iNEEBA-2024

SERB DIA sponsored

Indo-South Korea-Thailand 4th International Conference on Nanoscience and Nanotechnology for Energy, Environment and Biomedical Applications (iNEEBA 2024)

8th & 9th November, 2024

Jointly Organized by

VINAYAKA MISSION'S KIRUPANANDA VARIYAR ARTS & SCIENCE COLLEGE

VINAYAKA MISSION'S RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)
(Accredited by NAAC with A' Grade & Ranked in NIRF)

VINAYAKA MISSION'S KIRUPANANDA VARIYAR ARTS AND SCIENCE COLLEGE
A Constituent College of Vinayaka Mission's Research Foundation
(Deemed to be University) (Accredited with NAAC 'A' Grade)

and

CORE-FACILITY CENTER FOR PHOTOCHEMISTRY & NANOMATERIALS

RESEARCH INSTITUTE FOR GREEN ENERGY CONVERGENCE TECHNOLOGY (RIGET)

GYEONGSANG NATIONAL UNIVERSITY, SOUTH KOREA

&

DEPARTMENT OF CHEMICAL ENGINEERING

CHULALONGKORN UNIVERSITY, THAILAND

iNEEBA-2024 Conference Proceedings

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ISBN No : 978-93-341-2774-4

VINAYAKA MISSION'S
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with Blessing of

Dr. A. Shanmugasundaram

Founder Chancellor

Vinayaka Mission's Research Foundation, Salem

VINAYAKA MISSION'S
RESEARCH FOUNDATION
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VINAYAKA MISSION'S
RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)

Dato' Seri . Dr. S. Sharavanan
Chairman, VMRF

Dear Principal,

I'm happy the Vinayaka Mission's Kirupananda Variyar Arts and Science College, Salem and Core-Facility Center for Photochemistry & Nanometerials, Gyeongsang National University, South Korea and Department of Chemical Engineering, Chulalongkorn University, Thailand are organising SERB sponsored "Indo-South Korea Thailand 4th INTERNATIONAL CONFERENCE ON NANO SCIENCE AND NANOTECHNOLOGY FOR ENERGY, ENVIRONMENT AND BIOMEDICAL APPLICATIONS" (INEEBA-2024) on 8th and 9th, November, 2024 in Salem.

While I appreciate the venture by the VMKVASC, Salem, I'm confident that the deliberations will focus on the recent developments in the respective areas, ensuring the importance of conserving the environment while applying the technology and come out with appreciable recommendations to make the conference a success.

I wish a good number of our students and faculty members take part in this conference and make it a great success.

Dato' Seri . Dr. S. Sharavanan

VINAYAKA MISSION'S
RESEARCH FOUNDATION
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Hon'ble Dr. A. S. Ganesan
Chancellor, VMRF (DU)

It gives me great pleasure to recognize the importance of the SERB-sponsored Indo-South Korea-Thailand 4th International Conference on Nanoscience and Nanotechnology for Energy, Environment and Biomedical Applications (iNEEBA-2024), jointly organized by Vinayaka Missions Kirupananda Variyar Arts and Science College (VMKVASC), Salem, Gyeongsang National University (GNU), Republic of Korea, and Chulalongkorn University (CU), Thailand. This global collaboration is a testament to the power of shared knowledge and innovation.

The conference continues to serve as a beacon of scientific advancement, bringing together leading minds from around the world to address some of the most pressing challenges of our time. It is through partnerships like these that we are able to foster academic excellence, share expertise, and spark innovations that impact not just our respective fields but the world at large. The long-standing collaboration between VMKVASC, GNU, and CU highlights the value of faculty exchange and joint research, elevating our institutions to new heights. I am proud of the growth and reputation that iNEEBA has achieved over its past three editions, creating a vibrant platform for knowledge exchange, and forging international partnerships. The outstanding quality of research and collaborative output is a reflection of the dedication and commitment of the participants and organizers.

I extend my heartfelt thanks to the organizing committee for their unwavering dedication and vision in making this event a reality. They have created a platform not only for sharing cutting-edge ideas but also for building lasting global partnerships. As you participate in iNEEBA 2024, I encourage you to immerse yourself fully in this exchange of ideas, and I trust that the discussions here will spark new innovations that resonate far beyond the conference itself.

I wish you all a rewarding and intellectually enriching experience at INEEBA 2024 and look forward to the continued success of this vital conference.

