

# SRINIVAS UNIVERSITY

Private University Established by Karnataka

Govt. ACT No.42 of 2013

Srinivas Nagar, Mukka- 574 146, Surathkal, Mangaluru.

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## EMERGING TRENDS IN NANOSCIENCE AND NANOTECHNOLOGY (ICETNN-2021)

on

6<sup>th</sup> & 7<sup>th</sup> August 2021

### Abstract Book



### Organised by

Department of Chemistry & Nano Technology,  
College of Engineering & Technology

&

Department of Research & Innovation Council

# SRINIVAS UNIVERSITY

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## Chief Patrons



**Dr. CA. A. Raghavendra Rao**  
Chancellor



**Dr. A. Srinivas Rao**  
Pro Chancellor

## Patrons



**Dr. P. S. Aithal**  
Vice Chancellor



**Dr. Anil Kumar**  
Registrar



**Dr. Shrinivasa Mayya D.**  
Registrar (Evaluation)



**Dr. Ajay K. G.**  
Registrar (Development)



**Dr. Thomas Pinto**  
Dean



**Dr. Praveen B. M.**  
Director - Research & Innovation Council



**Two days International Virtual Conference**  
**on**  
**EMERGING TRENDS IN NANOSCIENCE AND**  
**NANOTECHNOLOGY (ICETNN-2021)**

**Dr. CA. A. Raghavendra Rao**

(Honourable Chancellor, Srinivas University)  
President of the function

**Dr. Seeram Ramakrishna**

(FREng Director, National University of Singapore, Singapore)  
Chief Guest

**Dr. Sabu Thomas**

(Honourable Vice-Chancellor, Mahatma Gandhi University, Kerala)  
Chief Guest

**Dr. A. Srinivas Rao**

(Honourable Pro - Chancellor, Srinivas University)  
Guest of honor

**Dr. Radhakrishna Prabhu**

(School of Engineering, Robert Gordon University, United Kingdom)  
Key note speaker

**Dr. P. S. Aithal**

Conference Chairperson  
(Honourable Vice – Chancellor, Srinivas University)



## **SRINIVAS UNIVERSITY**

### **VISION & MISSION**

#### **VISION**

To be a trendsetter among universities and build students who emerge as leaders with competence, conscience and compassion by empowering them with sound education and high standards of ethical and professional behaviour enabling them to build and promote a more humane, just and sustainable world for future generations.

#### **MISSION**

Our mission is to provide an exceptional learning environment where students can develop and enhance their leadership and teamwork skills, creative and intellectual powers and passion for learning by providing an uncompromising standard of excellence in teaching; embodying the spirit of excellence to educate the citizen-leaders of society with distinction

**Note:** All papers presented in the virtual conference will be published in the proceeding book after review with ISBN 978-81-949961-6-3.

## Chief Guests



**Dr. Seeram Ramakrishna**

Professor PE Seeram Ramakrishna, FREng, Everest Chair is among the top four researchers at the National University of Singapore, and among the top six researchers of Singapore. NUS ranked among the top ten best global universities for engineering in the world. Highest professional distinctions include an elected Fellow of UK Royal Academy of Engineering (FREng); Singapore Academy of Engineering; Indian National Academy of Engineering; and ASEAN Academy of Engineering & Technology. He received PhD from the University of Cambridge, UK; and the GMP training from Harvard University, USA. Among numerous recognitions he received are: Singapore Lee Kuan Yew Fellowship; UK Cambridge Nehru Fellowship; Honorary Everest Chair of Nepal; CUT Honorary Engineering Doctorate, South Africa; Global Engineering Dean's Council Ambassador; ASEAN Outstanding Engineer Award; Institute of Engineers Singapore (IES) Prestigious Engineering Achievement Award. Thomson Reuters identified him among the World's Most Influential Scientific Minds. His Google Scholar shows over 125,500 citations, 163 H-index, and over 1055 i10-index. Clarivate Analytics recognized him among the Top 1% Highly Cited Researchers in the world in materials science and cross-fields categories. Microsoft Academic ranked him among the top 50 authors out of three million materials researchers worldwide based on saliency, publications, citations and h-index. He is regarded as the guru of electrospinning and nanofibers.



**Dr. Sabu Thomas**

Prof. Dr. Sabu Thomas (born 14 March 1962) is an Indian professor who is serving as the vice-chancellor of Mahatma Gandhi University, Kerala. He is also a full professor (25 March 1998 onwards) of Polymer Science and Engineering at the School of Chemical Sciences. He was the Pro-Vice Chancellor of Mahatma Gandhi University, Kerala during the period of 31 August 2017 to 31 August 2018, Director of School of Chemical Science during the period of 1 November 2010 to 31 December 2013. Hon. Director of International & Inter-University Centre for Nanoscience and Nanotechnology during the period of 28 March 2009 to 11 September 2015, 2 February 2016 to 11 October 2017. In 2015, he received his first Doctor Honoris Causa from University of Southern Brittany in Lorient, France. In 2016, he received his second Doctorate honoris causa from University of Lorraine, France. He was awarded the Fellow of the Royal Society of Chemistry, London, FRSC in 2012. He received the Bronze Medal of the Chemical Research Society of India and the MRSI Medal of the Material Research Society of India in 2013. He was the recipient of Fulbright-Nehru International Education Administrators Award 2017. He received TRiLA Academician of the year 2018 award. He was ranked 114th in World's Top Scientists by a Stanford University study. The same list ranked him 2nd in top Indian polymer scientists.

## Keynote Speaker



**Dr. Radhakrishna Prabhu**

Reader in School of Engineering & Head, Centre for Research in Energy and the Environment (CREE)  
Lead, Sensors and Instrumentation Research Group Robert Gordon University Aberdeen, UK.

Dr. Prabhu has B.Tech. (Mahatma Gandhi University), M.Tech. (Cochin University) and a PhD degree (Indian Institute of Science (IISc), Bangalore). He has worked as Post-doctoral Research Fellow at the University of Twente, The Netherlands and the Robert Gordon University (RGU), UK. He started as a lecturer in Engineering at RGU in 2007 and currently holds a position as Reader. In 2012, he was appointed as the Deputy Director for the Medical Technologies JRI of Northern Research Partnership, UK, which co-ordinates research in the University of Dundee, the University of Aberdeen and the RGU. Currently, he is RGU's Lead for the Medical Device Manufacturing Centre (MDMC) being developed at Edinburgh. He has more than 20 years of research experience and generated strong research record in areas including Nanotechnology, Surface engineering & nanocoating's, Sensors and Instrumentation, Cten technology & Optical materials.

Dr. Prabhu is the Head for the RGU's Centre for Research in Energy and the Environment (CREE) and also leads RGU's Laser Safety Management Programme. He is also the Lead for the Sensors and Instrumentation Research Group in the School of Engineering. He has published more than 150 research outputs in various journals/international conferences/symposia. Furthermore, his research has resulted in inventions leading to four patents & two spin out companies. He has supervised 14 PhD students to completion and currently supervising 7 research students. His applied research expertise has resulted in successfully developing research collaborations nationally (within UK) and internationally (India, Brazil, Portugal, Germany, USA, etc). He has been an invited reviewer for several international journals and has been a member of the project review panel.

## Resource persons for chairing the sessions



**Dr. Sunil K.**  
Department of Chemistry  
SSIT, Tumakuru.



**Dr. M. P. Yashoda**  
Department of Chemistry  
Manipal Institute of Technology, Manipal.



**Dr. Narayana Hebbar**  
Department of Chemistry  
SDM College, Ujire



**Dr. Nagaraju D. H.**  
Department of Chemistry  
Reva University, Bengaluru.



**Dr. Mahesh Padaki**  
Centre for Nano and Material Sciences,  
Jain University, Bengaluru.



**Dr. Sachin H. P**  
Department of Chemistry  
JNNCE, Shivamogga.



**Dr. S. K. Rajappa**  
Department of Chemistry,  
Karnatak Science College, Dharwad.



**Dr. Nagaraju G.**  
Department of Chemistry,  
SIT, Tumakuru.

## Emerging Trends in Nanoscience & Nanotechnology (ICETNN-2021)

### Programme Schedule Day-1 Friday (06/08/2021)

Session	Time	Programme
Inaugural Session	11:00 am - 12:15 pm	<p style="text-align: center;"><b>Dignitaries</b></p> <p style="text-align: center;"><b>Dr. CA. A Raghavendra Rao</b> Chancellor – Srinivas University, will be the President of the function</p> <p style="text-align: center;"><b>Dr. Seeram Ramakrishna</b> FREng, Director, National University of Singapore, will be the Chief Guest.</p> <p style="text-align: center;"><b>Dr. Sabu Thomas</b> Vice Chancellor- Mahatma Gandhi University, Kerala, will be the Chief Guest.</p> <p style="text-align: center;"><b>Dr. A. Srinivas Rao</b> Pro-Chancellor- Srinivas University, will be the Guest of Honour</p> <p style="text-align: center;"><b>Dr. Radhakrishna Prabhu</b> School of Engineering, Robert Gordon University, United Kingdom. Key note speaker</p> <p style="text-align: center;"><b>Dr. P.S. Aithal</b> Vice Chancellor and Conference Chairperson</p> <p style="text-align: center;"><b>Dr. Thomas Pinto</b> Dean, Srinivas University, SUCET</p> <p style="text-align: center;"><b>Dr. Praveen B.M.</b> Conference Convenor</p>
		<b>Tea Break</b>
		<p style="text-align: center;"><b>Key Note Speaker</b></p> <p style="text-align: center;"><b>Dr. Radhakrishna Prabhu</b> School of Engineering, Robert Gordon University, United Kingdom.</p>
		<b>Lunch Break</b>



**Day-1 Friday (06/08/2021)****Technical Session – 1****2:00 pm - 3:00 pm (IST)****Young Scientist Category - 1**

<b>Paper ID</b>	<b>Name</b>	<b>Title</b>
VP-4	Canute Sherwin	Preventing star crack defects in copper moulds by nickel plating - analytical and numerical approach
VP-56	Purshotham P. Katti	A review on electrodeposition of zinc-nickel alloys
VP-42	Arjun G Kalkhambkar	Nano level surface activity studies of quinazolinone derivatives as corrosion Inhibitors for mild Steel in hydrochloric acid solution.
VP-32	Shareefraju J. Ukkund	Sustainable adsorption method for the remediation of brilliant green dye using halloysite nanotube: Isotherm, kinetic and modelling studies
VP-7	Mikitha Pais	Utilization of nanoparticles of biopolymer as an effective, eco-friendly corrosion inhibitor
VP-10	Meghana Navada K	Controlled synthesis of nano $\alpha$ -Fe <sub>2</sub> O <sub>3</sub> mediated from scoparia dulcis L.: optical, structural, surface characterizations
VP-11	Josline Neetha Dsouza	Antiproliferative activity of Vateria indica (L.) phytochemical influenced Ag and Ag/ZnO nanostructures against human triple-negative breast cancer cells
VP-13	Sabia Kouser	Sodium alginate functionalized halloysite nanotube/polycaprolactone bio nanocomposite films: structural, mechanical and biocompatible properties
VP-14	Rukaya Banu	Poly (fast sulphone black-f) modified pencil graphite electrode sensor for serotonin
VP-1	Shruti Karnik	Filtration efficiency of TiO <sub>2</sub> -graphene composite coated polypropylene masks
VP-3	Zhoveta Yhobua	Novel molecular and environmental friendly catalysts of carbene-ligated nickel(ii) complexes as ultrasensitive glucose sensors: functional analogues of glucose oxidase enzyme
VP-68	Manjunath Kumar K S	Bi-metallic layered double-layer hydroxide as an electrochemical catalyst for hydrogen evolution reaction
VP-21	Shanmukha N. T.	Comparative studies on different electrodes for the degradation of distillery spent wash using electrocoagulation process

**Chair:****Dr. Sunil K.**

Sri Siddhartha Institute of Technology, Tumakuru.

