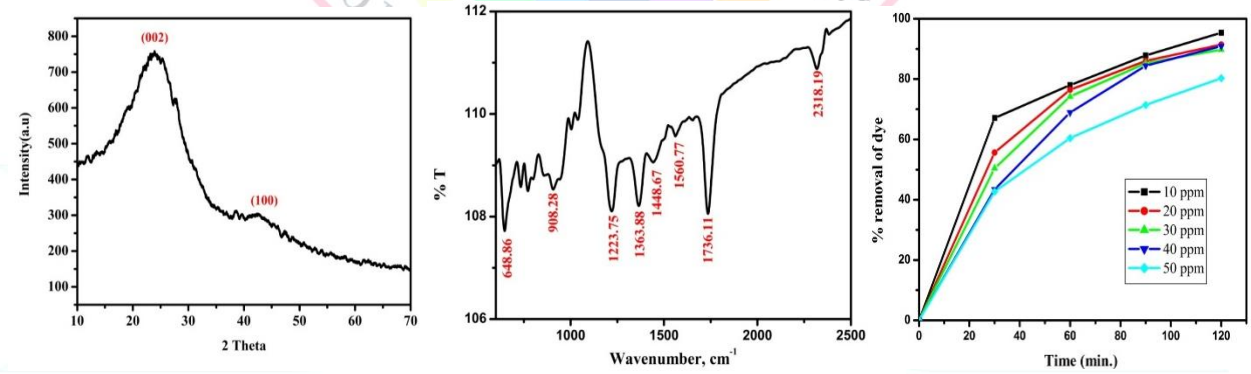
## Abstract

Low cost activated carbon was prepared from Terminalia catappa (Indian almond) using simple acid carbonization method. The amorphous nature of obtained activated carbon was confirmed from XRD pattern. The functional groups associated with an activated carbon are determined using FTIR spectrophotometer. The FTIR spectrum shows peak at 2318.19, 1736.11, 1560.77, 1448.67, 1223.75 $cm^{-1}$ confirm the functional groups O=C=O stretch, strong C=O stretching, medium C=C stretching, C-H bending, strong C-O stretching respectively while below 1000 $cm^{-1}$ shows presence of alkenes. The moisture content and volatile matter of carbon was found to be 4.92% and 6.55% respectively which can be consider as a good source of carbon. This obtained activated carbon was used as an inexpensive and effective adsorbent for removal of dye using methyl orange as a model dye. It was found that the activated carbon is efficiently removes 95.3% of dye at pH 7.2 in 2.30 h.



**PA-57**

# Investigation of Curie Temperature and Structural Transition of $BATIO_3$ based Electroceramics

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## Abstract

The lead-free Ba0.97Ca0.03Ti0.65Sn0.035O3 (BCTS) ceramics were synthesized by solid-state reaction. Curie temperature and temperature dependant structural transitions of BCTS ceramics is studied using dielectric, ferroelectric and Raman spectroscopy. At room temperature BCTS revealed the formation of tetragonal perovskite structure without trace of any secondary phase formation, which is evidenced by X-ray diffraction and temperature-dependent Raman spectroscopy study. Dense microstructure with irregular grain distribution with an average grain size of 30µm, having bulk densities of 5.86 g/cm3 is observed. The temperature dependent dielectric study reveals three polymorphic structural transitions corresponding to the rhombohedral to orthorhombic (TR-O), orthorhombic to tetragonal (TO-T) and tetragonal to cubic (TC) phase transitions. The BCTS composition gives TR-O at -50 ℃, TO-T at 20 ℃, TT-C at 118 ℃. Temperature dependent polarization-electric field (P-E) hysteresis loops provide information about the ferroelectric to paraelectric structural transition of BCTS ceramics for composition which supports the temperature-dependent dielectric and Raman spectroscopy studies.

**Keywords**: BaTiO3, Ferroelectrics, Curie temperature, Raman spectroscopy, Phase transition.

**PA-58**

# Synthesis and Characterization of Mn doped Zinc Ferrite Thin Films

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## Abstract

The MnxZn1-xFe2O4 (x=0.0-0.5) thin films were deposited onto the preheated ITO substrates using simple and cost effective chemical spray pyrolysis technique. These Mn substituted ZnFe2O4 thin films were characterized for their structural and morphological properties. The synthesized thin films were characterized by X-ray diffractometer (XRD), Field emission scanning electron microscopy (FESEM) and water contact angle measurement. XRD patterns shows MnxZn1-xFe2O4 (x=0.0-0.5) thin films exhibits spinel cubic crystal structure. Field emission scanning electron microscopy (FESEM) images shows that porous and nodular morphology of thin films for energy storage applications. MnxZn1-xFe2O4 (x=0.0-0.5) thin films show water contact angle in hydrophilic range. Spinel ferrite prepared by spray pyrolysis technique have tremendous amount of applications. The present work is to be carried to measure energy storage properties and memristor applications of Mn doped ZnFe2O4 thin films.

**PA-59**

# Study of Brachiostochrone Problem – Method of Calculus of Variation

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## Abstract

One of the numerous challenging issues in science at its solution level as well as demonstration is the Brachiostochrone problem. Though straight line is the shortest path between any two points lying in a plane, it's not the path of least time for a particle falling under gravity. Neither an arc nor smooth rectangular path can be proved to be path of least time. Theoretically cycloid can be proved, and can be demonstrated practically using model, to be path of least time between any two points; not exactly below one another for a particle falling under gravity. The equations of trajectory are: x=a(1-cos θ ) andy=a(θ-sin θ ). In the present problem techniques of calculus of variation are used to get the path of the particle. A practical model developed can used to demonstrate the path of least time as well as time taken is same irrespective of initial position of particle (ball) on the cycloid. The trajectory for cycloid can be drawn using any drawing techniques or calculating coordinates of points using Excel sheet and can be plotted using origin software.

**Keywords**: Brachistochrone, calculus of variation, cycloid, trajectory, shortest time.

**PA-60**

# Cadmium Oxide Nanoparticles Embedded Polyaniline Nanocomposite as LPG Sensor

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## Abstract

Polyaniline and CdO embedded Polyaniline samples were successfully synthesized by photo-induced polymerization method with various concentrations of cadmium nitrate. Sensor samples, fabricated in the form of thick films, were subjected to spectroscopic and structural characterization using UV-Visible spectroscopy, FTIR and XRD, SEM techniques respectively.

Analysis of XRD peaks of Pure PANI and PANI-CdO composite exhibits structural change and percentage of crystallinity. The FTIR peaks of PANI CdO exhibits shift towards lower wave length because of the formation of hydrogen bonding. The morphology of the nano composites is studied by means of SEM. The synthesized materials were further used for sensing various gases like LPG, Ethanol, NH3, CO2, H2 and H2S gas. The sensing abilities, including sensitivity, selectivity, response time and recovery time, long term stability to various gas concentrations, ranging from 50 ppm to 1000 ppm, were investigated. Polyaniline-CdO nano-composite would be a good candidate for application of LPG sensor.

**Keywords**: PANI-CdO, LPG sensor, XRD, polyaniline

**PA-61**

# Estimation of Electron – Vibration Interaction Parameters in Inorganic Phosphors using Python Language

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## Abstract

It is observed that the luminescence inorganic phosphors are widely used in light emitting devices, sensors, displays, light sanitizers and many others. Therefore these materials are extensively study by researchers from many years. Some of these phosphors show photoluminescence spectra in ultra – violet to visible region which can be used in up and down conversion of inorganic phosphors. In this study of Electron Vibrational Interaction (EVI) parameters such as Huang – Rhys factor, effective phonon energy and zero phonon line position from the experimental results and also regenerating stimulated emission spectra using the estimated parameters. To estimate and stimulating the theoretical graphs we coded python programs.

The presented work orients around europium (Eu) and cerium (Ce) rare earth doped inorganic phosphors for which the experimental data is already available. We fitted these curve to get initial values to estimate EVI parameters. Later by using python language we regenerate the PL graphs for studied samples.

**PA-62**

# Interfacial Interactive Ternary Copper Supported Polyaniline/Multiwalled Carbon Nanotube Nanocomposites Antibacterial Activity

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## Abstract

Ternary copper supported polyaniline multiwalled carbon nanotubes (Cu NPs-PANI/MWCNT) nanocomposites have been designed for antibacterial activity. The X-ray diffraction technique confirmed the presence of copper nanoparticles and TEM analysis illustrating the existence of copper nanoparticles on the surface of polyaniline along with MWCNT which reveals the formation of ternary nanocomposites. In the FTIR spectrum shifting of peaks reveals alteration of structure in polymer backbone because of chemical interaction with several positional sites of PANI. The decrease in intensity photoluminescence signifies the lower electron-hole recombination process. It also discloses that maximum numbers of electrons are available for antibacterial activity. Antibacterial activity of Cu NPs-PANI/MWCNT nanocomposites is higher against pathogenic bacteria. Thereafter, multifold applications of ternary nanocomposites have led to broad scope in the field of environmental and healthcare sectors.

**Keywords**: Antibacterial, Ternary nanocomposites

**PA-63**

# Facile Synthesis of Copper Oxide Thin Films for Glucose Sensing

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## Abstract

In the present study, copper oxide thin films are deposited via successive ionic layer adsorption and reaction (SILAR) method onto the stainless steel (SS) substrate. The glucose sensing properties of prepared copper oxide thin films are studied. Along with glucose sensing properties, the structural, morphological and electrochemical properties are studied using X-ray diffraction spectroscopy, field emission scanning electron microscopy and cyclic voltammetry technique with the variation of SILAR cycles. X-ray diffraction analysis is used to study phase formation and to find out the crystallite size. The XRD study reveals that deposited copper oxide thin films are monoclinic in nature.

**Keywords**: Copper oxide, SILAR, X-ray diffraction, FE-SEM, Cyclic Voltammetry

**PA-64**

# Synthesis of Tungsten Oxide Nanoparticles by Hydrothermal Method for Dye Degradation

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## Abstract

Pristine and vanadium, ruthenium doped tungsten oxide nanostructured powder was synthesized by using different precursors and surfactants by hydrothermal and co-precipitation routes. We obtained spherical, cubic, tetragonal and plate-like morphology of tungsten oxides. The WO3 in Pristine form have crystallite size of ~50 Å which increases to 75 Å on doping of vanadium. The optical absorption studies indicates band gap of 2.58eV which increases on doping of vanadium. The PL measurement of V doped WO3 shows an emission band at 400nm which matches well with the reported value.The results show about 65% photocatalytic activity for degradation of Methyle Blue dye in vanadium doped tungsten oxide.

**Keywords**: Tungsten Trioxide, Methyle Blue Photocatalytic

**PA-65**

# Study of Effect of Zinc Source on Properties of ZnS Thin Films for Photovoltaic Applications

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## Abstract

Nano-crystalline zinc sulfide (ZnS) thin films have been prepared on glass substrate using a simple and inexpensive chemical bath deposition (CBD) technique using various zinc sources. Zinc acetate, zinc sulfate, zinc chloride and zinc iodide were used as zinc ion source whereas thiourea was used as sulfur ion source. Ammonia and TEA were used as complexing agents. All the physical conditions were kept constant while growing the films.

The structural, morphological and optical properties have been studied using x-ray diffraction (XRD), scanning electron microscope (SEM) and UV-VIS spectrophotometer for the photovoltaic applications. The structural study shows all the films have pure cubic structure with grain size ranging between 5.29 and 8.78 nm. The optical band gap measured was found in between 3.21 to 3.42 eV.

**Keywords:** Zinc sulfide, CBD, nano-crystalline thin film, zinc source.

**PA-66**

# Plant Mediated Synthesis of $SnO_2$ Nanostructures and their Application in Photocatalysis

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## Abstract

An innovative green route has been demonstrated for the synthesis of SnO2 nanostructures using aqueous leaf extract of Syzygium cumini which acts as a reducing and stabilizing agent. The prepared SnO2 nanostructures were characterized by host of different techniques such as X-ray diffraction (XRD), diffuse reflectance spectroscopy (DRS), fourier transform infrared spectroscopy (FT-IR) and Brunauer-Emette-Teller (BET) surface area analyzer. The XRD pattern confesses that the diffraction peaks are in good agreement with tetragonal rutile SnO2 ( JCPDS no.41-1445) and the average crystallite size of SnO2 was found to be 5 nm which is calculated from the X-ray line broadening of peaks by using Scherrer's formula. The DRS absorption spectrum was used to calculate band gap of material and it is found to be 3.56 eV. The FT-IR spectra indicate the presence of different fnctional groups which are responsible for biochemical transformations. The surface area of material was determined using BET surface area analyzer and it was found to be 101 m2g-1. SnO2 nanostructures were subjected to photocatalytic degradation of methylene blue (MB) under UV light. The photodegradation efficiency of MB was found to be 97% within 150 min under UV light radiation.

**Keywords**: Plant mediated, SnO2 nanostructures, photodegradation.

**PA-67**

# Solar Cell Materials: It's Role in Solar Energy by 2030

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## Abstract

Photovoltaic are an efficient, clean and sustainable way to generate electricity. By increasing the efficiency of photovoltaic solar panels and reducing their initial cost we can move ahead. Most commonly used materials for solar panels are crystalline and amorphous silicon (Si) and gallium arsenide (GaAs) having conversion efficiency up to 22%.