Hon'ble Dr. A. S. Ganesan

VINAYAKA MISSION'S
RESEARCH FOUNDATION
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Mr. N.V. Chandrasekar

Vice President, VMRF(DU)

It is a great honor for me to write this message for the conference souvenir, which demonstrates our dedication to advancement and intellectual conversation. It gives me great pleasure to know that the SERB sponsored Indo-South Korea-Thailand 4th International Conference is being organized for the fourth time by Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem along with Core-Facility Centre for Photochemistry & Nanomaterials, Gyeongsang National University. Republic of Korea, Department of Chemical Engineering, Chulalongkorn University, Thailand during November 8-9, 2024.

It is important to note that the three series of conferences, INEEBA-2021, INEEBA-2022 and iNEEBA-2023 were successful and attracted a number of participants from all over the world. The accepted papers were published in journals such as Applied Biochemistry and Biotechnology, Materials Today Proceedings and Journal of Physics, IOP. Due to its success and the enthusiasm of the attendees, the conference is being held for the fourth time.

We are fortunate to have attendees from all around the globe, each of whom contributes a special viewpoint and level of knowledge to our conversations. My sincere gratitude goes out to organizing committee for their dedication to organize a conference program that looks to be insightful and rewarding. I would like to express my gratitude to all our wonderful presenters and attendees whose contributions whether in the form of posters, oral presentations, are the main reason for the success of this conference.

I hope that you would use this conference as a platform to exchange research concepts and expertise. Let's take use of this opportunity to interact, gain knowledge, and influence the future as a group. I'm grateful for all of your efforts, and I hope the conference is successful. I hope the conference works really well

N.V. Chandrasekar

Mr. N.V. Chandrasekar

VINAYAKA MISSION'S
RESEARCH FOUNDATION
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Prof. Dr. P. K. Sudhir

Vice Chancellor, VMRF(DU)

Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem is organizing SERB sponsored "Indo-South Korea-Thailand 4th International Conference on NANOSCIENCE AND NANOTECHNOLOGY FOR ENERGY, ENVIRONMENT AND BIOMEDICAL APPLICATIONS (iNEEBA-2024) during November 8-9, 2024, after the success of the three series of previous events iNEEBA-2021, iNEEBA-2022 and iNEEBA-2023 along with Core-Facility Centre for Photochemistry & Nanomaterials, Gyeongsang National University, Republic of Korea, Department of Chemical Engineering, Chulalongkorn University, Thailand. As Vice Chancellor, I am thrilled and honored to see how this conference series has developed into a global forum for cutting-edge research, thought-provoking discussion, and creative partnerships.

The international event seeks to address the need for nano materials and their applications in a variety of industries by utilizing cutting-edge technologies in conjunction with creative ideas for the creation of smart materials in science and engineering. I am glad to hear that a significant number of internationally recognized speakers, brilliant professors, and eminent scientists will be attending the international event to share their insightful research, creative ideas, and wealth of expertise in the field of materials science and engineering. It is noteworthy that new researchers, students, academics, and industrialists will have the chance to showcase their creative ideas and gain knowledge from the experiences of more eminent scientists. It should also be noted that excellent papers from previous conferences were published in the Applied Biochemistry and Biotechnology, Materials Today Proceedings and Journal of Physics, IOP. It is an honor for the team that outstanding research articles submitted to iNEEBA 24 will be published in Applied Physics A, published by Springer, with an impact factor of 2.5

I would like to use this opportunity to express my gratitude to the conveners, organizers, and members of the event committee for your genuine and committed efforts to make the international event more successful and unforgettable. It is my hope that the scientific talks, seminars, and other events will prove to be very beneficial and will undoubtedly set new records. I send my warmest wishes to the organizers for iNEEBA-2024's success.

On behalf of the university, I extend my best wishes for a successful and enriching conference.

Prof. Dr. P. K. Sudhir

VINAYAKA MISSION'S
RESEARCH FOUNDATION
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Prof. Dr. J. Sabarinathan

Pro - Vice Chancellor, VMRF(DU)

It is a privilege for me to give this message to the iNEEBA 2024 conference souvenir. It brings me great pleasure to know that Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem, is organizing SERB sponsored "Indo-South Korea-Thailand 4th International Conference on NANOSCIENCE AND NANOTECHNOLOGY FOR ENERGY, ENVIRONMENT AND BIOMEDICAL APPLICATIONS (iNEEBA-2024) during November 8-9, 2024 along with Core-Facility Centre for Photochemistry & Nanomaterials, Gyeongsang National University, Republic of Korea, Department of Chemical Engineering, Chulalongkorn University, Thailand after the success of three series of International conference iNEEBA.