**Dr. M. P. Yashoda**

Manipal Institute of Technology, Manipal

**Day-1 Friday (06/08/2021)**

**Technical Session – 2**

**3:30 pm - 4:30 pm (IST)**

**Category: Best Research Student Award**

<b>Paper ID</b>	<b>Name</b>	<b>Title</b>
VP-5	Neelamma M. K.	Bentonite clay liquid crystals for high-performance supercapacitors
VP-6	Akhil Chandran P.	Study of sensor behavior of functionalized cellulose
VP-39	Shweta Varute	ZnO nanoparticles based triboelectric nano generator for charging portable electronic gadgets
VP-40	Sudhanva Narayana K S	A review on the draw-backs of nanosized electronic components, and their solution with spintronics
VP-41	Ashwathi V Nair	Extraction and characterization of nano-hydroxyapatite from sea-shell and their application in pest control
VP-58	Sonali Wale	Preparation, damage repair and evaluation of GFRP composites with machine learning approach
VP-59	Yatheesha M K	Preparation and evaluation of impact load characteristics of filler loaded fiber reinforced plastics
VP-60	Navyashree K. C.	Synthesis and characterization of TiO <sub>2</sub> and Zr, Co doped TiO <sub>2</sub> powder
VP-61	Lovesome Benedict S	Synthesis and characterization of yttrium and cerium-based powders for high temperature applications
<b>Chair:</b>  <b>Dr. Narayana Hebbar</b> SDM College Ujire.  <b>Dr. Nagaraju D. H.</b> Reva University, Bengaluru		

**Day-2 Saturday (07/08/2021)****Technical Session – 1****09:30 am - 10:30 am (IST)****Young Scientist Category - 2**

<b>Paper ID</b>	<b>Name</b>	<b>Title</b>
VP-17	Nayan Kumar H N	Low-cost functionalized nano materials for an electrochemical detection of lead ions
VP-20	Sumedha H N	Development of novel manganese nitride ( $Mn_3N_2$ ) nanoparticles as a stable electrode material for supercapacitors
VP-22	Suraj M. Sutar	Synthesis and characterization of $Fe_3O_4$ -Cys-Naphthoquinone complex for biomedical applications
VP-30	Gopal C M	Pharmaceutical and personal care products in rivers and lakes, India
VP-31	Bhavya M. S.	Maghemite nanoparticles compatibilization of guar gum/hydroxypropyl methylcellulose blends
VP-52	K Raju	Bio mapping of gangadonahalli lake & scientific remediation of lake
VP-34	Gurunath S Janakunavar	Corrosion mitigation studies of mild steel using an imidazole derivative in 1M HCl solution
VP-35	Vinoda B. Patil	Glucose-based carbon electrode for trace-level detection of acetaminophen
VP-36	Rakesh	Detection of ketorolac using disposable pencil graphite electrode surface
VP-37	Manohar Rathod	Corrosion protection of soft-cast steel in 1M HCl with araucaria heterophylla leaves extract
VP-47	Varadaraj S	Investigation of mechanical characteristics of Ni-Nb composite coating
VP-55	Devaraja C	Influence of $Eu^{3+}$ ions and temperature on conductivity of alkali lead boro-tellurite glasses

**Chair:****Dr. Mahesh Padaki**

Jain University, Bengaluru

**Dr. Sachin H. P**

Jawaharlal Nehru National College of Engineering, Shivamogga

**Day-2 Saturday (07/08/2021)**

**Technical Session – 2**

**11:00 am - 12:00 pm (IST)**

**Category: Best Paper Award**

<b>Paper ID</b>	<b>Name</b>	<b>Title</b>
VP-2	Ambresh P. Ambalgi	Multiband, nanomaterial based multi-slotted patch with octal shape defected ground for C and X-band wireless applications with increased bandwidth
VP-15	Nagaraja S.	Review of nanoparticle studies in computer technology
VP-43	B. Jayalakshmi	Free radical scavenging capacity of a nutritionally and medicinally important seed <i>Coriandrum Sativum</i> L.
VP-51	Shivanna R.	Effect of sportsmen on academic performance of Tumkur university
VP-25	Jyoti S. Kavirajwar	Study of surface morphology and corrosion properties of zinc coatings
VP-62	Madan N.	Synthesis, characterization & Structural Studies of (E)-4-(2-amino-3,5-dibromo benzylidene amino) phenol
VP-48	Omprakash V. Bhat	Overview of nanorobots in medicine: a brief review
VP-19	Shwetha K. R.	Single-atom catalysts on iron oxide/MWCNTs for hydrogen evolution reaction
VP-12	Sangeeta Kulkarni	The Effect of dispersion state of Graphene for the study of Transport properties of Epoxy-Graphene nano composites
VP-63	Pradeep Kumar P. S.	Synthesis and Characterization of Novel pyrazole derivatives.
VP-64	Ranganatha S.	Electrochemical aspects of Ni/Co double hydroxides
VP-16	Hanmant Madhavrao Kasralikar	CuO-CeO <sub>2</sub> Nanocomposites: An efficient catalyst for the synthesis of Thiazepines

**Chair:**

**Dr. S. K. Rajappa**

Karnatak Science College, Dharwad.

**Dr. Nagaraju G.**

Siddaganga Institute of Technology, Tumakuru

## **KEY NOTE SPEAKER**

### **Nanotechnology and its applications**

Radhakrishna Prabhu<sup>a\*</sup>

<sup>a</sup>Reader, School of Engineering, Robert Gordon University, Sir Ian Wood Building,  
Aberdeen, AB10 7GJ, UK

Corresponding Author✉: [r.prabhu@rgu.ac.uk](mailto:r.prabhu@rgu.ac.uk)



**Abstract** – Nanotechnology has become an emerging research topic owing to its huge application potential in areas like information technology, homeland security, medicine, transportation, energy, food safety, and environmental science, etc. It refers to nanosized objects used directly in an application or a device that contains a nanodevice. The knowledge and understanding on the science underlaying this technology (nanoscience) has improved drastically over the past few decades, following the development of sophisticated instruments to image or see the effects at atomic scales. Along with this, the technological developments to realise the nanodevices, this nanotechnology is making great strides in our walks of everyday life, from compact and faster computers, nanomedicines on the high-end application side to environmentally friendly water treatment on the other end. This is poised to generate higher impacts to the society by integrating with the features of artificial intelligence in the future. This talk will highlight some of the fundamentals of the technology and recent developments in its applications especially in the areas like medicine, photonics and the environment.

**Key Words:** Nanotechnology, Nanodevices, Atomic scales.

## VP-1: Filtration efficiency of TiO<sub>2</sub>-graphene composite coated polypropylene masks

Shruti Karnik<sup>a</sup>, Emmanuel Okenwa<sup>a</sup>, Carlos Fernandez<sup>b</sup>, Sandhya Devalla<sup>c</sup>, Praveen B. M<sup>d</sup>, Radhakrishna Prabhu<sup>a</sup>

<sup>a</sup>School of Engineering, Robert Gordon University, Aberdeen, AB10 7GJ, U.K.

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<sup>c</sup>James Hutton Institute, Aberdeen, AB15 8QH, U.K.

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**Abstract** – The use of respirators/ masks has become widely prevalent in response to the global SARS-CoV-2 outbreak, where the virus can be transmitted via respiratory droplets. These respiratory droplets from sneezes, coughs can be of various sizes and are commonly classified as aerosols (made of droplets that are <5 µm). The use of physical barriers such as respiratory masks can be extremely efficient in mitigating this spread via respiratory droplets. However, the current surgical masks cannot self-sterilize to reuse or be recycled for other applications into resulting high economic

and environmental. Furthermore, the use of disposable surgical masks is common for patients, doctors, and even the public is highly risky. TiO<sub>2</sub> has demonstrated excellent photo-biocidal property under UV irradiation against various viruses, bacteria and yeasts which is attributed to the direct oxidation of these microbes by photogenerated holes or reactive radical species, such as hydroxyl radical, O<sub>2</sub><sup>-</sup>, and H<sub>2</sub>O<sub>2</sub>. Graphene has emerged as a remarkable material for different types of optoelectrical sensors for screening targeted virus protection and environmental filters. TiO<sub>2</sub>- graphene Coatings can act as nano filters for trapping pathogens onto the filter due to high surface to ratio volume, surface charges on graphene and inactivation of viruses due to TiO<sub>2</sub>-graphene and can be exploited as self-cleaning materials. In the present work, TiO<sub>2</sub>-graphene composites prepared hydrothermally were coated on clinical grade polypropylene fabric by dip coating method. The effectiveness of TiO<sub>2</sub>-graphene coatings against aerosols was evaluated by performing filtration efficiency and pressure drop test for breathability using an inhouse assembly consisting of an aerosol generation and mixing chamber and a downstream collection chamber. Two different flow rates of 1.2 CFM (a face velocity of 0.1 m/s) and 3.2 CFM (a face velocity of 0.26 m/s) were used that represented rates observed at rest to moderate activity, respectively. This preliminary study initiated to demonstrate the application of TiO<sub>2</sub>-graphene coated masks has paved ways to creating safe, economically viable, breathable multi-layered and self-cleaning masks.

**Key Words:** TiO<sub>2</sub>-graphene, Respiratory droplets, Photo-biocidal, Respiratory masks.

## VP-2: Multiband, nanomaterial based multi-slotted patch with octal shape defected ground for C and X-band wireless applications with increased bandwidth

Ambresh P. Ambalgi<sup>a</sup>, Sahana Nair<sup>b</sup>, P. V. hunagund<sup>c</sup>

<sup>a</sup>Dept. of Electronic, Mangalore University -574199, Mangaluru, Karnataka.

<sup>b</sup>Dept. of Physics, S.D.M Engineering College, Ujjire -574199, D.K-574240. Karnataka.

<sup>c</sup>Dept. of Applied Electronic, Gulbarga University -574199, Gulburga-585106. Karnataka.

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**Abstract** – The work in the paper demonstrates the multiband antenna etched with multi slotted on the upper patch surface with octal defected ground structure for enhancement in bandwidth suitable for C and X-band applications. The antennas are also coated with nanomaterial using RF sputtering technique to enhance its characteristics parameters in comparison to non coating. The three different independent resonances are obtained for the proposed antennas ( $f_{r1} = 5.92\text{GHz}$ ,  $f_{r2} = 9.76\text{ GHz}$  and  $f_{r3} = 12.61\text{ GHz}$  for MSMSADGS and  $f_{r1} = 5.95\text{GHz}$ ,  $f_{r2} = 9.88\text{ GHz}$  and  $f_{r3} = 12.22\text{ GHz}$  for NC-MSMSA-DGS). The antenna also exhibited better return loss and radiation characteristics with enhancement in the bandwidth up to 39.20%.

**Key Words:** Multiband antenna, X-band, RF sputtering technique.

### VP-3: Novel molecular and environmental friendly catalysts of carbene-ligated nickel(ii) complexes as ultrasensitive glucose sensors: functional analogues of glucose oxidase enzyme

Zhoveta Yhobu<sup>a,c</sup>, Brinda K. N.<sup>a</sup>, Gautam Achar<sup>a</sup>, Jan Grzegorz Małecki<sup>b</sup>, Nagaraju D. H.<sup>\*c</sup> and Srinivasa Budagumpi<sup>\*a</sup>

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**Abstract** – Biosensors that have high efficiency and sensitivity play a vital role in environmental, clinical, industrial and agricultural applications. As such there has been immense attention dedicated to the developments of materials that are associated with superior electrocatalytic ability and are cost effective. Biosensors for glucose determination were primarily developed as enzymatic glucose sensors from glucose oxidase (GOx) enzymes, however their utility has dwindled over the years due to its instability, high production cost and difficult immobilisation. In this regard, we have developed a non enzymatic glucose sensor from nickel due to its cost effectiveness, benign nature, abundance and its variable oxidation states. The nickel has been anchored to sterically varied 1,2,4-triazol-5-ylidene ligands to realise a nickel(II) N-heterocyclic carbene (NHC) complexes. These nickel(II) complexes have fair advantages over other materials due to its structural tunability, low metal utilisation and high atom economy. These complexes have been prepared by the in situ deprotonation of NHC precursor triazolium salts, and nickelocene in a Schlenk set-up and have been characterised by NMR, FT-IR, single crystal XRD and the morphology was studied using FE-SEM techniques. These complexes were immobilised onto glassy carbon electrodes (GCE) without further addition of binders. Electrochemical techniques with regard to cyclic voltammetry, chronoamperometry and electrochemical impedance spectroscopy were employed for studying the electrocatalytic properties of the complex modified GCEs. The electrocatalytic properties of the modified GCEs were further enhanced by the simple and physical mixing of a conductive and high surface area material i.e. graphitic mesoporous carbon (GMC). These enhanced modified electrodes exhibited higher sensitivity (up to 124.92  $\mu\text{A}/\text{mM cm}^2$ ) and its detection limit was calculated as low as 44.59  $\mu\text{M}$  (at S/N = 3). The modified electrodes were further probed and found to be reusable and exhibited long term stability. Further validation of the selectivity of the modified electrodes proceeded in exhibiting excellent selectivity in the presence of other interfering species.

**Key Words:** Glucose sensing, Non-enzymatic sensors, Nickel NHC complex, Modified GCE, X-ray diffraction.



## VP-4: Preventing star crack defects in copper moulds by nickel plating - analytical and numerical approach

Canute Sherwin<sup>a\*</sup>

<sup>a</sup>Department of Mechanical Engineering, St. Joseph Engineering College, Mangaluru, Karnataka, India.  
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**Abstract** – Mould is a key element in continuous casting process and is normally represented as the heart of continuous casting machine. Copper (Cu) and its alloys are widely used to manufacture mould plates due to its excellent thermal conductivity and corrosion resistance. However during the service these copper moulds get severely worn out and corrode. There is a possibility of Cu elements produced by wear and friction entering into liquid steel during the solidification process. This will lead to development of surface cracks on the steel slabs produced followed by decline in quality.

The commonly used term to represent this surface cracks developed in the cast steel slab is star crack defects. There are different reasons for the formation of star cracks, the major one being the non-uniform heat transfer through the solid shell and the surface irregularities of the manufactured copper mould plate being the other reason. The present work focusses on identifying the presence of surface irregularities in the polished copper substrate using scanning electron microscopy technique, coating the substrate by a thin layer of nickel by electrodeposition technique providing a uniform harder surface and performing thermal analysis on the coated and plane copper sample. The results of the analytical and numerical analysis is correlated to the actual application of nickel plating on copper mould plate, thereby reducing the possibility of star crack formation in continuous cast steel. Coating of nickel reduces the thermal conductivity of the mould slightly thereby reducing the rate of heat transfer. This reduction in heat transfer rate reduces thermal shocks leading to lower possibility of star crack formation.