The challenges ahead are increasing level for higher efficiency and lower cost. Fortunately some new materials are showing promising signs; solar cells containing thin film metals are showing a high solar cell efficiency of 22.2%. Perovskite solar panel materials to cost less than silicon materials and they are more lightweight.

A thin film solar cell is a second generation solar cell that is made by depositing one or more thin layers of thin film of photovoltaic materials. These materials are Cadmium Telluride (CdTe), Cadmium Sulphate (CdS) and composites of these materials.

Increasing demand of electricity day by day, by 2030, the solar energy will play vital role for India and more than 50% of electricity generation will be by solar energy.

**PA-68**

# Chemically Modified IPN Guar Gum Grafted Polyacrylimide Hydrogels for Sorption of Metals Ions

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## Abstract

Interpenetrating network systems compaiting of guar gum(GG) & polyacrylimide(PAAm) have been made by chemical crosslinking in aqueous medium.Simaltanoius polymerization & crosslinking has been achieved using potissumpersulfate (KPS) as initiator & metylene-bis-acrylamide (MBA) & gluteraldehyde (GA) as crosslinking agents. The acrylamide groups in the gel network have been subsequently hydrolyzed partially by saponification reaction.The gels have been charterized by FTIR, DSC, TGA & SEM techniques. The pH responsive swelling behavior is exhibited by gels prior & on chemical modification of amide groups. The gel with amide functionality swell to higher extent under acidic pH condition, where as on hydrolysis the gel showed higher swelling under neutral condition. The possibility of developing cost effective, environamentaly friendly, effluent treatment materials, using the present hydrogel system has been explored. The metal uptake capacity of the IPN gels for different metal ions such as cu2+,Ni2+,Pb2+ etc,has been determined under different pH conditions. Promising results have been obtained with the metal ions uptake capacity of >80%.

**PA-69**

# Synthesis and Thermoluminescence Response of Tb DOPED $CaSiO_3$ PHOSPHOR for Radiation Dosimetry

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## Abstract

Rare earth doped silicate phosphors are known to be the promising host materials for luminescence because they show excellent properties such as resistance to alkali and acid, good chemical and thermal stability etc. This phosphor has been widely used for LED, solid state lasers, radiation dosimetry and bone-related surgical applications. In this work, the phosphor CaSiO3 doped with Tb in different concentrations (0.01 mol%-0.05 mol%) has been synthesized by solid state reaction method. The formation of the phosphor has been confirmed using XRD technique. Further, the prepared phosphor has been investigated for radiation dosimetry applications by characterizing it for thermoluminescence (TL) measurements. Before taking TL, the prepared samples were annealed and irradiated with 15 Gy dose of gamma radiations from 60Co source. TL studies reveal that Tb doped CaSiO3 phosphor shows high TL intensity of the order of 107 and consist two TL glow peaks centered at approx. 1400C and 2840C. Among the obtained TL glow curves of varied concentrations of Tb in CaSiO3, it is observed that TL intensity of both glow peaks decreases with increase in concentration of dopant Tb. Thus, the phosphor CaSiO3 with 0.01 mol% concentration of Tb shows maximum TL intensity. The decrease in TL intensity with increase in dopant concentration is explained by concentration quenching effects. Also, the nature and type of traps involved in TL phenomenon have been analyzed and well understood by calculating the related TL kinetic parameters i.e. order of kinetics, activation energy, frequency factor and concentration of traps following Chen's peak shape method by deconvoluting the TL glow peaks. The obtained results indicate that Tb doped CaSiO3 is a high sensitive TL phosphor suitable for detection and monitoring of gamma rays.

**PA-70**

# Effect of Surfactant on Crystallite Size ZnO as a Gas Sensor

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## Abstract

A simple, ecofriendly and cost effective HMT, PVP and Triton X-100 various surfactant ZnO thin film gas sensor fabricated using aqueous chemical method. The thin film was investigated structural properties using XRD. The using XRD calculated crystalline size of thin films sensors. However measure gas sensing response with different reducing gas such as ethanol, acetone, LPG, ammonia. The effect of surfactant on crystalline size and gas response were found. The HMT-ZnO Sensor shows maximum response 45% acetone vapors on 100 ppm 325ºC and also HMT-ZnO shows 12s, 28s fast response and recovery time respectively.

**Keywords**: ZnO, Surfactant, XRD

**PA-71**

# Synthesis and Characterization of Leaf Extract (Azadirachta indica) Mediated Green Synthesis of Silver Nanoparticles from widely available Indian Plants

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## Abstract

The green synthesis of silver nanoparticles (AgNPs) has been attracting a lot of attention from chemists and researchers in recent years. In this respect, numerous sources of cost-effective, non-hazardous reducing and stabilizing compounds used in the preparation of AgNPs have yet to be revealed. The applications of nanotechnology are given which emphasizes the importance of nanotechnology in the modern era. AgNPs have been successfully synthesized using a well-known medicinal plant Neem leaf extract. The synthesized AgNPs are crystalline in nature, polydispersed and exhibit high energy SPR band at around 390 nm. A simple green synthesis of stable silver nanoparticles using indica leaf extract at room temperature was reported in this study. The synthesis was found to be efficient in terms of reaction time as well as stability of the synthesized nanoparticles, which exclude external stabilizers reducing agents. It proves to be an eco- friendly, rapid green approach for the synthesis providing a cost-effective and efficient way for the synthesis of silver nanoparticles. Therefore, this reaction pathway satisfies all the conditions of 100% green chemical processes. The AgNPs produced were characterized by different techniques including UV and fluorescence and TEM results indicated that AgNPs were roughly spherical in shape with particle sizes ranged from 20 to 50 nm. Among the various nonmaterial's, silver nanoparticles (AgNPs) have gained much attention due to their unique biological, chemical, and physical properties in contrast to micro and macro counterparts.

**Keywords**: AgNPs, Neem leaf, TEM, UV-Vis.

**PA-72**

# Synthesis of Nano (PANI-SnO2) Composites and Study of D. C. Conductivity

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## Abstract

In the present paper, we report D.C. conductivity on the composite of conducting polymer polyaniline (PANI) with nano crystalline SnO2 powder. The D.C. conductivity of (PANI-SnO2) composite has been investigated. The PANI samples with SnO2 are prepared with different (10,12,15,20,25) wt%. The experimental results showed that the D.C. electrical conductivity increased with increasing the tin oxide(SnO2) concentration and temperature. The nanosize Tin oxide is prepared in the laboratory from SnCl4 & ammonia solution. The polyaniline conducting polymer is synthesized by chemical oxidation method using ammonium persulfate as oxidizing agent. The 20 wt % of nanosize tin oxide (SnO2) powder was added in solution during the synthesis of polyaniline. TEM(Transmission electron microscopy) results shows the particle size of SnO2 in the range of 10-20 nm.

**PA-73**

# Stimuli Responsive Tragacanth Gum-Based Grafted Silver Nanocomposite Hydrogel for Sustained Release Formulations of Diclofenac Sodium

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## Abstract

Free radical polymerization of a mixture of 2-acrylamido-2-methylpropanesulfonic acid (AMPS), ammonium peroxodisulphate and N, N- methylene-bis-acrylamide in the presence of Tragacanth gum (TG) under microwave radiation resulted in the crosslinked graft copolymer network, TG-g-PAMPS. Silver nanoparticles (SNs) were formed and stabilized within by the reduction of silver nitrate using tri-sodium citrate. The hydrogel and its nanocomposite were characterized using FTIR, TGA, XRD, SEM, EDS and TEM techniques. The presence of SNs is observed to enhance the swelling ability of the TG-g-PAMPS gel significantly. Further, the TG-g-PAMPS gels and TG-g-PAMPS-SN were evaluated as matrix materials for the release of drug, Diclofenac Sodium and study the effect SNs on the release. Among the various models, the release data were well fitted into the Korsmeyer-Peppas equation and the release kinetics followed non-Fickian diffusion.

**Keywords**: Tragacanth gum, Microwave radiation, Silver nanoparticles, Drug delivery, Anti-bacterial activity.

**PA-74**

# Synthesis and Characterization of $MnO_2$ by Hydrothermal Method for Supercapacitor

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## Abstract

The $MnO_2$ have been synthesized by a hydrothermal method using the potassium manganate, hydrochloric acid and distilled water. The crystal MnO2 electrode possesses a high specific capacitance with a good power capability. The excellent pseudo capacitive properties a microstructure large tunnel cavity in the Mno2 crystal structure. The as obtained samples were characterized, in the preparation of good quality thin film where optimization of preparative parameters is of vital importance. The different characterization techniques such as thickness measurement, X-ray Diffraction (XRD),Scanning Electron Microscope (SEM), Cyclic Voltammetry (CV), Charging –Discharging (CD), Cyclic Color Voltammetry (CCV) etc, were used for optimization of preparative parameters.

**Keywords**: Manganese Oxide ($MnO_2$) and thin film.

**PA-75**

# An Approach to Harness Energy by CuO Thin Film Electrode by Thermal Evaporation

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## Abstract

The present study reports the growth, structural, morphological and electrochemical characterization of CuO thin films prepared by thermal evaporation method. Structural and morphological characterizations of copper oxide have been carried out by x-ray diffraction (XRD) and scanning electron microscopy (SEM). Electrochemical performance of CuO electrodes have been investigated using cyclic voltammetry, cycle stability and galvanostatic charge-discharge. The cyclic voltammetry curve recorded at a scan rate of 5 to 100 mVs-1 was pseudo rectangular. The CuO electrode shows good supercapacitance in 1M NaOH electrolyte with highest specific capacitance of 270 Fg-1. The present study signifies successful application of CuO thin films as supercapacitor electrode.

**Keywords**: Thermal evaporation, CuO electrode, XRD, SEM and CV.

**PA-76**

# An Efficient andEenvironmentally Friendly Protocol for the Synthesis of 1,4 dihydropyridine Derivatives using Sulfated Tin Oxide NPs

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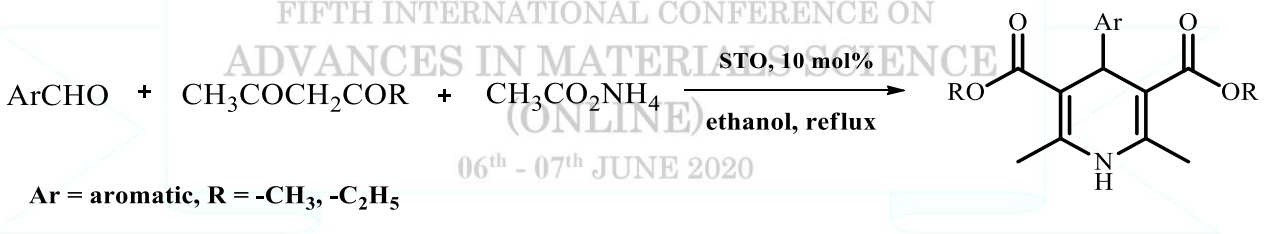
## Abstract

In this investigation, a unique approach for synthesis of 1,4 dihydropyridine has been formulated via one pot condensation of aromatic aldehydes, beta ketoester and ammonium acetate by employing prepared sulfated tin oxide NPs as an exceptional solid acid heterogenous catalyst in ethanol at reflux condition. The synthesized STO catalyst was confirmed by FTIR, XRD, SEM-EDX and studied for BET plots. The reaction was optimized for different solvents and loading of catalyst. The yields of all quinazolinone derivatives were observed in the range of 73-86 %. All the synthesized DHPs were investigated by spectral data. The use of ecologically benign catalyst, good atom economy, environmental affordability and easy work up makes this protocol sustainable.

**Keywords:** Sulfated tin oxide, aromatic aldehydes, ammonium acetate, beta ketoester, 1,4 dihydropyridine




**Scheme:** Synthesis of 1,4 dihydropyridines using STO

**PA-77**

# A Study on Structural Characterization of Y-substituted Zirconolite Ceramics for Actinides Immobilization

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## Abstract

Nuclear wastes produced during reprocessing of spent nuclear fuel have been a threat to environment due to the presence of long-lived and toxic radionuclides. For the development of nuclear energy, the safe disposal of such high-level wastes is crucial and a world-wide challenge. The present study has been underlined in the same context to develop such a nuclear waste form which could be capable to accommodate the radiation effects under repository conditions and over geological time scales. The best approach for the immobilisation of HLWs is the selection of a stable and durable host matrix which can sustain them for more than 500,000 years. Now-a-days, titanate based ceramic, zirconolite has been preferred as a host matrix due to its high radiation and thermal stability, and due to its high loading capacity incorporating lanthanides and actinides without affecting its own crystallinity. In the present work, the loading capacity of zirconolite has been investigated by approaching traditional method of sample synthesis through doping of non-radioactive lanthanide Y as actinide surrogates. For the said purpose, samples have been prepared using solid state reaction with 20% concentration of dopants. Single phase monoclinic structure has been confirmed through XRD and Raman measurements. The microstructural and chemical properties have also been elucidated by SEM-EDS and XPS techniques. It has been concluded that the zirconolite can easily accommodate trivalent wastes with its 20% concentration and retains its structural integrity.