It is important to note that their previous events, iNEEBA-2021, iNEEBA-2022 and iNEEBA-2023 were successful and attracted a number of participants from all over the world. The iNEEBA events are noteworthy that the accepted papers were published in scopus indexed journals such as Applied Biochemistry and Biotechnology, Materials Today Proceedings and Journal of Physics, IOP. I am confident that the discussions, idea sharing, and presentations that take place during this conference will inspire new ideas and creative solutions that will shape the future of our industries and society. I am glad to know that the accepted papers in iNEEBA 24 will be published in peer reviewed journal "Applied Physics A – Springer publisher" (conference series). I am confident that distinguished group of scientists will serve as a catalyst for progress and excellence in the field of nanoscience and nanotechnology.

We look forward to your active participation and wish you a fruitful and rewarding experience at iNEEBA 24. My sincere thanks to all the speakers, attendees, and organizers for their hard work in making this event a success.

J. Sabarinathan

Prof. Dr. J. Sabarinathan

VINAYAKA MISSION'S
RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)

Prof. Dr. A. Nagappan

Registrar, VMRF(DU)

Dear Participants,

I am delighted to know that Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem is jointly organizing SERB sponsored "Indo-South Korea-Thailand 4th International Conference on NANOSCIENCE AND NANOTECHNOLOGY FOR ENERGY, ENVIRONMENT AND BIOMEDICAL APPLICATIONS (iNEEBA-2024) during November 8-9, 2024 with Core-Facility Centre for Photochemistry & Nanomaterials, Gyeongsang National University, Republic of Korea, Department of Chemical Engineering, Chulalongkorn University, Thailand.

This prestigious conference is organized after the success of three series, which brings together leading experts, researchers, and professionals from across the globe to discuss and exchange knowledge on groundbreaking advancements in nanoscience and nanotechnology, particularly in the fields of energy, environment and biomedical applications. A significant numbers of high quality papers were published in scopus indexed journals like Applied Biochemistry and Biotechnology, Materials Today Proceedings and Journal of Physics, IOP during the last three iNEEBA events. I am also glad to note that the organizers have planned to publish high quality research papers in scopus indexed "Applied Physics A – Springer publisher" (conference series) with Impact Factor of 2.5.

As fields that are transforming society, nanoscience and nanotechnology are offering creative answers to some of the most important problems of our day. These domains' interdisciplinary nature makes it possible for physics, chemistry, biology, and engineering to come together, leading to advances with significant effects on the energy industry, environmental preservation, and healthcare. This conference provides a forum for exchanging scientific discoveries, encouraging teamwork, and motivating the following generation of scientists and inventors. I would like to express my sincere gratitude to our distinguished speakers, sponsors, and attendees on behalf of the organizing committee for their invaluable efforts. Your involvement and attendance are crucial to the success of this event. I encourage everyone to grab the chance to network, participate in insightful conversations, and consider possible collaborations that could advance the profession.

I wish everyone a successful and motivational conference.

Prof. Dr. A. Nagappan

VINAYAKA MISSION'S
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Prof. Myong Yong Choi

Department of Chemistry
Director of Core-Facility Center for
Photochemistry and Nanomaterials
Gyeongsang National University
Jinju, South Korea

Dear Participants,

I am delighted to know that Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem is jointly organizing SERB sponsored "Indo-South Korea-Thailand 4th International Conference on NANOSCIENCE AND NANOTECHNOLOGY FOR ENERGY, ENVIRONMENT AND BIOMEDICAL APPLICATIONS (iNEEBA-2024) during November 8-9, 2024 with Core-Facility Centre for Photochemistry & Nanomaterials, Gyeongsang National University, Republic of Korea, Department of Chemical Engineering, Chulalongkorn University, Thailand.

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I wish everyone a successful and motivational conference.

Prof. Myong Yong Choi

VINAYAKA MISSION'S
RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)

Prof. Soorathep Kheawhom

Department of Chemical Engineering,

Faculty of Engineering,

Chulalongkorn University, Thailand

Dear Esteemed Participants,

I am pleased to announce that the SERB sponsored 4th International Conference on Nanoscience and Nanotechnology for Energy, Environment, and Biomedical Applications (iNEEBA-2024) is being jointly organized by Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem, the Core-Facility Centre for Photochemistry & Nanomaterials at Gyeongsang National University, Republic of Korea, and the Department of Chemical Engineering at Chulalongkorn University, Thailand, on November 8-9, 2024. It brings me great joy to know that this is the fourth year of intellectual exchange and collaboration through iNEEBA 2024, following the successful online editions of iNEEBA 2021 and iNEEBA 2022 & iNEEBA 2023 through physical mode. The high-quality papers presented at these conferences have been published in Scopus-indexed journals like Applied Biochemistry and Biotechnology, Materials Today Proceedings and Journal of Physics, IOP. It is glad to know that selected papers from the conference will be published as special issue of Applied Physics A, a prestigious journal. This journal is published by springer and indexed in Scopus with impact factor of 2.5, ensuring maximum visibility for your research.