**Key Words:** Copper, Star crack defects, Electrodeposition, Analytical, Numerical, Scanning electron microscope.

## VP-5: Bentonite clay liquid crystals for high-performance supercapacitors

Neelamma M. K.<sup>a</sup>, Sowmya R. Holla<sup>a\*</sup>

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**Abstract** – As the human population increase, there is invariably excessive demand for energy sources, thus making it a fundamental need. The basic use of Supercapacitors is the storage of energy. But self-discharge is caused when no external power or internal battery is charging them. This clearly reduces its efficiency. It has been found that self-discharge can be reduced to a great extent by employing Liquid Crystals (LC). But the effect of the same in enhancing the supercapacitance was not discussed. So here, the naturally available Bentonite clay is analyzed for its Lyotropic Liquid Crystalline (LLC) properties. It's characterized by a polarised optical microscope (POM). These LCs are added as an additive electrolyte to the supercapacitors. The electrode materials used for Supercapacitors are the composite of activated carbon and polyaniline. The electrochemical behavior of the Supercapacitors is determined by Cyclic Voltammetry, Electrochemical Impedance Spectroscopy, and Galvanostatic charge-discharge cycling techniques.

**Key Words:** Lyotropic Liquid Crystalline, Supercapacitors, Bentonite.

## VP-6: Study of sensor behavior of functionalized cellulose

Akhil Chandran P.<sup>a</sup>, Sowmya R. Holla<sup>a\*</sup>

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**Abstract** – Bio sensing is growing as a wide tool for health monitoring field. Human body contain large amount of body fluids and proteins. They have specific functions in the body. An increase or decrease from their normal level may lead to malfunctioning of body. Sensing of body fluids by using chemicals is a good method for measurement of their concentration. In this work, cellulose acetate is produced through microwave irradiation and characterized through scanning electron microscopy. FTIR gave information about the structure of cellulose acetate. From this cellulose acetate, through oxidation polymerization, cellulose acetate polypyrrole is produced and characterized through the same way. The behavior of the composites as a biosensor was checked by using cyclic voltammetry.

**Key Words:** Cellulose, Cellulose acetate, Cellulose acetate polypyrrole (CAPP), Sensor.

## VP-7: Utilization of nanoparticles of biopolymer as an effective, eco-friendly corrosion inhibitor

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**Abstract** – Nanoparticles are widely used in different industrial and research areas, ranging from analytical chemistry and environmental science to medicine, agriculture to the pharmaceutical industry, and many more. This is because of the unique characteristics of nanoparticles and the novelty they introduce in such applications. This work attempts to explore the noble characteristic properties of nanoparticles for preservation for materials of engineering applications. In the recent decade, corrosion inhibition of metal by nanoparticles is gaining interest and is an ongoing discovery in the field of nanotechnology. Nanomaterials tend to show higher inhibition efficiency because of their large surface-to-volume ratio.

Nanoparticles of biopolymer maltodextrin (MLD-Np) were prepared by microwave-mediated nanoprecipitation technique. Characterization was done using ATR-FTIR, Raman, X-Ray Diffraction, Scanning Electron Microscopy, and zeta potential measurement. In the second part, these nanoparticles were tested for their surface protection ability due to interfacial adsorption and are compared with the microparticles of MLD. Corrosion attenuation of zinc is studied in 0.1 M sulfamic acid using MLD and MLD-Np. Electrochemical methods like the potentiodynamic polarisation method (PDP) and electrochemical impedance spectroscopy (EIS) techniques were employed for the corrosion measurement. The adsorption of inhibitor was established by studying surface morphology. The efficacy of these nanoparticles was 93% for the addition of 50 ppm of it, whereas for microparticles, the maximum efficiency was 62.3% for 400 ppm MLD concentration. The outcome of the work has dual advantages. One, it uses an environmentally accepted inhibitor to control corrosion. The second advantage is that when biopolymer is converted into its nanoparticles, inhibition efficiency increased 3 to 4 folds compared to the precursor molecule.

**Key Words:** Maltodextrin, Nanoparticles, Acid corrosion, Green inhibitor, Electrochemical methods.

## VP-8: Platinum-Rhodium alloy coatings with high corrosion resistance and their applications activity of photocatalysis

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**Abstract** – This article describes a method for electroplating a platinum-rhodium (Pt-Rh) alloy coating with a specific composition on a stainless steel (SS304) metal substrate. The Pt-Rh bath consists of [Pt (NH<sub>3</sub>)<sub>2</sub>]HPO<sub>4</sub>, H<sub>2</sub>SO<sub>4</sub> and Rh<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>. Different analytical methods, such as scanning electron microscopy (SEM) and X-ray diffraction, were used to characterise the Pt-Rh alloy electrodeposition coatings (XRD). The coating is uniform in 75 % of the duty cycle, according to SEM images. XRD confirms that crystalline size was reduced from 75% duty cycle to the rest of the PC's coatings and DC (Direct current). Incorporation of the Pt-Rh metal ions was verified by EDX analyses. The corrosion behaviour of the developed Pt-Rh alloy coatings was assessed using potentiodynamic polarisation and electrochemical impedance techniques in 0.1M Na<sub>2</sub>SO<sub>4</sub> solution. The corrosion resistance of a coating developed at PC-75 % duty cycle is the best. Under UV light, a photocatalytic degradation study of Pt-Rh coating for Methylene Blue (MB) dyes was carried out. PC When compared to a DC coating source, 75 percent duty cycles showed an exceptional dye degradation percentage. A UV–Vis spectrophotometer was used to monitor all photocatalytic behaviour.

**Key Words:** Platinum-Rhodium, SS304, SEM, XRD, Dye degradation, Corrosion.

## VP-9: Production of hydrogen evolution reaction from the platinum coating on SS304 by electrodeposition method

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**Abstract** – Direct current (DC) and pulse current (PC) electrodeposition methods were used to create a thin layer of platinum coating ( $0.5 \text{ g cm}^{-2}$ ) on a stainless steel surface for hydrogen evolution reaction (HER) application. The coatings were characterised using scanning electron microscopy (SEM), atomic force microscopy (AFM), and X-ray diffraction (XRD) analysis. The over potential values for hydrogen evolution reaction (HER) on developed platinum coatings were determined using linear sweep voltammetry (LSV) and cyclic voltammetry (CV). The reduction of

overall cost is aided by the optimization of catalytic activity for hydrogen evolution using various coating methods. The developed coatings behaved almost identically to pure platinum metal. For DC and PC platinum coatings, tafel polarization experiments were carried out to determine the hydrogen generation trend. According to the cathodic slope and HER current values, coatings obtained by PC method at 75 % duty cycle had a lower cathodic slope and more corrosion current with the highest hydrogen evolution. Chronopotentiometry was conducted and amount of hydrogen collected during these experiments was 20 ml for 75% sample.

**Key Words:** Electrodeposition, Platinum, HER, LSV, Chronopotentiometry.

## VP-10: Controlled synthesis of nano $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> mediated from scoparia dulsis L.: optical, structural, surface characterizations

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**Abstract** – In this study we report the synthesis of series of iron oxide nanoparticles ( $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>) by simple, facile Solution combustion method (SCS) using varied volume of green extract of Scoparia dulsis L. as a natural reducing agent and with the role to act as capping agent. The nano samples were well characterized by tools such as Fourier Transform Infrared Spectroscopy (FT-IR), powder X-Ray Diffraction (p-XRD), UV–Diffuse Reflectance Spectroscopy (UV-DRS), Field Emission Scanning Electron Microscope (FESEM) coupled with Energy Dispersive X-Ray (EDX). The average crystallite size of as synthesized three nano-samples was calculated by Scherer equation was found to be in the range of 27-37 nm and the diffraction patterns indicate the formation of pure, trigonal  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nanoparticles. Rietveld Refinement was performed to get the refined structural parameters. The surface morphology of the synthesized nanosamples were found to be aggregated and porous in nature due to escape of gases during the Combustion synthesis. Elemental composition of the samples prepared is studied using FESEM attached with EDS respectively ascertaining to its purity. The reflectance studies were carried out to evaluate optical energy band gap of the nanoparticles using UV–DRS (UV) spectroscopy. The band gap was analyzed using Kubelka Munk functions from the DRS spectral data obtained. Multipont BET, BJH pore analysis was carried out for the surface study of the prepared nano particles which is essential for the inherent catalytic property of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> NPs.

**Key Words:** Green synthesis,  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>, Solution Combustion method, Optical Energy Gap.



## VP-11: Antiproliferative activity of *Vateria indica* (L.) phytochemical influenced Ag and Ag/ZnO nanostructures against human triple-negative breast cancer cells

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**Abstract** – Human Triple-negative breast cancer (TNBC) being an aggressive cancer type accounts for about 10-15 % of all breast cancer. In the present study, the cytotoxicity of pure silver (AgVI) and silver/zinc oxide (Ag/ZnOVI) nanostructures was evaluated against the TNBC cells. The nanostructures synthesized from a green route using *Vateria indica* (L.) fruit extract were characterized to scrutinize their formation, crystal phase, size, shape, and surface properties via FTIR, PXRD, FE-SEM coupled with EDS spectroscopy, and BET analysis. The results of the studies have unveiled the formation of 26.43 nm and 20.97 nm sized AgVI and Ag/ZnOVI nanostructures in their purest form. The in-vitro anticancer study performed on human Triple-negative breast cancer (TNBC) cells [MDA-MB468] has revealed the enhancement in the antiproliferative potentiality of bimetallic Ag/ZnOVI nanostructures from  $66.99 \pm 0.13$  to  $79.73 \pm 0.23$  in comparison to pure AgVI nanostructures. In addition to this, the greenish yellow-fluorescence observed in the TNBC nuclei during the AO-EB staining study manifested the early apoptosis. Furthermore, the anti-inflammatory study has proven the biocompatibility of synthesized nanostructures with membrane stabilization percentage up to  $94.5 \pm 0.001$ . Additionally, the anti-oxidant and antidiabetic studies carried out have corroborated the radical scavenging and  $\alpha$ -amylase inhibition capability up to  $85.87 \pm 0.001$  and  $89.60 \pm 0.002$  % respectively. Thus the overall results of the study substantiate the superlative antiproliferative property of green synthesized AgVI and Ag/ZnOVI nanostructures.

**Key Words:** Cytotoxicity, TNBC, Anti-inflammatory, Antiproliferative.



## VP-12: The Effect of dispersion state of Graphene for the study of Transport properties of Epoxy-Graphene nano composites

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**Abstract** – The alternate substitute for traditional epoxy reinforcement with graphene have attracted graphene nano composites in advanced applications. In this paper the dispersion of graphene in to epoxy system by using sonication as well as dispersion states and reaggregation behavior of graphene in this system have been studied. In order to quantify the reaggregation by series of controlled experiments light transmittance UV visible spectroscopy has been used. After 25mins sonication of 0.5 wt of graphene disperse at 20°C the light transmittance are decreased from 85.6 to 66.23 in liquid epoxy while increasing the temperature from 20 to 60°C. The light transmittance in liquid epoxy decrease from 80.6 to 60.3% after 10 mins of sonication. The results showed that dispersion state depends on the sonication time and temperature

**Key Words:** Epoxy reinforcement, Transmittance, Dispersion states, Antiproliferative.

### VP-13: Sodium alginate functionalized halloysite nanotube/polycaprolactone bio nanocomposite films: structural, mechanical and biocompatible properties

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**Abstract** – Recent advances in polymeric materials, blends, and nanocomposites systems have demonstrated that these unique materials can aid in the creation of newer materials for biological purposes. In this report, the sodium alginate functionalized halloysite nanotubes (HNTs) via acylation process incorporated in the poly caprolactone (PCL) matrix through solution casting technique. The films exhibited enhanced thermal and mechanical properties. The swelling properties, in-vitro enzymatic degradation, and anti-inflammatory activity of the films were also analyzed.

The in vitro cytocompatibility study was performed on PCL nanocomposite films using mouse fibroblast (NIH3T3) cells to determine the cell proliferation, cell adhesion, and cell migration activity. The biological test results indicated the delayed enzymatic degradability, hemocompatibility and cytocompatibility of nanocomposites with enhanced cell adhesion, cell proliferation, and cell migration capabilities with respect to fibroblast cells. Thus, the fabricated PCL nanocomposite films potentially employed for wound healing application.

**Key Words:** Sodium alginate functionalization, Halloysite nanotubes, Polycaprolactone, Cytocompatibility, Hemocompatibility, Wound healing.