**PA-78**

# Biomaterials for Development of Biosensors and their Applications

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## Abstract

A biosensor could be a potential and innovative analytical device which has a biological sensor with a large range of applications, e.g. pharmaceutical industry, diagnosis, food safety and processing, environmental monitoring, defence, and security.

That the "biosensor" means "biological sensor" It's the device which made of a transducer and a biological element that may be an enzyme, an antibody or a supermolecule. Which means selection of the biomaterial for designing a biosensing element is a vital issue. Of those Enzymes, antibodies, DNA, receptors, organelles, microorganisms likewise animal and plant cells or tissues widely use to come up with differing kinds of sensing system.in biosensor field Techniques for immobilization of the biomaterials have played an important role. Immobilization not only brings about the cordial contact of the biologic catalysts with the transducer, but also helps within the stabilized the biologic system, thus increase its operational and archive lasting nature. Forms of techniques are developed in laboratory for the immobilization of enzymes like multi enzyme systems. Considering Biomaterials for biosensor because they're stable and performance even in highly acidic, alkaline, hydrophobic, or oxidizing environments likewise as stable to warmth and proof against toxic substrates within the processing stream will play a vital role. There is the rationale to increases the demand of biomaterial for the assist in healing (bone plates, screws), improve function like pacemaker and lens, correct the cosmetic problem like chin augmentation also for replacement of diseased or damaged part like Artificial articulatio spheroidea and kidney medical instrument. Also there's glucose biosensors, sensors for cancer detection, sensors for detection of varied drugs like kanamycin, daunomycin, and acetaminophen using differing kinds of biomaterials. Actually biomaterial don't seem to be new for us because romans and Chinese used gold in dentistry.it means biomaterial give combination of chemical and physical properties which match with tissues to enhance the standard of life.

There are various natural biomaterials like chitosan , collagen , and artificial materials like metal oxides , carbon nanotubes (CNT) , and various polymer composites, comprising quantum dots and grapheme also except for natural biomaterials for designing biosensors there also are commercially available biomaterials such as Collagen Type I, Sigma-Aldrich are more prominent and effective.

Natural biopolymer materials like chitosan is widely wont to develop biosensors by protein immobilization due to the charge of chitosan and its special properties like excellent film forming ability and good biocompatibility. Also using chitosan nanogel composites together with quantum dots as a biosensing explore for cancer cell detection. Chitosan is easily modified via chemical and physical reactions to get derivatives of varied structures, properties, functions, and applications. Actually the available biosensor are powerful but still designing Nano biosensors using biomaterial for more applications and for more explore.

**Keywords**: Biosensors, Biomaterial, Immobilization, Natural Biomaterial, Chitosan.

**PA-79**

# Electrochemical Photovoltaic Properties of Chemically Deposited Thin Film Cadmium Selenide as Photoelectrode

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## Abstract

Nanocrystalline cadmium selenide thin films were chemically deposited onto glass and Fluorine doped tin oxide (FTO) glass substrate from an alkaline bath having pH ~ 10 at room temperature (300K). Cadmium acetate and sodium selenosulphite were used as Cd2+ and Se2- ion sources respectively. Characterization was done by X-ray diffraction method, the scanning electron microscope (SEM) and the energy dispersive X-ray analysis (E-DAX). X-ray diffraction study indicates the hexagonal structure. The band gap was calculated as 1.76eV. The photoelectrochemical (PEC) studies of CdSe were carried using polysulphide as liquid electrolyte and platinum as counter electrode. CdSe used as photoanode was proactive under illumination but no significant activity was seen in dark. The photovoltaic output characteristics were used to calculate the fill factor (FF) and solar conversion efficiency (η). The decrease in shunt resistance (RSH) can be due to less number of recombination centers which maybe attributed to the reduced electrolyte contact with the absorber layer.

**PA-80**

# Simple Approach for Rapid Synthesis of Few Layered 2D Graphene Oxide Nanosheets Based on a Chemical Reduction of Natural Untreated Graphite

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## Abstract

The graphite oxide was produced using the Modified Hummers method by oxidizing the natural untreated graphite. Graphene oxide was developed in purified water with ultrasound waves by exfoliating graphite oxide. Using ultraviolet-visible spectroscopy (UV-vis), Fourier transform infrared spectroscopy (FTIR), X-ray powder diffraction (XRD) and Scanning electron microscopy (SEM), the product was analyzed with structural and physio-chemical properties. UV-vis spectra of GO display a maximum absorption peak of ~232 nm, due to $\pi$-$\pi^*$ atomic C-C bond transition. FT-IR and Raman's results showed that graphite oxidized by powerful oxidants was responsible for inserting oxygen atoms into the graphite layer and formed the chemical bond C=O, C-H, COOH and C-O-C. Fabricated Graphene Oxide will be utilized to further green synthesis of heteroatom doped reduced graphene oxide.

**Keywords**: Graphene oxide, Nanosheets, Rapid synthesis, Characterization, Carbon material.

**PA-81**

# Growth and Characterization of Sr Doped L-Arginine Capped Zns Nanoparticles for Optoelectronic Application

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## Abstract

Semiconductor nanoparticles have attracted due to their unique optical properties and potential applications. They are widely studied for the applications in solar cells, semiconducting lasers, sensors, fast optical switches, environmental studies etc. The nano sized particles of these material show a blue shift in the optical absorption spectrum, size dependent luminescence, exhibits strong nonlinear optical effects, modified geometrical structure, chemical bonding, ionization potentials, mechanical strength, melting point etc. The conventional approach for synthesis of nanoparticles involves chemical or physical attrition from bulk into objects of desired sizes and shapes using 'top-down' approach and inverse to the 'top-down' approach is a process also. The chemical synthesis has the advantages of producing size-controlled, un-agglomerated nanoparticles. The tunability of the properties of nanoparticles by controlling their size may provide an advantage in formulating new composite materials with optimized properties for various applications. But applications of these materials are restricted due to different non–radiative relaxations. One important non-radiative relaxation is surface related defects. Most of the physical or chemical properties exhibited by these nanoparticles are due to their crystallites. Further growth in their size is due to agglomeration of these crystallites to form primary particles. In order to control the growth one can, use different organic and inorganic capping agents to passivate the free QD's. To control the growth of nanoparticles organic stabilizers (polymers) e.g. polyethylene oxide (PEO), poly(N-vinyl-2pyrroledone)(PVP), Polyvinyl carbazole(PVK), mercaptoethanol, thiophenol, thiourea , SHMP, sodium polyphosphate, chitosan etc. can be added during the wet chemical synthesis for capping. Such materials have applications in luminescent devices, light emitters, phosphors optical sensors etc. Recently due to advancement in luminescent nanocrystals by successful capping which results in fluorescent labeling by semiconductor QD's for biological detection and tagging has demonstrated its application in many fields. Zinc sulphide is well-studied material due to its luminescence characteristics among other interesting properties. In the present work the synthesis and characterization of ZnS nanoparticles doped with Sr and capped with L-Arginine (ZnS:Sr /L-Arginine) is presented. L-Arginine is used as a capping agent and Sr as a dopant first time. UV Visible spectroscopic study shows blue sift in band gap while Powder XRD study shows the grown nanoparticles have an average dimension about 3.3nm. The photoluminescence study shows strong emissions at 425nm and 525nm.

**PA-82**

# Preparation Nickel Zinc Ferrite Thin Films for Supercapacitor Application

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## Abstract

Simple chemical solution deposition (CSD) method is utilized for preparation of nickel zinc ferrite (NZF) thin films. This deposition method is based on the thermal breakdown of $NH_3$ complex at 227 K. The alkaline nature is varied to 9.8, 9.9 and 10 pH. The effect on the physical and chemical properties was studied by various techniques. The films were characterized by XRD, FT-IR, FESEM and Cyclic voltammeter measurements. The XRD pattern revealed that NZFTF are oriented along (311) plane. The FT-IR spectra showed strong absorption peaks around 600 $cm^{-1}$which confirmed that, material structure is spinel. FESEM study revealed nanostructured flakes like morphology having average thickness between 80-90 nm. The ferrite is nothing but one oxide play vital role in electrochemical supercapacitor application. The specific capacitance in aqueous 1M KOH electrolyte was observed using Cyclic voltammetry (CV). NZF film produced at pH 9.9 solution has porous morphology exhibit specific capacitance 67 $Fg^{-1}$. These thin films used for sustainable development by supercapacitor application.

**Keywords:** Chemical Method, Cyclic voltammetry, Sustainable development.

**PA-83**

# Biomedical Sensors: A Tool for Detection of Viruses

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## Abstract

The semiconducting materials and polymer thin films, especially conducting polymers plays a commanding role in the fabrication of biomedical sensors. Since sensor being an internal part of the biomedical instrumentation system it has foremost importance regarding the important characteristics of the material. In case of biomedical sensors the target analyte interacts with bio-receptor and it is detected through an analyte reaction or the chemical interaction that takes place between them. The sensor translates the molecular changes to a signal which will be detected by any suitable digital detector or instrumentation system. Nowadays, for the detection of viruses antigen-antibody based detectors are available. Today viruses like COVID-19 requires fast diagnosis for advanced treatment of the patient. Most of the biomedical sensors are working on electrochemical reaction, electromagnetism, piezoelectric effect, optical and thermal principle. While manufacturing the biosensor most of the conductive Polymers such as polyaniline and polypyrrole and their derivatives, silicon-based graphene FET nanostructure of conductive Polymers, gold coated carbon nanotubes, Si nanowire etc are mainly used materials. Several new devices are available in the market for detection of viruses like HIV, dengue, malaria, Ebola, hepatitis and many more. In case of biosensors it is obligatory to have more sensitivity, stability, reliability, reproducibility and environmental stability. Moreover the biosensors should be feasible. As a result of detection of the viruses using biosensors is directly related to human health and wellness it should follow the standard of clinical analysis. The need of the hour is to get the accurate results within short period of time. By virtue of this authors made and endeavour to review recent biomedical sensors and instrumentation. Today there is an acute need of the hour to develop reliable biosensor for detection of COVID-19 virus.

**PA-84**

# A Review of the Effect of Gamma and Heavy Ions Radiation on Structural Steels used in Nuclear Reactors

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## Abstract

Fuel claddings and other structural components in various types of nuclear reactor are usually made up of austenitic stainless steels, such as SS 314 and SS316, as these materials must be able to withstand a highly damaging environment in the presence of neutron /gamma /ionic radiations among others factors such as high temperature, structural changes, corrosion and differential stress distributions.

Along with the environmental threats to the integrity of the steels, the generation of new microstructural features in the steels, that are specific to the radiation parameters, occurs. The cumulative result of such microstructural changes is often the production of an alloy microstructure that is not seen in equilibrium conditions. As a consequence of such an evolution in microstructure, we also find macroscopic changes in the physical and mechanical properties, and sometimes we see changes in dimensional stability that are not encountered in any other branch of engineering. The structural integrity and utility lifetime of these structural steels thus can get limited and unless guarded against, can result in catastrophic structural failures of steel structures.

With the nuclear industry being one of the possible renewable source of energy for the future, it is necessary to review the possibly cumulative phase-transformation aspects of all irradiation for the full range of nuclear reactor environments. This review is focused on firstly at describing the radiation characteristics of various reactors environments with a viewpoint of its structural components, and later on, this describes the microscopic mechanical property aspects of these radiations on stainless steels. Individual as well as synergistic effects of various types of radiations are described with our primary focus on gamma rays and heavy ion radiations.

**Keywords**: stainless steel, gamma radiation, mechanical properties, nuclear reactor

**PA-85**

# Hydrothermally synthesis of Nickel Oxide nanostructures: Effect of Urea concentration

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## Abstract

The NiO nanoflakes were successfully synthesized via simple and cost-effective hydrothermal route by varying the urea concentration. The phase formation and crystallinity is characterized by powder X-ray diffraction. The morphology and composition of all NiO samples were studied by using FESEM and EDS, respectively. The increase in urea concentration in NiO precursor causes agglomeration of nanoparticles with distortion of nanoflakes morphology. Furthermore, these NiO samples were utilized for electrochemical studies. Morphology of the sample plays a vital role for boosting the specific capacitance. In this investigation, samples various proportions were used. Among these samples, the NiO with Ni precursor: urea proportion (1:2) shows better supercapacitance about 128 F/g at scan rate of 10 mV/s with capacitance retention about 98.8 % for 500 cycles at 50 mV/s scan rate.

**Keywords**: NiO; Hydrothermal synthesis; XRD; Supercapacitors

**Acknowledgement**: This work is supported by DST- INSPIRE Scholarship.

**PA-86**

# Optical Properties of Terbium Doped $Sr_2GeO_4$ Phosphor

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## Abstract

Terbium doped Sr2GeO4 phosphors were synthesized by using traditional solid state reaction method. The synthesized phosphors are characterized by powder XRD, EDS, SEM and Photoluminescence (PL) studies. The powder XRD patterns of the samples are indexed and are found to form orthorhombic structure. All the elements are present in accordance with the proposed composition, as evidenced by EDS. The photoluminescence studies of terbium doped phosphor exhibit green emission at 543 nm upon ultra violet (UV) excitation. The strong emission peak is ascribed it may be due to the 5D4 →7F5 of Tb3+ ions respectively. The CIE (Commission International de I'Eclairage) chromaticity co-ordinates are calculated from emission spectra and falls in green region. Therefore, this phosphor may become potential alternative for green phosphor in the lamps as well as display devices.

