

**PROCEEDINGS OF THE INTERNATIONAL
CONFERENCE ON EMERGING TRENDS IN
MATERIAL SCIENCE
AND TECHNOLOGY (ICETMT-25)**

**Dr. Fazlur Rahaman
Dr. Priti Gupta
Dr. Varsha Brahmkhatri**

Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)

EDITORS

Dr. Fazlur Rahaman

Dr. Priti Gupta

Dr. Varsha Brahmkhatri

**CMR INSTITUTE OF TECHNOLOGY
BENGALURU, INDIA**



Copyright Statement:

All rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other noncommercial uses permitted by copyright law.

For permission requests, write to the publisher at the address below:

Magestic Technology Solutions (P) Ltd.

Chennai, Tamil Nadu, India

E-mail: info@magesticts.com

Website: www.magesticts.com

Copyright Registration:

This book and its content are intended to get registered with the Copyright Office of India. Unauthorized use, reproduction, or distribution of this publication, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.

Acknowledgments:

Any trademarks, service marks, product names, or named features are assumed to be the property of their respective owners and are used only for reference. There is no implied endorsement if we use one of these terms.

Published by:

Magestic Technology Solutions (P) Ltd. [2025]

Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)

EDITORS

Dr. Fazlur Rahaman
Dr. Priti Gupta
Dr. Varsha Brahmkhatri

**Copyright 2025 © Magestic Technology Solutions (P) Ltd.
All rights reserved**



ISBN: 978-93-92090-75-2

First Published: 14th July 2025

DOI: www.doi.org/10.47716/978-93-92090-75-2

Price: 400/-

No. of. Pages: 116



**Magestic Technology Solutions (P) Ltd.
Chennai, Tamil Nadu, India
E-mail: info@magesticts.com
Website: www.magesticts.com**

Name of the Monograph:

Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)

Editors:

Dr. Fazlur Rahaman

Dr. Priti Gupta

Dr. Varsha Brahmkhatri

ISBN: 978-93-92090-75-2

Volume: I

Edition: First

Printed & Published by:

Magestic Technology Solutions (P) Ltd, Chennai, India.

info@magesticts.com | www.magesticts.com

Copyright @2025. All rights reserved.

No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and specific other non-commercial uses permitted by copyright law. For permission requests, write to the publisher, addressed "Attention: Permissions Coordinator," at the address below.

Magestic Technology Solutions (P) Ltd.

544, Anna Street, Kathirvedu, Chennai,

Tamil Nadu, India

E-mail: info@magesticts.com

Website: www.magesticts.com



Principal's Message



It is with great pride and immense pleasure that I welcome all the esteemed delegates, speakers, researchers, and participants to the *International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)*, hosted by CMR Institute of Technology, Bengaluru. Organized as part of our institution's Silver Jubilee celebrations, this conference marks a significant milestone in our journey toward academic excellence and global engagement.

Material science and technology are at the forefront of innovations and transformative advancements across a multitude of industries, from the vital realms of healthcare and energy to the intricate fields of electronics and environmental sustainability. The ICETMT-25 conference serves as a remarkable platform for the exchange of ideas, fostering vibrant interdisciplinary collaborations, and showcasing research outcomes that have the power to shape our collective future. I congratulate the Department of Chemistry and the organizing committee for their efforts in uniting thought leaders and inspiring young researchers under one roof, creating an environment ripe for creativity and discovery.

Dr. Sanjay Jain

**Principal
CMR Institute of Technology, Bengaluru**

Vice Principal's Message



It is an honor to be part of ICETMT-25, a global forum aimed at exploring cutting-edge research and emerging innovations in material science. This conference reflects our institutional commitment to encouraging curiosity, critical thinking, and scientific discovery among our faculty and students.

The conference aims to bring together experts, researchers, and practitioners from around the world to share their insights, exchange knowledge, and discuss the latest advancements in the fields of materials Science and technologies. This event provides a unique platform for networking, collaboration, and staying abreast of cutting-edge developments. I am confident that the deliberations and discussions held here will inspire new directions and foster impactful collaborations. My sincere appreciation to all contributors who made this event possible.

Dr. B Narasimha Murthy

Vice Principal
CMR Institute of Technology, Bengaluru

Dean - Academics & IQAC Message



I am glad to welcome all participants and delegates to the *International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)*, hosted by **CMR Institute of Technology, Bengaluru**, as part of our institution's **Silver Jubilee celebrations**.

ICETMT-25 brings together a distinguished assembly of researchers, academicians, scientists, and industry experts from across the globe. This conference stands as a testament to our enduring commitment to fostering a culture of scholarly inquiry and global collaboration.

This conference aims to provide a diverse platform for the dissemination of cutting-edge research in areas such as nanomaterials, innovative and functional materials, green chemistry, biomaterials, and advanced sensor technologies. The diverse themes of ICETMT-25 reflect the interdisciplinary nature of modern scientific research and have relevance in addressing real-world challenges.

I am confident that the insights shared and the dialogues initiated during this conference will inspire innovative thinking and pave the way for future collaborations. I also take this opportunity to congratulate the Department of Chemistry and the organizing committee for curating this event that aligns seamlessly with the vision of CMRIT to be a center of excellence in higher education and research.

As we celebrate this landmark year in our institution's history, I extend my best wishes for a successful and enriching conference.

Dr. K. Chitra

Dean - Academics & IQAC
CMR Institute of Technology, Bengaluru

Head of the Department's Message



It is with great pleasure and a deep sense of pride that I extend a warm welcome to all participants of the *International Conference on Emerging Trends in Materials and Technologies – 2025 (ICETMT-25)*, on behalf of the Department of Chemistry.

Our Department is honored to have taken the lead in organizing this international academic event, which brings together a global community of scientists, academicians, and industry experts. ICETMT-25 reflects our shared commitment to advancing the frontiers of knowledge, fostering innovation, and addressing some of the most pressing scientific and technological challenges of our time.

The conference spans a broad spectrum of contemporary and emerging topics, including but not limited to nanomaterials, green chemistry, smart sensors, functional biomaterials, energy storage technologies, and sustainable materials. This breadth not only highlights the interdisciplinary nature of the conference but also underscores the importance of collaborative approaches in tackling global scientific and industrial challenges.

We believe that the interactions and deliberations that will take place during this conference will ignite new research directions, strengthen academic and industry linkages, and foster enduring partnerships across borders and disciplines. I hope this forum will catalyze new research ideas and collaborations.

Dr. Fazlur Rahaman

**Head, Department of Chemistry
CMR Institute of Technology, Bengaluru**

Book Name

Proceedings of the International Conference on Emerging Trends in
Material Science and Technology (ICETMT-25)

Editors

Dr. Fazlur Rahaman

Associate Professor & Head
Department of Chemistry
CMR Institute of Technology
Bengaluru

Dr. Priti Gupta

Head: CoE - Materials & Sensors
Associate Professor,
Department of Chemistry,
CMR Institute of Technology
Bengaluru

Dr. Varsha Brahmkhatri

Associate Professor,
Department of Chemistry,
CMR Institute of Technology
Bengaluru

Dr. Priti Gupta,
Head: CoE- Materials & Sensors
Associate Professor, Department of Chemistry,
CMR Institute of Technology,
Bengaluru 560037, India
ICETMT-2025 Convenor
E-mail:priti.g@cmrit.ac.in



Biography:

Dr. Priti Gupta is an Associate Professor in the Department of Chemistry at CMR Institute of Technology, Bengaluru. She has completed her doctoral degree in the field of synthetic organic chemistry from CSIR–National Chemical Laboratory (NCL), Pune, and subsequently worked as a Postdoctoral Fellow at the same institute. Dr. Gupta has published more than 30 papers in reputed international journals and holds a US patent. Her research contributions have earned her an H-index of 17 and several academic accolades. Her current research focuses on the development of organic systems for sensing applications, synthesis and application of nanomaterials, synthetic organic chemistry, and development of novel synthetic methodologies.

Homepage: <https://sites.google.com/a/cmrit.ac.in/priti-gupta-2014>

Research Interests: Synthetic Organic Chemistry, Development of methodology, application of small organic molecules for colorimetric and fluorometric sensing, synthesis and applications of nanomaterials

Dr. Varsha Brahmkhatri,
Associate Professor,
ICETMT-2025 Convenor
Institution: Department of Chemistry,
Centre of Excellence in Materials & Sensors,
CMR Institute of Technology,
Bengaluru 560037, India
E-mail: varsha.b@cmrit.ac.in



Biography:

With a focus on biomedical applications, Dr. Brahmkhatri's research expertise includes nanomaterial design and fabrication, nano-bioconjugates, and nanoparticle-biomolecule interactions. To bridge nanotechnology and spur innovation in real-time wound monitoring, regenerative medicine, and cancer treatments, she is working on nano drug delivery systems. For MRI imaging, co-drug delivery, and cancer targeting, Dr. Brahmkhatri has created nanoparticles encapsulated in hybrid MOFs. Her recent breakthroughs include drug polymer conjugates with various morphologies for inhibiting protein aggregation, controlling drug delivery for cancer treatment, and antibacterial action. With more than 45 journal articles published, a H index of 19, and more than 1970 citations, Dr. Brahmkhatri has won accolades and is a member of prominent scientific organizations.

Homepage:<https://sites.google.com/cmrit.ac.in/varshabrahmkhatri/home?pli=1&authuser=1>

Research Interests: Nanomaterials, targeted therapy, Cancer, protein aggregation, antimicrobial action, wound healing, Sensing, and Catalysis

ORGANIZING COMMITTEE

- Dr. Prabhat Gautam, Assistant Prof, Department of Chemistry, CMRIT
- Dr. Satyabrata Das, Assistant Prof, Department of Chemistry, CMRIT
- Dr. Pakrudheen Iqbal, Assistant Prof, Department of Chemistry, CMRIT
- Dr. Ayyappa Bathinapatla, Assistant Prof, Department of Chemistry, CMRIT
- Dr. Dhananjay Dey, Assistant Prof, Department of Chemistry, CMRIT
- Dr. Shyamsunder Hegde, Professor, Department of Physics, CMRIT
- Dr. Ramdas Balan, Associate Prof, Department of Physics, CMRIT
- Dr. A. Suvitha, Associate Prof, Department of Physics, CMRIT

ADVISORY COMMITTEE

- Prof. Satyendra Kumar Pandey, Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi, India
- Prof. Vijayaraghavan, Senior Professor, VIT, Vellore, India
- Prof. Anjali Patel, Department of Chemistry, Faculty of Science, The Maharaja Sayajirao University of Baroda, Gujarat, India
- Prof. Mahaveer Kurkuri, Associate Director, CRFM, JAIN (Deemed-to-be University), Bangalore, India
- Dr. Bhagwati Sharma, Head, Material Research Centre, MNIT Jaipur, India
- Dr. Niyaz Ahmad, Department of Astronomy and Physics, King Saud University
- Dr. Anitha Varghese, Head, Department of Chemistry, Christ University, Bangalore, India
- Dr. Jigar Soni, Dean of the Faculty of Basic and Applied Sciences, Madhav University, Abu Road, Rajasthan, India
- Dr. Nagendra B Kondekar, Founder and CEO, Vikalp Chem tech pvt ltd, Sholapur, Maharashtra, India
- Dr. Gururaj Shivashimpi, Founder and CEO, SudhiShubha ChemSynthons, Bengaluru, India
- Dr. Suvadhan Kanchi, Department of Chemistry, Christ University, Bangalore, India
- Dr. Parthasarathy Gandeepan, Department of Chemistry, Indian Institute of Technology Tirupati, India
- Dr. Dnyaneshwar Rasale, Principal Scientist, Convergence Bio, Cambridge, Massachusetts, USA
- Prof. Akshaya K Samal, CNMS, JAIN (Deemed-to-be University), Bangalore, India
- Prof. Shajesh Palantavida, CNMS, JAIN (Deemed-to-be University), Bangalore, India

DEPARTMENT PHOTO



Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)

International Conference

On

Emerging Trends in Material Science and Technology (ICETMT-25)

(Hybrid Mode)

19th & 20th June 2025

Organized by
Department of Chemistry
CMR Institute of Technology
132 AECS Layout, ITPL Main Road, Kundalahalli
Bangalore 560037, India

CHIEF PATRONS
Dr. K. C. Ramamurthy, IPS (Retd), Chairman CMRGI
Dr. Sabitha Ramamurthy, President CMRJT, Chancellor CMR University
Shri Jayadeep K R Reddy, CEO CMRGI, Pro-Chancellor CMR University
Dr. Trishna Ramamurthy, Vice President CMRJT, ProVost CMR University
Smt. Shreya Reddy, Executive Director, CMR group of Institutions

PATRONS
Dr. Sanjay Jain, Principal CMRIT
Dr. B. Narasimha Murthy, Vice Principal CMRIT
Dr. Chitra K, Dean-IQAC & Academics, CMRIT

ADVISORY PANEL MEMBERS
Dr. Fazlur Rahaman Head, Department of Chemistry, CMRIT
Dr. Raveesha K H Head, Department of Physics, CMRIT

CONVENERS
Dr. Varsha Brahmkhatri, Associate Prof., Department of Chemistry, CMRIT
Dr. Priti Gupta, Associate Prof. & Head-CoE, Department of Chemistry, CMRIT



Celebrating **25** Years of
CMR Institute of Technology



LIST OF SPEAKERS

Dr. Mahesh Narayan, Professor, University of Texas at El Paso, USA
Dr. Prasenjit Ghosh, Professor, Department of Chemistry, Indian Institute of Technology Bombay, Powai, Mumbai 400076, INDIA.
Dr. A. K. Tyagi, Dean and Senior Professor, Homi Bhabha National Institute, India
Dr. Ajeet Kaushik, Assistant Professor, Florida Polytechnic University, USA
Dr. P. Rajamalli, Assistant Professor, Materials Research Centre (MRC), Indian Institute of Science (IISc), Bangalore, India
Dr. Ramakrishnan Ganesan, Professor, Department of Chemistry, Birla Institute of Technology and Science (BITS), Pilani, Hyderabad Campus, Hyderabad, Telangana, India
Dr. Santhana Krishnan Kumar, Assistant Professor, Department of Chemistry, National Sun Yat-sen University, Taiwan
Dr. Dhanjyan Arun Kumar, Designated Lecturer, Center for Low-temperature Plasma Sciences, Nagoya University, Nagoya, Japan
Dr. Debajet K. Bora, Assistant Professor, University Mohammed VI Polytechnic (UM6P), Benguerir, Morocco
Prof. Leelakrishna Reddy, Associate Professor, Department of Physics, University of Johannesburg, Johannesburg, South Africa

Advisory Committee

Prof. Satyendra Kumar Pandey, Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi, India
Prof. Vijayaraghavan, Senior Professor, VIT, Vellore, India
Prof. Anjali Patel, Department of Chemistry, Faculty of Science, The Maharaja Sayajirao University of Baroda, Gujarat, India
Prof. Mahaveer Kurkuri, Associate Director, CRFM, JAIN (Deemed-to-be University), Bangalore, India
Dr. Bhagwati Sharma, Head, Material Research Centre, MNIT Jaipur, India
Dr. Niyaz Ahmad, Department of Astronomy and Physics, King Saud University
Dr. Anitha Varghese, Head, Department of Chemistry, Christ University, Bangalore, India
Dr. Jigar Soni, Dean of the Faculty of Basic and Applied Sciences, Madhav University, Abu Road, Rajasthan, India
Dr. Nagendra B Kondekar, Founder and CEO, Vikalp Chem tech pvt ltd, Sholapur, Maharashtra, India
Dr. Gururaj Shivashimpi, Founder and CEO, SudhiShubha ChemSynthons, Bengaluru, India
Dr. Suvardhan Kanchi, Department of Chemistry, Christ University, Bangalore India
Dr. Parthasarathy Gandeepan, Department of Chemistry, Indian Institute of Technology Tirupati, India
Dr. Dnyaneshwar Rasale, Principal Scientist, Convergence Bio, Cambridge, Massachusetts, USA
Prof. Akshaya K Samal, CNMS, JAIN (Deemed-to-be University), Bangalore, India
Prof. Shajesh Palantavida, CNMS, JAIN (Deemed-to-be University), Bangalore, India

Organizing Committee

Dr. Prabhat Gautam, Assistant Prof, Department of Chemistry, CMRIT
Dr. Satyabrata Das, Assistant Prof, Department of Chemistry, CMRIT
Dr. Pakrudheen Iqbal, Assistant Prof, Department of Chemistry, CMRIT
Dr. Ayyappa Bathinapatta, Assistant Prof, Department of Chemistry, CMRIT
Dr. Dhananjay Dey, Assistant Prof, Department of Chemistry, CMRIT
Dr. Shyamsunder Hegde, Professor, Department of Physics, CMRIT
Dr. Ramdas Balan, Associate Prof, Department of Physics, CMRIT
Dr. A. Suvitha, Associate Prof, Department of Physics, CMRIT

About the Institute

CMR Institute of Technology is a premier engineering college known for its excellence across the state, affiliated to Visvesvaraya Technological University, Belagavi, and approved by AICTE, New Delhi. It is accredited by NBA and IAAC with A++ grade and meets the need for innovative and progressive learning in engineering and management. This institute was established in the year 2000 by CMR Inanadhara Trust with a vision to be a nationally acclaimed and globally recognized institute of engineering, technology, and management, producing competent professionals with appropriate attributes to serve the cause of the nation and society at large. CMRITians have carved a niche across the globe through their leadership and dynamism.

About the Department

Established in 2000, the Department of Chemistry at CMRIT caters to the needs of B.E & Ph.D programs. It is one of the ten research centers recognized at the institute under VTU & has received research grants from agencies like DST, DBT, AICTE-SDP & KVGST. The faculty members & the research scholars are actively involved in teaching & research. The Department is involved in the research & development of facilities for the institute and students through its centers of excellence- Materials & Sensors. The department has made significant contributions to research by publishing papers in reputed peer-reviewed journals and patents.

About the Conference

The field of advanced materials has significantly contributed to securing our future and raising the standard of human living. The International Conference on Emerging Trends in Materials Science and Technology (ICETMT-25) would focus on state-of-the-art research and development of technologies in all aspects of Materials Science. This conference aims to provide a forum for scientists, engineers, researchers, and other professionals worldwide to present and discuss the most recent innovations, facilitate knowledge exchange, foster collaborations and outreach activities, address new challenges, and identify future research trends. Eminent industry professionals, professors, scientists, and research scholars from renowned organizations will share their views and enhance knowledge on a broad spectrum of materials science and applications. In addition to contributed paper presentations, ICETMT-25 includes keynote addresses and plenary lectures from eminent personalities. The conference will be held in a hybrid mode, incorporating virtual and in-person participation.

Website: <https://sites.google.com/cmrit.ac.in/icetmt-25/home>

Gain global recognition—All accepted abstracts will be officially published by the esteemed Jupiter Publications Consortium (www.jp.c.in.net), complete with ISBN and DOI to amplify your research reach and credibility.

THEME & THRUST AREA OF CONFERENCE

- Nanotechnology in Materials Science
- Nano Chemistry
- Synthesis and properties of nanomaterials
- Materials Science and Engineering
- Advanced Energy Materials
- Nanomaterials for Catalysis
- Surface, Interfaces and Thin Films
- Emerging Smart, functional Materials and devices
- Ceramics, Alloys, Polymers, Glass and Composite
- Sensing materials
- Optoelectronics and Photonics
- Biomaterials and bio-inspired Materials
- Semiconductors
- Thermoelectric materials and devices
- Graphene, Carbon Nanomaterials and 2D materials

Oral Presentation: 3 Prizes
Poster Presentation: 3 Prizes

Important Dates

Registration Opens : 10-03-2025
Abstract Submission Deadline : 5-06-2025
Registration Deadline : 15-06-2025
Conference Dates : 19th & 20th, June 2025

ABSTRACT SUBMISSION

Authors are requested to submit their extended abstract in the given format on the conference webpage. Extended abstracts will be published in the Institute conference proceedings

Click for ABSTRACT format guidelines

Click FOR REGISTRATION

Students/UG/PG -Rs. 500/-
Research Scholars/Faculties -Rs. 1000/-
Industrial Personnels -Rs. 1500/-
International Delegates -USD 50-

BANK ACCOUNT DETAILS

Students/ UG/PG : -Rs. 500/-
A/C Name : CMR INANADHARA TRUST
A/C NO. : 843410110011533
Bank Name : Bank of India
Branch : AECS Layout Branch
IFSC Code : BKID0008434

CONTACT

Email: icetmt2025@cmrit.ac.in

Dr. Varsha Brahmkhatri
Email: varsha.b@cmrit.ac.in

Dr. Priti Gupta
Email: priti.g@cmrit.ac.in

CONFERENCE SCHEDULE

Day 1: 19th June 2025			
Time Slot	Session	Title & Speaker(s)	Session Chair(s)
08:30 – 09:00	Inauguration & Opening Remarks		
09:00 – 09:45	Plenary Presentation	<i>NanoPlastics and Biomolecular Interactions</i> — Mahesh Narayan, The University of Texas at El Paso, USA	Dr. Varsha Brahmkhatri, Dr. Priti Gupta, Dr. Satyabrata Das
09:45 – 10:25	Keynote Presentation	<i>Superoxide radical-producing pro-oxidant nanozymes as antibacterial agents against antibiotic-resistant bacterial species</i> — Sanjay Singh, National Institute of Animal Biotechnology, Hyderabad.	
10:25 – 11:00	Invited Talk	<i>Semiconductor-Based Heterojunctions for Continuous Antimicrobial Action in Light and Dark</i> — Ramakrishnan Ganesan, BITS Pilani, Hyderabad	
11:00 – 11:15	Refreshment Break		
11:15 – 12:00	Keynote Presentation	<i>Wide band gap semiconductors for blue LED and high-power device applications</i> — Dr. Dhasiyan Arun Kumar, Nagoya University, Japan	Dr. Ramdas Balan, Dr. Pakrudheen Iqbal, Dr. Prabhat Gautam, Dr. Varsha Brahmkhatri, Dr. Priti Gupta
12:00 – 12:45	Keynote Presentation	<i>High Photo charging Current Density and Improved Hydrogen Evolution Through Photoelectrochemical Biomass Valorization on Mo-BiVO₄ Photoanodes</i> — Debajeet K Bora, University Mohammed VI Polytechnic, Morocco	