## VP-14: Poly (fast sulphone black-f) modified pencil graphite electrode sensor for serotonin

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**Abstract** – Development of sensitive and rapid biosensor for the investigation of serotonin has great significance because it is a key neurotransmitter and its unusual concentrations associated with serious mental disorders. In this study, an electrochemically modified serotonin-sensing electrode was fabricated by simple electropolymerisation of fast sulphone black f on pencil graphite electrode (PGE) using cyclic voltammetric technique. This modified electrode was applied for detection of serotonin(5-HT) and shows increased current responses of 5-HT in 0.2M PBS of pH 7.4. Several analytical parameters includes influence of 5-HT concentration, scan rate and solution pH were investigated. The diffusion controlled electrode process was observed for 5-HT and detection limit was found to be 1.7 $\mu$ M. Interference study of 5-HT was analysed in presence of dopamine (DA) through cyclic voltammetry(CV) and differential pulse voltammetry(DPV).

**Key Words:** Serotonin, Cyclic voltammetry, Differential pulse voltammetry, Pencil Graphite Electrode.

## VP-15: Review of nanoparticle studies in computer technology

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**Abstract** – Nanotechnology is already in use in many computing, communications, and other electronics applications to provide faster, smaller, and more portable systems that can manage and store larger and larger amounts of information. Nano technology in computer science is named as Nano computing, which is divided into categories- Electronic Nano computing, Mechanical Nano computing, Chemical Nano computing, Quantum Nano computing etc. The lack of a scalable nanoparticle-based computing architecture severely limits the potential and use of nanoparticles for manipulating and processing information with molecular computing schemes. Inspired by the von Neumann architecture (VNA), in which multiple programs can be operated without restructuring the computer, we realized the nanoparticle-based VNA (NVNA) on a lipid chip for multiple executions of arbitrary molecular logic operations in the single chip without refabrication. In this system, nanoparticles on a lipid chip function as the hardware that features memory, processors, and output units. One of the first achievements in nanocomputer research was perhaps the development of single-electron tunnelling (SET) transistors. Recently, the semiconductor industry has successfully built 70-megabit memory chips containing over half billion transistors. As the advancement in nanofabrication progresses, the silicon-based nanocomputer becomes closer to reality. Another approach to nanocomputers is DNA computing useful for the study of biological development of life.

**Key Words:** VNA, NVNA, DNA computing.

## VP-16: CuO-CeO<sub>2</sub> nanocomposites: an efficient catalyst for the synthesis of thiazepines

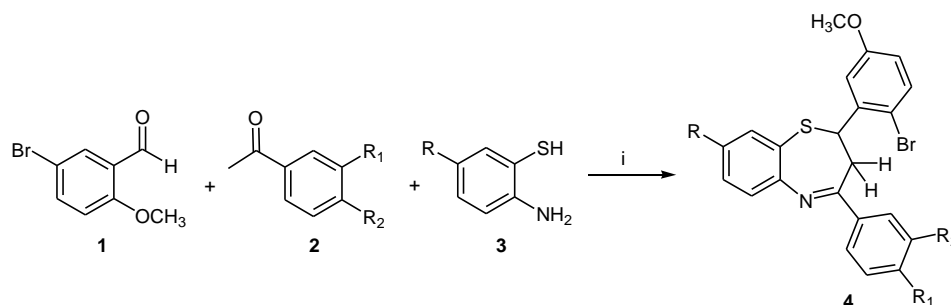
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**Abstract** – Thiazepines has the various biological and pharmaceutical applications. A new series of structurally diverse 2,3-dihydrobenzo[b][1,4]thiazepines (2,3-dihydro-1,5-benzothiazepines)4 with substituted phenyl groups at C(2) and C(4) have been synthesized by reaction of 3-(5-bromo-2-methoxyphenyl)-1-arylpropen-1-ones with 2-aminobenzenethiols 3 in the presence of CuO-CeO<sub>2</sub> nanocomposite. 3-(5-bromo-2-methoxyphenyl)-1-arylpropen-1-ones was obtained in the reaction mixture by the reaction between 5-bromo-2-methoxybenzaldehyde1 and substituted acetophenones2. This reaction leads high yield with mild reaction condition.



Reaction condition: i) CuO-CeO<sub>2</sub> Nanocomposite , Solvent free, 80oC, 90-98%.

**Key Words:** Thiazepines, Nanocomposites.

## VP-17: Low-cost functionalized nano materials for an electrochemical detection of lead ions

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**Abstract** – Heavy metal pollution of the environment is due to increased industrial activities (mining, metallurgical and chemical processes etc.). Heavy metal ions such as  $\text{Hg}^{+2}$ ,  $\text{As}^{3+}$ ,  $\text{Pb}^{2+}$ , and  $\text{Cd}^{2+}$  are highly toxic and carcinogenic even at a trace level. These heavy metal ions are non-biodegradable, can easily enter into the food chain causing severe threats to the human life and the environment. Therefore, monitoring the heavy metal pollutants in food, water and biological systems is an important challenging task. To detect these heavy metal ions conventional techniques like atomic absorption spectroscopy, inductively coupled plasma mass spectroscopy, high pressure liquid chromatography are used. However, these techniques are expensive, time consuming, involving sophisticated equipment or require high level of staff expertise. Here, we have developed electrochemical sensor which is fabricated using inexpensive functionalized nano material by simple sonication method. The functionalized nano material displays high surface area of  $73.644 \text{ m}^2 \text{ g}^{-1}$  and able to detect the heavy metal ions at very low concentrations.

**Key Words:** Electrochemical detection, SWASV.

## VP-18: Synthesis, characterization and electrochemical studies of calcium oxide nanoparticles modified carbon paste electrode for the determination of uric acid in presence of dopamine

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**Abstract** – In this work CaO nanoparticles are synthesized by Co-precipitation method and characterized by XRD, SEM and EDAX technique. The prepared nanoparticles are modified with carbon paste electrode for the detailed electrochemical investigation of uric acid in presence of dopamine using cyclic voltammetry and differential pulse voltammetry technique. The various parameters like scan rate, pH and concentration of uric acid is studied. The simultaneous determination of uric acid in presence of dopamine is investigated by using cyclic voltammetry technique.

**Key Words:** Calcium oxide (CaO) nanoparticles, Modified carbon paste electrode, Uric acid (UA), Dopamine (DA).

## VP-19: Single-atom catalysts on iron oxide/MWCNTs for hydrogen evolution reaction

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**Abstract** – Hydrogen has gained greater interest as a clean, renewable, and sustainable energy into the future. One of the sustainable approach for the production of molecular hydrogen is water electrolysis. The development of active, stable and inexpensive catalysts is an essential requirement for the desired electrocatalyst. In this work, we report a highly stable Single-Atom Catalysts (SACs) supported on iron oxide (SACs/Iron Oxide/MWCNTs) by simple electrochemical deposition method. The supported catalyst exhibits good hydrogen evolution reaction (HER) activity in an acidic medium. The overpotential of the prepared catalyst was found to be 101 mV vs RHE to reach a current density of 10 mA cm<sup>-2</sup>. The SACs display exceptional stability and found to be no change in the HER activity even after 1000 cycles. Good catalytic activity and stability of the catalyst can be a potential candidate for renewable energy technologies. The density functional theory (DFT) calculations were performed to investigate the role of SACs and underneath MWCNTs to enhance the catalytic performance of iron oxide. The octahedral site of SACs/iron oxide with low overpotential makes it HER catalyst. However, SACs/iron oxide/MWCNTs is more efficient towards HER could be due to the availability of both octahedral as well as tetrahedral sites with less overpotential.

**Key Words:** Single Atom Catalysts, Iron Oxide, MWCNTs, HER, Electrochemical deposition, overpotential, DFT.



## VP-20: Development of novel manganese nitride ( $\text{Mn}_3\text{N}_2$ ) nanoparticles as a stable electrode material for supercapacitors

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**Abstract** – The ever-increasing demand for energy generation and storage applications requires the discovery of new materials with high performance and long-term stability. In that way, we developed novel nitride based material to investigate the super capacitor application. The  $\text{MnN}_3$  is a promising material to show good capacitance due to its outstanding chemical properties and high chemical stability. The synthesised material was characterised by PXRD, SEM, BET, FT-IR techniques to check the physico-chemical properties of material. All electrochemical results were carried out using three electrode systems, which includes  $\text{MnN}_3$  as working electrode in 0.1 M KOH as an electrolyte. The Cyclic voltammetric studies shows good specific capacitance (83 F/g at 5mV/s) with excellent redox peaks at potential window of -0.8-1.2 V. Later material was tested with different scan rates (10, 20,30,40,50,100 mV/s) at a fixed potential window to test the variation of capacity. The Galavanostatic charge-discharge (GCD) studies were carried out in order to check the cyclic stability and columbic efficiency of  $\text{MnN}_3$  electrode using Chronopotentiometric technique (CP). The electrode shows very less solution and charge transfer resistance in EIS (Electrochemical Impedance spectroscopy) studies and hence prove the excellent stability of material.

**Key Words:** Cyclic voltammetric, Galavanostatic charge-discharge, Energy generation.

## VP-21: Comparative studies on different electrodes for the degradation of distillery spent wash using electrocoagulation process

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**Abstract** – A combination of paired Aluminum, Iron and Zinc electrodes was used for the degradation of distillery spent wash in batch mode of operation. The waste water was characterized for various parameters viz, color, total dissolved solids (TDS) and chemical oxygen demand (COD) as per the standard method of analysis and treatment results were analyzed. The trials were conducted to study the effect of operational parameters such as voltage, distance between the electrodes and electrolysis time. It was experiential that aluminum electrodes were more

suitable for the degradation of distillery spent wash as compared to iron and zinc electrodes. The maximum removal efficiency of color, TDS and COD is 94, 89 and 95 % were obtained with Al-Al electrodes at the voltage of 25, and distance between the electrodes was 2 cm and electrolysis time was 150 minutes with constant pH of 7 and stirring speed was 500 rpm. This study showed that the parameter reduction is influenced by the voltage and electrolysis time. The strongest organic industrial effluent having insignificant and extremely high COD, BOD and dark in color when discharged directly into natural water bodies and it can cause irretrievable damage to the environment. The electrochemical technique is one of the most vital treatment employed for industrial wastewater treatment to treat highly polluted industrial effluents.

**Key Words:** Distillery Spent Wash, COD, Aluminum, Colour, Iron, TDS, Zinc.

## VP-22: Synthesis and characterization of Fe<sub>3</sub>O<sub>4</sub>-Cys-Naphthoquinone complex for biomedical applications

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**Abstract** – Nanotechnology is a multidisciplinary field with diverse biomedical applications. Recently, iron oxide nanoparticles have attracted much attention in magnetic resonance imaging, in biotechnology, in ferrofluids and biosensing etc. One of the features of magnetic nanoparticles is their tendency to aggregate due to their magnetic attractive forces. An important prerequisite for such applications is functionalization of these nanoparticles with some suitable moieties so as to result into biocompatible nanoparticles. We describe here a simple method to functionalized Fe<sub>3</sub>O<sub>4</sub> nanoparticles with phenol complexes using cysteine as a linker to produce Fe<sub>3</sub>O<sub>4</sub>-Cys-naphthoquinone nanocomplex. These complexes are completely characterised by FTIR, SEM, XRD, TGA, VSM and TEM to know about the various properties such as size, shape, magnetisation etc. The FTIR spectrum of the complex shows a slight shift in the C=C and C=O stretching bands, confirming the interaction of the biomolecule with iron oxide nanoparticles. The method adapted to synthesized Fe<sub>3</sub>O<sub>4</sub> nanoparticles is very simple and produce stable particles at very less temperature and time as compared to other conventional chemical synthesis methods. The synthesized nanocomplex was used in study of anti-microbial activity and was found to show interesting responses.

**Key Words:** Nanotechnology, Fe<sub>3</sub>O<sub>4</sub> nanoparticles, Fe<sub>3</sub>O<sub>4</sub>-Cys-naphthoquinone nanocomplex, Biomedical Applications.

## VP-23: A study and analysis of engine performance characteristics of biodiesel with nano-fluid

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**Abstract** – In this study, the combustion characteristics, performance and exhaust emissions of conventional diesel fuel and biodiesel produced from waste fish oil (WFO) and its blends (B25, B50, B75) were compared experimentally. A single cylinder E6 Ricardo engine was used to perform the tests under steady state conditions and engine load range. In-cylinder pressure, exhaust emissions, fuel consumption and also intake and exhaust gas temperatures were recorded during experiments to analyse the gathered data. Results revealed that waste fish oil biodiesel leads to

higher in-cylinder pressure together with shorter heat release rate duration when compared to common diesel fuel. Also, more stable combustion without large cycle-to-cycle variations could be reached by using biodiesel and its blends. Analysis showed that biodiesel has about 2.92% more gross thermal efficiency and about 1.1% lower combustion loss when compared with the diesel fuel, averagely throughout all engine loads. CO emission concentration for biodiesel and its blends is reduced with gentle slope (5.2e27%) while significantly reduction occurred for UHC (11.6e70%). Oxygen content of biodiesel led to more efficient combustion and as result about 7.2% increase in CO<sub>2</sub> averagely while NO<sub>x</sub> emission is increased also (1.9e12.8%) by using the biodiesel and its blends. Biodiesel is a liquid fuel often referred to as B100 or neat biodiesel in its pure, unblended form. Like petroleum diesel, biodiesel is used to fuel compression-ignition engines. See the table for biodiesel's physical characteristics.