**Keywords**: Phosphor, XRD, EDS, Photoluminescence and CIE

**PA-87**

# Bio-inspired Synthesis of Multi-applicative Cobalt Nanoparticles using Bos Taurus (A-2 type cow) Urine Sample

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## Abstract

The bio-molecules present in cow excreta can successfully reduce cobalt ions into cobalt nanoparticles in a single step. This biogenic reduction of cobalt ions into cobalt nanoparticles (CoNPs) are very rapid, eco-friendly and economical. Interestingly, the cow urine was act as novel reducing agent. The presence of different bio-components especially urea in cow urine may be responsible for reducing the cobalt ion and formation of nanoparticles. This is a rapid and environmentally benign method which has added advantage of reduced reaction time and better control over size and shape. The synthesized CoNPs exhibit excellent antimicrobial and anti-neoplastic activities. X-ray diffraction pattern of reaction product confirmed the formation of cobalt nanoparticles. Antimicrobial activity of nanoparticles determine biogenic potential of the nanoparticles against different microorganism and antioxidant activity determined the potential of free radicals. Both of the antimicrobial and antioxidant activity helps in study application of nanoparticles in veterinary and medicinal sciences.

This is the first report on Biological activities of CoNPs employing cow urine as reducing agent. Antimicrobial activity exposed to synthesis the antimicrobial agents using of nanoparticles in medicinal science. Free radical activity of nanoparticles indicates to damages to the cell wall due to oxidative stress and also support in drugs delivery and drugs development. Synthesize CoNPs are characterized using various characterization tool, such as UV, SEM, TEM and particle size analyzer and Zeta potentials. Etc.

**Keywords**: Bio-inspired Synthesis; CoNPs;Zetapotential, Dye Degradation, ABTS and Antimicrobial etc.

**PA-88**

# Effect of MnO on Dielectric Properties of BaO-Bi2O3-B2O3 Glass System

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## Abstract

Glasses with compositions 20BaO-10Bi2O3-(70-x)B2O3 – xMnO with x= 0, 0.2, 0.4, 0.6, 0.8 and 1 mol% were prepared by melt quenching technique. Dielectric parameters such as dielectric constant (ε′), dielectric loss (ε″) and AC conductivity (σAC) were studied as a function of frequency in the range 100 Hz- 106 Hz. It was observed that ε′ decreases with increasing of frequency in all samples because at high frequencies only electronic polarization is dominating, ionic and orientational polarizations will be disappeared because of inertia between ions and it is most common in oxide glasses. The samples are following non-Debye behaviour at higher frequencies. At low frequencies, the increase in ε′ with increase in MnO is due to enhancing of space charge polarisation, which is also signifying increase in degree of disorder in sample. Dielectric loss (ε″) which describes the energy dissipation in a sample and is measured from loss factor (tan δ) and ε′. ε″ increases with frequency up to certain value then decreases and shows constant value at high frequencies, same trend was observed in samples with different concentrations of MnO in glass series. Peak of dielectric loss is observed for all samples at moderate frequency. The highest peak indicates more dipolar relaxation at that frequency. No shifting in peak is observed with increasing MnO content but peak value varies slightly. It is observed that the σAC increases linearly with frequency and at high frequencies it is almost constant. Dispersion region, where the AC conductivity increases with frequency is observed at low and intermediate frequencies. When MnO is doped into glass network it enhances the concentration of dangling bonds, this is reliable with optical absorption studies of this batch of glasses which indicated the increase in octahedral Mn ions with increasing in MnO content. Plateau, the frequency independent region is observed at high frequencies and it may due to translational motion of ions. There is slight increase in σAC throughout frequency is observed when manganese component is increased. This may be due to enhancing in NBOs, which is confirmed with reduction in density of samples.

**PA-89**

# Textile Apparels – Smart Step towards Electromagnetic Shielding

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## Abstract

Mobile phones, laptops, cellphones and many other electronic gadgets such as television, microwave etc. have become need of today's era. No doubt, they are helpful in our life; but one should also think of the risks associated with the use of these gadgets. The electronic devices emit electromagnetic rays and exposure to these rays affect lives, adversely. Hence, while we use these devices, protection against harmful electromagnetic waves is an essential prerequisite. Electromagnetic shields are the barriers made up of conductive or magnetic materials, which block and reduce the electromagnetic field in a space.

Textile materials in the form of regular apparels can also be converted into a shield, to protect oneself against these electromagnetic waves. The objective of the present study was to develop apparel fabric using conductive yarns. The study was carried out in two different parts. Silver-coated silk filament yarns and silver coated silk -cotton hybrid yarns were used for weaving the fabrics that can shield electromagnetic radiation of cell phones in the microwave range. The developed fabric samples were tested for various performance characteristics including electromagnetic shielding effectiveness. The study reveals that the developed fabrics are suitable for apparels-cum-shields for electromagnetic waves in the range of 300 KHz to 1500 MHz.

**Keywords**: Apparels, Electromagnetic Waves, Shields, Silver, Textile Yarns

**PA-90**

# HgS Sensitized $TiO_2$ using SILAR technique: Semiconductor Sensitized Solar Cells

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## Abstract

Present work demonstrate successive ionic layer adsorption and reaction (SILAR) technique for the sensitization of spin coated titanium dioxide (TiO2) surface with mercury sulfide (HgS) nanocrystals at room temperature (27oC). Preparative parameters such as ion concentration and pH of mercury sulphide precursor have been optimized. The number of deposition cycles has been altered over a range to obtain the conformal coating of HgS nanocrystals over the surface of TiO2. Qualitative confirmation of as deposited TiO2/HgS heterojunction was carried out using various characterizations techniques to study the structural, elemental and optical properties of the deposited films. The TiO2/HgS based photoelectrochemical device was fabricated and showed photoconversion efficiency of about 0.47%. This device was also qualitatively analyzed with the help of electrochemical impedance spectroscopy to know the behavior of electron in the circuit. The electron life time for the device showing 0.47% efficiency is 34.73ms.

**PA-91**

# Biological Material in Self-Healing of Concrete

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## Abstract

Biomineralization process is an innovative technology which can heal cracks in concrete. For this research work, Bacillus sphaericus which is alkali-resistant spore forming bacteria was selected. The ability of these bacteria in repairing cracks in concrete was assessed by checking the compressive strength and water absorption property of bio-remediated concrete. Bio-based agent prepared with various dosage of concrete was introduced in artificial created cracks in concrete. The results revealed that around 15 % improvement in strength and 20 % decrease in water absorption were obtained. This improvement in property of concrete was obtained due to filling of pores in concrete by calcite due to biological process. . The formation of calcite crystals was evaluated by scanning electron microscope (SEM) and XRD analysis. The prepared bacterial strain appear to be appropriate self healing bio-agent to repair the cracks in concrete and would substantially reduce maintenance, repair and not only saves money but would also reduce CO2 emissions as less cement would be required to develop sustainable concrete

**Keywords**: Bacterial self-healing; Mechanical strengths; water absorption, SEM observations.

**PA-92**

# UV Photodetector Properties of ZnO Thin Films Prepared via Chemical Bath Deposition

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## Abstract

Nanostructured metal semiconductor metal (MSM) UV photodetector has been fabricated by using ZnO thin films prepared by using Chemical Bath Deposition (CBD) on glass substrate, with temperature of reaction bath 70˚C and annealing temperature of the ZnO thin films were 400˚C for 5 hours. Thin films exhibits hexagonal crystal structure with preferential orientation along (002) plane. The scanning electron microscopy showed that the prepared film shows nanoflower like surface morphology. The optical properties were examined by UV- Vis spectroscopy, which confirms that ZnO thin exhibit band gap in the UV region of electromagnetic spectrum. The fabricated UV photodetector exhibits fast switching characteristic and higher photoresponsivity at 5V applied bias under illumination of 365 nm UV light (light intensity - 1.8 µW/cm2). These results provided a simple route to fabricate low-cost visible-blind UV photodetectors.

**Keywords**: Zinc Oxide; Chemical Bath Deposition; UV photodetector; Nanoflower.

**PA-93**

# LPG Sensing Properties of Spray Deposited Boron doped ZnO Thin Films at Relatively Low Substrate Temperature

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## Abstract

Boron-doped ZnO:B (BZO) thin films with various doping concentrations have been deposited on glass substrates by spray CVD technique. The influence of doping amount from 0.2 at% to 1 at% in steps of 0.2 on structural, electrical and optical properties of BZO films have been investigated. It is observed that ZnO phase synthesis is hardly affected with the doping concentration, but the preferential orientation of grain growth is influenced progressively. The results imply that the crystallinity and degree of orientation of the B: ZnO films were closely associated to the B doping concentration. Surface Morphology shows striking dependence on the concentration of dopant ions with transition of shapes from triangular columnar pyramids of undoped ZnO into cluster of islands, nanospheres, and finally into petal shaped morphology. AFM topography images reveals that all the film surfaces are well covered with the uniformly distributed spherical grains of varying sizes. It is evidently seen that addition of Boron changes the topography of films from clusters into well defined spherical grains which are correlated with FESEM morphology. Moreover, the Boron doping enhances optoelectronic properties with interference fringe pattern between the wave fronts generated at the two interfaces having maximum average optical transmittance. The extinction coefficient of the films is nearly equal to zero indicating no absorption of light at grain boundary.The effect of Boron doping on the liquefied petroleum gas (LPG) sensing properties were studied. The B: ZnO sensors shows different responses for different nanostructures. The LPG response is higher at an optimum operating temperature of 3250C of the film and it is lower on either side of operating temperature. The response and recovery times of the Boron doped ZnO films were enhanced significantly compared to those reported for ZnO films. The response of 0.4at% Boron doped ZnO film to LPG is considerable than that others.

**Keywords**: Spray pyrolysis; In-doped ZnO films; LPG sensing properties; response time.

**PA-94**

# Electrochemical Properties of Mesoporous NiMn2O4 Nanostructures in Aqueous KOH Electrolyte: Effect of Concentration of KOH Electrolyte

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## Abstract

NiMn2O4 (NMO) nanostructure was characterized by X-ray diffraction (XRD), field effect scanning electron microscopy (FE-SEM), contact angle measurement. XRD study showed the monoclinic phase of NiO. FE-SEM micrograph revealed non-uniform large spherical clusters agglomerated on the surface. Surface wettability study showed that contact angle was hydrophilic in nature. Moreover the electrochemical performances of NMO nanostructure in aqueous KOH electrolyte with different concentration such as 1M KOH, 2M KOH, 4M KOH and 6M KOH were investigated by using cyclic voltammetry, galvanostatic charge–discharge, cycle stability and electrochemical impedance spectroscopy. Results showed that the capacitance of NMO can be easily adjusted by the controlled concentration of aqueous KOH electrolyte. It was found that the specific capacitances of NMO -based electrodes was 594 Fg-1 in 6M KOH electrolyte at the scan rate of 5 mV/s .

**PA-95**

# Performance Evaluation Of Commercial Detergents

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## Abstract

Soiling of textile material affects its aesthetics and cleaning. It is an important aspect of garment life cycle. Laundering includes soaking of the apparels in house hold detergent, actual washing process, squeezing, drying and ironing. The effect of detergent of garment is immediately visible and need to be addressed carefully. Detergents for household use are complex formulations and contain the following major groups of substance: Surfactants, Builders, Bleaching agents, Enzymes and Auxiliary agents. Each of these components has a specific performance during the washing process.The most common fibre used in garmenting is cotton and its blends with polyester. This paper deals with laundering of stained reactive dyed cotton samples for three times using four type of commercially available detergents. The performance of detergents was analyzed after each wash by measuring K/S values and expressed in terms of change in colour of stained and unstained area of the dyed samples. It was found that the composition of detergents show significant effect on removal of the stains.

**Keywords**: Detergent, Surfactants, Enzymes, Launderometer, Stains, etc.

**PA-96**

# Synthesis and Characterization of Silica Aerogel Composite with Cobalt Nitrate as a Nano-Filler via Supercritical Drying Method

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## Abstract

We reported the synthesis of silica aerogel composite by reinforcing metal oxide particle cobalt nitrate hexahydrate[Co(NO3)2.6H2O)] as a nanofiller into SiO2 matrix. In silica matrix ,with the help of tetraethoxysilane(TEOS),ethanol and oxalic acid catalyst ,using sol-gel technique followed by high temperature(N2 gas) solvent extraction with supercritical drying technique. The porous morphology and different properties of the aerogel composite were observed changing along the content of particle with cobalt nitrate. The obtained silica aerogel composite doped with cobalt nitrate displayed a well-developed porous structure, excellent physical properties with less volume shrinkage, extremely high specific surface area, average pore size. The cross-linked silica aerogel composite, structural and physical properties were investigated by XRD (X-ray diffraction),Scanning Electron Microscope(SEM) and Brunauer, Emmett and Teller (BET) and BJH nitrogen gas adsoption-desorption and surface modification examined by FTIR(Fourier transforms infrared spectroscopy) spectra.