12:45 – 13:15	Invited Talk	<i>Gelled Microemulsions Sans Gelator: Rheology and Structure Property Correlation</i> — Sandeep R. Patil, Navrachana University, Gujarat	
13:15 – 14:00	Lunch Break		
14:00 – 14:15	Oral Presentation (OP1)	<i>Colloidal Engineering of PbS Nanoparticles Using Hydrophilic Spacer-based Cationic Gemini Surfactants: Structural, Optical, and Microbial Activities</i> — Dhruvi S. Chaudhari, Parul University, Gujarat	Dr. Dhananjay Dey, Dr. Ayyappa Bathinapatla, Dr. Varsha Brahmkhatri, Dr. Priti Gupta
14:15 – 14:30	OP2	<i>Synergistic g-C₃N₄-Encapsulated Cu-MOF: A Multifunctional Photocatalyst for Efficient 2,4-D Pesticide Degradation and Broad-spectrum Biological Activity</i> — Aseena Azeez, CMR University, Bengaluru	
14:30 – 14:45	OP3	<i>Mesostructured SBA-16 for Controlled Release of Alendronate and its Pharmacokinetics</i> — Shivangi Mehta, The Maharaja Sayajirao University of Baroda, Gujarat	
14:45 – 15:00	OP4	<i>Design and Synthesis of NiCoSe Oxide as an Efficient Electrocatalyst for the Oxygen Evolution Reaction</i> — Monika Nagaraj, CNMS, Jain (Deemed-to-be University), Karnataka	
15:00 – 15:15	OP5	<i>Synthesis, Physicochemical Properties and Antibacterial Activity of Dendritic Oligomeric Surfactant with Computational Studies</i> — Abhinav Santhosh, Parul University, Gujarat	

15:15 – 15:30	OP6	<i>Lanthanide-Based Systems for Inorganic Orthophosphate Detection</i> — Hendry Saju, CNMS, Jain (Deemed-to-be University), Karnataka	
15:30 – 16:00	Closing Remarks		

Parallel session Day 1			
Time Slot	Session	Title & Speaker(s)	Session Chair(s)
14:00 – 14:10	PO1	<i>Fiber Bragg Grating Sensors in Railway Engineering: From Structural Monitoring to Predictive Maintenance</i> — Neha, CMR University, Bangalore, India	Dr. Suvitha, Dr. Ramdas Balan, Dr. Pakrudheen Iqbal
14:10 – 14:20	PO2	<i>Quantum Dot Displays: Technological Evolution and the Shift Toward Sustainable Materials</i> — Aliabbas Sajjadhushen Kanani, CMR University, Bangalore, India	
14:20 – 14:30	PO3	<i>Determination of Chilli Pepper 'Hotness': Development of an Optical System for the Sensing of Capsaicin</i> — Sreevidhya K B, CHRIST University, Bengaluru	
14:30 – 14:40	PO4	<i>Synthesis and Biological Activities of Novel Indole-Based Compounds</i> — Jigneshkumar Bhikhubhai Lad, Parul University, Vadodara, Gujarat, India	

14:40 – 14:50	PO5 (Poster Session)	<i>Acid-redox Properties Tailored-supported Undecamolybdophosphate Catalyst for Direct Oxidative Cross- esterification of Aldehydes — Nisha Durga Giri, Parul University, Vadodara, Gujarat</i>	
14:50 – 15:00	PO6	<i>Template-Mediated Green Synthesis of Cobalt Oxide Nanoparticles and their Surface Functionalization Using β-Alanine for Biological Applications — Helen Rose J, CHRIST (Deemed to be University), Bangalore</i>	
15:00 – 15:10	PO7	<i>Design of Cost-effective Disposable Fabric Electrodes Modified with MOF-5 Composite as an Ultra- sensitive Sensor for the Detection of Ochratoxin A in Foods — Mega George, CHRIST University, Bengaluru, India</i>	

Parallel Session – Day 2 -20th June 2025			
Time Slot	Session	Title & Speaker(s)	Session Chair(s)
10:45 – 11:00	Invited Talk	<i>Study on the Optoelectronic Properties of Biodegradable Polymer Reinforced with DES Functionalised Activated Charcoal</i> — Santhosh G, CHRIST University, Kengeri Campus, Bengaluru, India	Dr. Ramdas Balan, Dr. Dhananjay Dey, Dr. Suvitha
11:00 – 11:15	OPP1	<i>Synthesis and Photocatalytic Performance of Ni-Fe LDH Modified Graphitic Carbon Nitride for Cr(VI) Removal</i> — Jyoti Rani, Akal University, Punjab, India	
11:15 – 11:30	OPP2	<i>Recent Developments in the Synthesis and Optoelectronic Activity of Novel Practical Applications of Using DFT and TD-DFT: Ethyl-4-(4-methoxyphenyl)-6-methyl-2-thioxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate</i> — Yarava Ramana Reddy, Annamacharya Institute of Technology and Sciences, Kadapa, Andhra Pradesh	
11:30 – 11:45	OPP3	<i>Experimental and Computational Spectral Investigation of Ethyl 4-(4-fluorophenyl)-6-methyl-2-thioxo-1,2,3,4-tetrahydro-5-pyrimidinecarboxylate</i> — Sanathkumar Akumalla, CMR Institute of Technology (VTU), Bangalore, India	
11:45 – 12:00	OPP4	<i>Biomimicry in Biomedical Engineering: Advances in Bio-</i>	

Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)

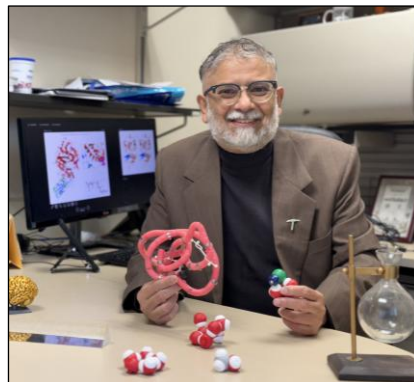
		<i>Inspired Materials for Tissue Engineering and Implant Design</i> — Dr. Anuradha Tyagi, Thakur Shyamnarayan Engineering College, Mumbai	
12:00 – 12:15	OPP5	<i>Aluminum-Doped Germanium Telluride Glasses for PCM Applications</i> — Mamatha M, CMR University, Bangalore, India	
12:15 – 12:25	PO7 (Poster)	<i>Supported Palladium Catalyzed Direct Reductive N-Formylation of Nitroarenes</i> — Aman Phoolchand Vishwkarma, Parul University, Vadodara, Gujarat	
12:25 – 12:35	PO8 (Poster)	<i>Silica Sulphuric Acid: An Efficient Catalyst for One-Pot Multicomponent Synthesis of Novel Pyrazol-amines Under Ultrasonication</i> — Sumaiya Tabassum, Surana College, Bengaluru, India	
12:35 – 12:45	PO9 (Poster)	<i>Role of Green Chemistry in Pharmaceutical Industry</i> — S. Vedavalli, Sea College of Science, Commerce, and Arts, Bangalore	
12:45 – 12:55	PO9 (Poster)	<i>Nanomedicine – Therapeutic Target to Coronavirus</i> — Anjamma B, Sea College of Science, Commerce, and Arts, Bangalore	
12:55 – 13:05	PO10 (Poster)	<i>Flow Chemistry: Chemical Reaction in Flow Reactors</i> — Somashekara C, Sea College of Science, Commerce, and Arts, Bangalore	

Day 2 – 20th June 2025			
Time Slot	Session	Title & Speaker(s)	Session Chair(s)
09:00 – 09:45	Keynote Presentation	<i>Magnetic Zeolite Thin Film Derived from Coal Fly Ash: Application to Detoxification of Inorganic and Organic Pollutants</i> — Sathana Krishna Kumar A, National Sun Yat-sen University, Kaohsiung, Taiwan	Dr. Satyabrata Das, Dr. Pakrudheen Iqbal, Dr. Prabhat Gautam, Dr. Varsha Brahmkhatri,
09:45 – 10:30	Keynote Presentation	<i>Palladacarbene: A Promising Lead in Cancer Therapy</i> — Prof. Prasenjit Ghosh, Indian Institute of Technology Bombay, Mumbai	Dr. Priti Gupta
10:30 – 10:50	Invited Talk	<i>Upcycling of Electronic Waste into Cu-based Multifunctional Materials</i> — Dr. Soyeb Pathan, Parul University, Vadodara, Gujarat	
10:50 – 11:00	Refreshment Break		
11:00 – 11:30	Invited Talk	<i>Electrochemical Detection of Terbutaline Using a TiO₂-MWCNT-Ionic Liquid Nanocomposite Modified GCE Sensor</i> — Dr. Rajasekhar Chokkareddy, Aditya University, Durban University of Technology	Dr. Satyabrata Das, Dr. Pakrudheen Iqbal, Dr. Prabhat Gautam, Dr. Varsha Brahmkhatri,
11:30 – 11:50	Invited Talk	<i>Mapping Mechanical Homogeneity in Ge₁₅Te₆₈In₅Ag₁₂ Glass: Role of Melt-State Hold Time</i> — Dr. G. Sreevidya Varma, CMR University, Bangalore, India	Dr. Priti Gupta
12:00 – 12:15	OP7	<i>Fabrication and Property Evaluation of Cellulose Acetate-Poly(ionic liquid) Composite Network for pH-responsive Delivery Systems</i> — Reshma Raj, CNMS, Jain (Deemed-to-be University), Karnataka	

12:15 – 12:30	OP8	<i>Tuning the Membrane Surface Charge: Zwitterionic Functionalized Iron Oxide Nanoparticles for Molecular Separation and Their Superior Antifouling Property</i> — Dasari Hindu Bhavani, REVA University, Bangalore	Dr. Dhananjay Dey, Dr. Ayyappa Bathinapatla, Dr. Shyamsunder Hegde, Dr. Varsha Brahmkhatri, Dr. Priti Gupta
12:30 – 12:45	OP9	<i>Synthesis and Physico-chemical Properties of Cholesterol-based Cationic Conventional & Gemini Surfactants</i> — Patel Jaykumar Baldevbhai, Parul University, Vadodara, Gujarat	
12:45 – 13:00	OP11	<i>Solubilization/Release Study of Herbal and Ayurvedic Molecules and Their Biological Applications: Influence of Aqueous Surfactant Micellar Solution</i> — Dhaval Mehta, Parul University, Vadodara, Gujarat	
13:00 – 13:15	Oral Presentation	<i>Interface-Engineered Metal Organic Framework Nanocomposites for High-Performance SO₂ Sensing at Elevated Temperature</i> — Padmaja Vasant Mane, CRFM, Jain University, Bangalore	
13:15 – 14:00	Lunch Break		
14:00 – 14:45	Plenary Presentation	<i>Electrochemical Sensing of Microplastic in Point-of-Care Settings</i> — Ajeet Kaushik, Florida Polytechnic University, Lakeland, FL, USA	Dr. Varsha Brahmkhatri, Dr. Priti Gupta
14:45 – 15:30	Closing Session	Announcement of Best Oral and Poster Presentation & Closing Remarks — Dr. Fazlur Rahaman, Dr. Varsha Brahmkhatri, Dr. Priti Gupta	

Prof. Mahesh Narayan

Department of Chemistry and Biochemistry
The University of Texas at El Paso, USA
E-mail: mnarayan@utep.edu



Prof. Mahesh Narayan has authored and co-authored over 100 research articles and book chapters in various fields, including free radical biology, protein-structure function, oxidative folding, protein misfolding, halogen bonding, in silico drug design, agricultural impact of nanomaterials, and chemical education. With a collective citation count of 3387 and an h-index of 24, the author retains corresponding authorship of 90% of published papers post-tenure. His work has been recognized through speaking engagements in 15 international forums and media outlets. He currently serves on the Editorial Board of PLOS One and Cell Biochemistry and Biophysics. He has been invited to deliver lectures at Shanghai University's Institute of NanoChemistry and NanoBiology.



Ajeet Kaushik, Ph.D.

Department of Environmental Engineering, Florida Polytechnic University, USA

Ajeet Kaushik, Fellow-ICS, is an Associate Professor of Chemistry at the Department of Environmental Engineering, Florida Polytechnic University, USA. He is exploring nano-enabled technologies for health and environmental monitoring, involving efficient sensing and nanomedicine. He is an accomplished scholar (supported by over 300 publications, editorial roles, 12 edited books, 3 patents, and international collaborations) and the recipient of several international awards in support of his credentials. His research interests include green chemistry, electrochemistry, chemical sensors, biosensors, nanomedicine, targeted drug delivery, point-of-care sensing, and personalized health wellness. To achieve goals, Dr. Kaushik is focused on cutting-edge research and seeking collaborations.

Dr. Sanjay Singh

National Institute of Animal Biotechnology
(NIAB), Hyderabad, Telangana
Email ID: sanjay@niab.org.com



Dr Sanjay Singh is currently working as a Scientist-F at the National Institute of Animal Biotechnology, Hyderabad, India. He has completed his doctoral degree from CSIR-National Chemical Laboratory, Pune, India, and worked as a postdoctoral fellow at the University of Central Florida, Orlando, USA, and also at the Pennsylvania State University, Pennsylvania, USA. Dr Singh joined Ahmedabad University, Ahmedabad, India, and established his research to develop novel inorganic nanozymes and their applications in biosensing and therapeutics. At NIAB, Dr. Singh's research group develops methods to selectively deliver nanominerals at the intestinal region for improved absorption and bioavailability, engineer nanozymes for wound healing, and curbing the growth of antibiotic-resistant pathogens. In his 20-year research career, Dr. Singh has authored over 120 international publications, 20 book chapters, and 5 edited books. Dr. Singh has been bestowed with several international awards, including the prestigious Endeavour Research Fellowship, Yamagiwa-Yoshida Memorial International Grant Award, IAAM Scientist Medal, MRSI Medal, and EMBO Fellowship.



Dr. Prasenjit Ghosh

Professor (HAG)

Department of Chemistry

Indian Institute of Technology Bombay

Powai, Mumbai 400076

E-Mail: pghosh@chem.iitb.ac.in

Dr. Prasenjit Ghosh is a Professor of Chemistry at IIT Bombay. He received his Ph.D. from Columbia University, New York, in 1998. Following two postdoctoral stints at Brookhaven National Laboratory and the University of California, Santa Barbara, he joined IIT Bombay in 2003. He received the *CRSI Bronze Medal* (2014) from the Chemical Research Society of India and the *Distinguished Lectureship Award* (2011) of the Chemical Society of Japan. He was on the Editorial Advisory Boards of *Organometallics*, American Chemical Society (2017-2019), and *Polyhedron*, Elsevier (2011-2023), and Subject Editor of *Indian Journal of Chemistry*, CSIR-National Institute of Science Communication and Policy Research (NIScPR), New Delhi, India (2022-present). His interests are in the domains of organometallic chemistry, homogeneous catalysis, and biomedical applications. Professor Ghosh served as a *Council Member* of the *Chemical Research Society of India (CRSI)* (2017-2020), a *Core Member* of the Project Advisory Committee (PAC) on Inorganic & Physical Chemistry, *Science and Engineering Research Board (SERB)*, Govt. of India, (2021-2024), and a *Member* of the ASPIRE Chemical Science Research Committee, *Council of Scientific & Industrial Research (CSIR)*, New Delhi, Govt. of India, (2023-2026).

Dr. Ramakrishnan Ganesan,

Associate Professor,
Department of Chemistry,
Birla Institute of Technology and Science (BITS),
Pilani, Hyderabad Campus,



Prof. Ramakrishnan Ganesan, Professor in the Department of Chemistry, has been with Birla Institute of Technology and Science, Pilani, Hyderabad Campus, India, since 2012. He obtained his Master's degree from Anna University, Chennai, and his Ph.D from Korea Advanced Institute of Science and Technology (KAIST, 2006). He also served as a scientific employee at Helmholtz-Zentrum Geesthacht (HZG), Teltow, Germany, from April 2008 to January 2010, and as a Scientist in the Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (A*STAR), Singapore, from January 2010 to January 2012. His research interests include materials design, synthesis, micro/nanofabrication, and characterization of functional nanomaterials, thin films, and polymers. He also works on the biodegradation of polymers, antimicrobial nanomaterials, photo-disinfection, and nanobiotechnology-based sensing of pathogeneses.

Full Name: Dhasiyan Arun Kumar
Email ID: arunkumar@nagoya-u.jp
Phone No: +818042244747



Dhasiyan Arun Kumar was born in Tamil Nadu, India. He received his Ph.D degree in Physics from the University of Madras, India, in 2014. In 2015, He joined Bannari Amman Institute of Technology, Tamil Nadu, India, as an Assistant Professor. Since 2017, he has been associated with the Center for Low-Temperature Plasma Sciences, Nagoya University, Japan. He became a postdoctoral researcher in 2018, an Assistant Professor in 2022, and a Designated Lecturer in 2023. His current research interests include III-Nitride semiconductor growth by various techniques for solar cell and HEMT device applications, III-Oxide growth by MBE for power device applications, Materials for solar energy conversion, Nanocomposites like TiO₂/SiO₂, TiO₂/SnO₂, etc., for solar cell applications, and Nanomaterials for sensor applications.

Dr. Sathana Krishna Kumar A

Assistant professor

Department of Chemistry, National Sun
Yat-sen University, Taiwan



Dr. Santhana Krishna Kumar has been serving as an Assistant Professor in the Department of Chemistry at National Sun Yat-sen University (NSYSU), Taiwan, since August 2023. He holds a Ph.D. in Chemistry from Birla Institute of Technology and Science, India (2009–2014). He brings a strong background in interdisciplinary research and international academic exposure. Following his doctorate, Dr. Kumar pursued postdoctoral research at NSYSU, Taiwan, from February 2014 to August 2021. He later served as an Adjunct Professor at AGH University of Krakow, Poland, from September 2021 to July 2023, before returning to NSYSU as a faculty member. With over 94 peer-reviewed journal publications indexed in SCI and SCIE and a Field-Weighted Citation Impact (FWCI) of 2.85, Dr. Kumar has made significant contributions to his field. His scholarly work has garnered over 3,517 citations (as of February 2025), with an h-index of 33, an i10-index of 51, and an i200-index of 3, according to Google Scholar. He has published 42 articles in the past three years alone (6 in 2023, 22 in 2024, and 14 in 2025). Recognized for research excellence, Dr. Kumar has authored six highly cited papers and has been ranked among the top 2% of scientists globally by Stanford University and Elsevier. In addition to his research accomplishments, he has received an Excellence in Teaching Award, with an outstanding teaching evaluation score of 6.98 out of 7. Dr. Kumar actively contributes to the academic community as a scholarly editor, guest editor, associate editor, and editorial board member for various international journals. His work reflects a strong commitment to both scientific advancement and pedagogical excellence.



Dr. Debajeet Kumar Bora

Laboratory of Inorganic Materials for Sustainable Energy Technologies (LIMSET)
University Mohammed VI Polytechnic
Benguerir, Morocco

Dr. Debajeet Kumar Bora is an assistant professor (HDR) in systems for the hydrogen energy sector at the Laboratory of Inorganic Materials for Sustainable Energy Technologies (LIMSET) of the University Mohammed VI Polytechnic, Benguerir, Morocco. He is associated with research and development related to solar hydrogen generation and storage systems via PV-mediated and direct artificial photosynthesis pathways. At LIMSET, he is responsible for electrolyzer research. His current research activities include electrochemical ammonia synthesis, anion-exchange electrolyzer development, and solid oxide electrolyzer and fuel cell balance of plant, as well as high-TRL reactor development. Before his current position, he worked as an assistant professor at the Centre for Nano and Material Sciences, JAIN University, from 2017 to 2021 in Bengaluru, India. He conducted his PhD research in photoelectrochemical water splitting using hematite hybrid nanoarchitectures as a photoanode at EMPA and the University of Basel, Switzerland, from 2009 to 2012. His thesis was graded “Magna Cum Laude” and awarded the “EMPA Research Award 2013.”

During his first postdoctoral period (2012–2013) at the ALS, Lawrence Berkeley National Laboratory, he commissioned an operando liquid-based synchrotron X-ray absorption spectroscopy end station to support the JCAP (Joint Center for Artificial Photosynthesis) project activities. Following this, he also worked as an Oberassistent at the Institute for Energy Technology, ETH Zurich, from 2016 to 2017 on the artificial photosynthesis project, where he co-investigated the photoelectrochemical biomass oxidation project financed by the Swiss Federal Office of Energy. He has published 54 journal and conference papers and 3 book chapters, with an h-index of 20.



Dr. Sandeep R. Patil
School of Science,
Navrachana University,
Vadodara, India

Dr. Sandeep R. Patil is currently an Associate Professor of Chemistry at Navrachana University, Vadodara. He served as Associate Dean, School of Science, Navrachana University from December 2021 to February 2025. Dr. Patil obtained his Ph. D. degree in Chemistry from The Maharaja Sayajirao University of Baroda, Vadodara, India, in the year 2005. Thereafter, he pursued Postdoctoral Research at the University of Pierre et Marie Curie, Paris, France (2005-2006) and University College Dublin, Ireland (2006-2008). He is the recipient of Fast Track Young Scientist Research Funding from the Department of Science and Technology, University Grants Commission-Department of Atomic Energy, Consortium for Scientific Research (UGC-DAE, CSR) Collaborative Research Scheme, and has completed three consultancy projects successfully. He has published 21 research articles in journals of international repute, with an *h*-index of 11, an *i10*-index of 13, and total citations of more than 600.



Dr. Sreevidya Varma

School of Engineering and Technology,
CMR University,
Bengaluru, India

Dr. Sreevidya Varma is presently working at CMR University as Associate Professor and HOD, Basic Science and Humanities, School of Engineering and Technology. She received her Ph.D. degree from the Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore, in 2014, and was also awarded the prestigious Srinivas Rao Krishnamurthy Gold Medal from IISc. She has also received an MHRD Research Associate fellowship from the Government of India. She worked as a postdoctoral fellow at the University of Colorado, Boulder, USA, in 2016, working on flash sintering of oxides and ceramics in the Mechanical Engineering Department. Additionally, she worked on in-situ high-temperature flash sintering x-ray diffraction synchrotron experiments at NSLS II, Brookhaven National Laboratory, New York, during her tenure as a Research Associate at CU Boulder, USA. Her research encompasses the synthesis of indium and silver-based chalcogenide glasses, along with their mechanical, structural, thermal, and electrical characterization and analysis for phase change memory applications. Additionally, it explores topological thresholds in semiconducting glasses, fast ion conducting oxide glasses, and Fiber Bragg Grating Sensors for biomedical applications, as well as the nano-mechanical behavior of materials.