**Key Words:** Waste fish oil biodiesel, Fuel blend, Cycle-to-cycle variation, Engine performance.

## VP-24: Schiff's bases as corrosion inhibitor on mild steel in acid media

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**Abstract** – Corrosion inhibitors like Schiff's bases were chosen and their ability to inhibit corrosion was studied. The inhibitory impact of these inhibitors on mild steel in an acidic media is investigated. Corrosion rate was determined by using chemical and electrochemical methods. In these works, corrosion inhibition was increased with concentration of inhibitor and decreased with temperature. Adsorption and thermodynamics mechanism was discussed in all these works. Surface morphology was discussed by using Scanning Electron Microscopic (SEM) studies. Experimental inhibition efficiencies were correlated with quantum chemical parameters.

**Key Words:** Corrosion, Schiff's base, Mild steel, Corrosion rate, SEM.

## VP-25: Study of surface morphology and corrosion properties of zinc coatings

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**Abstract** – Zinc coatings were obtained on mild steel substrate using Electrodeposition technique. Hull cell experiments were used for optimization of plating bath parameters and constituents. A new brightener was synthesized by condensation of two organic compounds using reflux condenser. Surface morphology and Corrosion studies of zinc coatings were done in absence and presence of newly synthesized brightener. Corrosion studies were carried out by Tafel Polarization and Electrochemical Impedance Spectroscopy technique, which helped to explore and confirm the good corrosion protection ability of the bright zinc coating. Modified surface morphology of bright zinc coating was confirmed by SEM and Reflectance spectroscopic technique. Change in the phase structure and orientation of zinc crystallites were studied and confirmed by X-Ray Diffraction technique. IR spectrum of bright zinc coating obtained from FTIR studies indicated the inclusion of brightener in the coating. These studies helped to discover the influence of brightener in enhancing the brightness and corrosion resistance of zinc coating on mild steel substrate.

**Key Words:** Tafel plot, Preferred orientation, Electrodeposition, Nyquist impedance plot.

## VP-26: Current status and future opportunities of green and eco-friendly nanotechnology in production industries

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**Abstract** – Nanotechnology is considered as a tool for solving problems and providing comfort in the livelihood of human beings, also possess challenges and treats if not used carefully. Nanotechnology, being multidisciplinary frontier technology useful for innovative solutions in primary, secondary, tertiary, and quaternary industry sectors has shown slow progress due to its potential risks due to predicted nanotoxicity. To counter this but to use nanotechnology solutions in societal progress, green and eco-friendly nanotechnology solutions play a major role in realizing sustainable development goals and eliminates the threat of the technification of development processes. This paper discusses the current research status, and future opportunities of green and eco-friendly nanotechnology in 21<sup>st</sup> century production industries.

**Key Words:** Nanotechnology (NT), Green nanotechnology (GNT), Green nanomaterials, Industrial prospects, Primary industry sector, Secondary industry sector, Tertiary industry sector, Quaternary industry sector, Green synthesis, Eco-friendly production, Technification.



## VP-27: Predictive analysis of green nanotechnology innovations based on explorative research to realize un sustainable development goals 2030

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**Abstract** – Adoption of suitable technology and managing it strategically to solve social problems of the world is the need of the hour. United nations being a multi-country membership organization, has announced 17 Sustainable Development Goals (SDG) in the year 2015 with a slogan of action to end poverty, to protect the planet, and to ensure peace and prosperity by the year 2030. It is argued that nanotechnology that is considered a technology of the 21st century can be used to realize ten Sustainable Development Goals by 2030. These ten SDGs are: Reduce

Poverty, Reduce Hunger, Health & Well-Being, Clean Water & Sanitation, Affordable renewable energy, Sustainable Industrialization, Ensure Sustainable Production & Consumption, Combat on Climate Change, Conserve Ocean & Marine Resources, and Protect life on Land. Nanotechnology anticipated as a universal technology has capabilities to solve problems of society at the basic level, comfortable level, and dreamy desirable levels. Nanotechnology, if not managed strategically and carefully has dangers to human health due to its potential risks of predicted nanotoxicity. In this paper, we have analysed these potentials challenges of nanotechnology, its strategic management, and developed a model of how green and eco-friendly nanotechnology can be used in many industries to realize these ten sustainable development goals and eliminates the threat of the technification of development processes. The paper also discusses the advantages and benefits of systematic management of green and eco-friendly nanotechnology in the process of realizing individual sustainable goals in detail. This paper discusses the concept, current research outcome, and the industrial prospects of achieving global SDG and much more using green and eco-friendly nanotechnology in the 21st century using predictive analysis framework of explorative research methodology.

**Key Words:** SDG, Nanotechnology (NT), Green nanotechnology (GNT), Strategic management, Green nanomaterials, Green synthesis, Eco-friendly production, Technification.



## VP-28: Advances in Large Scale Environmental Cleaning Process using Nanotechnology Filters

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**Abstract** – Nanotechnology being a universal technology has potential abilities to provide solutions to the environmental degradation problems through its precision pollution monitoring abilities using nanosensors, lower energy needs due to lightweight strong materials, and reducing the use of harsh cleansers through the applications of nanocoatings to the surfaces. A more advanced nanotechnology solution will lead to building a product with molecular-level precision through the use of productive nanosystems. In this paper, we analysed the use of nanotechnology and techniques in controlling environmental pollution with an emphasis on air pollution and water pollution. We have developed a concept of using nanotechnology-based techniques in optimizing large scale environmental cleaner using bottom-up and top-down methods based on a systematic review. Finally, a segregated large-scale environmental cleaning machine called mega-machine is proposed which works on renewable solar/wind energy and scaled up or down. The proposed concept of the machine is analysed using SWOC and ABCD framework.

**Key Words:** Nanotechnology, Nanosensors, Nanotechnology based environment cleaner, Mega air cleaner, Mega water cleaner, SWOC analysis, ABCD analysis.

## VP-29: Single step solution phase synthesis of cuprous oxide nanofluids for enhanced thermal conductivity and stability

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**Abstract** – Nanofluids represent the new generation fluids which have attracted attention for various energy related applications. The stable dispersions of nanoparticles of either metallic or nanometallic origin in the base fluid have been found more suitable for heat transfer applications than the conventional fluids. As the stability and the thermal conductivity of the nanofluids are highly dependent on the shape and size of the nanoparticles dispersed within the base fluid, precise control over synthetic condition is of utmost importance. Among metal oxide nanoparticles cuprous oxide has higher conductivity, higher resistance to corrosion and is cost effective and hence is chosen for the study as an additive. To control the morphology as well as size of the nanoparticles formed sodium lauryl sulphate is used as a capping agent. Cuprous oxide nanofluids are prepared by one step solution phase synthesis by the reduction of copper acetate using sodium hypophosphite. A 1:1 mixture of water and ethylene glycol is used as base fluid. The resulting nanofluid is studied to determine its phase structure, morphology and stability by diffraction, microscopy and sedimentation measurement techniques. The rheological measurements revealed the nanofluid to be Newtonian in nature. Cuprous oxide particles were found to be spherical in shape with 40 to 50 nm diameter remaining stably suspended in the base fluid for over 6 weeks. The synthesized nanofluid showed a thermal conductivity of 1.5 Wm<sup>-1</sup>K<sup>-1</sup> at 30 °C. The higher conductivity of cuprous oxide nanoparticles, uniform and stable dispersion of the nanoparticles led to such high conductivity of the resulting nanofluid. The facile synthetic technique provided a green approach to synthesize nanofluids for large scale applications in the field of waste heat recovery and renewable energy technologies.

**Key Words:** Nanofluids, Rheological measurements, Renewable energy technologies.

## VP-30: Pharmaceutical and personal care products in rivers and lakes, India

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**Abstract** – Water samples were collected across the western portion of Bengaluru metropolitan area containing Arkavathi river stream and lakes during October 2018 and February 2019. The pharmaceutical and personal care products (PPCPs) occurrence, seasonal variation and toxicology study were performed for 11 target analytes (ethylparaben, propylparaben, ibuprofen, BP-1, oxybenzone, bisphenol A, sulfamethoxazole, triclosan, diclofenac, triclocarban, chloramphenicol). The PPCPs belongs to different classes like non-steroid anti-inflammatory drugs, antibiotics, antibacterials, UV-filters, plasticizer, and parabens. The highest concentration was reported for ibuprofen (1834.39 ng/L) followed by triclosan (1761.29 ng/L) and diclofenac (1129.60 ng/L). The decrease in sulfamethoxazole, chloramphenicol and diclofenac concentration during rainy season may due to high water run-off with dilution, whereas decrease in concentration during summer for remaining analytes confirms the higher hydrophobic nature of the analytes may sorbed into soil or sediment. This was supported by less effective elimination/biodegradation of PPCPs from STPs made increases the concentration for few analytes during rainy season. The seasonal concentration variation among target analytes may due to various processes like water dilution, biotransformation, atmospheric temperature, efficiency of sewerage treatment plant, and physicochemical properties of chemical pollutant. The highest detection frequencies with greater PPCPs concentration at midstream region confirms the continuous discharge of wastewater from highly populated metropolitan and industrial areas into river stream. The acute toxicity data for triclosan was HQ >1 for daphnia, fish and algae observed from the Shanumangla (S19) sampling station. It was followed by chloramphenicol with 0.54 HQ value from Varthur bridge (S8). No human health risk assessment was estimated from the identified sampling station. This is the first report on seasonal occurrence with their associated toxicology study from western portion of Bengaluru, India.

**Key Words:** Arkavathi river, Hazard quotient, LC-MS/MS, Oasis HLB, PPCPs, Risk assessment.

## VP-31: Maghemite nanoparticles compatibilization of guar gum/hydroxypropyl methylcellulose blends

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**Abstract** – Water-soluble miscible polymer blends are extensively used in many applications like water purification, biomedical engineering, agriculture applications. The biopolymers used in the present study are guar gum (GG) which is a natural polymer and hydroxypropyl methylcellulose (HPMC) is a modified natural polymer. Based on refractive index, ultrasonic velocity, density, adiabatic compressibility, and dilute solution viscosity measurements the GG/HPMC blend is found to be miscible when the GG content is more than 50% in the blend. Maghemite nanoparticles were added to the blends as compatibilizers, their homogeneity and specific intermolecular hydrogen bonding was confirmed by SEM, FTIR measurements. The TGA and tensile strength measurement confirms the improved thermal properties and mechanical strength of the GG/HPMC blends with and without maghemite nanoparticles. The results also confirm the improved mechanical strength of the 10/90 GG/HPMC blend – maghemite composite.

**Key Words:** Guar gum, HPMC, Maghemite, Miscibility, Polymer Blends.

## VP-32: Sustainable adsorption method for the remediation of brilliant green dye using halloysite nanotube: Isotherm, kinetic and modelling studies

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**Abstract** – First-ever use of halloysite nanotube (HNT), a relatively low-cost nanomaterial abundantly available with least toxicity for the removal of brilliant green dye from aqueous media is reported. Factors affecting adsorption studies were carried out to assess the adsorption capacity, the kinetics and the equilibrium thermodynamics. All the experiments were designed at about Ph 7. The Redlich-Peterson isotherm model fits best amongst nine isotherm models studied. Kinetic studies data conformed to pseudo-second-order model. Mechanistic studies suggest that the rate controlling step is predominantly dominated by intraparticle diffusion.

Scanning electron microscopy and Fourier transform infrared spectroscopy were used in characterizing the adsorbent. Process optimization was carried out using Response Surface Methodology (RSM) through two-level Fractional Factorial Experimental Design (FEED) to study the influence of parameters on the process of adsorption. Analysis of variance (ANOVA) was used to study the combined effect of the parameters. Possibilities of the use of dye-adsorbed HNT (“sludge”) for the fabrication of the composites using plastic waste are suggested.

**Key Words:** Halloysite nanotube, Brilliant green, Adsorption studies, Kinetics, Modeling.

### VP-33: Radish (*Raphanus sativus*) leaves mediated CuO-NiO nanocomposite for photocatalytic activity

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**Abstract** – CuO-NiO nanocomposite has been prepared by hydrothermal method using radish (*Raphanus sativus*) leaves for photocatalytic degradation application. The composite nanoparticles (NPs) are characterized by XRD, FTIR, UV-DRS and SEM with EDS for the elemental and structural information. XRD data indicated that the formation of monoclinic and hexagonal crystallite structures for CuO and NiO respectively. FTIR confirmed the presence of Cu - O and Ni - O molecular vibrations. Surface morphology and elemental composition of composite was analysed by SEM with EDS. CuO-NiO NPs acts as good photocatalytic material towards the Methylene blue (MB) dye degradation compared to individual metal oxides under the UV light interaction

**Key Words:** CuO-NiO NPs, Hydrothermal method, Photocatalytic activity, XRD, SEM.

## VP-34: Corrosion mitigation studies of mild steel using an imidazole derivative in 1M HCl solution

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**Abstract** – The corrosion mitigation of imidazole derivative such as 2(1(3,5bis(trifluoromethyl)phenyl)-4,5-diphenyl-1H-imidazol-2yl) phenol [TMPDI] on the corrosion inhibition of mild steel in presence of 1M HCl. Chemical and Electrochemical techniques were employed. The results showed that maximum 96.55% inhibition efficiency at 10ppm concentration was recorded. Further the inhibition efficiency was explained through adsorption process. FT-IR & AFM studies revealed the adsorption of the inhibitor and SEM images shows the surface morphology changes during corrosion & Corrosion control process. Contact angle studies exhibited the hydrophobic nature of the layer formed on the surface of the mild steel. The adsorption of TMPDI on mild steel surface was found to obey Freundlich adsorption isotherms. Experimental results show that developed inhibitor act as a mixed type inhibitor and its inhibition efficiency increase with increase in concentration.