**Keywords**: Nano-filler, Cobalt nitrate silica aerogel, supercritical drying, Porosity, surface area.

**PA-97**

# Preparation of Superhydrophobic Polypropylene/$SiO_2$ Coating for Self-cleaning Application

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## Abstract

By inspiring anti-wetting and self-cleaning ability of Lotus leaf, many efforts have been reported preparation technology of artificial superhydrophobic surfaces. In composite coating silica particles helps to create roughness and polypropylene forms continuous film and enhance the wettability of coating. Herein, we prepared hydrophobic silica particles by using methyltremithoxysilane as a source of silica particles. The coating solution prepared by adding silica particles in polypropylene solution and applied on glass slide using dip coating method. We achieved the water contact angle 160 ±2° by optimizing concentration of silica particles in polypropylene solution. The dip and withdrawing speed controlled by dip coating machine. The self-cleaning property of coating analysed by spreading chalk dust on coating. The water droplets are easily roll off by collecting dust particles at small inclination. The prepared superhydrophobic coating exhibits excellent self-cleaning performance. Such superhydrophobic coating may be applicable to large scale industrial application.

**Keywords**: Superhydrophobic, self-cleaning and silica particles.

**PA-98**

# Synthesis of $Fe_2O_3$ Nanoparticles Prepared by Combustion Method

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## Abstract

Iron oxide (Fe2O3) nano particles are synthesized via glycine assisted solution combustion technique. The current research work reports, role of fuel in the formation of Fe2O3 phase. Citric acid and glycine was used to study the role of fuel in the phase formation and its impact on structural properties. X-ray diffraction spectroscopy is used to study its structural properties. As revealed in XRD, single phase Fe2O3 is obtained in glycine assisted combustion. As prepared Fe2O3 is calcined at different temperature, it Reveled that crystallanity of Fe2O3 is enhanced with the calcination temperature. This study shows fuel plays major role in the phase formation of Fe2O3.

**PA-99**

# EPR and Optical Absorption Studies of Manganese doped Lithium Borate Glasses

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## Abstract

Glasses with composition 15Li2O-25CaO-(60-x)B2O3-XMnO2 (x=0, 0.2, 0.4, 0.6, 0.8 and 1 mol%) have been prepared by traditional melt quenching technique and investigated by X-ray diffraction, EPR and Optical absorption techniques. The X-ray diffraction patterns of the prepared glass samples confirmed the glassy nature. The obtained EPR spectra of Mn2+ ion exhibits resonance signals at g = 2.03, 3.4 and 4.3. These signals are due to the Mn2+ ions in an environment close to octahedral symmetry and due to the rhombic surroundings of Mn2+ ions. Hyperfine splitting parameters at g = 2.03 were also evaluated. The optical absorption spectra exhibit a single broad band near 470 nm and is due to the spin allowed 5Eg → 5T2g transition of Mn2+ ions in octahedral symmetry.

**Keywords**: Melt quenching; Electron Paramagnetic Resonance; Optical absorption.

**PA-100**

# Temperature Monitoring System in Winter for Grapes Horticulture using Sensor and IOT Technology

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## Abstract

Agriculture is the significant economical activity in India.80% Indians are depending on agriculture and its products directly or indirectly. India is known as agricultural country. 16% of total GDP contributes agriculture in India. Agriculture is mostly depending on monsoon. Environmental changes affect on crop field and its productivity. In India, Maharashtra is the well-known state for fruit production. Bananas, Grapes, Papayas, Oranges and many more fruits are produced as well as exports to the other countries. Among them grapes are produced in Maharashtra in large amount. It is the profitable economical activity but the grape crops are very sensitive to the environmental changes. For proper growth of grape crops the ideal temperature range is 100C to 400C. The grape crops can handle rise in temperature but below 100C temperature and high humidity affect on production. In winter below 100C temperature, the leaves become blackish, crops tend to stop the growing and affecting the overall production. So, to maintain the temperature is very important task. The farmers can control the temperature by their own traditional strategies like to cover the stems with hey or remaining part of sugarcane and many other methods, if they know the exact temperature of the field.

In the present paper, the temperature monitoring system developed for grape horticulture by using sensor and IoT technology. In the system, temperature sensor LM35 used for detecting the temperature of the field. The microprocessor PIC16F877A processed the data and sent to the server by using ESP8266 Wi-Fi Module. If the temperature goes down or up of the predefined level which is set to the microcontroller then the SMS goes to the farmer's smartphone. Farmer can take immediate control action for temperature management in the crop field. The system is useful for farmers for protecting their crop fields from environmental changes. The sensor and IoT technology switch the traditional agriculture to smart agriculture. The IoT technology improves the efficiency of crops as well as the farmers. Thereby productivity and profit also increase.

**Keywords**: LM35 sensor, PIC16F477A microcontroller, ESP 8266, Wi-Fi Module

**PA-101**

# PPy:PEG Gel for Electrochemical Charge Storage

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## Abstract

PPy:PEG composite gel based electrochemical charge storage device has been fabricated. PPy was synthesized by oxidative polymerization of 0.1 M pyrrole using 4 mM K2Cr2O7 potassium dichromate (K2Cr2O7). As the concentration of oxidative polymerizer is very low, the impurity Cr2O3 was not formed in the composite. PEG 4000 was dissolved in double distilled water in 1:5 weight proportions at 353.15 K to form a thick gel. The uniform mixture of PPy, PEG, and Na2SO4 in 2:1:1 weight proportion has been sandwiched between two flexible stainless steel plates (304 grade) of dimensions 1 cm ×5cm to form highly flexible gel based electrochemical device (FGED). The device shows maximum current hence the maximum specific capacitance. The characteristic peak at 1565 cm-1 in FTIR spectra of the PPy powders confirms the existence of PPy in the composite GE. Cyclic voltammetric (CV) analyses substantiated that depending on the molarity of the oxidizer used to synthesize PPy, the specific capacitance varies. The observed maximum specific capacitance (SC) was 12.59 F g-1 at 5 mV s-1. Galvanostatic charge-discharge analyses of the FGED have been carried at different current densities. The observed values of SC at current density 0.1 mA cm-2 was 15.18 F/g which are nearly same as that given by the CV.

**Keywords**: Gel electrodes, PPy PEG, electrically conducting polymers, cyclic voltammetry, galvanostatic charge-discharge.

**PA-102**

# Instant Exploration of Major Macronutrients (NPK) using Analog pH Sensor

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## Abstract

The customised sensor based analysis may provide the precise data quickly rather than mundane and traditional methods, which are generalized and not to the targeted are or specific area. Quickly and accurately soil data can be analysed by the precise agriculture practice through electronic systems rather than traditional geochemical analysis. Also, unsystematic use of fertilizers may lead to ground water pollution, hence nutrients management, balanced plant nutrition, which are ecological alternatives for fertilizers. This research work facilitates the exploration of major macronutrients – Nitrogen (N), Phosphorous (P) and Potassium (K) by the measured value of pH from pH sensor with suitable conversion, signal conditioning and embedded programming. The macronutrients presents in soil are displayed on LCD module interfaced with Microchip PIC16F877A microcontroller. Hence, by this method it is possible measure the concentration of NPK and also this method prevents the overfeeding of nutrients through fertilizers.

**PA-103**

# Peripherally Naphthol substituted Co(II)phthalocyanine for Electro Polymerization of 2-Aminophenol

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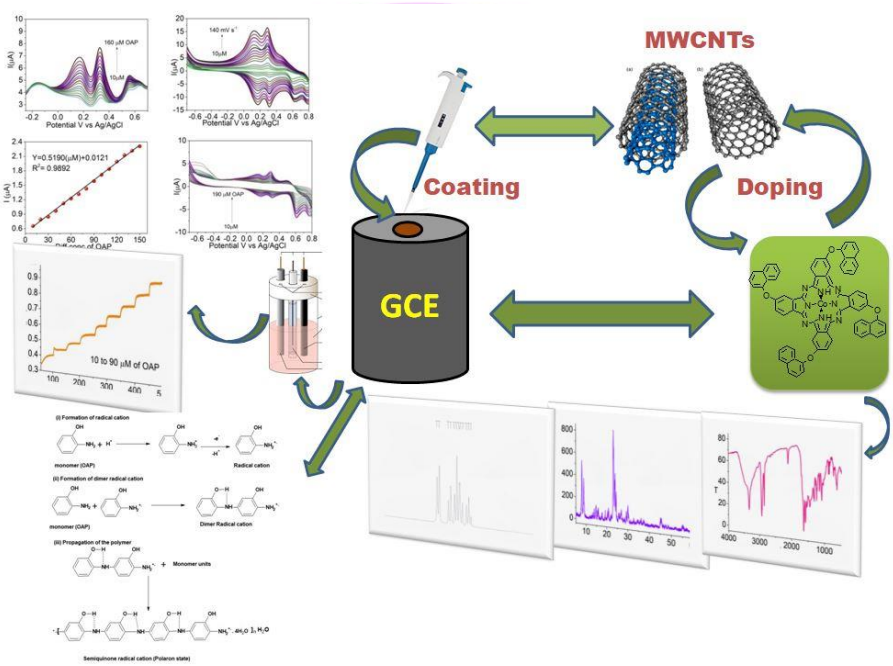
## Abstract

The electro-polymerization of 2-Aminophenol (OAP) was done by using Naphthol substituted Co(II)-phthalocyanine. The tetra carboxylic acid Cobalt-phthalocyanine and naphthol was used for synthesis of Naphthol substituted metallo-phthalocyanine (NMPc). The prepared compound was characterized by FTIR, UV-Vis, NMR and Mass Spectroscopy. The electrochemical polymerization of OAP was studied by cyclic voltametric method (CV). It exhibits good electron transfer compared with Glassy carbon electrode (GCE), the modified NMPc electrode enhances the oxidation peak current with decrease in potential. The electrochemical polymerization of OAP was carried out in $H_2SO_4$ buffer (pH-3) electrolytic medium. The modified NMPc electrode shows more response for the oxidation of OAP in the concentration range of 10 µM to 200 µM and detection limit range from 12 and 10 µM (S/N=3). In CV studies, it shows that 2 pairs of potential peaks at 0.15 and 0.3 mV vs Ag/AgCl, the peak I represents conversion of amine nitrogen into radical cations, and peak II represents conversion of radical cations into imine nitrogens. The diffusion-controlled method is used for electro formation of the POAP on the NMPc/GCE electrode. Differential pulse voltammetric (DPV) technique exhibits more response for the OAP oxidation and sensitivity of 0.9968 and 0.0269 µA nM-1 cm-2. Therefore NMPc electrode excellent electro-catalytic activity towards the electrochemical oxidation of OAP and MWCNTs-NMPc/GCE electrode shows more response compared with NMPc/GCE electrode towards the oxidation of OAP. The Chronoamperometric (CA) method exhibits excellent linear response in

sensitivity of 0.9926 and 0.0066 µA nM-1 cm-2. The modified MWCNTs-NMPc electrode shows good sensitivity and electro catalytic activity towards electro polymerization of OAP compared with NMPc electrode.

**Keywords**: Naphthol, phthalocyanine, 2-Aminophenol, DPV, CVs, CA



**PA-104**

# Characterizing the Optical Properties of One-Pot Chemically Synthesized Poly(Thiophene-Indole) Conducting Copolymers

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## Abstract

The present work reports the complex optical properties of one pot chemically synthesized poly(thiophene-indole) conducting copolymers through oxidative copolymerization of their monomers in aqueous solution at room temperature using anhydrous ferric chloride (FeCl3) as an oxidant. The structural study of the studied samples has been confirmed through X-ray diffraction (XRD) technique. Field emission-scanning electron microscopy (FE-SEM) ensured the morphology of prepared samples. The complex optical parameters of the samples have been estimated through ultraviolet-visible (UV-Vis) spectroscopy. The studied samples exhibited absorption around 240-300 nm. The optical band gap values for the studied samples were found to be 2.52 and 2.67 eV for 1:1:1 and1:1:2 molar feed ratio of monomers to oxidant, respectively. The estimated optical energy band gap validated that the studied material has potential applications in optical devices. The optical conductivity shows gradual increase around 280 nm.

**Keywords**: Chemical copolymerization; optical band gap: optical conductivity

**PA-105**

# Aluminium Alloys for Small Satellite

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## Abstract

The aerospace industry provides a range of services for both the public and private sector. A major product of the aerospace industry is satellites. Satellites (Small Sats) provide a wide range of services from relaying communication, to global positioning, to scientific research. It can collect more data, more quickly, than instruments on the ground. The selection of material is important step in design of small satellite structure. There are typical materials used in spacecraft application such as Aluminum alloy, Beryllium, Titanium alloy, steel and composites. Material that used in space is aluminum as it is light in weight. Generally aluminum alloys are used for structure. Because aluminum is not very strong but when combined into alloys with other metals into it becomes much stronger. Aluminum alloys are often strong and lightweight enough to be functional in space structures and satellites Weight and strength are relevant factors in satellite design. Not only cost but also stiffness, thermal conductivity, thermal expansion, manufacturing etc. these factors are also considered during satellite design. The material should be good mechanical properties and the possibility to use it in space application with temperature range between -55oC to + 185oC. Satellite structural designs also use different materials.