Dr. Soyebkhan Pathan

Assistant Professor, Research Cadre
Research and Development Cell,
Department of Chemistry, Parul Institute of Applied
Science, Parul University
Email- khan_9751@yahoo.com,
soyebkhan.pathan20616@paruluniversity.ac.in

Dr. Soyeb Pathan is associated with the Research and Development Cell at Parul University. He earned his Ph.D. in Inorganic Chemistry, with a strong focus on heterogeneous catalysis, from Maharaja Sayajirao University of Baroda. Dr. Pathan enhanced his academic and research expertise through postdoctoral positions at the Qatar Environment and Energy Research Institute, which the Qatar National Research Fund supported. After completing his postdoctoral assignment, he joined Parul University in 2021. His research focuses on the development of Heterogeneous Catalysis, Biomass valorization, Single-atom/controlled cluster catalysts, Materials and Applications, Green and Sustainable Chemistry, and Polyoxometalates Chemistry, aligning with global efforts toward sustainable development. He has authored several research publications in reputable international journals, including *Inorganic Chemistry*, *Catalysis Science and Technology*, *Chemical Engineering Journal*, *Applied Catalysis A: Chem*, *Dalton Transactions*, and *Microporous and Mesoporous Materials*. He served as co-convenor and organizing secretary for several national conferences. Additionally, he is actively involved in professional organizations such as the Royal Society of Chemistry and the American Chemical Society. His awards and distinctions include a Travel Grant for International Conference from the Royal Society of Chemistry (2024), INSA-Visiting Scientist Fellowship (2024–25), International Travel Grant from SERB-DST, Govt. of India (2022), Postdoctoral Research Associate position awarded by Qatar National Research Fund (2017), National Postdoctoral Fellowship (NPDF-SERB, DST, 2017), Dr. D. S. Kothari Postdoctoral Fellowship (2016), and CSIR-Research Associateship (2015).



Dr. Rajasekhar Chokkareddy

Department of Chemistry, Aditya University,
Surampalem-533437, Andhra Pradesh, India.

Department of Chemistry, Durban University of
Technology,

Durban, South Africa-4001.

Email: chokkareddys@gmail.com

Dr. Rajasekhar Chokkareddy is currently working as an Associate Professor in the Department of Chemistry at Aditya University, Surampalem, East Godavari, India. He holds a Y2 researcher rating from the National Research Foundation (NRF) of South Africa, recognizing his contributions to scientific research. He earned his Ph.D. in Chemistry from the Durban University of Technology (DUT), South Africa, where he also completed a postdoctoral fellowship in the Department of Chemistry. His postdoctoral work focused on electrochemical sensors and biosensors, as well as the thermophysical properties of ionic liquids. He has an extensive publication record, with 32 research papers, 2 edited books, and 19 book chapters published in reputed international journals. He is also an active peer reviewer for several international scientific journals.

Table of contents

S.No	Title of the Article & Author(s)	Page No
1.	Nanoplastics And Biomolecular Interactions Mahesh Narayan	7
2.	Electrochemical Sensing of Microplastics in Point-of-Care Settings Ajeet Kaushik	9
3.	Superoxide Radical Producing Pro-Oxidant Nanozymes as Antibacterial Agents Against Antibiotic-Resistant Bacterial Species Sanjay Singh	10
4.	Palladacarbene: A Promising Lead in Cancer Therapy Prasenjit Ghosh	12
5.	Semiconductor-Based Heterojunctions for Continuous Antimicrobial Action in Light And Dark Jayati Ray Dutta and Ramakrishnan Ganesan	13
6.	Wide Band Gap Semiconductors For Blue LED And High-Power Device Applications Dhasiyan Arun Kumar	15
7.	Magnetic Zeolite Thin Film Derived from Coal Fly Ash: Application to Detoxification of Inorganic and Organic Pollutants Sathana Krishna Kumar A.	17
8.	High Photo Charging Current Density and Improved Hydrogen Evolution Through Photoelectrochemical Biomass Valorization on Mo-Bivo4 Photoanodes Debajeet K Bora	19

9.	Gelled Microemulsions Sans Gelator: Rheology and Structure Property Correlation Sandeep R. Patil and Vinayak Valodkar	21
10.	Mapping Mechanical Homogeneity in $GE_{15}TE_{68}IN_5AG_{12}$ Glass: Role of Melt-State Hold Time G. Sreevidya Varma and Abhishek Chaturvedi	22
11.	Upcycling of Electronic Waste into Cu-Based Multifunctional Materials Soyeb Pathan	24
12.	Electrochemical Detection of Terbutaline Using A TiO_2 -MWCNT-Ionic Liquid Nanocomposite Modified GCE Sensor Rajasekhar Chokkareddy, Gan G Redhi and N M Xhakaza	26
13.	Mesostructured SBA-16 for Controlled Release of Alendronate and its Pharmacokinetics Shivangi Mehta and Anjali Patel	28
14.	Design and Fabrication of Low-Cost and High-Efficient O-Nicose as an Electrocatalyst for Oxygen Evolution Reaction Monika Nagaraj and Akshaya K. Samal	30
15.	Synergistic g- C_3N_4 -Encapsulated Cu-MOF: A Multifunctional Photocatalyst for Efficient 2,4-D Pesticide Degradation and Broad-Spectrum Biological Activity Aseena Azeez, Udayabhanu, Srinivas Reddy, Anusha BR, Ayyappa B, Prashantha K and Bhujangaiah NS	33
16.	Colloidal Engineering of PBS Nanoparticles using Hydrophilic Spacer-Based Cationic Gemini Surfactants: Structural, Optical, and	34

	Microbial Activities Dhruvi S. Chaudhari and Shanta Raj Lakshmi	
17.	Synthesis, Physicochemical Properties, and Antibacterial Activity of Dendritic Oligomeric Surfactant with Computational Study Abhinav Santhosh and Kushan Parikh	36
18.	Lanthanide-Based Systems for Inorganic Orthophosphate Detection Hendry Saju and Shajesh Palantavida	38
19.	Fabrication and Property Evaluation of Cellulose Acetate-Poly(Ionic Liquid) Composite Network for pH-Responsive Delivery Systems Reshma Raj and Shajesh Palantavida	40
20.	Tuning the Membrane Surface Charge: Zwitterionic Functionalized Iron Oxide Nanoparticles for Molecular Separation and its Superior Antifouling Property Dasari. Hindu Bhavani, Manjunatha Kumara K S, Mahesh Padaki, D. H. Nagaraju	42
21.	Synthesis and Physico-Chemical Properties of Cholesterol Based Cationic Conventional & Gemini Surfactants Jay Patel, Abhinav Santosh, Shanta Raj Lakshmi and Kushan Parikh	43
22.	Solubilization /Released Study of Herbal and Ayurvedic Molecules and Their Biological Applications: Influence of Aqueous Surfactant Micellar Solution Dhaval Mehta and Kushan Parikh	44
23.	Aluminum-Doped Germanium Telluride Glasses for PCM Applications	45

	Mamatha. M and G Sreevidya Varma	
24.	Synthesis and Photocatalytic Performance of Ni-Fe LDH Modified Graphitic Carbon Nitride for Cr(VI) Removal Jyoti Rani and Sandeep Kumar	48
25.	Study on the Optoelectronic Properties of Biodegradable Polymer Reinforced with DES Functionalised Activated Charcoal Santhosh G	49
26.	Recent Developments in the Synthesis and Optoelectronic Activity of Novel Practical Applications of using DFT and TD-DFT Ethyl-4-(4-Methoxy Phenyl)-6-Methyl-2-Thioxo-1,2,3,4-Tetrahydropyrimidine-5-Carboxylate Yarava Ramana Reddy, A.Suvitha and T. Amaranatha Reddy	51
27.	Ethyl 4-(4-Fluoro Phenyl)-6-Methyl-2-Thioxo-1,2,3,4-Tetrahydro-5-Pyrimidine Carboxylate Sanathkumar Akumalla, A. Suvitha and T.Amaranatha Reddy	52
28.	Biomimicry in Biomedical Engineering: Advances in Bio-Inspired Materials for Tissue Engineering and Implant Design Dr. Anuradha Tyagi	53
29.	Supported Palladium Catalyzed Direct Reductive N-Formylation of Nitroarenes Aman_Vishwakarma and Soyeb Pathan	54
30.	Design of Cost-Effective Disposable Fabric Electrodes Modified with MOF-5 Composite as an Ultra-Sensitive Sensor for the Detection of Ochratoxin A in Foods Megha George and Suvardhan Kanchi	56

31.	Template-Mediated Green Synthesis of Cobalt Oxide Nanoparticles and its Surface Functionalization using B-Alanine for Biological Applications Helen Rose J, Parin Praveen, Ananya S Agnihotri, Ganesan Krishnamoorthy and Nidhin M	58
32.	Synthesis and Biological Activities of Novel Indole-Based Compounds Jignesh Lad and Kushan Parikh	60
33.	Determination of Chilli Pepper ‘Hotness’; Development of an Optical System for the Sensing of Capsaicin Sreevidhya K B and Suvadhan Kanchi	62
34.	Silica Sulphuric Acid: An Efficient Catalyst for One-Pot Multicomponent Synthesis of Novel Pyrazol-Amines under Ultrasonication Sumaiya Tabassum	64
35.	Acid-Redox Properties Tailored- Supported Undecamolybdophosphate Catalyst for Direct Oxidative Cross-Esterification of Aldehydes Nisha Giri and Soyeb Pathan	66
36.	Role of Green Chemistry in Pharmaceutical Industry S. Vedavalli	68
37.	Fiber Bragg Grating Sensors in Railway Engineering: From Structural Monitoring to Predictive Maintenance Neha, Nithya Konappa, Shravani R Pattanshetty and G Sreevidya Varma	69

Proceedings of the International Conference on Emerging Trends in Material Science
and Technology (ICETMT-25)

38.	Quantum Dot Displays: Technological Evolution and the Shift Toward Sustainable Materials Aliabbas Sajjad Hushen Kanani, Adithya T P, Ganesh Reddy U and G Sreevidya Varma	72
39.	Nanomedicine – Therapeutic Target to Coronavirus Anjamma. B, Manjunath B.S and S.Vedavalli	75
40.	Flow Chemistry Chemical Reaction in Flow Reactors Abdul suhail AM, Somashekara C and S. Vedavalli	76
	Conference Photographs	77
	Concluding Remarks	79
	Winners (ICETMT 2025)	81

NANOPLASTICS AND BIOMOLECULAR INTERACTIONS

Mahesh Narayan

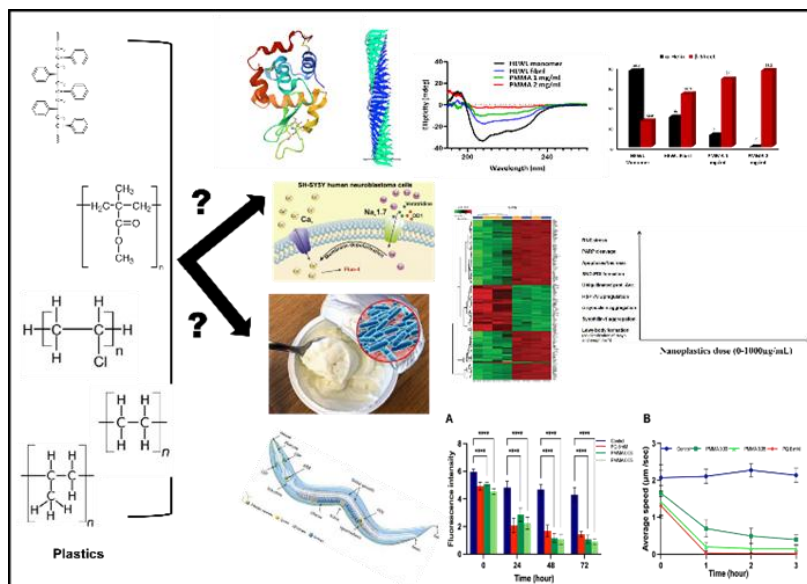
Department of Chemistry and Biochemistry, 500 W. Univ. Ave.

The University of Texas at El Paso, USA

E-mail: mmarayan@utep.edu

Abstract

Ingestion, pulmonary inhalation, and dermal infiltration of nanoplastics (NPs) causes oxidative stress, inflammation, DNA damage, and developmental defects in adults and infants. Exposure-related outcomes also depend upon particle size, chemical composition of the constituent monomers and additives (plasticizers) complicating regulation and treatment regimens. Interactions between plastics and trace organic compounds further exacerbates plastics' toxicity 10-fold. Considering the aforementioned health burdens associated with plastics exposure, the need for ambitious action to address the multitude of problems driven by plastics has never been greater.



An atomic- and molecular-level understanding of the interactions between NPs and intracellular constituents such as proteins, lipids, DNA and carbohydrates is key not only for identifying plastics' connectivity to human health but also for the design of next-generation, biocompatible engineered nanomaterials. The existing knowledge gaps regarding the interfacial interactions between NPs and biological macromolecules and cellular assemblies represents a significant barrier to advancing measures designed to mitigate plastics-associated toxicity. Experimental and computational data from our laboratories reveal that polystyrene (PS) NPs distorted the secondary structure of the milk-proteins β -lactoglobulin (BLG) and α -lactalbumin (ALAC) in a dose-dependent manner. The PS NPs driven helix-to-sheet transformation impacted BLG: retinol interactions and exacerbated the soluble-to-toxic fibril transition of the amyloidogenic protein Hen Egg-White Lysozyme. PS NPs were found to ablate dopaminergic neurons in the nematode *C. elegans* and induced locomotory deficits in a manner mimicking exposure to the neurotoxin paraquat. Computational docking studies and molecular dynamics simulations revealed NP-dependent alternations in the protein side-chain: retinol contacts, beginning an atomic and molecular understanding of NPs-driven structural perturbations and functional deficits. Our findings are likely to significantly and broadly impact the area of health outcomes associated with plastics exposure and guide the design of biocompatible plastics.

ELECTROCHEMICAL SENSING OF MICROPLASTICS IN POINT-OF-CARE SETTINGS

Ajeet Kaushik

NanoBioTech Laboratory, Department of Environmental Engineering, Florida
Polytechnic University, Lakeland, FL-USA
Email: akaushik@floridapoly.edu

Presently smart materials-based sensing technology interfaced with other tools like the Internet of Things (IoT, 5th generation sensing) and artificial intelligence (AI, 6th generation sensing) are emerging useful for efficient sensing for point-of-care (POC) applications. Such systems are on track of transformative research according to the sustainability goals of the United Nations. To achieve such tasks, we are exploring electrochemical sensing of a targeted analyte in POC settings. Our approach consists of customized electrodes interfaced with the smart electrochemical analyzer that can be operated using a smartphone. Recently, we have developed a Molecularly Imprinted Polymers (MIPs)-based electrochemical sensing of microplastic in water samples at a low concentration. The fabrication of MIP and its capability to trap targeted nano/microplastic was categorized using spectroscopic and electrochemical techniques. Such developed smartphone-EA@MIP-based microplastic sensing systems can detect microplastic in the field to analyze the situation and decision-making timely.

SUPEROXIDE RADICAL PRODUCING PRO-OXIDANT NANOZYMES AS ANTIBACTERIAL AGENTS AGAINST ANTIBIOTIC-RESISTANT BACTERIAL SPECIES

Sanjay Singh

National Institute of Animal Biotechnology, Near Journalist Colony, Gachibowli,
Gowlidoddy, Hyderabad - 500032, Telangana

Email: sanjay@niab.org.in

Abstract:

Antimicrobial resistance (AMR) is considered as one of the major concerns of the global health including humans and animals. AMR presents a significant challenge to our capacity to eradicate pathogens and treat infectious diseases. AMR is estimated to be responsible for ~7,00,000 yearly fatalities that may reach 10 million per year by 2050, surpassing the current cancer death rate. Currently, antibiotics are the most preferred ways to curb the infections by pathogenic bacterial, however, overdo could result into the origin of antibiotic-resistant pathogens and thus exacerbating the emergence of AMR. Therefore, novel antibacterials that are effective in the treatment of antibiotic sensitive as well as resistant pathogens are required to be urgently developed. Recently, a new class of nanomaterials (nanozymes) that exhibit pro-oxidant enzyme-like catalytic activities have shown effective antibacterial potential. The pro-oxidant nanozymes are categorised into peroxidase and oxidase mimetics that operate through the generation of hydroxyl radicals, and superoxide radicals, respectively. The generated reactive oxygen species are found to be responsible for the observed antibacterial activity of pro-oxidant nanozymes. The superoxide radicals are considered to be more reactive and toxic than hydroxyl radicals, therefore, oxidase mimetic nanozymes must be preferred over peroxidase mimetics as antibacterials. Further, the optimum pH for oxidase mimetic nanozymes are reported as ~4.0, which significantly restricts the broad-spectrum application of nanozymes. For example, chronic wound infections by *E. coli*, *P. aeruginosa*, *K. pneumoniae* operate at pH 6.5 – 8.5 and therefore,

nanozymes operating at acidic pH would be inefficient to kill these pathogens. This presentation will discuss the newly developed oxidase-mimetic cerium oxide-based nanozyme exhibiting the oxidase mimetic activity at physiological pH. The nanozyme showed the generation of oxidase mimetic activity, which led to the strong antibacterial activity against antibiotic resistant and sensitive strains of *S. aureus* and *E. coli* within few hrs. The antibacterial activity at physiological pH by superoxide radical generating oxidase-mimetic pro-oxidant nanozymes could be further extended to other AMR pathogens.

PALLADACARBENE: A PROMISING LEAD IN CANCER THERAPY

Prasenjit Ghosh

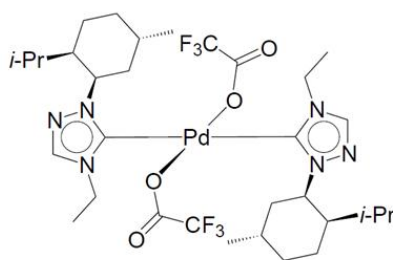
Department of Chemistry, Indian Institute of Technology Bombay,

Powai, Mumbai 400076 India

Email: pghosh@chem.iitb.ac.in

Abstract

Our objective of exploring the chemotherapeutic space for anticancer applications beyond platinum, mainly with respect to its much used drug, cisplatin, has led us to develop a palladium Nheterocyclic carbene (NHC) complex, christened as palladacarbene, that not only is more effective than cisplatin under *in vitro* conditions on a range of cancer cell lines, but also is effective on a multidrug-resistant cell line. More importantly, the palladacarbene complex is significantly more selective towards the cancer cells than on the normal ones, and thus, offers an exciting lead for the development of a new genre of palladium based chemotherapeutic drugs [1].



(1R,2R,5S-1c)

Palladacarbene

References

US Patent No.: US 10421769 (Granted on Sep 24, 2019).; Indian Patent No.: 380602 (Granted on Oct 28, 2021). *ACS Omega*, 2017, 2, 4632-4646.; *J. Am. Chem. Soc.* 2007, 129, 15042-15053

SEMICONDUCTOR-BASED HETEROJUNCTIONS FOR CONTINUOUS ANTIMICROBIAL ACTION IN LIGHT AND DARK

Jayati Ray Dutta¹ and Ramakrishnan Ganesan²

¹ Department of Biological Sciences, Birla Institute of Technology and Science (BITS), Pilani, Hyderabad Campus, Jawahar Nagar, Kapra Mandal, Medchal District, Hyderabad, Telangana – 500078. India

² Department of Chemistry, Birla Institute of Technology and Science (BITS), Pilani, Hyderabad Campus, Jawahar Nagar, Kapra Mandal, Medchal District, Hyderabad, Telangana – 500078. India

Corresponding authors: Prof. Ramakrishnan Ganesan & Prof. Jayati Ray Dutta
Email: ram.ganesan@hyderabad.bits-pilani.ac.in

Abstract

Ensuring clean water through effective disinfection strategies is vital for public health. Among various approaches, advanced oxidation processes—particularly photocatalysis—have garnered significant interest due to their ability to utilize sunlight for generating reactive oxygen species (ROS), which inactivate microbes and degrade organic contaminants. However, conventional photocatalysts often function in a single operational mode, limiting their utility under fluctuating environmental conditions. There is, therefore, a pressing need for materials capable of disinfection both in the presence and absence of light. This presentation highlights the design, synthesis, and evaluation of semiconductor heterojunctions engineered for dual-mode (light and dark) antimicrobial activity. The work encompasses both powder-based nanocomposites and structured thin films. To enable dual-mode functionality, CuO/AgX (X = Cl, Br, I) composites were developed using a metal-organic framework (MOF)-derived strategy. This method exploits the visible-light activity of CuO alongside the inherent dark-active antimicrobial nature of AgX. The resulting materials feature a highly amorphous AgX phase integrated within a CuO matrix, forming efficient heterojunctions. For thin film applications, nanoimprinting was employed to fabricate high-surface-area nanostructured coatings. Initial efforts

focused on TiO₂/AgBr films using a two-step process involving TiO₂ patterning followed by AgBr deposition. To improve functionality and simplify fabrication, a one-step nanoimprinting method was later developed using Fe₂O₃ as a visible-light-active alternative to TiO₂. This advancement enabled the formation of Fe₂O₃/AgBr heterojunctions with enhanced antibiofilm properties and selective bactericidal activity. These material innovations demonstrate promising potential for scalable antimicrobial coatings and self-disinfecting surfaces capable of continuous operation under both illuminated and dark conditions.

References

1. Mariya Midhu Francis, et. al., *Chemical Engineering Journal*, 2022, 446. 137363.
2. Ravikiran Nagarjuna, et. al., *Materials Advances*, 2024, 5, 593-607.
3. Anindita Thakur, et. al., *Small Methods*, 2025, 9, 2401574.