**Key Words:** Corrosion inhibition, Tafel plots, EIS studies, Adsorption isotherms.



## VP-35: Glucose-based carbon electrode for trace-level detection of acetaminophen

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**Abstract** – A highly sensitive electrochemical method for trace level detection of acetaminophen (AMP) was employed using glucose-based carbon electrode (Gu/CPE) by cyclic voltammetry (CV) and differential pulse voltammetry (DPV). The properties of glucose improved the performance of electrochemical sensing of AMP. Electrochemical properties of AMP were well suited in 0.2M phosphate buffer solution (PBS) of pH 7.0 and peak intensity of AMP at the Gu/CPE was enhanced compared to the bare carbon paste electrode. Furthermore, the different parameters such as pH of electrolyte, scan rate, accumulation time effects were investigated by cyclic voltammetry (CV). The redox reaction of AMP was quasi-reversible as controlled by a diffusion process with two protons and two electrons. As per DPV technique, a lower detection limit (LOD) of  $3.72 \times 10^{-8}$  M over a wide linearity range (0.6  $\mu$ M-9.0  $\mu$ M) was observed. The excipient study demonstrates the selectivity of the electrode towards the electrochemical detection of AMP. Furthermore, the electrode was utilized to quantify AMP in clinical and pharmaceutical samples.

**Key Words:** Electrochemical behavior, Voltammetric techniques, Acetaminophen, Glucose based sensor, Analytical applications.



## VP-36: Detection of ketorolac using disposable pencil graphite electrode surface

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**Abstract** – A highly sensitive, and economic electroanalytical method was proposed for the electrochemical investigation of ketorolac (KEC) employing a pencil graphite electrode (PGE) as a sensor. Electroanalysis was done using the voltametric techniques to examine the electrochemical nature of KEC via cyclic voltammetry (CV) and differential pulse voltammetry (DPV) technique. The pH study revealed the participation of protons and electrons in the electrochemical mechanism, while the scan rate effect estimated that three electrons were involved during electrooxidation and the process was irreversible and diffusion controlled. The linearity range was between  $2.0 \times 10^{-6}$  and  $1.0 \times 10^{-3}$  M, while the limit of detection was  $4.59 \times 10^{-7}$  M. Pharmaceutical drug, real sample analysis and interference study confirmed the rapid assessment of the method which was rapid along with high selectivity, and preciseness for KEC detection. Further, the method established can be implemented for the determination of real and clinical samples.

**Key Words:** Electroanalysis, Ketorolac, Voltammetry, Pencil graphite electrode, Limit of Detection.

## VP-37: Corrosion protection of soft-cast steel in 1M HCl with araucaria heterophylla leaves extract

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**Abstract** – The mass-loss, polarization tests, and electrochemical impedance spectroscopic (EIS) strategies were applied to assess the inhibition performance of the environmentally friendly inhibitor Araucaria heterophylla leaves extract (AHLE) for soft-cast steel corrosion safety in 1M HCl at 300 ±1K. The environmentally-friendly inhibitor creates a protective coat on soft-cast steel that decelerates the corrosion process in acidic environments. The percentage inhibition effectiveness, corrosion current density, corrosion potential, cathodic and anodic Tafel slopes being assessed. The outcomes of chemical and electrochemical research are almost similar. The inhibitor's inhibition activity was well illustrated by the AHLE adsorption on soft-cast steel follows the Langmuir adsorption isotherm. According to the study, AHLE is a mixed kind of inhibitor. Experiments were conducted with varying inhibitor amounts and temperatures. The calculated  $[\Delta G]_{ads}$  values were in the range of -33.75 to -34.40 kJ mol<sup>-1</sup> which discloses the corrosion inhibitory action is exothermic and spontaneous. SEM, FT-IR and contact angle techniques were used to determine the association of the AHLE on the metal surface.

**Key Words:** Araucaria heterophylla leaves extract, Mass-loss, Soft-cast steel, Corrosion, Inhibition performance, Contact angle.

## VP-38: Optical limiting application of cerium oxide/polycarbonate nanocomposite for comfortable night time driving

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**Abstract** – The synthesized particles are found to be in the range of 40 to 60 nm. Polycarbonate is dissolved in chloroform and mixed with cerium oxide nanoparticles. The nanoparticles are dispersed using ultrasonication. The ratio is varied from 0.25, 0.5, 0.75 and 1 wt%. The obtained dispersion is coated on a polycarbonate sheet using drop casting. In this work, the optical limiting effect of cerium oxide/polycarbonate nanocomposite is examined. The cerium oxide nanoparticles are synthesized using co-precipitation method. The absorptive characteristics are studied using luminous intensity (lux) meter and UV-Vis Spectrometer and compared to the plain sample.

**Key Words:** Optical limiting effect, Co-precipitation, Luminous intensity.

## VP-39: ZnO nanoparticles based triboelectric nano generator for charging portable electronic gadgets

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**Abstract** – Triboelectric Nanogenerator (TENG) has been introduced recently as a novel, robust, and versatile technique for mechanical sensing system as well as harvesting mechanical energy to power electronics. TENG can be used for harvesting energy from different sources such as human activities, wind and water motion, and structural vibration. TENG operates based on the mechanism of contact electrification and electrostatic induction between two dissimilar thin film materials with very different electron affinity. In this experiment we fabricate a triboelectric nanogenerator which comprises of Polytetrafluoroethylene (PTFE), paper, Zinc Oxide (ZnO). This ZnO based TENG can be useful for charging portable electronic gadgets anytime and anywhere.

**Key Words:** Triboelectric Nanogenerator (TENG), Polytetrafluoroethylene (PTFE), Zinc Oxide (ZnO).

## VP-40: A review on the draw-backs of nanosized electronic components, and their solution with spintronics

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**Abstract** – Spintronics is a promising technology that aims to solve the major problems existing in today's conventional nanosize electronic devices. Realistically, this technology can combine the main functions of the modern semiconductor nanoelectronics and magnetic storage devices in a single chip. Electrons have two fundamental degrees of freedom called charge and spin. Conventional nano electronic devices used only the charge of electrons for information processing using binary bits 0 and 1. The continuous developments in conventional nano electronics are depending on reducing the size of integrated circuits by reducing the size of components like transistors, and capacitors for their applications in random access memory, microprocessor, etc. The main aim of this work is to give a simple and clear picture to researchers who are beginners of research in this field. The present work reviews the history and development of memory devices. It also includes the present developments in spintronics beginning with different types of spin-valve devices, their working principle, about conventional MTJs along with recently developed different types of MTJ devices such as DI-MTJ and DMTJ. The review also describes the main characteristics of spintronic devices such as GMR and TMR effects along with different parameters that influence these effects and various writing techniques adapted for MTJs such as FIMS, TAS, and STT.

**Key Words:** Semiconductor, Memory devices, CMOS, Spintronics, Spin valve & MTJ.

## VP-41: Extraction and characterization of nano-hydroxyapatite from sea-shell and their application in pest control

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**Abstract** – In this study we focused on a simple and low-cost method for the extraction of nano-hydroxyapatite from sea shells. Nano-hydroxyapatite (nHAp),  $[\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2]$  is the main inorganic component of sea shell and is widely used in various applications due to its excellent property. The obtained nHAp is characterized by Scanning Electron Microscope (SEM), Transmission Electron Microscopy (TEM) and Fourier-transform infrared spectroscopy (FTIR). By aggregating nano-hydroxyapatite (nHAp) and a soluble Cu (II) compounds with nitrogen stabilizer shows promising results in the control of the pathogen called *Plasmopara viticola*, which is considered to be the most devastating disease of *Vitis vinifera* (Grape vine). It confirms the potential role of nHAp as an innovative delivery system of Cu (II) ions. In addition to nHAp and Cu (II) compounds, nitrogen stabilizer is used to maintain the stability of the crops. The present work indicates the possibility of improving the biological activity of a bioactive substance by modifying its structure through an achievable formulation with a naturally extracted material.

**Key Words:** Pest, Pesticide, Sea shell, Nano-hydroxyapatite (nHAp), Copper (II) compounds, Nitrogen stabilizer, *Plasmopara viticola*, *Vitis vinifera* (Grape vine).

## VP-42: Nano level surface activity studies of quinazolinone derivatives as corrosion Inhibitors for mild Steel in hydrochloric acid solution.

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**Abstract** – Quinazolinone derivatives namely E)-3-(3-hydroxybenzylideneamino)-2-(3-hydroxyphenyl)-2,3-dihydroquinazolin-4(1H)-one (SB-1) and ((E)-3-(5-bromo-2-hydroxybenzylideneamino)-2-(5-bromo-2-hydroxyphenyl)-2,3-dihydroquinazolin-4(1H)-one (SB-2) were synthesized and confirmed using elemental analysis, FTIR, and <sup>1</sup>H NMR spectra. Further prepared compounds were tested as a new nano corrosion inhibitors for mild steel in 2M hydrochloric acid medium by chemical and electrochemical methods. Tafel polarization measurements clearly showed that, the synthesized inhibitors are of mixed type (cathodic/anodic) inhibitors and the maximum inhibition efficiencies 89.02% for (SB-1) and 80.74% for (SB-2) were observed in presence of optimum concentrations of inhibitors. The data obtained from EIS technique were analyzed through appropriate equivalent circuit diagram. The adsorption of prepared inhibitors on the mild steel surface which obeys Langmuir's adsorption isotherm. From the adsorption isotherm, some thermodynamical data of the adsorption process were calculated and interpreted. Kinetic activation parameters such as  $E_a$ ,  $\Delta H^*$ ,  $\Delta S^*$  were calculated from the effect of temperature on corrosion and inhibition processes. The negative values of  $\Delta G_{ads}$  showed the spontaneous adsorption of inhibitor on the metal surface. SEM, AFM, UV and FT-IR technique revealed that nano level molecular adsorption takes place on the metal surface and control the rate of corrosion to a greater extent.

**Key Words:** Corrosion, Corrosion inhibitors, Quinazolinone derivatives, Percentage inhibition efficiency.



## VP-43: Free radical scavenging capacity of a nutritionally and medicinally important seed *Coriandrum Sativum* L

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**Abstract** – Oxygen is the life-giving, life-sustaining element .A free radical is an atom, ion or molecule, possessing an unpaired electron in an outer orbit .It is harmful because in search for a pairing electron, the free radical takes one electron from a stable molecule, in turn the stable one becomes a free radical and the resulting chain reaction that can injure tissues and impair their functions and excess of Reactive Oxygen Species would lead to damage of body tissues . The antioxidants of plant origin with free-radical scavenging properties have great importance as therapeutic

agents in several diseases caused due to oxidative stress. Antioxidants are abundantly found in vegetables, fruits, leaves, oilseeds, cereal crops, barks, roots, spices and herbs and crude plant drugs. In the present investigation, a high valued medicinally important seed *Coriandrum sativum* L commonly called coriander , having astringent, laxative, anthelmintic, aphrodisiac, and general debility was subjected to antioxidant assay by diphenyl picryl hydrazyl (DPPH) , hydroxyl radical scavenging assay (HO) and nitric oxide scavenging assay (NO) methods using petroleum ether, chloroform and methanol extracts of *Coriandrum sativum*. The petroleum ether extract was most active with IC<sub>50</sub> value 24 µg/ml , 17 µg/ml and 63 µg/ml in DPPH , hydroxyl radical scavenging assay and nitric oxide scavenging assay methods compared to standard ascorbic acid . Followed by was chloroform extracts with IC<sub>50</sub> values at 24µg/ml and 19µg/ml respectively in DPPH and HO methods compared to standard ascorbic acid (35µg/ml). Among all the tested extracts petroleum ether and chloroform extracts showed good scavenging activity compared to standard ascorbic in all conducted methods. The Phytochemical analysis revealed that petroleum ether and Methanol extracts showed the presence of flavonoids, steroids, chloroform extracts showed the presence of steroids and carbohydrates. These findings have proved that tested plant showed promising antioxidant activity which as validated it use in traditional medicine.