**Keywords**: Spacecraft, cubesat, Smallsatellite, materials, Aluminum alloy

**PA-106**

# Efficient Photocatalytic Degradation of Crystal Violet with Mixed-Metal Oxides Framework

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## Abstract

Environmentally benign scientific separable nano composite catalyst of Nb2O5-CoFe2O4 has been synthesized and studied its photocatalytic activity for crystal violet degradation under sunlight type radiation. In these colloid systems, different percentage of niobia exists as a dispersed phase on cobalt ferrite. The particle size of the composite is in the range of 10-20 nm. The composite sample was found to be ferromagnetic even after loading 50% of Nb2O5 (by weight) on cobalt ferrite. UV–vis absorption spectra show a red shift of the absorption edge and improved visible light absorption for the composite system compared to single phase Nb2O5. Photocatalytic activity of the composites improved with Nb2O5 concentration and almost complete degradation was observed when 50%Nb2O5-CoFe2O4 was used. The enhanced photocatalytic activity is attributed to the increased visible light absorption and improved adsorption of the dye on the surface of the composite catalyst. The ferromagnetic property can be exploited for the retrieval of the catalyst from water after the purification process. Such nanocomposites are helpful to reduce environment pollution and also brought various benefits to the mankind.

**Keywords**: Cobalt ferrite, niobia, magnetic photocatalyst, Photocatalytic degradation, Crystal violet

**PA-107**

# The Effect of Al-doped ZnO Nanocrystalline Sol-gel Derived Thin Films for UV Photodetector

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## Abstract

In this paper, we demonstrated the fabrication of Al-doped ZnO (AZO) thin film based Metal Semiconductor-metal Photodetector. ZnO and Al-doped ZnO synthesis using the sol-gel method. The prepared AZO and ZnO thin film are characterized by X-ray diffraction (XRD), high resolution scanning electron microscope (HRSEM), photoluminescence and UV visible A Spectroscopy. XRD result confirmed the formation of the Hexagonal wurtzite structure of ZnO. HRSEM image of ZnO and AZO thin film confirmed the uniform distribution of particles and average particle size~30 nm and ~60 nm respectively. An efficient photoluminescence band is observed at 447 nm and 435 nm in ZnO thin film and AZO thin film respectively at ambient temperature when excited with 370 nm wavelength light. Finally, the ZnO and AZO thin films are investigated for an electrical and optical response using fabricated metal-semiconductor-metal (MSM) Photodetector.

**Keywords**: Aluminum-doped ZnO thin Film, Metal-semiconductor-metal, Photodetector, Responsivity, sol-gel method.

**PA-108**

# Synthesis of Amorphous Ni(OH)2 Nanoflakes by SILAR Method for Electrochemical Supercapacitor

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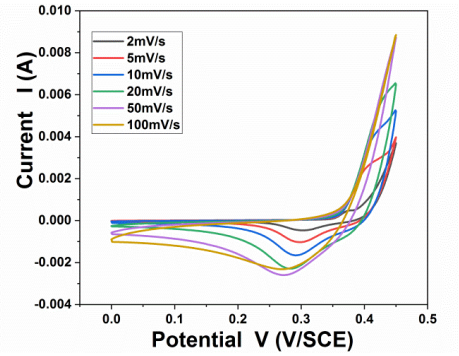
## Abstract

The present work describes the synthesis of interconnected Ni(OH)2 nanoflakes by successive ionic layer adsorption and reaction (SILAR) method. The structural, chemical and surface morphological properties of deposited films have been studied. The X-ray diffraction (XRD) study shows that deposited film is amorphous in nature, formation of nickel compound in hydroxide phase is confirmed by FT-IR studies. The deposited film shows interconnected nanoflakes with porous morphology that provides high surface area. The supercapacitive behavior of amorphous Ni(OH)2 nanoflakes is studied by cyclic voltammetry in 1M KOH electrolyte solution revealed pseudo capacitive behavior. The Ni(OH)2 nanoflakes shows specific capacitance of 550 F/g at 2 mVs-1. The result shows that the deposited amorphous Ni(OH)2 nanoflakes by SILAR method is a promising material for high performance supercapacitor.



**PA-109**

# Design a Smart Sensor Module for Monitoring H2S Gas based on Polycrystalline Ferrite

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## Abstract

Keeping pace with facets of nanotechnology and its applications in the field of development of smart sensors of promising features, Manganese-Zinc nanoparticle spinel ferrites have been synthesized by adopting co-precipitation method. The formation of the materials is confirmed by characterization of the same with X-ray powder diffraction and FTIR absorption. From the results of X-ray diffraction investigation, it was found that, materials exhibit FCC structure with Fd3m symmetry with the average particle size from 38 nm to 54nm. Results of FTIR spectroscopy support these results. The compositions show fine grains with uniform distribution (figure1), which facilitate the surface conduction mechanism [1] that essentially happens during sensor based applications. Existence of nanoparticles causes increase in the effective surface area required to favour surface phenomenon such as chemisorption and physisorption. Polycrystalline ferrite materials are sensitive to LPG, ethyl alcohol, formaldehyde, methane, CO2 and ammonia gas, H2S [2-3]. These materials were used for development of the sensor for monitoring of H2S gas. The detection of H2S gas is essential in various industries, chemical laboratory and for environmental prediction as well. The sensing elements of the sensors are developed using thick film technology and H2S gas sensitive electrical properties are investigated. An operating temperature was optimized to 125 0C. H2S gas is reducing gas and hence it plays remarkable role on the electrical properties [4]. The electrical resistance R, measured against in concentration of ammonia, shows decreasing trend with increase in concentration of ammonia. From sensitivity data, it is confirmed that, the materials are mostly suitable for sensing of H2S gas. Employing embedded technology and using thus prepared sensor, a sensor module is designed and deployed for monitoring of the H2S gas. From performance analysis, it is found that sensor module is suitable for further

development of measurement instrumentation. Results of implementation are interpreted in this paper.

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**PA-110**

# Development of the Poly (Ethylene) Oxide Based Solid Polymer Electrolytes for Energy Storage Devices

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## Abstract

Solid polymer electrolytes (SPEs) have attracted considerable attention due to the rapid development of the need for more safety and powerful lithium ion batteries. The prime requirements of solid polymer electrolytes are high ion conductivity, low glass transition temperature, excellent solubility to the conductive lithium salt, and good interface stability against Li anode, which makes PEO and its derivatives potential candidate polymer matrixes.

Conductivity in polymer electrolytes has long been viewed as confined to the amorphous phase above the glass-transition temperature (Tg). Above Tg, polymer chain motion creates a dynamic, disordered environment that was thought to play a critical role in facilitating ion transport. Difficulty of finding the amorphous polymer with sufficient ionic conductivity has raised the fundamental question of whether polymer electrolytes are intrinsically inferior to other electrolytes in terms of their charge-transport capability. The classic polymer electrolyte comprises organic macromolecules (usually polyether polymer) that are complexed with inorganic salts. The polymer matrix must contain a Lewis base (e.g. ethylene-oxide unit, –OCH2CH2–) to solvate the lithium salt. The salt-solvent mixing entropy consists mainly of two components: translational and configurational. This review mainly encompasses on the synthetic development of PEO-based SPEs (PSPEs), and the potential application of the resulting PSPEs for high performance, all-solid-state lithium ion batteries.

**PA-111**

# Comparative Studies on Growth Strategies of ZnO Nanostructures Prepared by CBD and SILAR

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## Abstract

Zinc oxide (ZnO) is the most important material having wide range of applications. The ZnO can be synthesized with diverse nanostructures by different chemical methods. Chemical bath deposition (CBD) and successive ionic layer adsorption and reaction (SILAR) are two main chemical methods used for the synthesis of nanostructured materials. CBD leads continue growth of material after nucleation while SILAR leads intermittent growth and provides nucleation sites at each cycle.

In the present study, we have investigated and compared the growth of ZnO nanostructures on glass substrate by CBD and SILAR method. The ammonia complexed zinc nitrate (with pH-12) is used as precursor in both CBD and SILAR method. CBD method leads to (002) preferred orientation growth of ZnO crystallites forms hexagonal faceted ZnO nanorods. While, intermittent growth strategies in SILAR method leads to formation of randomly oriented ZnO nanoparticles. Both nanostructures have shown high surface area and can be effectively used in gas sensors.

**PA-112**

# Effects of the Action of MgO Nanoparticles with Polyaniline on their Physical Properties

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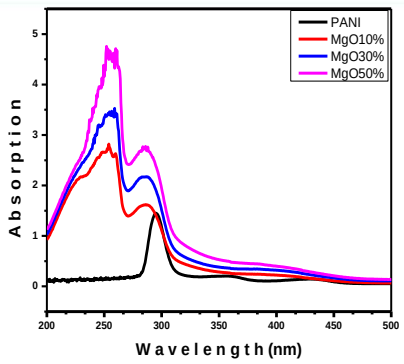
## Abstract

Green synthesis of multifunctional Magnesium oxide Nanoparticles (NPs) are prepared by low temperature solution combustion route employing Aloe-Vera leaves extract as a fuel. The obtained MgO Nanoparticles were further used to synthesis of PANI/MgO different weight percentages by in-situ polymerization technique. The synthesized PANI, composites have been characterized by various techniques i.e. Powder XRD, SEM, TEM and UV-Visible spectroscopic studies to investigate the various applications like electrical, optical, electronic, optoelectronics, semi conductor devices etc. The surface morphologies of the samples were studied with the scanning electron microscopy (SEM). The XRD pattern confirmed the Cubic (Halite) structure of the product. The particle size were calculated by means of XRD profile and it was found to be in the range of 35-45nm by using the Debye-Scherer relation. SEM images indicated the formation of various shaped MgO NPs.

**Keywords**: MgO , Nanoparticles, XRD, SEM, TEM, Optical, Cubic structure.





**PA-113**

# Materials of Solar Energy

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## Abstract

Solar energy materials like PVs and Solar cells indeed are ultimate source of energy for the demand of Post Modern Era population . The current worldwide energy situation and utilization rate is disturbing enormously as the gigantic increment in population. The comprehensive extraction of fossil fuel since industrial revolution and dependency on fossil resulted into numerous natural issues. In this respects each Nation is investing in energy to increment energy efficiency just as exchanging over to new and sustainable power source advancements. Among such sun oriented vitality from the sun is free and eternal source. The purpose of the study is to provide a comprehensive review of solar energy materials that can replace fossil fuel entirely. It offers number of vital advantages which replaces the non-renewable energy source ignition for the different electrical and warm needs by limiting the discharges of harmful gases and air toxins. Currently, Sun oriented vitality' commitment to the complete worldwide vitality gracefully is extremely low and little yet the potential is gigantic. Although it costs a high amount in the beginning but once installed it produces energy at low cost. Anyway present advancement and supports for sun based assembling and deals costs have dropped extraordinarily from the previous barely any decades coming about into at vitality value equality. Study says that extreme proficiency of a solitary intersection Sun oriented cell can show. The ebb and flow inquire about in this course is proceeding to discover the best substitute materials and innovation to improve the exhibition of sun oriented cells. The investigation of light range and diverse retention levels in semiconductor material, unique covering, use of Nano innovation and utilization of natural polymers have prompted more noteworthy sparing and quick creation . This report summarizes emerging solar technologies for high potential for large scale energy and identifies fundamental research topics that is crucial for improving performance competitiveness all over the World . .

**Keywords**: Solar cells, PV

**PA-114**

# HMTA Assisted Chemical Synthesis of α-MnO2 Thin Films for Supercapacitor Application

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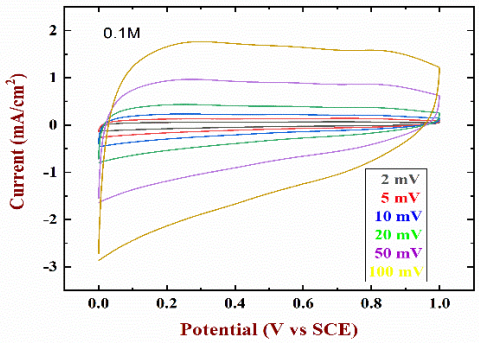
## Abstract

Recently, manganese dioxide (MnO2)-based materials have been intensively investigated for use in pseudocapacitors due to their high theoretical specific capacitance, good chemical and thermal stability, natural abundance, environmental benignity. In present work, the facile chemical bath deposition method (CBD) is used to synthesize MnO2 thin film on stainless steel substrates. The effect of HMTA concentration (0.05 M to 0.2 M) on the growth of MnO2 thin film is systematically studied. All the deposited films show α-MnO2 phase with crystallite size about 20 nm. The supercapacitive behaviour of nanocrystalline α-MnO2 films were studied in 1M Na2SO4. The HMTA concentration shows significant impact on the growth and then supercapacitive performance of nanocrystalline α-MnO2 films. The MnO2 film deposited with 0.1 M HMTA shows highest specific capacitance of 245 F/g at lower scan rate 2mV/s in 1M aqueous Na2SO4 electrolyte with good cycling stability.