WIDE BAND GAP SEMICONDUCTORS FOR BLUE LED AND HIGH-POWER DEVICE APPLICATIONS

Dhasiyan Arun Kumar

Center for Low-Temperature Plasma Sciences,
Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8603, Japan
Email: arunkumar@nagoya-u.jp

“In the beginning there was light,” emphasizes how closely light is tied to our lives. Light is indispensable for mankind and for many other creatures, and humans have pursued light sources since ancient times. Starting with flame, humans have developed electric light bulbs, fluorescent lamps, and then semiconductor light-emitting devices (light-emitting diodes (LEDs) and laser diodes (LDs)) in the second half of the last century. Although these light sources cover a wide wavelength range, the development of high-energy light sources has largely lagged. The development of an efficient blue LED has been a long-term dream for researchers worldwide, as it is indispensable for realizing LED-based full-color displays and general lighting applications. Drastic improvements in the crystal quality of gallium nitride (GaN) and the ability to control conductivity in both p- and n-type nitride semiconductors in the late 1980s enabled the production of high-brightness GaN-based p-n junction blue/ultraviolet (UV) LEDs, high-performance blue-violet light-emitting diodes (LDs), and many other novel devices. These successes triggered the opening of an entirely new field of electronics. Though various substrates are available for the growth of nitrides, silicon (111) has the unique advantage because of its availability in large size, high quality, and low cost. The growth of III-Nitrides on Si is challenging due to the large lattice mismatch, high thermal expansion coefficient difference, and reaction with Si substrates at high temperatures. InN is a promising material among III-Nitrides, but is difficult to grow good quality single crystals because the vapor pressure is very high compared with GaN and AlN, and needs a low-temperature growth technology. At low temperatures, the cracking efficiency of NH_3 into atomic nitrogen is low, so it is difficult to grow by the conventional MOCVD method. In the case of MBE, InN can be grown at lower temperatures, but the growth rate is very low.

In the case of MOCVD, a lot of ammonia gas is used, several thousand times more than what is necessary. This is because stable ammonia has to be thermally excited, but the efficiency is very small. Therefore, ammonia cost takes a large part of the total cost, which makes it difficult to decrease the power device cost. Since high temperature is necessary, the growth of large diameter wafers makes wafer breakage and bowing due to the difference in thermal expansion coefficient with Si substrates.

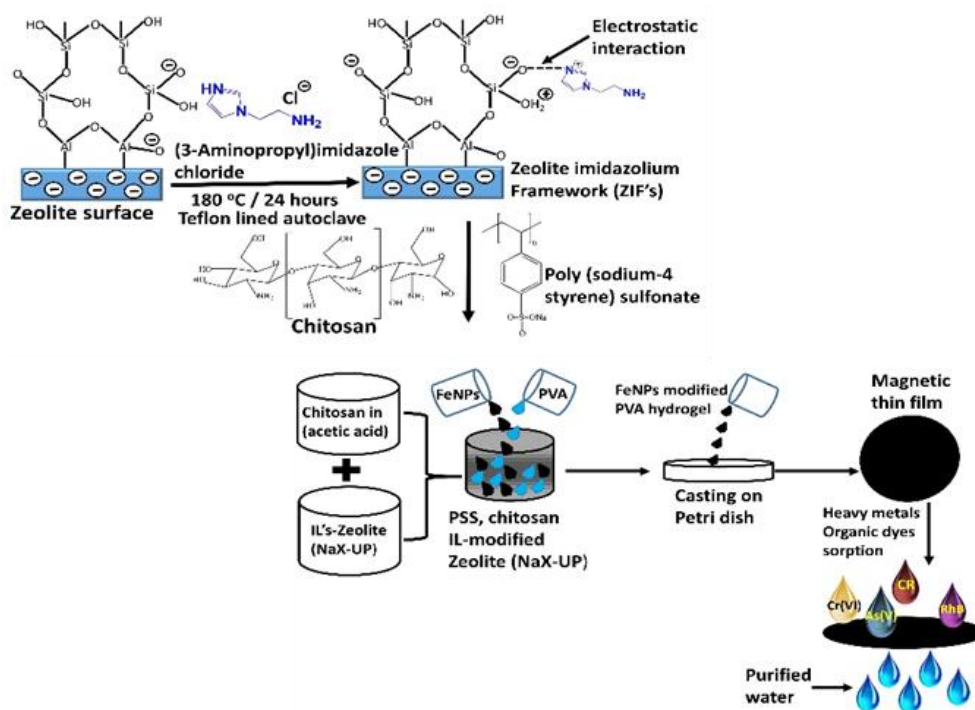
To address the issues, we have developed a novel REMOCVD method, which is based on our long-time experience in plasma science and technology, since the crystal growth can be performed at lower temperatures without ammonia gas due to the radical-enhanced growth. In this method, nitrogen and hydrogen gas are flowed from a top shower electrode and various radicals can be formed by applying the RF power to the top electrode and nitrides can be grown by the reaction between radicals and MO gas which is flowed to the sample susceptor located with a certain distance underneath the top electrode. In fact, by using this novel REMOCVD method, it was proved that high-quality GaN, AlInN, and InN epitaxial layers can be grown at lower temperatures than conventional MOCVD. High-quality InN can be grown even at a temperature as low as 200 °C.

MAGNETIC ZEOLITE THIN FILM DERIVED FROM COAL FLY ASH: APPLICATION TO DETOXIFICATION OF INORGANIC AND ORGANIC POLLUTANTS

Sathana Krishna Kumar A.

Department of Chemistry, National Sun Yat-sen University,
No. 70, Lien Hai Road, Gushan District, Kaohsiung 80424, Taiwan
Email: krishnakumar@mail.nsysu.edu.tw

Fly ash, produced during coal combustion for energy making, recognized to as an industrial by-product, could lead to environmental health hazards. Subsequently, fly ash was found to have an exceptional adsorption performance for removing various toxic pollutants. The adsorption capacity of fly ash might be altered by introducing physical/chemical stimulation. Successively converting fly ash into zeolites recovers their disposal difficulties and transforms unwanted material into merchandisable products for various industrial applications. Here we fabricated that, converting fly ash into zeolite and then modifying it with amino propyl imidazole (ionic liquid). The imidazolium-based zeolite will be used as a template for loading Fe_3O_4 nanoparticles [1]. The as formation of Fe_3O_4 NPs decorated zeolites are incorporated with polymeric materials are [including polystyrene sulphonate (PSS), polyvinyl alcohol (PVA) and chitosan], producing to magnetic thin film (named Fe_3O_4 NPs@zeolite film) as depicted in scheme 1. The as-fabricated magnetic thin film exhibits excellent functionality and durability for the sorption of heavy metals: chromium, selenium, and organic dyes: Congo red and RhB [1]. These toxic contaminates were electrostatically bonded through adsorbent due to their protonation of below the pH_{zpc} 7.0 with surface functional groups from imidazolium cationic moiety (R-N^+), amino groups derived from chitosan ($-\text{N}$, $-\text{NH}$ and $-\text{NH}_2$), and hydroxyl groups (Fe-OH), electrostatically bind with anionic selenium species are [SeO_3^{2-} , Se(IV)], and [SeO_4^{2-} , Se(VI)], chromium species HCrO_4^- , $\text{Cr}_2\text{O}_7^{2-}$ and CrO_4^{2-} . The maximum removal performance were achieved in a wide pH range are highly suitable for practical application. Subsequently, the practical application was validated by conducting their detoxification of chromium and selenium in alkaline batteries industrial wastewater samples.



Scheme 1. The schematic illustration of a detailed procedure for the synthesis of magnetic film (Fe_3O_4 NPs@IL-NaX-UP zeolite) and application to the removal of heavy metals and organic dyes.

References

1. Santhana Krishna Kumar, A., Warchol, J., Matusik, J., Tseng, W.-L., Rajesh, N., Bajda, T. (2022). Heavy metal and organic dye removal via a hybrid porous hexagonal boron nitride-based magnetic aerogel. *npj Clean Water*, 5, 24.

HIGH PHOTO CHARGING CURRENT DENSITY AND IMPROVED HYDROGEN EVOLUTION THROUGH PHOTOELECTROCHEMICAL BIOMASS VALORIZATION ON MO-BIVO₄ PHOTOANODES

Debajeet K Bora*^{1,2}

¹ Laboratory of Energy Science and Engineering,
ETH Zurich, 8092 Zurich, Switzerland

² Laboratory of Inorganic Materials for Sustainable Energy Technologies (LIMSET),
University Mohammed VI polytechnic, Benguerir – 43150, Morocco

Email: Debajeet.BORA@um6p.ma

Abstract

In the last decade, the application of n-type metal oxide photoelectrodes for photoelectrochemical solar water splitting to produce hydrogen has been a cornerstone of artificial photosynthesis research. With a theoretical STH efficiency of 9.1%, the use of BiVO₄ as a highly efficient photoanode material is an intriguing possibility [1]. It is utilized extensively in photocatalysis and photoelectrochemical water splitting for hydrogen production due to its low bandgap and ability to absorb visible light. Recently, BiVO₄ was used to convert biomass into organic compounds with added value.

Due to its well-matched VB position with the electrochemical oxidation potential of 5-hydroxymethyl furfuryl, it is employed in the conversion to 2,5-furan dicarboxylic acid using TEMPO (2,2,6,6-tetramethylpyridine-1-oxyl) as an ion scavenger [2]. This work [3] aims to increase the photocurrent density to match the current state of the art, as well as the solar-to-hydrogen conversion efficiency and faradaic efficiency for hydrogen generation. PEC-based glycerol oxidation is utilized to produce value-added organics, with an emphasis on controlling the activity-selectivity factors of the BiVO₄ photoanode, as described in a recently published work. In the current case, hydrogen forms as a byproduct of CO, along with the formation of formic acid and formaldehyde on the cathodic side. It also helps to avoid the formation of explosive H₂/O mixtures caused by membrane leakage. In terms of kinetics, the oxidation of biomass by PEC is more advantageous than oxidation by water because it involves

fewer intermediate reaction steps, which increases the associated potential. The most important research gap is the direct application of photoelectrochemical biomass oxidation to increase the solar-to-hydrogen conversion efficiency (STH) of existing Mo-BiVO₄ without resorting to costly modification techniques such as heterojunction formation or the tandem approach. A novel surfactant-mediated method has been developed to produce Mo-doped BiVO₄ photoelectrodes with well-controlled morphology and pure clinobisvanite phases, as confirmed by FESEM and XRD. The photoelectrode exhibits the typical absorbance band in the visible spectrum, proving its suitability for photoelectrochemical applications. When exposed via a full aperture under front light illumination, the photoanode exhibits a photocurrent density of 3.5 mA cm⁻², which is the highest among the existing pristine bismuth vanadate photoanodes without modification. Upon TEM beam exposure, the scratched nanoparticles constituting the photoelectrodes exhibit a unique phenomenon of dynamic crystallite fringes, indicating the photodecomposition nature of the photoelectrode. Mo-BiVO₄ is further utilized for photoelectrochemical glycerol oxidation to prevent electron-hole recombination and enhance the STH efficiency, and it exhibits the highest current density of 5 mA cm⁻² under backside illumination. A glycerol layer on the photoelectrode's surface obstructs photons, resulting in a decrease in photocurrent density under front light illumination. The photoelectrode exhibits photocharging, enabling the photocurrent density to reach a maximum of 8 mA cm⁻² with water splitting current density of 5.8 mA cm⁻². The effect is a result of the increased band bending at the photoelectrode's surface, which facilitates enhanced charge generation and prevents the recombination of excitonic pairs. Upon photoelectrochemical glycerol oxidation, the photoelectrode exhibits significant hydrogen gas evolution with the highest STH efficiency of 5.5% and IPCE of 52%.

References:

1. M. Rohloff, B. Anke, S. Zhang, U. Gernert, C. Scheu, M. Lerch and A. Fischer, *Sustainable Energy Fuel*, 2017, 1, 1830.
2. H. G. Cha and K.-S. Choi, *Nat. Chem.*, 2015, 7, 328.
3. D. K. Bora, M. Nadjafi, A. Armutlulu, D. Hosseini, P. Castro-Fernandez, R. Toth, *Energy Advances*, 2022, 1, 715.

GELLED MICROEMULSIONS SANS GELATOR: RHEOLOGY AND STRUCTURE PROPERTY CORRELATION

Sandeep R. Patil*, Vinayak Valodkar

School of Science, Navrachana University
Vasna-Bhayli Road, Vadodara-391 410, Gujarat, India

*Corresponding Author, email: sandeep@nuv.ac.in

Abstract

Gelled microemulsions are versatile, adaptable systems used in scientific and industrial fields due to their stability, structural integrity, and rheological behavior. By optimizing their composition and conditions, it is possible to control the domain structure and size, enhancing their functionality for various applications. A gelator-free ternary gelled microemulsion system constituting water, non-ionic surfactants (Plantacare-810®: Triton X-100 in a 1:1 ratio), and hydrocarbon solvents was formulated and characterized. The hydrocarbon solvents used for formulation included Hexane, Octane, Decane, Dodecane, and Tetradecane. Phase transitions were monitored as a function of temperature, and microstructural changes were observed using polarization microscopy. Clear isotropic gel formation was observed in these systems at a specific surfactant mass fraction, where the hydrocarbon solvent (C8 to C14 chain) acts as a critical determinant in the gelation process. Gel formation was further explored through Tgel determination (ascertaining sol-gel transition) and rheological measurements, especially amplitude sweep, and temperature sweep to establish structure-property correlation. Our findings provide insights into the factors influencing gel-formation and potential applications of these gelled microemulsion systems.

References:

1. Cosima Stubenrauch, Renate Tessendorf, Reinhard Strey, Iseult Lynch, Kenneth A Dawson, Gelled polymerizable microemulsions. 1. Phase behavior, *Langmuir* 2007, 23, pp. 7730-7737.
2. Ke Peng, Thomas Sottmann, Cosima Stubenrauch, Gelled non-toxic microemulsions: phase behavior & rheology, *Soft Matter*, 2019, 15, pp. 8361-8371.

MAPPING MECHANICAL HOMOGENEITY IN Ge₁₅Te₆₈In₅Ag₁₂ GLASS: ROLE OF MELT-STATE HOLD TIME

G. Sreevidya Varma¹, Abhishek Chaturvedi²

¹Department of Basic Sciences and Humanities, SOET, CMR University,
Bangalore 562149, India

²Micro and Nano Characterisation facility (MNCF), Center for Nano Science and
Engineering, (CeNSE), Indian Institute of Science,
Bangalore 560012, India

Email: sreevidya.v@cmr.edu.in

Abstract

The effect of hold time, t , in the melt state on the mechanical properties of a quenched silver-based quaternary chalcogenide glass, Ge₁₅Te₆₈In₅Ag₁₂, which corresponds to the centroid composition of the intermediate phase region, was examined for t up to 168 h. Results show that $t = 6$ h is insufficient as the X-ray diffraction scan reveals a crystalline peak. Nano- and micro-indentation experiments point to an increase in elastic modulus, hardness, and fracture toughness, for t up to 24 h, where after the properties remain nearly-invariant. Quasi and dynamic nanoindentation were performed by using a Triboindenter (Hysitron, Minneapolis, USA) equipped with nano DMA III transducer along with in-situ imaging capacity using SPM. Contour maps showing the spatial variations of elastic moduli indicate the growth of homogenized domains; as homogenization time increases, the modulus maps tend to become more uniform. The Initial maps show high spatial variability, suggesting compositional or structural inhomogeneity. At longer homogenization times, the maps show smoother, more evenly distributed modulus values, indicating better atomic-scale uniformity. The mechanical uniformity improves with homogenization. Reduced modulus values become more consistent across the scanned surface, indicating enhanced network connectivity and structural relaxation. Homogenization helps eliminate localized stiffness fluctuations likely caused by microsegregation or incomplete mixing. The contour maps of reduced modulus demonstrate that increasing homogenization time leads more homogeneous mechanical properties in Ge₁₅Te₆₈In₅Ag₁₂ glasses.

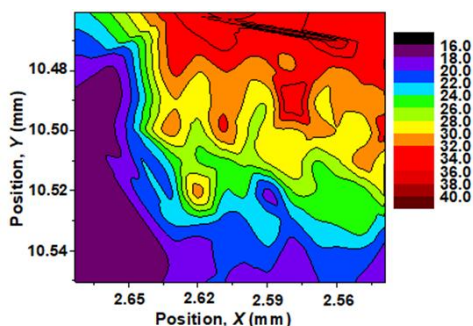


Figure 1(a): Surface plot of reduced modulus for 6 h of homogenization time.

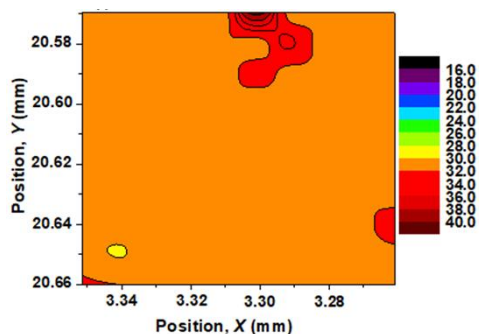


Figure 1(b): Surface plot of reduced modulus for 168 h of homogenization time

References

1. K. Gunasekera, S. Bhosle, P. Boolchand, M. Micoulaut, Superstrong nature of covalently bonded glass-forming liquids at select compositions., *J. Chem. Phys.* 139 (2013) 164511. doi:10.1063/1.4826463.
2. S. Bhosle, K. Gunasekera, P. Chen, P. Boolchand, M. Micoulaut, C. Massobrio, Meeting experimental challenges to physics of network glasses: Assessing the role of sample homogeneity, *Solid State Commun.* 151 (2011) 1851–1855. doi:10.1016/j.ssc.2011.10.016.
3. S. Bhosle, K. Gunasekera, P. Boolchand, M. Micoulaut, Melt Homogenization and Self-Organization in Chalcogenides-Part I, *Int. J. Appl. Glas. Sci.* 3 (2012) 189–204. doi:10.1111/j.2041-1294.2012.00093.x.

UPCYCLING OF ELECTRONIC WASTE INTO Cu-BASED MULTIFUNCTIONAL MATERIALS

Soyeb Pathan^{1,2}

¹Department of Chemistry, Parul Institute of Applied Sciences,
Parul University, Vadodara, Gujarat 391760, India

²Research and Development Cell (RDC), Parul Institute of Applied Sciences,
Parul University, Vadodara, Gujarat 391760, India

E-mail: khan_9751@yahoo.com

Abstract

The rapid advancement of technology has created an increasing issue with electronic waste (E-waste) disposal, which contains hazardous materials such as plastics, flame retardants, heavy metals, and other toxic chemicals¹. Metals like gold (Au), silver (Ag), copper (Cu), palladium (Pd), platinum (Pt), and others are crucial for the industrial manufacturing of numerous electronic devices due to their favorable chemical and physical characteristics². However, most methods for recovering metals and their precursors from E-waste involve complex, multi-step processes. Metal-organic frameworks (MOFs) have emerged as versatile multifunctional materials and have been extensively studied in recent years for a range of applications such as catalysis, drug delivery, and electrochemistry, thanks to their exceptional tunability^{3, 4}.

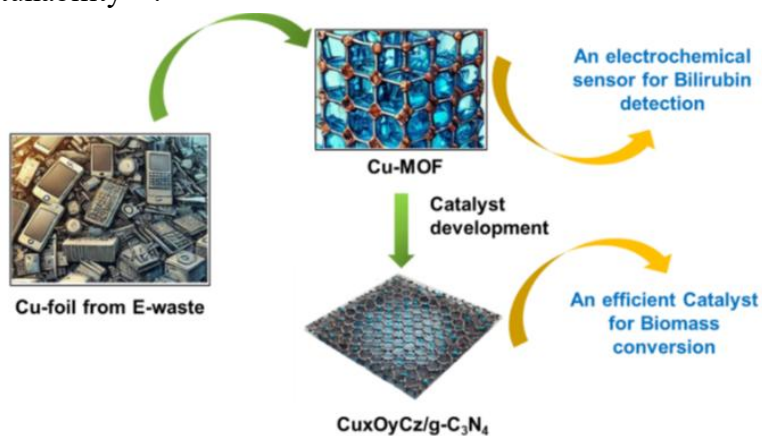


Figure 1: E-waste to multifunctional materials

Copper-based MOF, known as Cu-BTC, is a widely studied material where Cu(II) metal units are linked by benzene-1,3,5-tricarboxylate (BTC) linker.

This work presents an innovative method for repurposing electronic waste (E-waste) by converting copper foil extracted from discarded cell phones into copper-based metal–organic frameworks (MOFs), specifically CuBTC (BTC = benzene-1,3,5-tricarboxylic acid). To maximize the yield of CuBTC, the synthesis was performed under various reaction conditions and analyzed using various physicochemical characterization methods. The synthesized CuBTC MOFs were characterized and utilized as electrode modification materials for electrochemical sensing of bilirubin. Remarkably, the sensor exhibits outstanding selectivity and remains entirely unaffected by common interfering biomolecules, making it an indispensable tool for precise bilirubin detection in healthcare diagnostics. Furthermore, the synthesized CuBTC was used as a precursor to convert it into a catalyst, namely, a CuOx/g-C₃N₄ composite, for the sustainable valorization of levulinic acid (LA) to γ -valerolactone (GVL). The catalyst showed excellent conversion of LA (>70%) as well as selectivity of GVL (>80%) under optimized reaction conditions.

References

1. N. Hoàng Ly, S.-W. Joo, J. Choo, Y. Vasseghian, J. Cho and S. Rezaia, *Chemical Engineering Journal*, 2023, 471, 144324.
2. P. Ryabchuk, M. Anwar, S. Dastgir, K. Junge and M. Beller, *ACS Sustainable Chemistry & Engineering*, 2021, 9, 10062-10072.
3. S. Li, L. Zhang, B. Lu, E. Yan, T. Wang, L. Li, J. Wang, Y. Yu and Q. Mu, *New Journal of Chemistry*, 2018, 42, 7247-7253.
4. B. Lu, S. Li, J. Pan, L. Zhang, J. Xin, Y. Chen and X. Tan, *Inorganic Chemistry*, 2020, 59, 1702-1714.
5. S. Pathan, J. Raveendran, M. Memon, V. Chavda, K. Niyas, J. Bayry and P. A. Rasheed, *Chemical Engineering Journal*, 2025, 511, 162217.

ELECTROCHEMICAL DETECTION OF TERBUTALINE USING A TiO₂-MWCNT-IONIC LIQUID NANOCOMPOSITE MODIFIED GCE SENSOR

Rajasekhar Chokkareddy^{a, b} *, Gan G Redhi^{b*} and N M Xhakaza^b

^aDepartment of Chemistry, Aditya University,
Surampalem-533437, Andhra Pradesh, India.

^bDepartment of Chemistry, Durban University of Technology,
Durban, South Africa-4001.