**Key Words:** Free radicals, Solvent extracts, Phytochemical analysis.



## VP-44: Investigation of mechanical characteristics of nickel-vanadium composite coating

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**Abstract** – Mild steel is a type of steel alloy, which contains a high percentage of carbon as a major alloying agent. Alloys are simply a mixture of one or more metals with non-metals, designed to give specific improved properties over the parent base metal. Steel is a range of alloys principally of iron, with 0.2% to 2.1% of carbon, acting as a hardening agent. As well as the carbon, there are many metal elements that are a part of steel alloys and have a great effect on their properties. The elements other than iron and carbon used in steel can be a mixture of some or all of these; chromium, manganese, tungsten and vanadium. These elements in addition to carbon, act as hardening agents. By hardening agents, we mean they create points within the iron crystal lattice layers preventing the layers from sliding past each other. They do this by attaching themselves to the interstitial sites within the crystal structure and act as a block on lattice movement. This is simply why steel is harder than iron, the addition of alloying agents. When the alloying agents are varied different grades of steel are produced with different practical industrial uses. The higher the percentage of carbon and other hardening agents within the steel the harder the steel will become but with a consequent reduction in ductility. By adding small percentages of vanadium to steel and aluminum creates ultra-high strength, super-light and resilient alloys. Vanadium's corrosion-resistant properties make it ideal for tubes and pipes manufactured to carry chemicals. Vanadium carbide coating was deposited on carbon steel (EN9) and mild steel using a thermal diffusion process. The corrosion behavior of the vanadium carbide coatings was evaluated by accelerated electrochemical tests. The corrosion resistance of the carbide coating was found to be superior to that of the untreated base alloys. In this we study on effect of Nickel-Vanadium composite coating obtained on mild steel by electrodeposition. Electrodeposited Ni coatings are widely used for corrosion protection but present some limitations in acid solutions.

**Key Words:** Electrodeposition, Nickel, Vanadium, Scratch test, Profilometry.

## **VP-45: Investigation of corrosion and surface characteristics of nickel-vanadium composite coating.**

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**Abstract** – The paper deals with study on effect Nickel-Vanadium composite coating were obtained on mild steel by electrodeposition Mild steel is not an alloy steel and therefore does not contain large amounts of other elements besides iron; you will not find vast amounts of chromium, molybdenum, or other alloying elements in mild steel Electrodeposited Ni coatings are widely used for corrosion protection but present some limitations in acid solutions. Vanadium is more corrosion-resistant than Ni in almost all aqueous media. Thus, it can be expected that the incorporation of Vanadium particles in a Ni matrix improves the corrosion resistance of the coatings.

**Key Words:** Electrodeposition, Nickel, Vanadium, Corrosion.

## VP-46: Investigation of corrosion and surface characteristics of Ni-Nb composite coating

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**Abstract** – A coating is a covering that is applied to the surface of an object, usually referred to as the substrate. The purpose of applying the coating may be decorative, functional, or both. The coating itself may be an allover coating, completely covering the substrate, or it may only cover parts of the substrate. The proposed project investigation of corrosion and surface characteristics of Nickel-Niobium composite coating. Mild steel is not an alloy steel and therefore does not contain large amounts of other elements besides iron; you will not find vast amounts of chromium, molybdenum, or other alloying elements in mild steel. Mild steel is prone to corrosion and deteriorates gradually therefore there is a need for suitable coating in order to improve the life of mild steel component.

**Key Words:** Electrodeposition, Nickel, Niobium, Corrosion.

## VP-47: Investigation of mechanical characteristics of Ni-Nb composite coating

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**Abstract** – The paper is related to the electrodeposition of Nickel-Niobium Oxide composites on to the mild steel substrate. Mild steel is not an alloy steel and therefore does not contain large amounts of other elements besides iron; you will not find vast amounts of chromium, molybdenum, or other alloying elements in mild steel. Mild steel is prone to corrosion as it is not an alloying element. Niobium is more corrosion resistant than nickel. Therefore the nickel niobium is a better corrosion resistant coating. Here the tests related to the study of the profile as well as its scratch resistance is studied. The tests have given a satisfying results making Nickel Niobium electrodeposited coating a reliable one in the related application.

**Key Words:** Electrodeposition, Nickel, Niobium, scratch test, Profilometry.

## VP-48: Overview of nanorobots in medicine: a brief review

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**Abstract** – Since past few decades, a Nanorobots are widely discussed subject area with respect its design and applicability in medicine. In medical applications a Nanorobot plays a role of tiny surgeons, achieving the replacement of damaged cells; clone themselves to redress a genetic deficiency, drug delivery at cell level. The small size of Nanorobots enables it to take a significant part in tissue repair, it can attach itself to the white blood cells and squash it to the injured area. In this review article more emphasis is given for analysis of the development of interventional Nanorobots and its influence on health care in precision diagnostic and treatment. A hybrid robot, comprising of biological and artificial components presents higher benefits of miniature design of devices with embedded sensors and actuators, more functionalities. During past few decades, many micro-organisms and synthetic carriers have been combined, makes it capable to sense and react to the changes in its vicinity. Microorganism will attain higher thrust in reaching the target area, and size is tuned to the capillary size in the human body. A hybrid robot is reviewed in this paper for its design and applications. Nanorobots differ from a macro-robot with respect to its size factor and functionality, which makes it one of the best candidates for medical and pharmaceutical applications. At this moment of time, a nanorobot can be built using biological means, there is no technology at hand to establish nanorobots. This paper provides a detailed discussion about Nanorobots and its applications in health care industry.

**Key Words:** Nanotechnology, Nano/Macro robots, Nano manipulators, Microorganism, Synthetic materials.

## VP-49: Effect of yogic practice on cognitive variables of sports men in Tumkur university

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**Abstract** – Yoga is an ancient system of exercise from India. Yoga comes from the Indian word yuj, which means to bind together, to join or to unite. It is the union of the mind, body and spirit a holistic approach to your physical and mental wellbeing It is a system of exercise that combines stretching and breathing with a Relaxed awareness, Resulting in beautiful, toned body, complexion and positive attitude towards life.

**Key Words:** Yogic Practice, Long term memory.

## VP-50: The effect of sportsmen participation on emotional intelligence among ug level student of Tumkur university

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**Abstract** – Many educators and psychologists believe that students who receive an exclusively academic environment may be ill equipped for future challenges, both as individuals as well as members of the society. Certain instances come in our day to day life wherein the brightest students in a class did not succeed later in their lives as individuals having well rounded personalities as compared to their less intellectual counterparts. These examples are particularly evident in various fields like politics, business and administration (Singh, 2002). But then a question arises what is it that helps a person to succeed in life other than intelligence? Which human quality is it that helps people to function better in all spheres from career to personal life? With the dawn of 21st century, the human mind added a new dimension which is now being held responsible more for success than intelligence. This is termed as Emotional Intelligence and is measured as EQ (Emotional Quotient).

**Key Words:** Emotional Quotient, Emotional intelligence.

## VP-51: Effect of sportsmen on academic performance of Tumkur university

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**Abstract** – Sports and academic performance is a matter of concern for teachers, students, parents and researchers. The supporters of sports program in educational institutions say that participation in sports improves students' grades, academic achievement raises their educational aspirations and keep them in schools and colleges. Critics say that participation in sports deflects time away from the classroom and divert student's attention from study. They further say that it is not possible for students to achieve excellence and satisfaction in sports as well as in education. A continuing debate about the role of sports and academic achievement of students has sports and physical activities raise the level of alertness (mental and physical) and improve intellectual functioning of the participants.

**Key Words:** Students, Academic performance, Educational institutions, Satisfaction in sports, Academic achievement.



## VP-52: Bio mapping of gangadonahalli lake & scientific remediation of lake

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**Abstract** – Deteriorating water quality is becoming a major problem nationwide making it unlikely to meet the demand for fresh water for its growing population unless drastic measures are adopted. The Lake considered in this study is the Gangadonahalli Lake one of the major catchment area Lake for Arkavathi River & located at Gangadonahalli village Bengaluru North Taluk near NICE Road Bengaluru which receives water flow from Shivapura lake Karihobanahalli / Thigalarapalya lake & Andrahalli Lake which are located in BBMP city limits of Bengaluru. The

study aims to determine the polluting sources responsible for the poor water quality of the Gangadonahalli Lake and to suggest a scientific water remediation plan to rectify the same. According to the study of surface water quality of Arkavathi River the report reveals & assessed as bad quality. The study of above said lakes water qualities of Arkavathi River, and summarized the study on Lakes pollution control and remediation. The remediation aims to better the quality of Lakes by enabling it to be used for domestic and gardening/agricultural purposes. After comparing and analyzing different techniques and clarifying the concepts of remediation technology, based on the advances of Lakes remediation, and its approaches to alleviate the Lakes pollution problem that plagues the Gangadonahalli Lake.

**Key Words:** Lake Water Quality, Lakes Pollution Control and Remediation.

## VP-53: Polymer - Iron doped Aluminum Oxide Nanocomposite membranes for intensified antifouling property and heavy metal removal

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**Abstract** – In this present investigation, the productivity and selectivity of the Polysulfone (PSf) membrane was ameliorated by adding Iron doped Aluminium Oxide (Fe:Al<sub>2</sub>O<sub>3</sub>). The nanoparticles were prepared by solution combustion method using aluminium nitrate nonahydrate and ferrous nitrate as aluminium and iron precursor respectively have a good surface area 108.24 m<sup>2</sup>/g<sup>-1</sup> with an approximate size of 50 nm. The prepared nanoparticles were characterized by XRD, FESEM, and BET. Polysulfone nanocomposite membranes were prepared by incorporating nanoparticles using diffusion induced phase separation (DIPS) method and characterized by various techniques such as FESEM, XRD, Zeta Potential, Tensile strength. The performance of the nanocomposite membranes were studied in terms heavy metal ion removal, water flux, porosity, BSA rejection. The prepared nanocomposite membranes exhibited 99% rejection of lead and cadmium, 70% rejection of mercury along with 210 LMH flux. Moreover, this work demonstrates a rational design of novel mixed matrix membranes exhibiting characteristics of hydrophilicity, surface charge, and porosity adequate to realize the efficient removal of heavy metals.

**Key Words:** Mixed matrix membranes, Hydrophilicity, Heavy metal ions, Anti-fouling study.

## VP-54: Synthesis, characterization of electrochemical studies of titanium oxide nanoparticle modified carbon paste electrode for the determination of paracetamol in presence of adrenaline

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**Abstract** – In this work, TiO<sub>2</sub> nanoparticles were synthesized by co-precipitation method and characterized by XRD, SEM and EDAX techniques. The prepared nanoparticles were modified with carbon paste electrode for the detailed electrochemical investigations of Paracetamol [PA] in presence of Adrenaline (AD) using cyclic voltammetry [CV] and differential pulse voltammetry [DPV] techniques. The modified electrode showed good electro catalytic activity towards the oxidation of PA and AD. The LOD and LOQ were found to be 5.2 µM and 18 µM for Paracetamol, 4.2 µM and 14.1 µM for Adrenaline respectively. The same method can

also be used for the determination of some bioactive molecules.

**Key Words:** Adrenaline, Paracetamol, Electrochemical Sensors, Modified carbon paste electrode, Titanium oxide (TiO<sub>2</sub>) nanoparticles.

## VP-55: Influence of $\text{Eu}^{3+}$ ions and temperature on conductivity of alkali lead boro-tellurite glasses

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**Abstract** – The influence of  $\text{Eu}^{3+}$  ions on DC conductivity of alkali lead boro-tellurite glasses were studied in the temperature range of 343 to 483 K by using impedance analyser. The glass samples were synthesised by conventional melt quenching technique. The prepared glasses were considered for XRD measurements and XRD analysis reveal the non-crystalline nature of the glasses. The complex impedance plot (Cole-Cole) versus temperature of glasses contains semicircles, but only one plot is perfectly fit with semicircle at 483K which is characteristic nature of materials having ideal Debye type relaxation. At 483 K, in Cole –Cole Plot the well-defined semicircle fit is sign of an equivalent parallel RC circuit. The Arrhenius behavior and compositional dependence of DC conductivity were studied by using Arrhenius plot. The estimated DC activation energy ( $E_{dc}$ ) of all samples ranges from 0.201 to 0.232 eV.

**Key Words:** XRD, Alkali Lead boro-tellurite glasses, Europium Oxide, DC conductivity.

## VP-56: A review on electrodeposition of zinc-nickel alloys

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**Abstract** – Composite coatings can demonstrate ameliorated property performance as compared to metals and alloy materials. One category of composite coatings is composed of metal or metal alloys with a dispersed phase of nonmetallic nanoparticles. The integration of these nanoparticles has been found to amend corrosion, wear resistance, and hardness. Engendering metal composite coatings utilizing electrochemical techniques can be salutary due to abbreviated engenderment cost, lower working temperatures, and precise control of experimental parameters.

Metal coatings such as zinc have been prosperously co-deposited with  $\text{TiO}_2$ ,  $\text{SiO}_2$ ,  $\text{CeO}_2$  and mica particles and nickel has been co-deposited with a number of materials including  $\text{TiO}_2$ ,  $\text{SiC}$ ,  $\text{Al}_2\text{O}_3$ , PTFE and silicates. Zinc-nickel alloys have long been studied for a number of properties, most eminently corrosion resistance and recently their tribological properties. So in this review, we visually examine the general trends for nanoparticle incorporation, deposition mechanisms, system stability, microstructures of the coatings and general corrosion trends.