**PA-115**

# Molecular Docking Studies and DFT Analysis of 2-SUBSTITUTED 4,5-DIPHENYL-1H-IMIDAZOLE Derivatives

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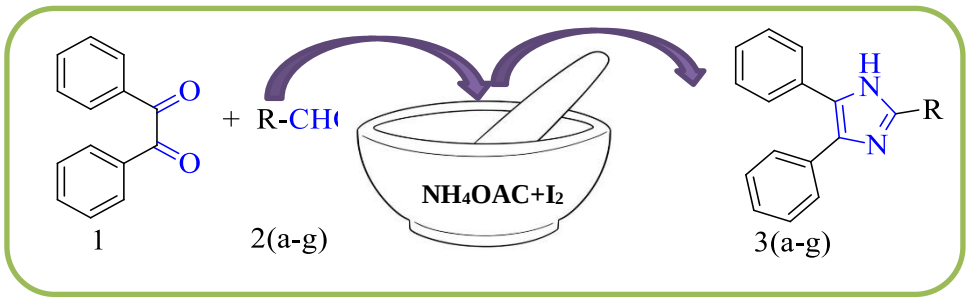
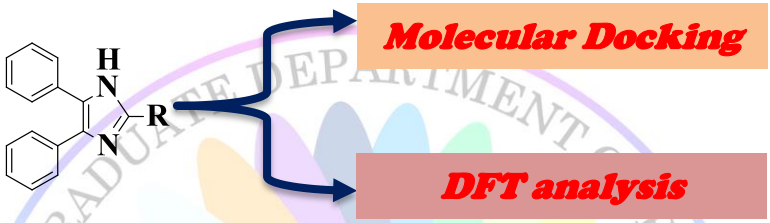
## Abstract

A series of 2-Substituted 4,5-diphenyl-1H-imidazole derivatives (3a-g) were subjected molecular docking studies against selected bacterial protein (PDB ID 3G57) to determine their potency as anti-bacterial agent, The drug characteristics were evaluated using the Lipinski rule of 5, Ligands were optimized using Chemistry at Harvard Molecular Mechanics (CHARMm) molecular force field (MMF) followed by energy minimization protocol. A flexible docking approach was employed for molecular docking studies using the Lead IT software in which target was considered as receptor protein. The DFT calculations were performed for geometry optimization using Gamess software. The molecular geometry of optimization was carried out using Hartree-Fock (HF) , B3LYP hybrid functionals of 6-31 G (d,p) as basis set. All DFT calculations were performed in gas phase only. The required input for the Gamess software was generated using Avogadro.




**Keywords**: 2-Substituted 4,5-diphenyl-1h-Imidazole derivatives .Molecular Docking Studies and DFT analysis.

**PA-116**

# Synthesis and Characterization of Nanocrystalline Al-Co Ferrite

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## Abstract

In present work, our main focus is formation of nano-sized crystalline ferrite material of the composition [Alx Co1-xfe2O4] where, x = 0.2, 0.4, 0.6, 0.8. The compositions were synthesised through nitrate citrate by sol-gel auto combustion method. The prepared powder were sintered at 400 0C for 4 hours. The structural morphology, ferrite formation of powder was determined by X-ray powder diffractometry (XRD), Scanning electron microscope (SEM) photograph of the sample and Infrared spectroscopy (IR) technique. The X-rays revealed the formation of nano-size crystalline ferrite particles with cubic spinel structure and the cubic phase in the ferrite matrix. The average crystalline particle size was calculated by Scherrer method. The average particle size of the sample is obtained between 25 to 30 nm. The lattice parameters, X-ray density and bond length parameters are calculated from XRD patterns. The average crystalline particle size of ferrite samples are increases with increasing Ni and decreases with Co compositions. The IR characteristic shows, the ferrite bonds were confirmed.

**Keywords**: Al-Co nano-crystalline ferrite, IR, XRD, SEM

**PA-117**

# Green Synthesis of Silver Nanoparticles using Fruit Extract of Ananas Comosus (Pineapple) from Bromeliaceae Family

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## Abstract

Silver is an inorganic agent used for different wounds and ulcer treatment as it is nontoxic. However Silver, whether in ionic or nanoparticle form, is highly toxic to microorganisms .Hence, Silver nanoparticles has wide range of applications than silver ion. Green synthesis method is eco-friendly and cost effective over the chemical methods. This study reveals the production of silver nanoparticles by using Ananas Comosus by observing the colour change. Further it is characterized by the X-ray diffraction, UV-Visible and antimicrobial activity. The diffraction peaks at 2θ values of 38.11˚, and 44.27˚ (111, 200) reveals the formation of silver nanoparticles. UV-Vis spectrophotometer show surface Plasmon resonance (SPR) at 469 nm. The antibacterial studies of silver nanoparticle assures the ability of AgNPs to inhibit growth of Escherichia coli.

**Keywords**: Fruit, Green synthesis, nanoparticles, eco-friendly, AgNPs

**PA-118**

# Urea Assisted Chemical Synthesis of Interlocked In2O3 Microcubes for NO2 Gas Sensor

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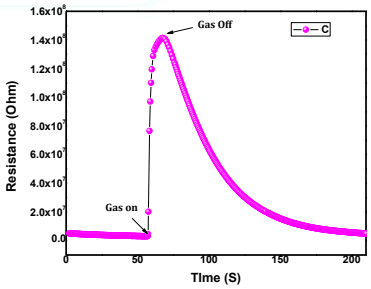
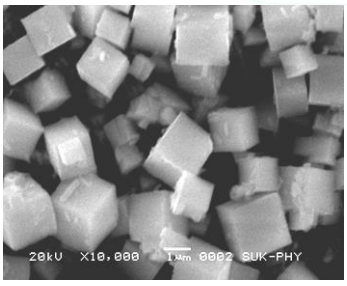
## Abstract

The present reports deal with development of the urea assisted chemical method for the growth of interconnected Indium oxide (In2O3) microcubes. Urea assisted hydrothermal method used to prepare Indium hydroxide [In(OH)3] precursor and followed by the air annealing to get In2O3 microcubes (IMC). In2O3 samples show cubic crystal structure with (222) preferred oriented growth. The concentration of urea effectively changes the size of the cubes from 0.3 to 1.0 □m. The PL studies show the controlled oxygen- defective growth of IMC is possible by varying Urea concentration. IMC displays high sensitivity and selectivity for NO2 gas sensor. Sensing response of IMC film was 50 for 60 ppm NO2 gas at 100 0C.



**PA-119**

# XRD, FTIR and Morphological Study of Samarium Substituted Nanocrystalline NI-ZN Ferrites

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## Abstract

Oxalate co-precipitation method was used to synthesize samarium substituted nanocrystalline Ni-Zn ferrites with composition Ni0.6Zn0.4SmxFe2-xO4 (where x = 0, 0.01, 0.02 and 0.03). Establishment of cubic spinel structure with formation of nano-size ferrites were confirmed by XRD analysis. Lattice constant, bond lengths and ionic radii on A- site as well as on B- site of Ni-Zn ferrites were decreases with increase in Sm3+ content. X- ray density of all the ferrites was increases with increase in Sm3+ content. This is attributed to decrease in lattice constant with increase in Sm3+ content. The presence of two main absorption bands in the range 585 to 580 cm-1 and 373 to 421 cm-1 corresponding to tetrahedral and octahedral complexes, in the FTIR spectra confirms the formation of ferrites. The additional band appeared in the range 471 to 492 cm-1, may be due to presence Fe2+ ions in the ferrites. Morphological investigation reveals that the grain size of the ferrites decreases with increase in Sm3+ content.

**Keywords**: Oxalate co-precipitation method, Ni-Sm-Zn Ferrites; XRD, FTIR, SEM.

**PA-120**

# Materials For Solar Energy

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## Abstract

Energy is very important to all, without Energy we can't do any work. There are different forms of Energy sources such as Renewable and Non Renewable source. But non renewable energy resources are depleting now because of high usage, and their demand also increases day by day due to low supply of non renewable energy it's cost is increases, then now Renewable energy sources are used. Renewable sources are wind, solar , hydro, tidal etc. In this solar energy is commonly used now a day. In this paper we focused on different types of materials for solar energy and their efficiency.

**Keywords**: Renewable Energy, Solar Energy, Solar Photovoltaic materials, efficiency, Environmental impacts.

**PA-121**

# Synthesis and Characterization of Fe doped Polypyrrole

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## Abstract

As nanocomposite materials are a special class of material which has unique physical properties and wide range of application. In the present study reveals that the method of synthesis is also playing a major role in its structure and property. Nanocomposite material of Iron doped Polypyrrole is synthesized by chemical bath deposition method. To deposite material the ammonium per sulphate is used as an oxidant agent and Iron Oxide(Fe2O3) is added in varying percentage from 10% to 50% . The substrate can be used for the thin film coating a glass, copper and stainless steel. The films coated on the glass substrate can be used for electrical and optical characteration while other films may be used for structural and morphological characteration. The paper gives the detailed procedure of material synthesis and its structural characterization with the help of X-Ray diffraction(XRD) study.

**Keyword**: Polypyrrole

**PA-122**

# Preparation of Superhydrophobic SiO2/PVC composite Coating

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## Abstract

In this work, simple method reported for preparation of superhydrophobic SiO2/ Polyvinylchloride coating on glass substrate using dip and spray coating technique respectively. The SiO2 nanoparticles enhance roughness of surface. A layer of polyvinyl chloride (PVC) deposited on glass slide by dipping in PVC solution. Hydrophobic SiO2 particles dispersed in hexane and sprayed on PVC deposited glass slide. The water contact angle 169 ± 2º and sliding 6º achieved by applying three layers of PVC and SiO2 particles respectively on glass slide. The mechanical durability of coating characterized by impacting water jet and water drops, sandpaper abrasion and adhesive tape test. The prepared superhydrophobic coating showed excellent self-cleaning performance.

**Keywords**: Superhydrophobic, self-cleaning and coating.

**PA-123**

# Growth and Characterization of Potassium Thiourea Chloride doped Potassium Dihydrogen Phosphate Crystal

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## Abstract

The Potassium thiourea chloride (PTC) doped Potassium dihydrogen phosphate (KDP) has been grown by slow evaporation solution technique ( SEST) and Sankaranarayanan-Ramasamy (SR) method. The size of the grown crystal is 11x15x4 mm3 at room temperature by SEST method. The crystalline nature of grown crystal was confirmed by single crystal X-ray diffraction technique. The different functional groups were identified by Fourier transform infrared (FT-IR) analysis. The UV-visible studies were employed to examine the high transparency and optical constants in the range of 200-900nm. The second harmonic generation (SHG) efficiency of the grown crystal was determined by the Kurtz-Perry powder test and it is found to be 1.25 times that of potassium dihydrogen phosphate.

**Keywords**: Nonlinear optical material, second harmonic generation, optical studies, microhardness, dielectric studies etc.

**PA-124**

# Design and Calibration of AC, DC Voltage and Current Measurement Sensors

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## Abstract

With the modernization of the world, almost all the day to day applications are managed by using various types of sensors. It is difficult to manage the different control systems without sensors. Now a days every systems are designed with automated control. The automization uses different sensors for precise control. Sensors are used every where with different types and application which needs variable power to operate. Design of the different sensors are different and depends on the construction, principle and material for the application. All the sensors are not the same type therefore it is necessary to design the sensors differently for different applications. In the present investigation AC and DC voltage and current sensors are designed and calibrated for the measurement of the voltage and current. These are electronic sensors having the designed using electronic components. Calibration of the system is very essential to maintain the accuracy of the system because, while sensing instrumental, human or environmental error may occur which may lead to deviation from the actual value. Therefore, it is necessary to have a precision meters and a stable noise free DC voltage source. In the present system speed, current and voltage calibration is carried out by standard meters and required correction factor is applied through software.

**Keywords**: Sensors, Signal conditioning, Calibration, high power sensing system.

**PA-125**

# Heavy Metals Removal from Wastewater by Adsorption Process: A Review

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## Abstract

Methods for treating industrial wastewater containing heavy metals often involve technologies for reduction of toxicity in order to meet technology-based treatment standards. This article was focused on the recently developed and newly applicable various treatment processes for the removal of heavy metals from industrial wastewater. Physico-chemical removal processes such as; adsorption on new adsorbents, ion exchange, membrane filtration, electro dialysis, reverse osmosis, ultra filtration and photo catalysis were discussed. Their advantages and drawbacks in application were evaluated.

In the processes of biological treatments microorganisms play a role of settling solids in the solution. Activated sludge, trickling filters, stabilization ponds are widely used for treating industrial wastewater. Bio adsorption is a new biological method and various low cost bio adsorbents (agricultural waste, forest waste, industrial waste, algae etc.) are used for maximum removal of heavy metals from wastewater. Adsorption techniques are eco friendly best solutions for removing heavy metals from wastewater rather than physic-chemical methods. But chemical methods are most suitable treatments for toxic inorganic compounds produced from various industries which cannot removed from any biological and physical techniques.

**PA-126**

# Progress and Development in Nanofluids Research: A Review

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## Abstract

A nanofluid (engineered fluid) is basically investigated for the enhancement the rheological and thermal properties of base fluids (like water, oil, ethylene glycol etc.). Various types of nanomaterials (typically in size from 1 to 100nm) such as metal oxides (Al2O3, CuO, Fe3O4), nitride ceramics (AlN, SiN), carbide ceramics (SiC, TiC), metals (Cu, Ag, Au), semiconductors (TiO2, SiC), single, multi walled carbon nanotubes, alloyed nanoparticles etc. have been used for development of nanofluids. Due to the tremendous application of nanofluids such as electronics industry, nuclear cooling system transportation, heating building, pollution reduction etc. worldwide research has been carried out. In-situ, practical applications its different properties, synthesis, property measurement techniques and current progress of nanofluids technology should clearly understand is the necessity for upcoming new researcher. Thus, the present review has been glancing the known literature and summarizes the different synthesis, properties measurement techniques application and current development of nanofluids.