*Corresponding authors: Email: chokkareddys@gmail.com; redhigg@dut.ac.za

Abstract

In this study, we developed a novel electrochemical sensing strategy for the detection of terbutaline (TBS) using a nanocomposite-modified glassy carbon electrode (GCE). Titanium dioxide nanoparticles (TiO₂NPs) were synthesized and subsequently incorporated with multi-walled carbon nanotubes (MWCNTs) and an ionic liquid (IL) to form the TiO₂-MWCNT-IL nanocomposite. The structural and physicochemical properties of the synthesized TiO₂NPs and the resulting nanocomposite were thoroughly characterized using scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier-transform infrared spectroscopy (FTIR), and thermogravimetric analysis (TGA). Electrochemical characterization of the TiO₂-MWCNT-IL-modified GCE was conducted via electrochemical impedance spectroscopy (EIS) to evaluate its electron transfer kinetics and confirm its suitability for electrocatalytic sensing applications. The modified electrode demonstrated excellent electrocatalytic activity towards the electro-oxidation of TBS under optimized experimental conditions. The sensor exhibited good reproducibility, stability, and sensitivity, with a wide linear detection range from 0.5 μ M to 3.0 μ M. The limit of detection (LOD) and limit of quantification (LOQ) were determined to be 0.0162 μ M and 0.2140 μ M, respectively. These analytical performance metrics were benchmarked against previously reported sensors for terbutaline detection, showing competitive or superior results. Furthermore, the TiO₂-MWCNT-IL-GCE sensor exhibited excellent selectivity, stability, and repeatability. It was also successfully applied for the quantification of

TBS in pharmaceutical formulations, achieving recovery rates ranging from 93.0% to 100.2%.

References:

1. Perillo, P. M., & Rodríguez, D. F. (2012). The gas sensing properties at room temperature of TiO₂ nanotubes by anodization. *Sensors and Actuators B: Chemical*, 171–172, 639–643. <https://doi.org/10.1016/j.snb.2012.06.056>.

MESOSTRUCTURED SBA-16 FOR CONTROLLED RELEASE OF ALENDRONATE AND ITS PHARMACOKINETICS

Shivangi Mehta, Anjali Patel*

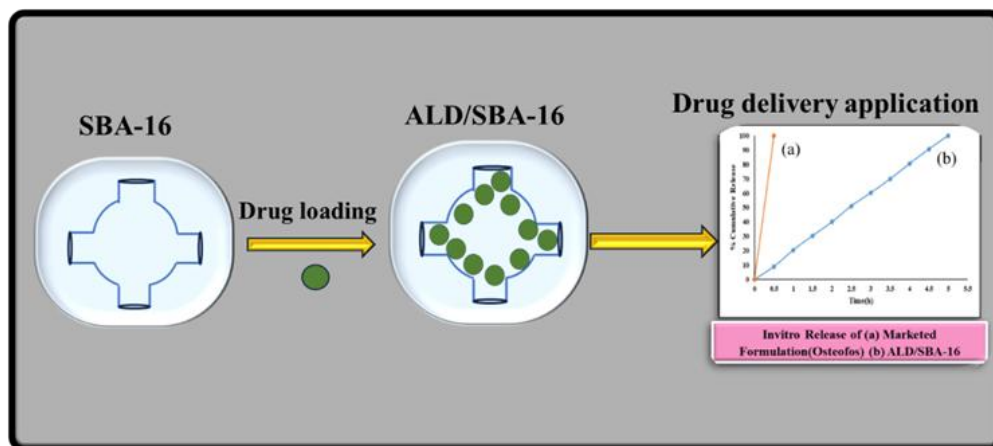
Department of Chemistry, Faculty of Science,

The Maharaja Sayajirao University of Baroda, Vadodara, 390002, India

Email: shivangimehta2000@gmail.com, anjalipatel-chem@msubaroda.ac.in

Abstract

Osteoporosis, 'silent epidemic' is a medical condition emerges out due to alteration in the bone remodeling process, which comprises removing old bone (osteoclast) and forming new bone (osteoblast). Alendronate (ALD), nitrogen containing bisphosphonate has been widely used for healing postmenopausal osteoporosis, Paget disease [1]. According to Biopharmaceutical Classification (BCS), it is characterized by low bioavailability and limited oral absorption and has some side effects related to gastrointestinal tract when increases dosage amount. The objective is to develop controlled drug delivery system (CDDs) based on mesoporous silica material, SBA-16, encapsulation of ALD, characterized it using different physico-chemical techniques, in vitro release study of drug in simulated body fluid (SBF). Various model were explored to study kinetics and mechanism. Also, release study was compared with marketed formulation of ALD. SBA-16 was synthesized by sol-gel method and loading of drug was carried out by solvent immersion technique. Carrier as well as CDDs were characterized by TGA, BET, FT-IR, and HRTEM. In vitro release study was carried out in SBF with 1:1 (drug: carrier) ratio. Results demonstrate that slower release was obtained in case of ALD/SBA-16 when compared with marketed formulation. Dissolution studies were conducted and results were in good agreement with in vitro release study. Further, release kinetics and mechanism were studied using various models like Zero order, First order and Higuchi model.



Designed biocompatible drug delivery system, based on SBA-16 turns out to be better than marketed formulation (Osteofos). Further, the dissolution of drug follows Zero order kinetics followed by Higuchi model according to kinetic study.

References

1. Patel, A., & Mehta, S. (2024). *RSC Pharmaceuticals*, 1(4), 797–805.

DESIGN AND FABRICATION OF LOW-COST AND HIGH-EFFICIENT O-NICOSE AS AN ELECTROCATALYST FOR OXYGEN EVOLUTION REACTION

Monika Nagaraj, Akshaya K. Samal*

Centre for Nano and Material Sciences (CNMS), Jain (Deemed-to-be University),
Jain Global Campus, Ramanagara, Karnataka, India – 562112

Email: *s.akshaya@jainuniversity.ac.in*

Abstract:

Developing electrocatalysts with earth-abundant elements for efficient oxygen evolution reactions (OER) is crucial for clean and sustainable energy sources. Many reports exist on designing oxide-based electrocatalysts for water oxidation through a facile approach to form the active species for their OER. The in-situ electrochemical transformations of non-oxide catalysts are faster than those of the corresponding oxides, with an enhancement in their OER activity [1]. Along with many approaches for tuning the active surfaces of catalysts and investigations into their roles in the mechanism of adsorption of OER intermediates have been reported in in-situ electrochemical tuning as an unavoidable phenomenon in non-oxide-based electrocatalysts [2], we still have a poor understanding of the dominant active sites formed during the OER. The non-metallic components seem to play intrinsic roles in boosting the activity of transition metals by readily transforming into amorphous metal oxides and (oxy)hydroxides [3]. In this work, in-situ electrochemical tuning was employed for non-oxide catalysts such as selenides (Se) during the OER process. Binary metal-based electrocatalyst (i.e., Ni and Co) was developed via an in situ electrochemical oxidation transformation from their corresponding selenides as highly active catalysts for OER. The fabrication of porous hollow O-NiCoSe was synthesized with a simple hydrothermal method followed by calcination in an inert atmosphere. For comparison, NiCo₂O₄ was also synthesized using a similar technique without a selenium source. The calcination process was carried in the air atmosphere. The OER electrochemical activities were tested in a three-electrode configuration in an electrochemical workstation. A platinum wire electrode was used

as the counter electrode and the reference electrode was a Hg/HgO in 1M KOH aqueous solution as the electrolyte.

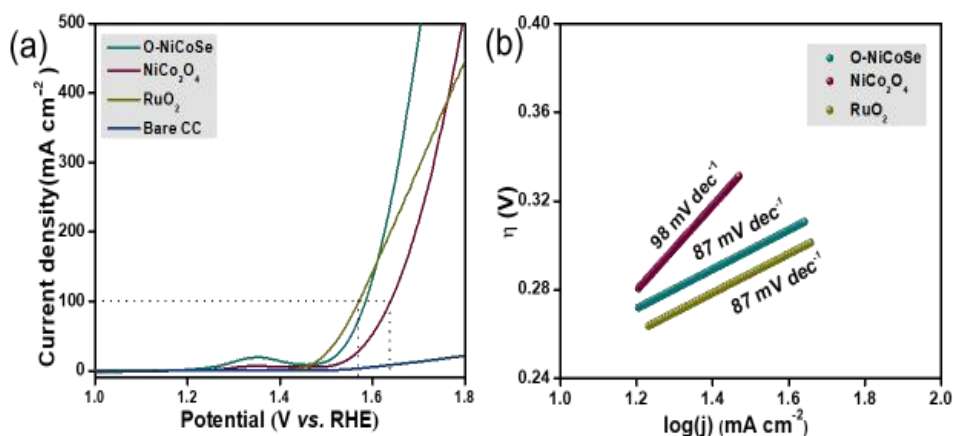


Fig. 1: (a) OER polarization curves of O-NiCoSe, NiCo₂O₄, RuO₂ and bare carbon cloth in 1M KOH ; (b) Corresponding Tafel plots for O-NiCoSe , NiCo₂O₄, RuO₂

The electrochemically tuned nickel cobalt selenate (O-NiCoSe) catalyst exhibits a low overpotential of 336 mV at a current density of 100 mA cm⁻², low Tafel slope of 87 mV dec⁻¹, and exceptional long-term chronoamperometry measurement for 48 h in 1 M KOH. The reconstruction of the Se during the electrochemical oxidation tuning of O-NiCoSe and the exposure of the electrochemically active sites at the surface of electrodes led to an enhancement of the OER activity. The real active sites for OER have been identified from the electrocatalyst's pre- and post-analysis characterizations. A deeper understanding and mechanistic pathways of in-situ electrochemical transformations of electrocatalysts can pave the way to developing an efficient electrocatalyst for real-time applications.

References

1. Chen, W., Wang, H., Li, Y., Liu, Y., Sun, J., Lee, S., Lee, J. S., & Cui, Y. (2015). In situ electrochemical oxidation tuning of transition metal disulfides

to oxides for enhanced water oxidation. *ACS Central Science*, *1*(5), 244–251. <https://doi.org/10.1021/acscentsci.5b00160>

2. Shang, X., Dong, B., Chai, Y. M., & Liu, C. G. (2018). In-situ electrochemical activation designed hybrid electrocatalysts for water electrolysis. *Science Bulletin*, *63*(13), 853–876. <https://doi.org/10.1016/j.scib.2018.05.008>
3. Chen, W., Liu, Y., Li, Y., Sun, J., Qiu, Y., Liu, C., Zhou, G., & Cui, Y. (2016). In situ electrochemically derived nanoporous oxides from transition metal dichalcogenides for active oxygen evolution catalysts. *Nano Letters*, *16*(12), 7588–7596. <https://doi.org/10.1021/acs.nanolett.6b03744>

SYNERGISTIC g-C₃N₄-ENCAPSULATED Cu-MOF: A MULTIFUNCTIONAL PHOTOCATALYST FOR EFFICIENT 2,4-D PESTICIDE DEGRADATION AND BROAD-SPECTRUM BIOLOGICAL ACTIVITY

Aseena Azeez^a, Udayabhanu^{b*}, Srinivas Reddy^c, Anusha BR^d, Ayyappa B^e, Prashantha K^d, Bhujangaiah NS^{a*}

^a Department of Chemistry, School of Engineering & Technology, CMR University, Bengaluru 560043, Karnataka, India 560043

^b Department of Chemistry, BMSIT and Management Avalahalli, Yelahanka, Bengaluru-560068, Karnataka, India.

^c Department of Physics and Chemistry, Mahatma Gandhi Institute of Technology, Hyderabad, Telangana -500075

^d Centre for Research & Innovations, BGSIT, Adichunchanagiri University, B.G. Nagara, Mandya District, Karnataka 571448, India

^e Department of Chemistry, CMR Institute of Technology, Bengaluru 560037, India
Email: udayabhanubc@gmail.com, & bhujangaiah.n@cmr.edu.in

Abstract:

The persistent use of synthetic herbicides such as 2,4-dichlorophenoxyacetic acid (2,4-D) poses significant environmental and health challenges due to their toxicity and resistance to natural degradation. Here, we report the fabrication of a stable composite material by encapsulating copper-based metal–organic framework (Cu-BTC MOF) within graphitic carbon nitride (gC₃N₄), yielding a multifunctional photocatalyst with enhanced performance. Comprehensive structural and morphological characterizations confirm the successful integration of Cu-BTC and g-C₃N₄, resulting in a composite with improved light absorption, reduced band gap, and increased surface area. Under visible light irradiation, the Cu-BTC@g-C₃N₄ composite demonstrates superior photocatalytic degradation of 2,4-D compared to its individual components, attributed to synergistic charge separation and abundant active sites. Additionally, the composite exhibits remarkable antibacterial, antifungal, and antioxidant activities, outperforming both pure g-C₃N₄ and Cu-BTC MOF in biological assays. These results highlight the potential of g-C₃N₄-encapsulated Cu-MOF as a robust and versatile material for environmental remediation and biomedical applications.

COLLOIDAL ENGINEERING OF PBS NANOPARTICLES USING HYDROPHILIC SPACER-BASED CATIONIC GEMINI SURFACTANTS: STRUCTURAL, OPTICAL, AND MICROBIAL ACTIVITIES

Dhruvi S. Chaudhari, and Shanta Raj Lakshmi*

Parul Institute of Applied Sciences, Parul University, Vadodara, Gujarat, India
E-mail: rajlakshmi.shanta0@gmail.com

Abstract

An unique colloidal engineering-chemical reduction technique is accessible, to modulate the spherical morphology and size reduction of lead (II) sulfide (PbS) nanoparticles (NPs) at RT, using an aqueous micellar solution of hydrophilic spacer (s) and hydrophobic alkyl tail lengths (m = 12 to 16) based cationic gemini surfactants (g1-g3), as stabilizing agents. The gemini with hydrophilic spacer (s) provide a pliable model in designing the smooth surface morphology, which enhances the structural, optical, and bacterial properties of PbS NPs (PbS-g1 to PbS-g3). The surface morphology of PbS found to be effectively capped and stabilized by the geminis through their m, using various experimental techniques (EDX, FT-IR, XRD, and Raman). Identical spherical morphology, promising nano-size (5-10 nm), and high thermal stability of PbS NPs were observed through TEM, DLS, and TGA data, except PbS-g1. A significant positive charge for all systems was also perceived through zeta potential measurements. High optical band gap (Eg) with smaller size and reduced surface structural disorder were examined using UV-visible and PL spectroscopy. Interestingly, “Non-Bacterial” effect on selective bacterial strains and high antioxidant results were demonstrated by agar-disc and agar-well diffusion assays and DPPH scavenging assay, respectively, for all PbS NPs. This study strongly suggests the potential of gemini surfactants with hydrophilic spacer, as an effective stabilizer, for enhancing structural and optical properties of semiconductor NPs, while also addressing environment and sustainable concerns with their non-adverse biological response.

References

1. Sklénard, B., Mugny, G., Chehaibou, B., Delerue, C., Arnaud, A., & Li, J. (2022). Size and solvation effects on electronic and optical properties of PbS quantum dots. *The Journal of Physical Chemistry Letters*, *13*(39), 9044–9050. <https://doi.org/10.1021/acs.jpcllett.2c02526>
2. Lim, C., Choi, M., Kim, T., Shin, D., Song, J. H., & Jeong, S. (2023). Effect of bandgap variation on photovoltaic properties of lead sulfide quantum dot solar cell. *Materials Today Energy*, *36*, 101357. <https://doi.org/10.1016/j.mtener.2023.101357>
3. Parikh, K., Singh, S., Desai, A., & Kumar, S. (2019). An interplay between spacer nature and alkyl chain length on aqueous micellar properties of cationic gemini surfactants: A multi-technique approach. *Journal of Molecular Liquids*, *278*, 290–298.

SYNTHESIS, PHYSICOCHEMICAL PROPERTIES, AND ANTIBACTERIAL ACTIVITY OF DENDRITIC OLIGOMERIC SURFACTANT WITH COMPUTATIONAL STUDY

Abhinav Santhosh, Kushan Parikh*

Department of Chemical Science, Faculty of Applied Sciences,
Parul University, Vadodara – 391 760, India

E-mail: abhinav.january@gmail.co, kushan.parikh82129@paruluniversity.ac.in

Abstract:

Dendritic oligomeric surfactant provides a possible route to minimize gap between conventional to geminie to polymeric surfactants and leads to bridge many profound improvements in the properties of surfactants in aqueous solution at different interfaces. Dendritic oligomeric surfactants (trimeric, tetrameric and hexameric) have been synthesized and characterized (NMR, FT-IR, CHN and ESI-Mass) by using different dendritic spacer and hydrocarbon tail length ($n = 12$). Micellization behaviour of synthesized novel surfactants have been evaluated by conductivity and tensiometer, respectively. Particle size has been analysed by Zeta and DLS. Stimulation studies on synthesized compounds have been calculated molecular properties based on data, electron cloud, EPT and their energy levels. Antimicrobial study using well diffusion method in (Gram+, Gram-, fugue and yeast) showing an outstanding performance with these dendritic oligomeric surfactants.

References

1. Brycki, B. E., Kowalczyk, I. H., Szulc, A., Kaczerewska, O., & Pakiet, M. (2017). Multifunctional gemini surfactants: Structure, synthesis, properties, and applications. In *IntechOpen*.<https://doi.org/10.5772/intechopen.69736>
2. Rhein, L. D. (Ed.). (2007). *Surfactants in personal care products and decorative cosmetics* (3rd ed.). CRC Press.
2. Fan, Y., & Wang, Y. (2018). Self-assembly and functions of star-shaped oligomeric surfactants. *Langmuir*, 34(38), 11220–11241. <https://doi.org/10.1021/acs.langmuir.8b01945>

3. Su, X., Feng, Y., Wang, B., Lu, Z., & Wei, L. (2011). Oligomeric cationic surfactants prepared from surfimers via ATRP: Synthesis and surface activities. *Colloid and Polymer Science*, 289(1), 101–110. <https://doi.org/10.1007/s00396-010-2321-7>
4. Zhou, C., Wang, F., Chen, H., Li, M., Qiao, F., Liu, Z., et al. (2016). Selective antimicrobial activities and action mechanism of micelles self-assembled by cationic oligomeric surfactants. *ACS Applied Materials & Interfaces*, 8(6), 4242–4249. <https://doi.org/10.1021/acsami.5b11727>

LANTHANIDE BASED SYSTEMS FOR INORGANIC ORTHOPHOSPHATE DETECTION

Hendry Saju, Shajesh Palantavida*

Centre for Nano and Material Sciences (CNMS),
JAIN (Deemed-to-be University), Bangalore, India
E-mail: p.shajesh@jainuniversity.ac.in

Abstract

Biosensing technologies are vital tools in healthcare diagnostics, environmental monitoring, and food safety due to their ability to detect biological analytes such as pathogens, toxins, and biomarkers, quickly, sensitively, and in real time. These systems employ biorecognition elements integrated with physicochemical transducers to convert specific biological interactions into measurable signals with high specificity. Their utility extends to early disease detection, precision medicine, physiological monitoring, and safeguarding public health, all with minimal invasiveness and low operational cost¹. Quantification of inorganic phosphate in is a crucial need to understand various environmental and physiological conditions. Herein, we propose a novel sensing strategy which utilizes the fluorescence sensitization between rare earth elements within the nanoparticles to quantify phosphate concentration in the stimulant serum sample. In presence of inorganic phosphate, the developed lanthanide stock was converted to cerium terbium phosphate nanoparticles in the room temperature, which gave intense green fluorescence. The developed sensing method differ from conventional lanthanide sensing mechanism, which generally utilize antenna effect from organic ligands in complexes or self assembles². The method follows a simple, rapid mix-and-analyse approach, making it user-friendly and easy to handle. Additionally, it uses non-toxic ingredients and low concentrations of metal salts, ensuring cost effectiveness. Compared to the existing gold standard method for phosphate detection (Murphy and Riley Method), the devised method holds clear and distinct advantages. The limit of detection of the developed system was found to be 0.63 μM . The devised method was further also miniaturized and phosphate analysis was made possible with a smartphone. The approach shows strong potential for phosphate detection in clinical, environmental, and food safety applications.

References

1. Lielpetere, A., Jayakumar, K., Leech, D., & Schuhmann, W. (2023). Enhancing electrochemical biosensor performance through optimized nanostructured interfaces. *ACS Sensors*, 8(4), 1756–1765. <https://doi.org/10.1021/acssensors.2c02457>
2. Sahoo, J., Krishnaraj, C., Sun, J., Panda, B. B., Subramanian, P. S., & Jena, H. S. (2022). Recent advances in metal–organic frameworks and their derivatives for electrochemical energy applications. *Coordination Chemistry Reviews*, 466, 214583.

FABRICATION AND PROPERTY EVALUATION OF CELLULOSE ACETATE-POLY(IONIC LIQUID) COMPOSITE NETWORK FOR PH-RESPONSIVE DELIVERY SYSTEMS

Reshma Raj, Shajesh Palantavida*

Centre for Nano and Material Sciences, Jain University,
Jain Global Campus, Kanakpura, Ramanagara, Bangalore 562112, India.
Email: p.shajesh@jainuniversity.ac.in

Abstract:

Since transdermal drug delivery systems (TDDSs) are non-invasive, have a continuous and controlled release, and have less systemic side effects, they have emerged as an intriguing drug delivery technique¹. Herein we propose a drug-loaded transdermal patches using cellulose-derived biopolymer-poly(1-butyl-3-vinylimidazolium bromide) [poly(ionic liquid)]². Different formulations with varying concentrations were designed and been assessed by various characterization techniques. ATR-FTIR analysis was used to investigate drug-polymer interactions, and the results revealed that the drugs and polymers were compatible. The produced patches' physicochemical properties, including hydrophilicity, thickness, weight uniformity, surface pH, physical appearance, the percentage of moisture absorbed and lost and in vitro release were further investigated³. Drug release kinetics has been studied using different mathematical models⁴. The present study concluded that drug-loaded cellulose-derived biopolymer-poly (1-butyl-3-vinylimidazolium bromide) composite showed improved performance than those lack poly (ionic liquid).