**Key Words:** Non-metallic nanoparticles, Metal coatings, Zinc-nickel alloys.

## VP-57: Mechanical characterization and experimental evaluation of impact resistance of wollastonite filled E-glass/epoxy composites subjected to thermal ageing

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**Abstract** – The present work describes the development and characterization of polymer composites comprising of E-glass fibre reinforced in epoxy matrix with varying wollastonite as filler with varied percentage by weight. The developed composites are characterized with respect to their mechanical and wear properties. The present study involved in assessing the mechanical and tribological behavior of composites with varying filler percentage (No filler, 1, 3, 5, and 7 %) and the effect of filler percentage on the impact and wear behavior has been investigated. It is inferred that, the flexural and tensile strength of chopped strand composites records increasing trend with increase in filler loading. The wear behavior of E-glass epoxy wollastonite filler filled woven composites which are aged at RT (room temperature), +50° C and -5° C for about 75hrs are carried out using a Pin on Disc apparatus in dry condition with 4 kg (constant) load at 1200 rpm disc speed has been conducted. Results shows that addition of filler records decrease in wear rate of e-glass epoxy composites. The present study also revealed that the minimal weight percentage of filler results in considerable increase in impact resistance of GFRP composites has been discussed and reported.

**Key Words:** Wollastonite, Filler composites, Wear behavior.

## VP-58: Preparation, damage repair and evaluation of GFRP composites with machine learning approach

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**Abstract** – Composites have been found to be the most promising and discerning material available in this century. Presently, composites reinforced with fibers of synthetic or natural materials are gaining more importance as demands for lightweight materials with high strength for specific applications are growing in the market. The functional properties of various fibers available worldwide, their classifications and the manufacturing techniques used to fabricate the composite materials need to be studied in order to figure out the optimized characteristic of the material for the desired application. The present investigation aims to preparation of fibre reinforced plastics using mineral filler with varied percentage. The mechanical properties evaluation for prepared samples and comparative study on percentage reduction of its impact behavior after repairing the test samples as well as with different filler percentage and fracture studies on samples failed under impact loading has been studied. It is observed that there is considerable increase in impact resistance of fiber reinforced plastics with specified filler loading compare to the samples without filler. Present study also succeeded in implementing machine learning model for experimented samples concluding that the plot of different composite sample with varied filler percentage against absorbed energy shows the linear correlation with the machine learning approach.

**Key Words:** GFRP composites, Impact Resistance, Filler Composites.

## **VP-59: Preparation and evaluation of impact load characteristics of filler loaded fiber reinforced plastics**

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**Abstract** – Composite materials have been widely used in engineering applications because of their advantages compared to conventional metallic materials. For instance, composite materials have high specific strength, high specific stiffness, and high resistance to catastrophic loading. In the present work, research work has been successfully completed in developing the mineral filler loaded E-glass /epoxy composites with varied percentage by employing manual hand layup technique followed by compression molding technique. Prepared samples have been cured at room temperature for 24hrs and visual inspection of cured samples has been done to ensure proper binding and finishing of the samples. It is concluded from the results that, samples with at 1% filler exhibits high impact resistance compared to the rest. It is noted that there is considerable improvement in samples with minimal weight percentage against catastrophic testing due to proper bonding and low matrix cracks. Addition of further filler records gradual decrease in the performance in material toughness.

**Key Words:** FRP composites, Impact Behavior, Filler Composites.



## VP-60: Synthesis and characterization of TiO<sub>2</sub> and Zr, Co doped TiO<sub>2</sub> powder

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**Abstract** – This paper discusses about the preparation of TiO<sub>2</sub> and various transition metals doped with TiO<sub>2</sub> powders such as Co and Zr. Un-doped TiO<sub>2</sub>, Co-TiO<sub>2</sub>, Zr-TiO<sub>2</sub> and Zr-Co-TiO<sub>2</sub> are synthesized using sol-gel technique. The crystalline nature of the powders was analyzed using X-ray Diffraction (XRD) method. Micro crystalline properties of powders were evaluated for surface morphological studies by using Scanning Electron Microscope (SEM) and elemental composition studies were done by EDAX (Energy Dispersive Absorption X-ray Spectrometer). XRD showed prominent peaks at 5.3210, 5.5420, 5.2140 and 5.6410 for TiO<sub>2</sub>, Zr-TiO<sub>2</sub>, Co-TiO<sub>2</sub> and Zr-Co-TiO<sub>2</sub> powders respectively. SEM images revealed the particle agglomeration and non-homogeneous distribution of particles. Particles were found to have cubic structures. The average particle size was found to be 146.5nm, 92.64nm, 176.4nm and 103.6nm for TiO<sub>2</sub>, Zr-TiO<sub>2</sub>, Co-TiO<sub>2</sub> and Zr-Co-TiO<sub>2</sub> powders respectively. EDX analysis showed large traces of Titanium and Oxygen.

**Key Words:** Co-Doping, TiO<sub>2</sub> powder, Co-TiO<sub>2</sub>, Zr-TiO<sub>2</sub>, Zr-Co-TiO<sub>2</sub> powder.

## VP-61: Synthesis and characterization of yttrium and cerium-based powders for high temperature applications

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**Abstract** – Thermal Barrier Coatings (TBCs) are one of the significant forms of coating which exhibits promising properties for aerospace applications as it deals with very high temperature, corrosive and oxidative conditions. The nanostructured Thermal Barrier Coatings (N-TBCs) are widely employed in aerospace applications as they disclose unique and excellent properties like high surface to volume ratio, melting point and thermal properties due to their nano-sized structural behavior when compared to TBCs. This work focuses on the fabrication and characterization of yttrium nano-structured coatings obtained by sol-gel technique, which are then used as nano-structured thermal barrier coatings (TBCs). Titanium, cerium doped titanium and cerium-yttrium doped titanium nano-powders were synthesized using sol-gel method and were analyzed for properties that suited for aerospace applications such as thermal stability, oxidation resistance, heat resistance, phase stability. The characterization of these powders were carried out by using X-Ray Diffractometer (XRD), Scanning Electron Microscope (SEM), Energy Dispersive X-ray Analysis (EDX) and Thermo-Gravimetric Analysis (TGA).

**Key Words:** Nano powder, Nanostructured Thermal Barrier Coatings (N-TBCs), XRD, SEM, EDX and TGA.

## VP-62: Synthesis, characterization & Structural Studies of (E)-4-(2-amino-3,5-dibromo benzylidene amino) phenol

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**Abstract** – Nitrogen containing compounds is very widely distributed in nature and are essential to life; Schiff bases are condensation products of primary amines with carbonyl compounds gaining importance day by day in present scenario and are found to be a versatile pharmacophore for design and development of various bioactive lead compounds. Schiff's bases of aromatic aldehydes having an effective conjugated system are more stable and an aliphatic aldehydes are relatively unstable and readily polymerizable. Schiff bases obtained from aromatic aldehydes and aromatic amines have a shown number of applications in many fields including pharmaceutical, life sciences and chemical science including inorganic and analytical chemistry. Some Schiff Bases derivatives were reported to possess antimicrobial, anti-inflammatory. Moreover, Schiff Bases are also known to have biological activities such as antifungal, antitumor. A new Schiff base (E)-4-(2-amino-3,5-dibromo benzylideneamino) phenol was synthesized by 2-amino-3,5-dibromobenzaldehyde with 4-amino phenol.

**Key Words:** Schiff Bases, Pharmacophore, Biological activity.

## VP-63: Synthesis and characterization of novel pyrazole derivatives.

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**Abstract** – A Novel compound bicyclization strategy has been established, allowing a flexible and practical approach to examples of bicyclic 1 (tetrahydro-2H-pyran-4-yl)-1,2,4,5,6,7-hexahydro-3H-pyrazolo[4,3-c] pyridine-3-one from low-cost and readily accessible tetrahydro-4H-pyran-4-one, tert-butyl hydrazine carboxylate, and 1-(tert-butyl) 3-methyl 4-oxopiperidine-1,3-dicarboxylate. The hexahydro-3H-pyrazolo [4, 3-c] pyridine-3-one were stereo selectively synthesized through a conventional method pyrazolo [4, 3-c] pyridine-3-one bicyclization with good control yield. The novel 1-(tetrahydro-2H-pyran-4-yl)-1, 2, 3, 4, 5, 6, 7-hexahydro-3H-pyrazolo [4, 3-c] pyridine-3-one bicyclization resulted in few examples of unreported hexahydro-3H-pyrazolo [4, 3-c] pyridine-3-one. These novels molecules open up wide area of biological activity.

**Key Words:** Bicyclization, Hydrazine carboxylate, Biological activity.

## VP-64: Electrochemical aspects of Ni/Co double hydroxides

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**Abstract** – NiCo-layered double hydroxides (NCLDH) synthesized by a simple one pot sol-gel process using propylene oxide as gelation agent. Synthesized material is investigated for its crystal structure, morphology including specific surface area and electrochemical performance as supercapacitor electrodes. The specific capacitance of as-synthesized NCLDH is 1166 F/g, when the electrodes undergone charge/discharge cycling in 6 M potassium hydroxide at 1 A/g specific current. Enthrallingly, retention of capacity over 1000 and 2000 cycles found up to correspondingly 80% and 64%, at relatively high 30 A/g specific current. High capacity is ascribed to uniform porous nature of the material with considerable surface area. With an appreciable cycle life and charge storage capacity, the material prepared is an able contender for supercapacitor electrodes.

**Key Words:** Nickel Cobalt double hydroxides, LDH, Supercapacitors, Electrodes.

## VP-65: Polyethyleneimine – chromium oxide nanocomposite for CO<sub>2</sub> sensing application

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**Abstract** – This research deals with materials, methods, experimental, characterization, and results and discussions related to polyethyleneimine – chromium oxide nanocomposite for CO<sub>2</sub> sensing application followed by analysis and correlation of the sensitivity properties for various formulations with the analysis results. The reason for the difference in sensitivity behaviour of samples with 0.25, 0.50, 0.75, and 1.00 wt % of chromium oxide (Cr<sub>2</sub>O<sub>3</sub>) in polyethyleneimine (PEI) coated on interdigitated electrode (IDE) prepared from copper-clad is

discussed. Further, the variation in resistance vs gas concentration, repeatability, response time and recovery time is narrated.

**Key Words:** Cr<sub>2</sub>O<sub>3</sub>, CO<sub>2</sub> sensing, PEI, IDE.

## VP-66: Polyethyleneimine – cerium oxide – reduced graphene oxide nanocomposite for CO<sub>2</sub> sensing application

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**Abstract** – This research deals with materials, methods, experimental, characterization & results and discussions related to polyethyleneimine – cerium oxide – reduced graphene oxide nanocomposite for CO<sub>2</sub> sensing application followed by analysis and correlation of the sensitivity properties for various formulations with the analysis results. The reason for the difference in sensitivity behaviour of samples with 0.25, 0.50, 0.75, and 1.00 wt % of cerium oxide (CeO<sub>2</sub>) and reduced graphene oxide (rGO) in polyethyleneimine (PEI) coated on interdigitated electrode (IDE)

prepared from copper-clad is discussed. Further, the variation in resistance vs gas concentration, repeatability, response time and recovery time is narrated.

**Key Words:** CeO<sub>2</sub>, rGO, CO<sub>2</sub> sensing, PEI, IDE.

## VP-67: Polyethyleneimine – chromium oxide – reduced graphene oxide nanocomposite for CO<sub>2</sub> sensing application

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**Abstract** – This research deals with materials, methods, experimental, characterization and results and discussions related to polyethyleneimine – chromium oxide – reduced graphene oxide nanocomposite for CO<sub>2</sub> sensing application followed by analysis and correlation of the sensitivity properties for various formulations with the analysis results. The reason for the difference in sensitivity behaviour of samples with 0.25, 0.50, 0.75, and, 1.00 wt % of chromium oxide (Cr<sub>2</sub>O<sub>3</sub>) and reduced graphene oxide (rGO) in polyethyleneimine (PEI) coated on interdigitated electrode (IDE) prepared from copper clad is discussed. Further, the variation in resistance vs gas concentration, repeatability, response time and recovery time is narrated.

**Key Words:** Cr<sub>2</sub>O<sub>3</sub>, rGO, CO<sub>2</sub> sensing, PEI, IDE.



## VP-68: Bi-metallic layered double-layer hydroxide as an electrochemical catalyst for hydrogen evolution reaction

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**Abstract** – All over the globe, there is an increasing energy demand, at present, the energy is furnished by conventional sources like coal, hydrothermal, geothermal, nuclear power, fossil fuels, and sustainable paths like solar energy, wind energy, and tidal energy. Each energy sources have their drawback. the main source way for energy is fossil fuels but this ends up with global warming and global pollution. Due to this now everyone sre looking at energy from renewable sources, but these sources are intermittent. So, the energy is to be stored, different options like a battery, capacitor, and supercapacitor are available to store energy. But these devices have harmfulness' to mankind and pollution to the environment. So researchers are looking for a greenway to store the energy. The most acceptable greenway is a water-splitting reaction yielding molecular hydrogen and oxygen. Our work ascertained electrochemical hydrogen evolution by Ni-CO LDH. The synthesized catalyst shows very low overpotential at a high current density (492mV at 100 mA/cm<sup>2</sup>). Cylic-stability is studied by cyclic voltammetry and Chrono amperometry techniques and morphology of Ni-Co LDH is conformed or analyzed by XRD, SEM and TEM.

**Key Words:** Ni- Nickle , Co-Cobalt, LDH- layer double layer hydroxide.

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