**PA-127**

# Study of Excess Acoustic Parameters of Urea Based Aqueous System at 298.15 K

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## Abstract

In the present paper, Ultrasonic velocity, density have been measured for the aqueous Urea system at ambient temperature 298.15 K and at constant 2MHz frequency as a function of concentration. Then attempts have been made to estimate the Excess acoustic parameters of the binary system consisting of Urea+water. From experimental data the excess acoustic parameters such as excess Ultrasonic Velocity (UE), excess density (ρE), excess intermolecular free length (LfE), excess adiabatic compressibility (βE) and excess acoustic impedance (ZE) have been calculated for the solutions. The results are interpreted in the light of solute-solvent molecular interaction.

**Keywords**: Aqueous Urea, Ultrasonic velocity, Density, Excess acoustic parameters, molecular interaction

**PA-128**

# Structural, Optical and Luminescence properties of Core Shell heterostructure CdSZn3(PO4)2 Nanocomposite for LED application

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## Abstract

Inorganic semiconducting CdSZn3(PO4)2 nanocomposite synthesized at mild reaction temperature of 100°C under hydrothermal method. The prepared nanocomposite is investigated by Powder X-ray diffraction, UV-Vis absorption, Diffusion Reflectance spectra, FT-IR spectra, Scanning electron microscope, and Photoluminescence techniques in a systematic manner. XRD shows peaks corresponding to hexagonal structure of CdS and monoclinic γ-phase of Zn3(PO4)2 with good crystalline nature.. Interstingly, due to coupling of CdS with Zn3(PO4)2 it shows the phase transition from α-Phase of Zn3(PO4)2 to γ-phase of Zn3(PO4)2 under hydrothermal conditions and also there is internal structural variations due to the formation of CdSZn3(PO4)2 nanocomposite. Average crystallite size, lattice strain and dislocation density are estimated by Debye-Scherrer and W-H method. The average crystal lattice is found to be 15-25nm. The surface morphology of prepared composite shows the hexagonal spheres accumulated on rectangular flakes which indicate core-shell heterostructure. From UV–Vis absorption spectra, the absorption wavelength exist in the visible region due quantum size effects and energy band gap is 2.42eV. FT-IR spectrum shows the fundamental vibrational modes of CdS/Zn3(PO4)2. The photoluminescence spectrum exhibits broad intense luminescence band in visible region of wavelength 510-518nm range which is in good agreement with absorption wavelength and from CIE diagram, Colour coordinate values and CCT values of the prepared composites are utilized for LED applications.

**Keywords**: CdS ; Zn3(PO4)2; Nanocomposite

**PA-129**

# Dielectric Properties and Impedance Spectroscopy of BST Thin Films on LNO Coated Si(100) Substrate by Sol Gel Method

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## Abstract

Ba(1-x)Sr(x)TiO3 thin films for x=0.3 and 0.2 have been deposited on LaNiO3 (LNO) coated SiO2/n-Si(100) substrate by sol gel method followed by spin coating technique. The BST and LNO thin films are characterized for crystallographic study using x-ray diffraction technique. Scanning electron microscopy (SEM) images of BST and LNO thin films are used for morphological study. The dielectric properties and impedance spectroscopy of BST thin films are studied in the frequency range of 20 Hz to 10 MHz using impedance analyzer. From dielectric properties, it is observed that BST with x=0.3 possess higher value of dielectric constant as compare to BST with x=0.2. The impedance spectroscopy of BST thin films is studied to find out the grain and grain-grain boundary effect and to correlate with dielectric properties. .

**Keywords**: BST, Dielectric constant, Impedance spectroscopy

**PA-130**

# SnO2 Substituted In2O3 Thick Films as PPM Level $NH_3$ Gas Sensors

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## Abstract

The SnO2 and In2O3 powder mixed with different ratio and heated at 9000C about 5 hrs and then this powder is used to prepared thick films by a screen – printing technique on glass substrate. The NH3 gas sensing properties, particularly the rate of response of SnO2-In2O3 sensors are studied at room temperature. SEM and EDAX analysis showed that crystallite size is small (86.43 nm) for 65SnO2-45In2O3 composition. The Sensitivity increases drastically as the expose of NH3 gas for 65SnO2-45In2O3 sample. This sample is found to be better sensing material as regards to other in all respect.

**Keywords**: Ammonia Gas; SnO2; In2O3; SEM; EDAX.

**PA-131**

# Effect of Molecular Orientation on the NLO Properties of Organic Molecules

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## Abstract

In the present work we investigate the effect of molecular orientation on the nonlinear optical properties of the organic molecules. In order to understand the effect of molecular orientation on the NLO properties of these molecules, the first hyperpolarizabilities ( β) were computed for the monomer and unit cell for the single crystal XRD geometry using DFT by adopting B3LYP/6-31G (d) level of theory. The intra molecular charge transfer occurs from ends of the molecule to the center and thus these polymorphs possess D-π-A-π-D type push-pull charge transfer structure. It is observed that the planarity of the molecules has a great impact on the charge transfer characteristics and hence on the nonlinear optical properties. Though both the molecules have same chemical formula, they possess different molecular conformations leading to varied molecular orientation in the crystal structure. The present polymorphs differ in their nonlinear optical properties mainly due to different molecular orientation. The molecule CC crystallized in centrosymmetric structure and one of the C=C adopts trans conformation whereas the CN molecule crystallized in acentric structure with both the C=C adopting cis conformation. The β computed for CC unit cell is found to be far lesser than the β of CN unit cell due to centrosymmetric structure of CC. In CN, the β value computed for one unit cell is smaller compared to β of the monomer. This is mainly due to antiparallel alignment of the molecules in the unit cell of CN. Therefore, in order to enhance the NLO properties of organic molecules one need to optimize the molecular orientation by adopting crystal engineering approach by fine tuning the intermolecular interactions to fabricate materials with superior NLO characteristics.

**PA-132**

# Structural and Optical Properties of 10LiF-40Li2O-20RO-30Bi2O3 Glasses

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## Abstract

A series of bismuth based oxide glasses have been prepared with the following compositions 10LiF-40Li2O-xRO-(50-x)Bi2O3 where R= Mg, Ca, Sr & Ba and x lies in the range of 0≤x≤20 mole%. The various physical parameters of the present glasses will be estimated. The glassy nature of prepared glass samples confirmed by the XRD technique. The FTIR spectra revel that the vibrational bands are made up of [BiO3] pyramidal and [BiO6] octahedral units.

**Keywords**: Glasses; MDSC; FTIR spectra.

**PA-133**

# Effect of Chromium Substitution on Structural and Magnetic Properties of CuFe2O4 Nanoparticles Prepared by Sol-Gel Auto-Combustion Method

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## Abstract

Nanosized CuFe2-xCrxO4 ferrites are prepared by sol-gel auto-combustion method. X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Vibrating Sample Magnetometer (VSM) is used to study the impact of chromium substitution on structural parameters and magnetic parameters of copper ferrite. SEM images revealed the formation of homogenous, uniformly distributed grains. The crystallite size and lattice parameter of Cu-Fe chromites was decreased with increased chromium concentration up to x=2.0. The saturation magnetization of Cu-Fe chromites decreased with continuous increase in concentration of less magnetic chromium.

**PA-134**

# Electrical and Thermoelectric Properties of Fly Ash Zeolite

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## Abstract

The zeolite type A was synthesized by using fly ash a solid waste product obtained from thermal power station. The conventional hydrothermal synthesis method using microwave exposure was used to obtain fly ash zeolite type A. The as synthesized sample was ion exchanged to obtain Cu-A zeolite. The zeolite sample was characterized by XRD and SEM. The electrical property dc resistivity was studied by using two probe method. The sample shows the semiconducting nature. The thermoelectric power of Cu substituted Zeolite A with the formula Na (1-x) Cu(x) A, where (x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0) prepared by ion exchange were studied. The measurements were carried out from 300K to well beyond Curie temperature. The Seebeck coefficient is negative for all these samples showing that these zeolite samples behave as n-type semiconductors. On the basis of these results a conduction mechanism for zeolite Cu-A is suggested in different temperature regions.

**Keywords**: Fly ash zeolite, dc resistivity, Seebeck Coefficient

**PA-135**

# Self-Cleaning Superhydrophobic Polycarbonates through Chlorosilane Modification

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## Abstract

Self-cleaning coloured superhydrophobic surfaces can find huge market in decorative applications. Here we present a novel and simplistic approach to prepare self-cleaning yellow superhydrophobic polycarbonates by simple nitric acid treatment to attain yellow colour polycarbonate (PC) and subsequent surface silylation by methyltrichlorosilane (MTCS) for superhydrophobicity. A colour of PC can be controlled from light to dark yellow by simply varying the immersion time in nitric acid. The surface silylation by MTCS provides morphologies from nanofibers to nanospheres depending on reaction times. These morphologies are responsible to achieve superhydrophobicity on yellow coloured PC with water contact angle higher than 155° and sliding angle < 8°. The yellow superhydrophobic PC showed self-cleaning properties, where the dust particles from the surface were easily taken away by rolling water drops. After several water jet impact tests (oblique to vertical angle), no loss in superhydrophobic behaviour was observed confirming its mechanical stability.

Keywords: Self-cleaning, Superhydrophobic, Lotus leaf, Wetting, Contact angle.

**PA-136**

# Synthesis and Characterization of Molybdenum Sulfide ($MoS_2$) Nanoparticle by Solvothermal Method

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## Abstract

Molybdenum disulfide (MoS2) is one of the most important two-dimensional materials after graphene. Monolayer MoS2 has a direct bandgap (1.9 eV) and is potentially suitable for post-silicon electronics. Among all atomically thin semiconductors, MoS2 synthesis techniques are more developed. We synthesized nono-particles of MoS2 by a solvothermal Method by changing their different parameter such as temperature at 160℃,180℃,200℃ and time 24h. We confirm that material by studying Structural, Optical, and Morphological properties by different characterization techniques such as XRD, UV, IR & Raman. XRD shows the Hexagonal structure of MoS2. For MoS2 we get the highest peak at the 2θ of value 32.911 at (1 0 0) hkl plane of XRD. The Raman Spectra Shows peak (377cm-1and 406 cm-1) of MoS2 only and no impurity peak are observed. The UV-Vis spectra show an absorption peak at 200 nm.

**Keywords**: MoS2, 2D material, Solvothermal, Hexagonal, XRD, Semiconductors, Nanoparticle.

**PA-137**

# Chemical Route to Synthesize CdSe Thin Films and its Characterization

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## Abstract

Crystalline CdSe thin films have been deposited using the precursor solutions containing cadmium sulfate octahydrate, tartaric acid, potassium hydroxide, ammonia and sodium selenosulfate. The effect of various parameters such as bath composition, deposition temperature, pH of the solution, speed of the rotation and role of the complexing agent on growth process are investigated. The 'as-deposited' CdSe thin films were red in colour, specularly reflective and well adherent to glass substrate. The crystalline phase of the deposited samples was the hexagonal wurtzite-type phase along with some amorphous phase present. The optical absorption data showed the energy band gap (Eg) 2.15 eV of the deposited CdSe thin films. The surface morphological studies and compositional analysis of film sample have been also discussed. The electrical resistivity of CdSe thin films was found to the order of 106 Ω cm.

**Keywords**: Cadmium Selenide, Solution growth, XRD, SEM, Optical absorption study, Electrical transport properties.

**PA-138**

# Environmentally Benign Synthesis of 3,3-Disubstituted Oxindoles as a Multicomponent Protocol

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## Abstract

One pot multicomponent synthesis of 3,3-Disubstituted Oxindoles was achieved by condensation of indole, , malononitrile and isatin in presence of EPZ-G as a envirocat heterogeneous catalyst. This is an environmentally benign method and reusability of the catalyst is beneficial over the others.

**Keywords**: Oxindoles, EPZ-G and Enviro catalyst.

**PA-139**

# Synthesis, Characterization and Humidity Sensing Application of CuXZn1-XNi2O4

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## Abstract

Ni-Zn Ferrites are reported to have many applications(1). They can be used as temperature and humidity sensors.(2,3,4) T. Okamoto have reported that Zn is used to enhance humidity sensing characteristics and increase the durability of the sensor.(5) Nickel being ferromagnetic, it's magnetic properties can be used to sense the temperature as they are highly sensitive but do not change with humidity. On the other hand, since the ferrites are mostly porous materials, their electrical properties sensitively depend upon humidity. Instead of having two ferromagnetic materials, it was decided to remove Fe and add Cu into the composition to increase the conductivity. Hence, the compounds with general formula CuXZn1-XNi2O4 with X= 0.3 and 0.7 were prepared by standard ceramic technique using a solid state route. Synthesized powders were compressed with pellets of 1 cm diameter and 3-4 mm thickness.

**Keywords**: Cu-Zn-Ni Ferrites , Humidity sensors