References:

1. Latif, M. S., Azad, A. K., Nawaz, A., Rashid, S. A., Rahman, M. H., Al Omar, S. Y., Bungau, S. G., Aleya, L., & Abdel-Daim, M. M. (2021). [Article title]. *Polymers*, 13(1). <https://doi.org/10.3390/polym13010001>
2. Narayanan, A., Naik, N., Kapse, S., Thapa, R., Geetha, B., Rout, C., & Padaki, M. (2024). [Article title]. *Journal of Materials Chemistry A*, 12. [https://doi.org/\[insert DOI\]](https://doi.org/[insert DOI])

3. Ullah, W., Nawaz, A., Akhlaq, M., Shah, K. U., Latif, M. S., Doolaanea, A. A., & Alfatama, M. (2021). [Article title]. *Journal of Drug Delivery Science and Technology*, 66, 102829. <https://doi.org/10.1016/j.jddst.2021.102829>
4. Mohan, T., Ajdnik, U., Nagaraj, C., Lackner, F., Dobaj Štiglic, A., Palani, T., Amornkitbamrung, L., Gradišnik, L., Maver, U., & Kargl, R. (2022). [Article title]. *ACS Applied Materials & Interfaces*, 14(3), 3726–3738. <https://doi.org/10.1021/acsami.1c21258>

TUNING THE MEMBRANE SURFACE CHARGE: ZWITTERIONIC FUNCTIONALIZED IRON OXIDE NANOPARTICLES FOR MOLECULAR SEPARATION AND ITS SUPERIOR ANTIFOULING PROPERTY

Dasari Hindu Bhavani^a, Manjunatha Kumara K S^a, Mahesh Padaki^b, D. H. Nagaraju^{a*}

^aDepartment of Chemistry, School of Applied Sciences, REVA University, Bangalore-560064, India.

^bCentre for Nano and Material Sciences, Jain University, Jain Global Campus, Kanakapura, Ramanagaram, Bangalore, 562112, India.

*Email: dhnagu@gmail.com

Abstract

In this study, we present a simple, effective yet unique strategy to tune the surface charge density of polysulfone membrane utilizing zwitterionic amino acid functionalized iron oxide nanoparticles (f-Fe₃O₄) derived from Alanine (Ala-Fe₃O₄), Glycine (Gly-Fe₃O₄) and Lysine (Lys-Fe₃O₄). These nanoparticles effectively removes anionic dyes, contribute to water purification and function as an antifouling material. Ala-Fe₃O₄ (f-Fe₃O₄) demonstrates a high positive zeta potential of 30.4 ± 0.60828 (at pH 7.5) enhancing its efficacy in removing anionic dyes like Erichrome black-T (EBT) and Alizarin Red (AR) resulting in removal efficiencies of 94% and 99.9%, respectively which are higher than the Gly-Fe₃O₄ and Lys-Fe₃O₄. This integration of f-Fe₃O₄ into a polysulfone (PSF) membrane resulted in the formation of microvoids and the functional groups significantly improved both hydrophilicity (contact angle of 55.0°) and water permeability. f-Fe₃O₄/PSF membrane demonstrated a significantly enhanced permeate flux of 390 Lm-2h-1bar-1 along with an impressive removal rate of 99.6 % which is about four times higher than the pristine membrane (flux of 89.5 Lm-2h-1bar-1 and 40% removal rate). Most importantly, the f-Fe₃O₄/PSF membrane shows an impressive permeance and dye molecule rejection performance across a range of organic solvents, such as methanol, ethanol and isopropyl alcohol (IPA). In addition, the membrane revealed outstanding antifouling performance with a flux recovery ratio (FRR) of 91.3 % against bovine serum albumin (BSA). Additionally, the f-Fe₃O₄ demonstrates remarkable regeneration capabilities and good recyclability.

SYNTHESIS AND PHYSICO-CHEMICAL PROPERTIES OF CHOLESTEROL BASED CATIONIC CONVENTIONAL & GEMINI SURFACTANTS

Jay Patel, Abhinav Santosh, Shanta Raj Lakshmi and Kushan Parikh*

Department of Chemical Science, Faculty of Applied Sciences,
Parul University, Vadodara – 391 760, India

Email: kamser2057@gmail.com, kushan.parikh82129@paruluniversity.ac.in

Abstract

Novel cholesterol based conventional cationic surfactants (denoted as Chol-DMG, Chol-DMPA, Chol-DMBA and Chol-DMABA) have been synthesized, via multiple steps, by using cholesterol, amino acids & Dimethylamine (Figure 1). The synthesized surfactants were characterized with a variety of analytical techniques, including Fourier-transform infrared spectroscopy (FTIR), Nuclear magnetic resonance (NMR) spectroscopy, ESI-Mass and Elemental Analysis. Physico-chemical properties (micellization, surface parameters, aggregation number, etc.) have been examined by surface tension and fluorescence measurement. The study revealed that cholesterol-based surfactants shown better micelle formation, improved surface arrangements with comparative aggregation numbers, respectively. The work offers important new information for the use of biocompatible and environmentally friendly surfactants from natural resources to biomedical applications.

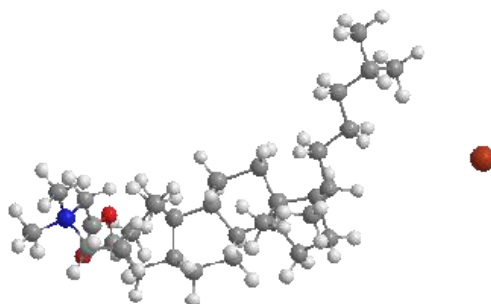


Figure 1. Representative Chemical Structure of Cholesterol-based Cationic Conventional Surfactant (Chol-DMG)

SOLUBILIZATION /RELEASED STUDY OF HERBAL AND AYURVEDIC MOLECULES AND THEIR BIOLOGICAL APPLICATIONS: INFLUENCE OF AQUEOUS SURFACTANT MICELLAR SOLUTION

Dhaval Mehta and Kushan Parikh*

Department of Chemical Science, Faculty of Applied Sciences,
Parul University, Vadodara – 391 760, India

Email: mdhaval701@gmail.com, kushan.parikh82129@paruluniversity.ac.in

Abstract

Herbal and Ayurvedic bioactive compounds, including Piperine, Diketene curcumin, carvacrol, and catechin, exhibit notable pharmacological properties but suffer from poor aqueous solubility and limited bioavailability, restricting their clinical utility. To address these challenges, this study explores the use of surfactant-based micellar systems—comprising both conventional and Gemini surfactants—to enhance solubilization, stability, and potential bioavailability of these hydrophobic molecules. Diketene curcumin was synthesized via the Michael addition method, and its incorporation into micellar systems was investigated alongside the other selected compounds. Solubilization efficiency was quantitatively assessed using UV-Visible spectroscopy. A significant increase in piperine solubility was observed with increasing concentrations of cetyltrimethylammonium bromide (CTAB), demonstrating the efficacy of cationic surfactants in improving aqueous solubility. Overall, the study highlights the potential of micellar systems as promising delivery platforms for enhancing the therapeutic applicability of hydrophobic herbal bioactive.

ALUMINUM-DOPED GERMANIUM TELLURIDE GLASSES FOR PCM APPLICATIONS

Mamatha. M, G Sreevidya Varma*

Department of Basic Sciences and Humanities, SOET, CMR University,

Bangalore 562149, India

Email: mamatha.m@cmr.edu.in

Abstract

Tellurium (Te)-based glasses are considered a foundational class of functional materials due to their exceptional optical and electrical properties [1,2]. Gradual compositional modifications, such as the incorporation of Ge and further doping with Al, allow for precise control of structural and electronic features [3,4]. This study investigates the progressive transformation from pure Te glasses to GeTe and GeTeAl systems, with a particular focus on changes in structure, phase stability, conductivity, and the implications for phase-change memory (PCM), thermoelectric devices, and photonic technologies [5–7]. The evolution of these materials underscores the strategic role of compositional design in optimizing glassy semiconductors for advanced applications. Tellurium (Te) glasses offer exceptional infrared transmission, low phonon energy, and tunable electrical properties. Addition of germanium (Ge) into Te glass networks leads to the formation of GeTe, enhancing thermal stability, electrical conductivity, and optical contrast, which are crucial for memory and optoelectronic applications [3,6], further doping of GeTe with aluminum stabilizes the phase transitions and increases structural robustness [4,8]. The resulting materials demonstrate enhanced potential in high-density data storage, neuromorphic computing, energy conversion, and optical communication platforms [5,7,9]. This work explores the continuous structural and property evolution from Te glasses to GeTe and finally GeTeAl systems, highlighting their scientific relevance and applications in data storage, energy conversion, and photonic technologies [4]. The progression from Te to GeTe and further to GeTeAl illustrates the power of compositional engineering in tuning glassy materials for high-performance applications. Structural reinforcement through Ge addition and further optimization

with Al doping results in materials with enhanced thermal, optical, and electrical performance [4].

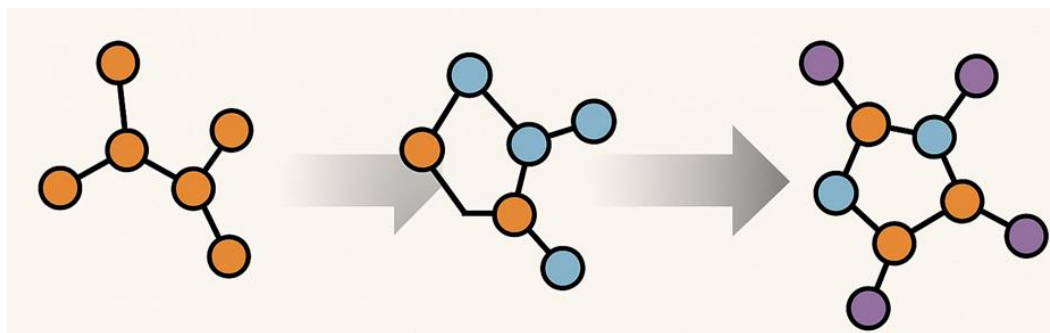


Figure 1: Structural progression in Te to GeTe and further to GeTeAl

References

1. Wagner, T., Frumar, M., & Frumarova, M. (2003). Chalcogenide glasses and their applications. *Current Opinion in Solid State and Materials Science*, 7(1), 35–43. [https://doi.org/10.1016/S1359-0286\(03\)00008-3](https://doi.org/10.1016/S1359-0286(03)00008-3)
2. Sanghera, J. S., Shaw, L. B., & Aggarwal, I. D. (2009). Chalcogenide glass-fiber-based mid-IR sources and sensors. *IEEE Journal of Selected Topics in Quantum Electronics*, 15(1), 114–119. <https://doi.org/10.1109/JSTQE.2008.2008478>
3. Kato, H., & Tanaka, K. (2005). Structural study on Ge–Te glasses by Raman spectroscopy. *Journal of Non-Crystalline Solids*, 351(5–6), 370–375. <https://doi.org/10.1016/j.jnoncrysol.2004.08.166>
4. Orava, J., Fons, P., Kolobov, A. V., Tominaga, T., & Tominaga, J. (2016). Structural relaxation and phase transition in amorphous Ge–Te–Al films. *Acta Materialia*, 103, 280–287. <https://doi.org/10.1016/j.actamat.2015.10.051>
5. Wuttig, M., & Yamada, N. (2007). Phase-change materials for rewriteable data storage. *Nature Materials*, 6(11), 824–832. <https://doi.org/10.1038/nmat2009>

6. Yoon, H., Lee, J., Hong, S., & Ovshinsky, S. R. (2008). Electrical properties of Ge–Te-based phase change materials. *Journal of Applied Physics*, *103*(12), 123506. <https://doi.org/10.1063/1.2932111>
7. Raoux, S. (2009). Phase change materials. *Annual Review of Materials Research*, *39*, 25–48. <https://doi.org/10.1146/annurev-matsci-082908-145405>
8. Cheng, Y., Xu, M., & Zhou, X. (2015). Improved thermal stability in GeTeAl chalcogenide phase-change materials. *Journal of Alloys and Compounds*, *650*, 703–708. <https://doi.org/10.1016/j.jallcom.2015.07.016>

SYNTHESIS AND PHOTOCATALYTIC PERFORMANCE OF Ni-Fe LDH MODIFIED GRAPHITIC CARBON NITRIDE FOR Cr(VI) REMOVAL

Jyoti Rani , Sandeep Kumar*

Department of Chemistry, Akal University,
Talwandi Sabo, Bathinda, Punjab, India.

Email: jyotibharia83@gmail.com

Abstract

Effective photocatalytic materials exhibiting high photochemical efficiency are crucial for the advancement of sophisticated photocatalytic systems. Layered Double Hydroxides (LDHs) have garnered significant interest because of their unique electronic characteristics, compositional flexibility, and tunable band gaps, which improve their efficiency in photocatalytic hydrogen production. Nevertheless, the elevated surface energy of LDHs may cause layer deactivation, restricting their effectiveness when utilized as independent photocatalysts. This study investigates a new method that combines two-dimensional (2D) g-C₃N₄ with 2D NiFe LDH to create a 2D/2D binary heterojunction composite. This design ensures a robust electrostatic interaction that enhances photocatalytic efficiency. The g-C₃N₄/LDH composites were analyzed via X-ray diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy, scanning electron microscopy (SEM), and energy-dispersive X-ray (EDX) analysis. Analysis of surface morphology showed that LDH crystals formed on the GCN surface, taking advantage of the delocalized π -electrons from the graphitic structure to improve chemical stability. Additionally, the synthesized materials were utilized as catalysts for the elimination of Cr(VI) from aqueous solutions under different experimental conditions. The elimination of Cr(VI) was observed to be highly influenced by pH, and the point of zero charge (pHZPC) was examined as well. The research emphasizes the promise of LDH-doped g-C₃N₄ as an effective photocatalyst for environmental cleanup, especially in addressing harmful chromium pollutants in wastewater.

STUDY ON THE OPTOELECTRONIC PROPERTIES OF BIODEGRADABLE POLYMER REINFORCED WITH DES FUNCTIONALISED ACTIVATED CHARCOAL

Santhosh G

Department of Sciences and Humanities, CHRIST University, Kengeri Campus,
Mysore Road, Kanminike, Bengaluru 560074. India
E-mail: santhosh87org@gmail.com

Abstract

Optical transparency, water solubility, and thermal stability of polyvinyl alcohol (PVA) biopolymer make it a more rendering material because of its exceptional properties and hence used in optoelectronic applications like solar cells, photo voltaic, photodetectors and light-emitting devices. In this work, polyvinyl alcohol and chitosan were reinforced with deep eutectic solvent (Trimethyl ammonium chloride + Ethylene glycol (1:2)) and functionalised by activated charcoal to enhance its optoelectronic properties. FTIR, XRD, Band gap study and Impedance spectroscopy confirmed that the functionalised composite polymer exhibits significantly improved electrical conductivity and enhanced thermal stability, making it a promising candidate for optoelectronic applications.

References

1. Alam, M., Alandis, N. M., Ansari, A. A., & Shaik, M. R. (2013). Optical and electrical studies of polyaniline/ZnO nanocomposite. *Journal of Nanomaterials*, 2013, Article 157810. <https://doi.org/10.1155/2013/157810>
2. Voon, C. H., Foo, K. L., Lim, B. Y., Gopinath, S. C. B., & Al-Douri, Y. (2020). Synthesis and preparation of metal oxide powders. In *Metal Oxide Powder Technologies* (pp. xx–xx). INC. <https://doi.org/10.1016/B978-0-12-817505-7.00003-8>
3. Pitruzzella, R., Nasr, B., Zuppella, P., Asaro, F., Fioravanti, G., Maccagnani, P., & Ciminelli, C. (2023). Polymer doping as a novel approach to improve

- the performance of plasmonic plastic optical fiber sensors. *Sensors*, 23(12), 5548. <https://doi.org/10.3390/s23125548>
4. Zhou, P. K., Yu, H., Li, Y., Yu, H., Chen, Q., & Chen, X. (2024). Recent advances in covalent organic polymers-based thin films as memory devices. *Journal of Polymer Science*, 62(8), 1536–1553. <https://doi.org/10.1002/pol.20230273>

RECENT DEVELOPMENTS IN THE SYNTHESIS AND OPTOELECTRONIC ACTIVITY OF NOVEL PRACTICAL APPLICATIONS OF USING DFT AND TD-DFT ETHYL-4-(4-METHOXY PHENYL)-6-METHYL-2-THIOXO-1,2,3,4-TETRAHYDROPYRAMIDINE-5-CARBOXYLATE”.

Yarava Ramana Reddy¹, A.Suvitha², T.Amaranatha Reddy³

¹CMR Institute of Technology (VTU), Bangalore, India

²Department of Physics, CMR Institute of Technology, Bangalore, Karnataka, India.

³Aditya College of Engineering, Madanapalle, Andhra Pradesh, India

Email: ramanareddyphysics2007@gmail.com, suvitha@cmrit.ac.in

Abstract:

Pyrimidine derivatives are widely used as chemotherapeutic agents for the treatment of various diseases resulting from different microorganisms. Many useful drugs containing these skeletal structures with diverse biological activities have now emerged and are widely used against tumours and viral diseases. Pyrimidine derivatives such as pyrimethamine and trimethoprim are well known to inhibit the enzyme dihydrofolate reductase, thereby blocking the reduction to tetrahydrofolic acid from its dihydro precursor, an essential coenzyme in nucleic acid synthesis. The constituents of nucleic acids also pyrimidine exists in form of base. This theory helps treatment of AIDS. The discovery of pyrimidine is itself a big revolution in medical science. Tetrahydropyrimidines act on the nervous system of the worms as inhibitors of acetylcholinesterase. Terminating the transmission of nervous signals where acetylcholine is the neurotransmitter the parasites are paralyzed and cannot keep themselves attached to the intestinal wall. Pyrimidine as heterocyclic moiety it has a large application and wide drug antiptotozoal, antiviral, antihypertensive, anti-inflammatory, analgesic and central nervous system. In a view of great importance of pyrimidine derivatives, here in we synthesis of new Ethyl-4-(4-methoxyphenyl)-6-methyl-2-thioxo-1,2,3,tetrahydropyrimidine-5-carboxylate compounds and test their biological activities on nervous system, spectral data confirmation by analytical techniques such as NMR, IR and Mass spectrometer.

ETHYL 4-(4-FLUORO PHENYL)-6-METHYL-2-THIOXO-1,2,3,4-TETRAHYDRO-5-PYRIMIDINE CARBOXYLATE

Sanathkumar Akumalla¹, A. Suvitha², T.Amaranatha Reddy³

¹CMR Institute of Technology (VTU), Bangalore, India

²CMR Institute of Technology, Bangalore, India

³Aditya College of Engineering, Madanapalle, Andhrapradesh

E Mail: sanathkumar112@gmail.com, suvitha@cmrit.ac.in

Abstract:

Vibrational, NLO, NBO, HOMO-LUMO, NMR chemical shift and structural analysis of Ethyl 4-(4-fluoro phenyl)-6-methyl-2-thioxo-1,2,3,4-tetrahydro-5-pyrimidine carboxylate using quantum computational calculations are reported. Molecular geometry, bond length and bond angle, Mulliken atomic charges and vibrational wave numbers of 2, 3, 5, 6 –tetrachloro-P- benzoquinone in the ground state have been calculated by using Hartree–Fock (HF) and density functional theory in B3LYP method employing the 6-311++G(d, p) basis sets. Assignments of vibrational frequencies have been performed by potential energy distribution (PED) analysis. A study on the electronic properties, such as HOMO and LUMO energies were performed by time independent DFT approach. In addition, molecular electrostatic potential (MEP), Natural Bond Orbitals (NBO) and Non Linear Optical (NLO) properties were performed. The ¹³C nuclear magnetic resonance (NMR) chemical shifts of the molecule were calculated by gauge independent atomic orbital (GIAO) method and compared with experimental chemical shift. Swiss ADME, were used to compute physicochemical descriptors as well as to predict ADME parameters, pharmacokinetic properties, pH value, druglike nature and medicinal chemistry friendliness of small molecule. All these properties were analyzed by Computer Aided Drug Designing approach (CADD) to support drug discovery.

BIOMIMICRY IN BIOMEDICAL ENGINEERING: ADVANCES IN BIO-INSPIRED MATERIALS FOR TISSUE ENGINEERING AND IMPLANT DESIGN

Dr. Anuradha Tyagi

Thakur Shyamnarayan Engineering College

Mumbai, India

Email: dranuradhatyagi@tsecmumbai.in

Abstract

Biomaterials and bio-inspired materials represent a convergence of engineering, biology, and material science aimed at mimicking nature's strategies for solving complex biomedical challenges. The implementation of bioinspired principles in the development of implants, scaffolds, and adhesives has resulted in a new class of materials with enhanced biocompatibility, mechanical resilience, and adaptability to physiological environments. This paper presents a detailed review of current trends in the design and application of nacre-inspired composites, gecko-inspired adhesives, and biodegradable materials for regenerative medicine. Emphasis is placed on the structure-function relationships of natural models, fabrication methods such as electrospinning and spark plasma sintering, and their integration into clinical practice. Recent advances, limitations, and future directions for the field are also discussed.

SUPPORTED PALLADIUM CATALYZED DIRECT REDUCTIVE N-FORMYLATION OF NITROARENES

Aman Vishwakarma^{1,2} and Soyeb Pathan^{*1,2}

¹Department of Chemistry, Parul Institute of Applied Sciences, Parul University, Vadodara, Gujarat 391760, India

²Research and Development Cell (RDC), Parul Institute of Applied Sciences, Parul University, Vadodara, Gujarat 391760, India

*E-mail: khan_9751@yahoo.com

Abstract

Aryl amines and N-aryl formamides are essential intermediates with diverse applications, especially in the polymer, pharmaceutical, agrochemical, dye, and fragrance industries[1]. Formamides are typically synthesized through the direct formylation of amines and reductive amination of nitro compounds[2]. The use of one of the abundant CO₂ surrogates, Formic Acid (FA) as a reagent for one-pot reductive formylation nitro-compounds makes the process more sustainable as FA is considered not only an excellent alternative to hydrogen [3] but also C1 source for formylation. However, these base metal-catalyzed processes often face limitations, including the need for a high reagent-to-substrate ratio, elevated temperatures, low product yields, and extended reaction times[4]. Studies on efficient one-pot direct N-formylation of nitroarenes using CO₂ surrogates usually involved the use of noble metal catalysts such as platinum (Pt), gold (Au), rhodium (Rh) etc. Therefore, to reduce the overall cost of the process, it is highly desirable to employ more affordable metals, such as palladium (Pd)-based catalysts. It is widely recognized that the support material plays a vital role in heterogeneous catalysis, influencing the dispersion of active metals, diffusion processes, and thermal stability. These factors are greatly affected by the morphology of the support, including characteristics such as surface area, pore size, pore volume, pore type, etc. Taking into account the one-pot transformation using formic acid as well as heterogeneous catalysts in selective reduction and reductive N-formylation, this study will focus on synthesizing Pd anchored porous silica with various morphologies. Advanced characterization techniques will be employed to determine how the morphology of the support

influences the physicochemical properties of the synthesized Pd catalysts. The reaction will be optimized by varying several parameters, including reaction time, temperature, Pd loading, and the nitro: formic acid (FA) ratio. Furthermore, a correlation between the structure and morphology of the synthesized supported catalysts and their catalytic performance will be established.

References

1. Sawant, D. N.; et al. Palladium-Catalyzed Carbon-Monoxide-Free Aminocarbonylation of Aryl Halides Using N-Substituted Formamides as an Amide Source. *J. Org. Chem.* 2011, 76 (13), 5489–5494.
2. Nasrollahzadeh, M.; et al. Recent Advances in N-Formylation of Amines and Nitroarenes Using Efficient (Nano)Catalysts in Eco-Friendly Media. *Green Chem.* 2019, 21 (19), 5144–5167.
3. Johnson, T. C.; Morris, D. J.; Wills, M. Hydrogen Generation from Formic Acid and Alcohols Using Homogeneous Catalysts. *Chem. Soc. Rev.* 2010, 39 (1), 81–88.
4. Li, J.; et al. Atomically Dispersed Zn–Nx Sites in N-Doped Carbon for Reductive N-Formylation of Nitroarenes with Formic Acid. *ChemCatChem* 2020, 12 (6), 1546–1550.

DESIGN OF COST-EFFECTIVE DISPOSABLE FABRIC ELECTRODES MODIFIED WITH MOF-5 COMPOSITE AS AN ULTRA-SENSITIVE SENSOR FOR THE DETECTION OF OCHRATOXIN A IN FOODS

Megha George^{1,2}, Suvaradhan Kanchi^{1,2*}

¹Department of Chemistry, CHRIST University, Bengaluru -560029, India

²Centre for Renewable Energy and Environmental Sustainability, CHRIST University, Bengaluru 560 029, India

E-mail: megha.george@res.christuniversity.in; suvaradhan.k@christuniversity.in

Abstract

Mycotoxins are toxic metabolites produced by numerous moulds and fungi, which can contaminate food and agricultural products, causing serious health risks such as cancer, DNA damage, and immunological issues. Among these, Ochratoxin A (OTA) is a harmful mycotoxin produced by different fungal species such as aspergillus and penicillium (1). Ochratoxin A (OTA) has been detected in cereals, cereal-derived products, dried fruits, wine, beer, nuts, and spices. The detection of these compounds is important for food safety and public health, making them relevant study analytes due to their abundance in food crops (2). In this work, an electrochemical sensor was developed for Ochratoxin A (OTA) detection, using an electrode modified with a nanocomposite of MOF-5 and iron oxide nanoparticle to develop cost effective electrochemical sensing platforms with high accuracy and sensitivity (3). Metal organic framework (MOFs) based nanocomposite on to the electrodes improves sensitivity for the detection of mycotoxins with more accuracy and specificity The characterization of MOF nanocomposites was carried out with X-Ray Diffraction (XRD), Scanning Electrode Microscopy (SEM), Transmission Electron Microscopy (TEM), Fourier Transform Infrared Spectroscopy (FTIR) to confirm the structural and chemical properties. This work highlights the potential of MOF-based nanocomposites in electrochemical sensing applications and provides a promising platform for the rapid, sensitive, and reliable detection of mycotoxins in food safety monitoring (4).

References

1. Jahangiri-Dehaghani, F., Zare, H. R., & Shekari, Z. (2024). Simultaneous measurement of ochratoxin A and aflatoxin B1 using a duplexed-electrochemical aptasensor based on carbon nanodots decorated with gold nanoparticles and two redox probes hemin@HKUST-1 and ferrocene@HKUST-1. *Talanta*, 266, 124947. <https://doi.org/10.1016/j.talanta.2023.124947>
2. Ubaidullah, M., Al-Enizi, A. M., Ahamad, T., Shaikh, S. F., Al-Abdrabalnabi, M. A., Samdani, M. S., Kumar, D., Alam, M. A., & Khan, M. (2021). Fabrication of highly porous N-doped mesoporous carbon using waste polyethylene terephthalate bottle-based MOF-5 for high performance supercapacitor. *Journal of Energy Storage*, 33, 102125. <https://doi.org/10.1016/j.est.2020.102125>
3. Zhang, J., Xu, X., & Qiang, Y. (2020). Ultrasensitive electrochemical aptasensor for ochratoxin A detection using AgPt bimetallic nanoparticles decorated iron-porphyrinic metal-organic framework for signal amplification. *Sensors and Actuators B: Chemical*, 312, 127964. <https://doi.org/10.1016/j.snb.2020.127964>
4. Zheng, C., Greer, H. F., Chiang, C.-Y., & Zhou, W. (2014). Microstructural study of the formation mechanism of metal-organic framework MOF-5. *CrystEngComm*, 16(6), 1064–1070. <https://doi.org/10.1039/C3CE41291A>

TEMPLATE-MEDIATED GREEN SYNTHESIS OF COBALT OXIDE NANOPARTICLES AND ITS SURFACE FUNCTIONALIZATION USING B-ALANINE FOR BIOLOGICAL APPLICATIONS

Helen Rose J^a, Parin Praveen ^a, Ananya S Agnihotri ^a, Ganesan Krishnamoorthy ^b, Nidhin M^{a*}

^aDepartment of Chemistry, CHRIST (Deemed to be University),
Bengaluru, 560029, India

^bR & D Cell, Department of Biochemistry, Muthayammal College of Arts and
Science, Rasipuram, Tamil Nadu, India

Email: nidhin.m@christuniversity.in, helen.rose@res.christuniversity.in

Abstract

Nanotechnology brought new opportunities in diverse fields like electronics, medicine, energy, environmental science and became a great milestone in today's era. Among these advancements, metal oxide nanoparticles, especially cobalt oxide nanoparticles, have gained significant attention, among other nanoparticles, due to their unique structural properties. However, the conventional method of synthesis of nanoparticles faces many drawbacks like the use of toxic chemicals, complex procedures, high energy consumption and so on. But these issues were addressed by green alternatives utilising natural resources. Here, Gum Arabic is used as a natural template for the synthesis of Cobalt oxide (Co₃O₄) nanoparticles. Co₃O₄ were prepared using calcination involving different concentrations of precursor and templates. Surface functionalization of the nanoparticle was carried out to enhance the biomedical potential of the synthesised nanoparticle. β-alanine, an amino acid known for its biocompatibility, was successfully utilised for surface functionalization of nanoparticles. The composition and structural properties were studied using characterisation techniques like UV-Vis absorption, TEM, SEM, VSM, FTIR and XRD. To analyse the cytocompatibility of both functionalised and non-functionalised nanoparticles, a cell viability test was also conducted. Compared with native ones, an increase in cell viability (99.82%) was also noted for biosynthesised

cobalt oxide nanoparticles in DMSO/water. This work highlights and promotes the importance of green synthesis and advanced functionalisation techniques in developing biocompatible and multifunctional Co_3O_4 nanomaterials. This work underscores the importance of a sustainable, innovative green approach for the development of nanoparticles by addressing existing gaps in current methodology.

“SYNTHESIS AND BIOLOGICAL ACTIVITIES OF NOVEL INDOLE-BASED COMPOUNDS”

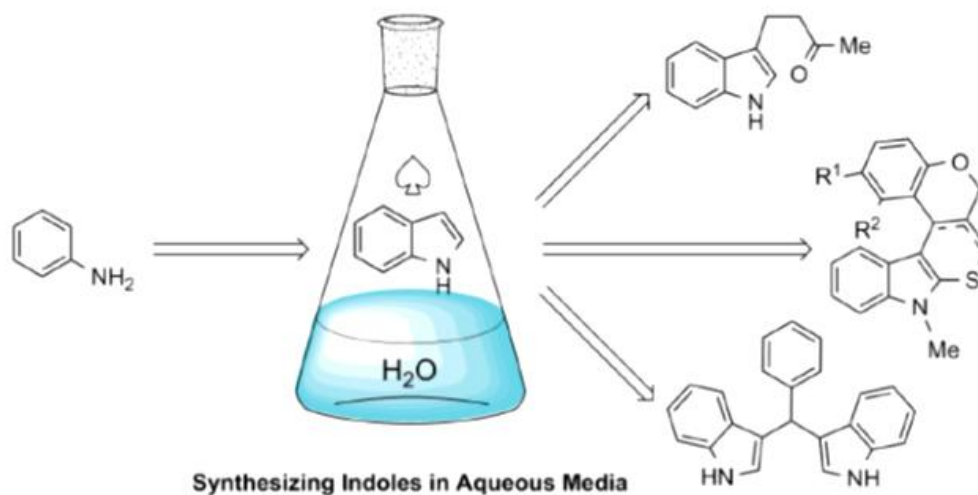
Jignesh Lad, Kushan Parikh*

Department of Chemical Science, Faculty of Applied Sciences,
Parul University, Vadodara – 391 760, India

Email: Jigneshlad86681@gmail.com, kushan.parikh82129@paruluniversity.ac.in

Abstract

Novel Indole based conventional compounds [(N'-substituted aryl hydrazine) indole 3-carbohydrazine-N"-azetidiny] and its derivatives and (N'-substituted aryl hydrazine) indole 3-carbohydrazine-N"-thiazolidinone and its derivative] have been synthesized, via multiple steps, by using (N'-substituted aryl hydrazine) indole 3-carbohydrazine, Chloro acetyl chloride, Mercapto acetic acid, Zinc chloride (Scheme 1). The synthesized compounds will be characterized with a variety of analytical techniques like Fourier-transform infrared spectroscopy (FTIR), ¹H-NMR spectroscopy, ESI-Mass and Elemental Analysis. The biological effectiveness of the newly synthesized compounds as antifungal agents against *Aspergillus flavus*, *Aspergillus niger* and *Aspergillus fumigatus*, *Candida krusei*, *Candida albicans*, *Candida parapsilosis* and *C. glabrata HO5* will be assessed. In addition, wound healing activation will be analyzed. This work will offer important information regarding synthesis of novel Indole based compounds along with the biological applications.



Scheme 1

DETERMINATION OF CHILLI PEPPER ‘HOTNESS’; DEVELOPMENT OF AN OPTICAL SYSTEM FOR THE SENSING OF CAPSAICIN

Sreevidhya K B^{1,2}, Suvaradhan Kanchi^{1,2*}

¹Department of Chemistry, CHRIST University, Bengaluru -560029, India

²Centre for Renewable Energy and Environmental Sustainability,
CHRIST University, Bengaluru 560 029, India

Email: *sreevidhya.b@res.christuniversity.in*, *suvaradhan.k@christuniversity.in*

Abstract

Capsaicinoids are a group of naturally occurring organic compounds capable of imparting pungency, heat and endorphin mediated pleasure that contributes to the popularity of spicy foods among consumers (1). Capsaicin is a major compound in capsaicinoid family accounting for majority of total capsaicinoids in chilli pepper varieties (2). It is important to determine the amount of capsaicin as it serves as a quality indicator of commercial chilli peppers. The current work reports the development of an optical system based on metal organic frameworks for the detection of capsaicin thereby determining the hotness of chilli. The scope of the study encompasses the synthesis of a zirconium based fluorescent MOF, UiO-67 using solvothermal method and its characterization by XRD, FT-IR, FE-SEM, and, TGA techniques. The optical properties of UiO-67 were studied using UV-visible spectra and fluorescence emission spectra. The detection conditions were systematically optimized and under optimal parameters, the hotness of chilli which is proportional to the concentration of capsaicin (3) can be determined from change in fluorescence of UiO-67 while capsaicin is interacted with the framework. Additionally, the fluorometric assay enables quantitative detection of capsaicin concentration. The process is rapid, non-destructive, and suitable for classifying and quantifying capsaicin content in food samples, supporting practical applications in food safety and quality control (4). Thus, the optical sensor approach, especially when combined with advanced MOF materials, can

be concluded as an effective, fast, and user-friendly method for capsaicin detection in various matrices.

References

1. Mohammad, R., Ahmad, M., & Heng, L. Y. (2014). Chilli hotness determination based on optical capsaicin biosensor using stacked immobilisation technique. *Sensors and Actuators B: Chemical*, *190*, 593–600. <https://doi.org/10.1016/j.snb.2013.09.087>
2. Collins, M. D., Wasmund, L. M., & Bosland, P. W. (1995). Improved method for quantifying capsaicinoids in *Capsicum* using high-performance liquid chromatography. *HortScience*, *30*(1), 137–139. <https://journals.ashs.org/view/journals/hortsci/30/1/article-p137.xml>
3. Mohammad, R., Arip, M. N. M., Ahmad, M., Heng, L. Y., & Shafie, K. A. (2016). Capsaicin determination in chilli fruit using a new solid-state sensor based on reflectance transduction. *Sensor Letters*, *14*(7), 692–699. <https://doi.org/10.1166/sl.2016.3684>
4. López Pacheco, M. A., Báez Rojas, J. J., Castro-Ramos, J., Villa Manríquez, J. F., & Esmonde-White, K. (2021). Optical study to identify and quantify capsaicin in optical window. *Heliyon*, *7*(3), e05797. <https://doi.org/10.1016/j.heliyon.2020.e05797>

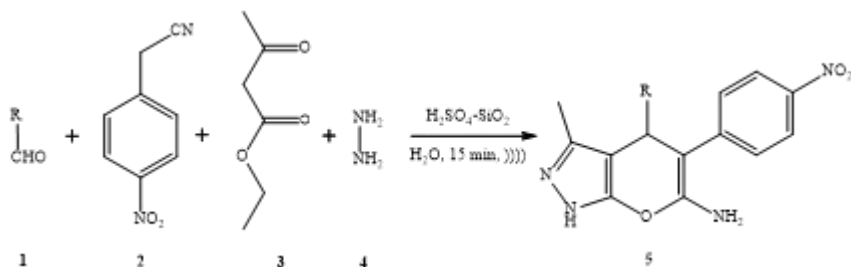
SILICA SULPHURIC ACID: AN EFFICIENT CATALYST FOR ONE-POT MULTICOMPONENT SYNTHESIS OF NOVEL PYRAZOL-AMINES UNDER ULTRASONICATION

Sumaiya Tabassum

Department of Chemistry, Surana College,
South End Road, Bengaluru 560004. India
Email: sumaiyatabassum2711@gmail.com

Abstract

The catalytic potential of Sulphuric acid supported silica gel ($\text{H}_2\text{SO}_4\text{-SiO}_2$) as a catalyst has been assessed for the one-pot cyclocondensation reaction involving an aromatic aldehyde, 4-nitrophenylacetonitrile, ethyl acetoacetate and hydrazine to form poly-functionalized pyrano[2,3-*d*]pyrazol-amines under ultrasonication. The strategy successively tolerates a variety of functional groups, both electron-donating/electron-withdrawing, and shows higher synthetic efficiency and product structural diversity. Moreover, the blend of Sulphuric acid supported silica gel and ultrasonication process is eco-compatible, environment-friendly, and the products are obtained in excellent yields without column chromatography. The feasibility of a gram-scale reaction and catalyst recycling/reuse is demonstrated. By reaching a higher level of complexity in the products, this research explores a new direction in the field of the construction of heterocycles via a multicomponent approach.



Scheme 1: Synthesis of pyrano[2,3-*d*]pyrazol-amines

References

1. Nair, V., Rajesh, C., Vinod, A. U., Bindu, S., Sreekanth, A. R., Mathen, J. S., & Balagopal, L. (2003). *Accounts of Chemical Research*, 36(12), 899–907. <https://doi.org/10.1021/ar030032i>
2. Smil, D. V., Manku, S., Chantigny, Y. A., Leit, S., Wahhab, A., Yan, T. P., Fournel, M., Maroun, C., Li, Z., & Lemieux, A. M. (2009). *Bioorganic & Medicinal Chemistry Letters*, 19(3), 688–692. <https://doi.org/10.1016/j.bmcl.2008.11.099>

ACID-REDOX PROPERTIES TAILORED- SUPPORTED UNDECAMOLYBDOPHOSPHATE CATALYST FOR DIRECT OXIDATIVE CROSS-ESTERIFICATION OF ALDEHYDES

Nisha Giri^{1,2} and Soyeb Pathan^{*1,2}

¹Department of Chemistry, Parul Institute of Applied Sciences,
Parul University, Vadodara, Gujarat 391760, India

²Research and Development Cell (RDC), Parul Institute of Applied Sciences,
Parul University, Vadodara, Gujarat 391760, India

Email: khan_9751@yahoo.com

Abstract

The traditional method for synthesizing esters using mineral acids under homogeneous conditions has its drawbacks, including thermodynamic reversibility and slow reaction rates. Alternatively, the ester can be produced via oxidative esterification of aldehyde which includes oxidation of the aldehyde to acids and subsequent esterification to ester. However, general process oxidation is carried out in the presence of stoichiometric oxidants with disadvantages such as lack of selectivity, the use of solvents, reagents, and waste production[1]. Thus, ester production under relatively mild conditions, as well as the development of more effective and eco-friendly processes utilizing sustainable catalysts, still remains a challenge. In this context, polyoxometalates (POMs) $[XM_{12}O_{40}]^{n-}$ ($X = Si^{4+}, P^{5+}; M=W^{6+}, Mo^{6+}, V^{5+}$) are excellent candidates because of their redox properties. Despite the excellent redox properties of the phosphomolybdate especially, lacunary phosphomolybdate, very few reports are available on the catalytic activity of this LPOM [2, 3]. This may be due to their low thermal and hydrolytic stability. The reports on mono lacunary phosphomolybdate $[PMo_{11}O_{39}]^{7-}$ exhibited that the stabilization of highly reactive $[PMo_{11}O_{39}]^{7-}$ could be achieved either by using large cation viz. Cs or by anchoring to a suitable support which also contributed to enhancing thermal and hydrolytic stabilities.

With the goal of developing a novel heterogeneous catalyst for the one-step oxidative cross-esterification of aldehydes to esters with improved activity and

selectivity under mild conditions, we present the synthesis of a defect-regulated undecamolybdophosphate supported on ZSM-5 [4]. The acidity was enhanced by replacing the available Na⁺ ions with protons through an ion-exchange method. The structural and morphological properties of the synthesized 20% PMo₁₁/ZSM-5-H catalysts were confirmed through characterization techniques. The synthesized catalysts were employed in direct oxidative esterification reactions using an environmentally friendly oxidant (O₂). The effect of various reaction parameters such as %loading of PMo₁₁, amount of catalyst, reaction time, and reaction temperature and volume of methanol on activity and selectivity was studied. The scope and limitations of the current catalytic system were further investigated by utilizing various aldehydes and alcohols under optimized reaction conditions. Stability and recyclability tests confirmed that the synthesized catalyst operates as a truly heterogeneous system and retains its activity for at least six successive cycles.

References

1. Ribeiro, H., Silva, C., Florêncio, M. H., & Rego, A. M. B. (2013). From coffee industry waste materials to skin-friendly products with improved skin fat levels. *European Journal of Lipid Science and Technology*, 115(3), 330–336. <https://doi.org/10.1002/ejlt.201200186>
2. Pathan, S., & Patel, A. (2014). Selective green oxidation of alcohols and alkenes with molecular oxygen using supported undecamolybdophosphate under solvent-free condition. *Chemical Engineering Journal*, 243, 183–191. <https://doi.org/10.1016/j.cej.2013.12.026>
3. Narkhede, N., Patel, A., & Singh, S. (2014). Mono lacunary phosphomolybdate supported on MCM-41: Synthesis, characterization and solvent-free aerobic oxidation of alkenes and alcohols. *Dalton Transactions*, 43(6), 2512–2520. <https://doi.org/10.1039/C3DT52555C>
4. Pathan, S., & Patel, A. (2011). Novel heterogeneous catalyst, supported undecamolybdophosphate: Synthesis, physico-chemical characterization and solvent-free oxidation of styrene. *Dalton Transactions*, 40(2), 348–355. <https://doi.org/10.1039/C0DT00797E>

ROLE OF GREEN CHEMISTRY IN PHARMACEUTICAL INDUSTRY

S. Vedavalli

Department of Chemistry, Sea College of Science, Commerce and Arts.

K.R. Puram, Bangalore, India

Email: vedachem9@gmail.com

Abstract:

The goal of the cutting-edge field of "green chemistry" is to create chemical products and processes that require fewer or no harmful materials. The use of green chemistry in pharmaceutical manufacturing has the potential to significantly improve sustainability, process efficiency, and environmental impact. In the pharmaceutical sector, this research examines a number of green chemistry tactics, such as continuous processing, atom economy, solvent use, and catalysis. The synthesis of ibuprofen and sitagliptin serve as examples of how green chemistry can be used practically. A sustainable future in pharmaceutical production depends on continuous improvements, a dedication to learning, and innovation, even in the face of adoption obstacles.

References:

1. Singh, N. B., Jain, P., et al., Green synthesis and applications of nanomaterials, *Curr Pharm Biotechnol*, 2021; 22(13):1705-1747.
2. Huston, M., DeBella, M., et al. (2021). Green synthesis of nanomaterials, *Nanomaterials* 2021, 11(8), 2130

FIBER BRAGG GRATING SENSORS IN RAILWAY ENGINEERING: FROM STRUCTURAL MONITORING TO PREDICTIVE MAINTENANCE

Neha¹, Nithya Konappa¹, Shravani R Pattanshetty¹, G Sreevidya Varma*²

¹Department of Computer Science and Engineering, SOET,
CMR University, Bangalore 562149, India

²Department of Basic Sciences and Humanities, SOET,
CMR University, Bangalore 562149, India

Email: n_neha@cmr.edu.in

Abstract

Fiber Bragg Grating (FBG) sensors have emerged as a pivotal technology in the development of intelligent sensing systems, offering a robust solution for industries requiring real-time monitoring and predictive diagnostics. Among these, the railway sector has shown increasing interest in FBG-based systems to enhance safety, operational reliability, and maintenance efficiency [1,2]. Owing to their inherent advantages—including high sensitivity, immunity to electromagnetic interference, multiplexing capabilities, and durability under harsh environmental conditions—FBG sensors are well-suited for deployment in complex railway environments [3].

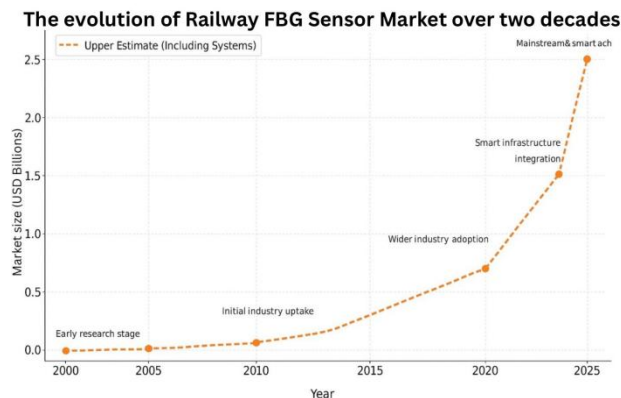


Figure 1: Market Development of FBG Sensing in Rail Transport over the past two decades

Recent advancements have demonstrated the effectiveness of FBG sensors in a variety of critical railway applications. These include rail track integrity monitoring, axle counting, slope stability assessment, health diagnostics of switches and crossings, rail tension measurement, and intrusion detection systems [4–6]. The integration of FBG networks enables continuous, distributed sensing that supports condition-based maintenance strategies and enhances system responsiveness to dynamic structural changes.

This review synthesizes key contributions from recent research, examining the functionality and performance of FBG systems in improving the resilience and automation of railway infrastructure. Moreover, it discusses persistent challenges, such as high implementation costs and integration complexity, which currently limit large-scale adoption. Emerging trends such as the fusion of FBG sensors with artificial intelligence and wireless communication platforms offer promising pathways for enhancing scalability, autonomy, and data-driven decision-making in smart railway systems [7,8].

In conclusion, FBG sensor technology is poised to play a transformative role in modernizing railway networks. Its continued development is critical for the realization of next-generation intelligent rail systems that prioritize safety, efficiency, and sustainability.

References

1. Majumder, M., Gangopadhyay, T. K., Chakraborty, A. K., Dasgupta, K., & Bhattacharya, D. K. (2008). Fibre Bragg gratings in structural health monitoring—Present status and applications. *Sensors and Actuators A: Physical*, 147(1), 150–164. <https://doi.org/10.1016/j.sna.2008.04.008>
2. Zhao, Y., Wang, J., & Zhao, X. (2011). Application of fiber Bragg grating sensors in railway engineering. *Optics & Laser Technology*, 43(7), 1086–1090. <https://doi.org/10.1016/j.optlastec.2010.11.005>
3. Cusano, A., Cutolo, A., & Albert, J. (Eds.). (2011). *Fiber Bragg grating sensors: Recent advancements, industrial applications and market exploitation*. Bentham Science Publishers.
4. Zhang, C., He, H., Sun, J., Lin, B., & Li, Y. (2016). Application of fiber Bragg grating sensor for railway track temperature monitoring. *Optik*, 127(20), 7684–7689. <https://doi.org/10.1016/j.ijleo.2016.05.040>

5. Liao, H., Li, X., Liu, F., Sun, Y., & Du, Y. (2018). Fiber Bragg grating-based monitoring system for axle counting and rail condition. *Journal of Lightwave Technology*, 36(12), 2520–2527. <https://doi.org/10.1109/JLT.2018.2818143>
6. Inaudi, D., & Glisic, B. (2010). Long-range pipeline monitoring by distributed fiber optic sensing. *Journal of Pressure Vessel Technology*, 132(1), 011701. <https://doi.org/10.1115/1.4000683>
7. Wu, J., Lyu, S., Liu, X., & Zhang, Z. (2021). Smart railway condition monitoring using FBG and AI-enabled edge devices. *Measurement*, 175, 109144. <https://doi.org/10.1016/j.measurement.2020.109144>
8. Kashyap, R. (2009). *Fiber Bragg gratings* (2nd ed.). Academic Press.

QUANTUM DOT DISPLAYS: TECHNOLOGICAL EVOLUTION AND THE SHIFT TOWARD SUSTAINABLE MATERIALS

Aliabbas Sajjad Hushen Kanani¹, Adithya T P², Ganesh Reddy U³, G Sreevidya Varma^{*4}

^{1,2,3} Department of Computer Science and Engineering, SOET,
CMR University, Bangalore 562149, India

⁴Department of Basic Sciences and Humanities, SOET,
CMR University, Bangalore 562149, India
E-mail: aliabbas.sajjadhushen@cmr.edu.in

Abstract

Quantum dot (QD) technology has significantly transformed the display industry, particularly in enhancing liquid crystal displays (LCDs). By utilizing the size-dependent photoluminescence of semiconductor nanocrystals, QDs enable displays with exceptional color accuracy, brightness, and energy efficiency [1,2]. These nanoscale emitters convert backlight into highly pure red, green, and blue hues, thereby improving the vividness and realism of on-screen imagery [3]. Compared to conventional display technologies, QD-enhanced displays offer broader color gamuts and improved luminance, while also reducing power consumption—an important advantage for extending battery life in portable devices [4,5]. Furthermore, recent innovations have focused on the development of cadmium-free and environmentally benign QDs, such as those based on indium phosphide and perovskite materials, aligning the technology with stricter environmental and health regulations [6,7].

Quantum dots are also being explored for integration with emerging micro-LED technologies, offering a pathway to next-generation displays with superior resolution, contrast, and energy performance [8,9]. This review focuses on the scientific foundations, technological progress, and commercial evolution of QD-based displays, highlighting their synergy with micro-LEDs and the shift toward sustainable materials. Overall, quantum dots play a pivotal role in advancing modern display technologies by delivering vibrant colors, enhancing energy efficiency, and supporting eco-friendly innovation [10,11]. Continued research

and development promise further improvements in performance and sustainability, potentially shaping the future of visual display systems.

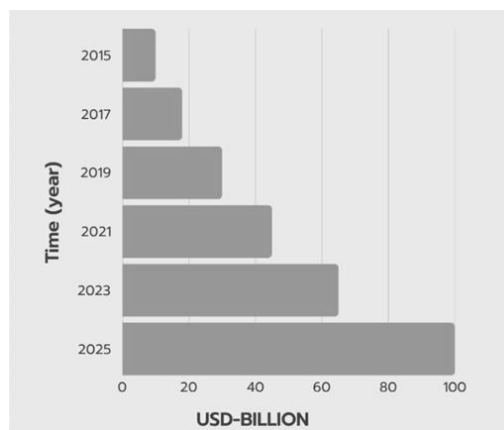


Figure 1: Global Quantum dot Display's market till 2025

References

1. Wood, V., & Bulović, V. (2010). Colloidal quantum dot light-emitting devices. *Nano Reviews*, *1*(1), 5202. <https://doi.org/10.3402/nano.v1i0.5202>
2. Talapin, D. V., Lee, J.-S., Kovalenko, M. V., & Shevchenko, E. V. (2010). Prospects of colloidal nanocrystals for electronic and optoelectronic applications. *Chemical Reviews*, *110*(1), 389–458. <https://doi.org/10.1021/cr900137k>
3. Coe-Sullivan, S., Liu, W., Allen, P., & Steckel, J. S. (2013). Quantum dots for down conversion in display applications. *ECS Journal of Solid State Science and Technology*, *2*(2), R3026–R3030. <https://doi.org/10.1149/2.011304jss>
4. Lim, H., Lee, J.-M., Bae, J.-S., et al. (2015). High color purity and wide color gamut in quantum-dot-enhanced LCDs. *Journal of the Society for Information Display*, *23*(4), 208–214. <https://doi.org/10.1002/jsid.297>

5. Green, M., & Dawson, P. (2016). Optical properties of colloidal quantum dots and their application to display technology. *Journal of Applied Physics*, *119*(8), 083102. <https://doi.org/10.1063/1.4941711>
6. Nag, A., Chakraborty, S., & Nag, A. (2021). Environmentally benign quantum dots: Recent developments and future prospects. *Journal of Materials Chemistry C*, *9*(1), 155–174. <https://doi.org/10.1039/D0TC03222C>
7. Nedelcu, R., & Kovalenko, M. V. (2015). Photoluminescence efficiency and stability of inorganic lead halide perovskite quantum dots. *Nano Letters*, *15*(8), 5635–5640. <https://doi.org/10.1021/acs.nanolett.5b02404>
8. Lee, S., Kim, Y., Kim, D., et al. (2020). Quantum dot color conversion layers for micro-LED displays. *Photonics Research*, *8*(10), 1534–1541. <https://doi.org/10.1364/PRJ.389922>
9. Zhang, Y., Zhang, B., Wang, Y., Zhuang, J., & Peng, X. (2022). Quantum dot integration in micro-LEDs: Materials and challenges. *Advanced Materials*, *34*(26), 2108957. <https://doi.org/10.1002/adma.202108957>
10. Jang, S., & Kim, D. H. (2022). The future of QLED displays: Challenges and opportunities. *Journal of Information Display*, *23*(3), 123–133. <https://doi.org/10.1080/15980316.2022.2038023>
11. Zhang, Y., & Wang, J. (2020). Recent advances in quantum-dot displays: Materials, device structures, and commercialization. *Nano Today*, *35*, 100975. <https://doi.org/10.1016/j.nantod.2020.100975>

NANOMEDICINE – THERAPEUTIC TARGET TO CORONAVIRUS

Anjamma. B, Manjunath B.S, S.Vedavalli*

Department of Chemistry, Sea College of Science, Commerce and Arts,
K.R. Puram, Bangalore, India
Email: vedachem9@gmail.com

Abstract

Nanomedicine, the application of nanocarriers to deliver drugs specifically to a target sites, has been applied for different diseases, such as cancer but also in viral infections. Nanocarriers can be designed to encapsulate vaccines and deliver them towards antigen presenting cells or function as antigen-presenting carriers themselves[1]. In particular, virus-mimicking nanoparticles (NPs) such as self-assembled viral proteins, virus-like particles or liposomes, are able to replicate the infection mechanism and can not only be used as delivery system but also to study viral infections and related mechanisms[2]. This review will provide a detailed description of the composition and replication strategy of CoVs, an overview of the therapeutics currently evaluated in clinical trials against SARS-CoV-2 and will discuss the potential of NP-based vaccines, targeted delivery of therapeutics using nanocarriers as well as using NPs to further investigate underlying biological processes in greater detail.

References:

1. Kirtane, A. R., Verma, M., Karandikar, P., Furin, J., Langer, R., & Traverso, G. (2021). Nanotechnology approaches for global infectious diseases. *Nature Nanotechnology*, 16, 369–384. <https://doi.org/10.1038/s41565-021-00866-8>
2. De Jong, W. H., & Borm, P. J. (2008). Drug delivery and nanoparticles: Applications and hazards. *International Journal of Nanomedicine*, 3(2), 133–149. <https://doi.org/10.2147/IJN.S596>

FLOW CHEMISTRY CHEMICAL REACTION IN FLOW REACTORS

Abdul suhail AM, Somashekara C, S. Vedavalli*

Department of Chemistry Sea College of Science, Commerce and Arts,
KR Puram, Bangalore, India

Email: somashekar331781@gmail.com, abdulshail2003@gmail.com.

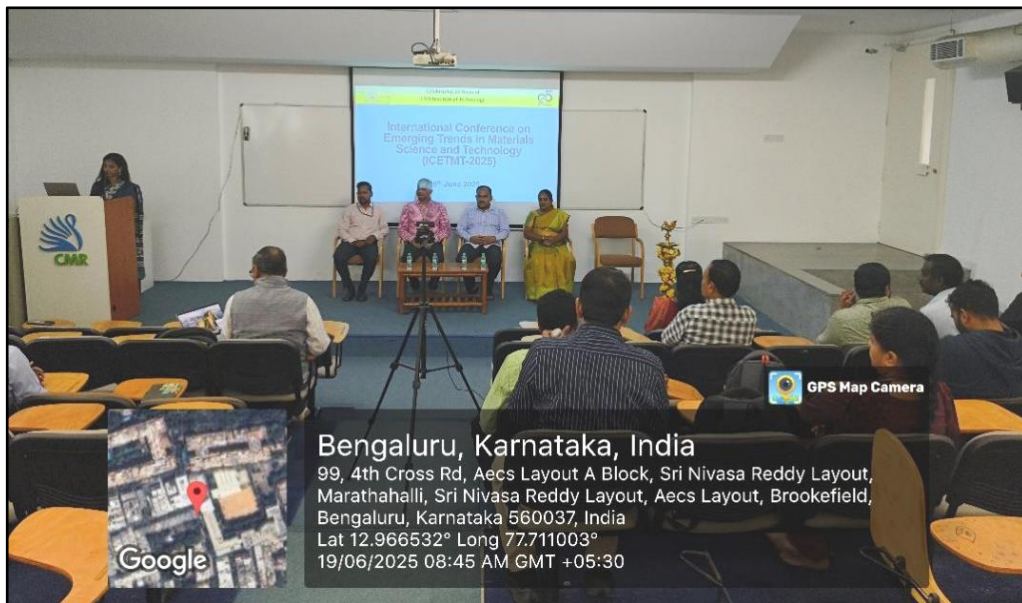
Abstract

Flow chemistry, is a process that involves performing chemical reactions in a continuously flowing stream rather than in traditional batch production. This technique offers significant advantages in terms of safety, efficiency, scalability, and control over reaction parameters[1]. By enabling precise management of reaction conditions such as temperature, pressure, and residence time, flow chemistry facilitates enhanced reaction selectivity and yield. It is particularly beneficial in hazardous or highly exothermic reactions, where real-time control reduces risks. Flow chemistry has gained widespread application in pharmaceuticals and industrial chemistry, fine chemicals, and materials science, supporting faster process development and greener synthesis routes. This approaches allow for precise manipulation heating and residence time leading to better yield, impurity control, and in some cases enabling reactions that are difficult or impossible in batch setting.

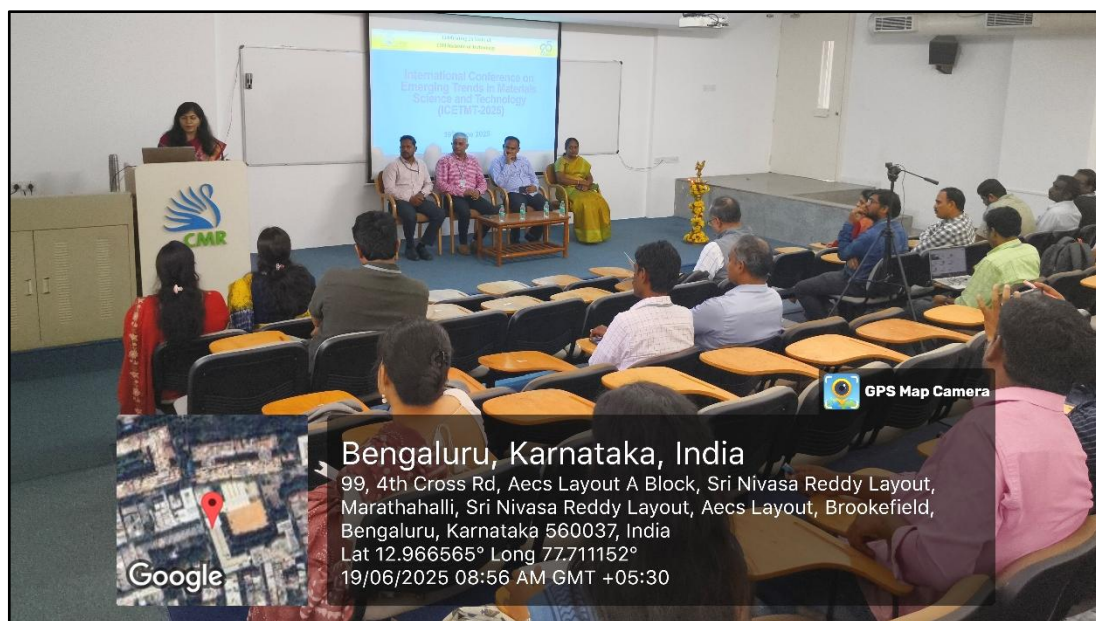
Reference:

1. Sugimoto, H., Yano, M., Sato, K., Miyanishi, M., Sugisaki, K., Shiota, Y., Kaga, A., Yoshizawa, K., & Itoh, S. (2021). Tin(II)–nitrene radical complexes formed by electron transfer from redox-active ligand to organic azides and their reactivity in C(sp³)–H activation. *Inorganic Chemistry*, 60(23), 18603–18607.

Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)



Proceedings of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25)



Concluding remarks

We are proud to announce the successful conclusion of the International Conference on Emerging Trends in Material Science and Technology (ICETMT-25), held on June 19–20, 2025. The event was expertly organized by CMR Institute of Technology, Bangalore, and proved to be a resounding success.

Over the past two days, we have witnessed a dynamic and enriching virtual exchange of knowledge, ideas, and innovations. From cutting-edge research on nanomaterials and energy storage to breakthroughs in biomaterials, sensors, and sustainable technologies, this conference has brought together some of the finest minds in the field of material science and technology from across the globe.

We were honored to host distinguished plenary speakers Prof. Mahesh Narayan from the University of Texas at El Paso, USA and Dr. Ajeet Kaushik, Florida Polytechnic University, Lakeland, FL-USA, keynote speakers, invited experts, young researchers, and academicians, whose insights and contributions helped make ICETMT-25 a truly global and intellectually stimulating platform for scientific dialogue and collaboration.

We were also delighted by the enthusiastic participation of presenters in oral and poster sessions from across the country to name a few we have Parul Institute of Applied Sciences, Gujarat ,CMR University, Bengaluru, Jain university, Bengaluru, The Maharaja Sayajirao University of Baroda, CHRIST University, Bengaluru, Reva University, Bengaluru, Akal University Punjab, Surana College and Sea college of Science, Bengaluru, Commerce and arts, Annamacharya institute of technology and sciences, Andhra Pradesh and many others. The high-quality research and professional presentations have greatly enriched the academic value of this conference.

We would like to extend my heartfelt gratitude to all speakers, session chairs, and participants for their active involvement and engagement throughout this event. Special thanks go to the organizing committee, technical team, and our student volunteers, whose tireless behind-the-scenes efforts ensured a smooth and successful virtual experience for everyone.

We acknowledge the valuable support of our management at CMR Institute of Technology, as well as our academic partners, for their unwavering commitment to the advancement of research and knowledge-sharing.

We are deeply grateful for the support and guidance of our Principal, Vice Principal and Dean- Academics and IQAC, for the successful execution of this conference. We also sincerely thank the Head, Department of Chemistry, Dr. Fazlur Rahaman and faculty members Dr. Prabhat Gautam, Dr. Satyabrata Das, Dr. Ayyappa B, Dr. Pakrudheen I and Dr. Dhananjay Dey for their dedicated efforts and contributions throughout the planning and coordination of this event.

We extend our sincere gratitude to Anjana Scientific Supply, Bengaluru, for financial support, which played a vital role in the successful organization of the conference.

In recognition of academic excellence, five exceptional oral presentations and two outstanding poster presentations were honored with special awards. As we conclude this successful conference, let us continue to embrace the spirit of innovation, collaboration, and intellectual curiosity that ICETMT-25 has inspired. May the relationships forged and insights shared over these two days pave the way for impactful research collaborations and significant advancements in the field.

Convenors

Dr. Priti Gupta

Head : CoE - Materials & Sensors
Associate Professor,
Department of Chemistry,
CMR Institute of Technology
Bengaluru

Dr. Varsha Brahmkhatri

Associate Professor,
Department of Chemistry,
CMR Institute of Technology
Bengaluru

Best Oral Presentation Awardees

- OP4 : Design and Synthesis of NiCoSe Oxide as an Efficient Electrocatalyst for the Oxygen Evolution Reaction, Monika Nagaraj, Centre for Nano and Material Sciences (CNMS), Jain (Deemed-to-be University), Karnataka, India
- OP8: Tuning the Membrane Surface Charge ,Zwitterionic Functionalized Iron Oxide Nanoparticles for Molecular Separation and Their Superior Antifouling Property, Dasari. Hindu Bhavani, REVA University, Bangalore
- OP2: Synergistic g-C₃N₄-Encapsulated Cu-MOF: A Multifunctional Photocatalyst for efficient 2,4-D Pesticide degradation and broad-spectrum Biological Activity, Aseena Azeez, CMR University, Bengaluru
- OP3 : Mesostructured SBA-16 for controlled release of alendronate and its pharmacokinetics Shivangi Mehta, The Maharaja Sayajirao University of Baroda, Gujarat
- OP1: Colloidal Engineering of PbS Nanoparticles Using Hydrophilic Spacer-based Cationic Gemini Surfactants: Structural, Optical, and Microbial Activities Dhruvi S. Chaudhari, Parul University, Vadodara, Gujarat, India

Best Poster Presentation Awardees

- PO8: Supported Palladium Catalyzed Direct Reductive N-Formylation Of Nitroarenes Aman Phoolchand Vishwkarma, Parul University, Vadodara, Gujarat
- PO7: Design of cost-effective disposable fabric electrodes modified with MOF-5 composite as an ultra-sensitive sensor for the detection of ochratoxin A in foods, Megha George, CHRIST University, Bengaluru, India

About the Conference

The field of advanced materials has significantly contributed to securing our future and raising the standard of human living. The International Conference on Emerging Trends in Materials Science and Technology (ICETMT-25) would focus on state-of-the-art research and development of technologies in all aspects of Materials Science. This conference aims to provide a forum for scientists, engineers, researchers, and other professionals worldwide to present and discuss the most recent innovations, facilitate knowledge exchange, foster collaborations and outreach activities, address new challenges, and identify future research trends. Eminent industry professionals, professors, scientists, and research scholars from renowned organizations will share their views and enhance knowledge on a broad spectrum of materials science and applications. In addition to contributed paper presentations, ICETMT-25 includes keynote addresses and plenary lectures from eminent personalities. The conference will be held in a hybrid mode, incorporating virtual and in-person participation.



ISBN: 978-93-92090-75-2

DOI: 10.47716/978-93-92090-75-2

Magestic Technology Solutions (P) Ltd

www.magesticts.com

ISBN 978-93-92090-75-2



9 789392 090752 >