Our journey in organizing this conference has been marked by dedication, innovation, and a steadfast commitment to advancing our fields. Each year, we observe remarkable progress across science, technology, the humanities, and many other domains. Through engaging panel discussions, insightful keynote addresses, and thought-provoking presentations, we aim to deepen our understanding of critical issues and explore innovative solutions.

I would like to express my heartfelt gratitude to our distinguished keynote speakers, esteemed panelists, dedicated organizing committee members, and every participant who has contributed to the success of this conference.

Thank you for being a part of this remarkable journey. I wish you all a productive, enlightening, and memorable conference experience.

Soorathep Kheawhom

Prof. Soorathep Kheawhom

Organizing Committee

It is with great pleasure that we welcome you to the SERB sponsored "Indo-South Korea-Thailand 4th International Conference on NANOSCIENCE AND NANOTECHNOLOGY FOR ENERGY, ENVIRONMENT AND BIOMEDICAL APPLICATIONS (iNEEBA-2024) during November 8-9, 2024 organised by Vinayaka Missions Kirupananda Variyar Arts and Science College, Salem along with Core-Facility Centre for Photochemistry & Nanomaterials, Gyeongsang National University, Republic of Korea, Department of Chemical Engineering, Chulalongkorn University, Thailand. We are glad that this international conference "iNEEBA" is being organized for the fourth time after the successful completion of three series of iNEEBA.

The past series of iNEEBA was very successful and participants from all over the world took part in the conference. High-quality papers were published in scopus indexed journals like Applied Biochemistry and Biotechnology, Materials Today Proceedings and IOP: Journal of Physics-Conference series. Organizing this conference has been a rewarding journey, and we owe our deepest gratitude to our esteemed speakers, participants, sponsors, and the dedicated team behind the scenes. Their efforts have been instrumental in bringing this event to life. More than 200 research papers were submitted for iNEEBA-2024, which was split into oral and poster sessions. Presentations of invited speakers from both India and other countries were also included. Key advancements in the development of biomaterials, such as composites, nanobiomaterials, surface engineering, implant coatings, and smart materials, are highlighted in iNEEBA-2024 along with their most current applications in a variety of biomedical fields. Papers with novel research findings will be published in scopus indexed "Applied Physics A – Springer publisher" (conference series) with Impact Factor of 2.5.

This souvenir book is a memento of the collective effort, creativity, and passion that went into creating this event. We hope it serves as a reminder of the knowledge gained, collaborations made, and the shared commitment to advancing in the field of nanoscience and nanotechnology. Thank you for being a part of iNEEBA 24. We look forward to the discussions ahead and hope this event leaves a lasting impact on all of us.

Warm regards,

Prof. Dr. V. Anbazhagan
Principal, VMKVASC
Salem, India

Dr. J. Theerthagiri
Senior Scientist-
Brain Pool Fellow
GNU, South Korea

Dr. C. Karthik Kumar
Assistant Professor
VMKVASC, Salem

Dr. M. Prakash
Professor
VMKVASC,
Salem

Dr. M. Jeyakanthan
Assistant Professor
VMKVASC, Salem

Dr. R. Ganesamoorthy
Assistant Professor
VMKVASC, Salem

Dr. E. Shinyjoy
Assistant Professor
VMKVASC, Salem

Dr. S. Yogapriya
VMKVASC,
Salem


VINAYAKA MISSIONS

SERB Sponsored

Indo-South Korea-Thailand 4th International Conference on Nanoscience and Nanotechnology for Energy, Environment and Biomedical Applications (iNEEBA-2024)

8th & 9th November - 2024

Jointly Organized by

Vinayaka Mission's Kirupananda Variyar Arts and Science College

A Constituent College of Vinayaka Mission's Research* Foundation Deemed to be University, *Salem, Tamil Nadu

Core-Facility Center for Photochemistry & Nanomaterials, Research Institute for Green Energy Convergence Technology (RIGET), Gyeongsang National University, South Korea

Faculty of Engineering, Chulalongkorn University, Thailand

iNEEBA–2024

Programme Schedule - Technical Session – I

Day 1: 08-11-2024

10.00 AM to 11.30 AM	**INAGURAL FUNCTION** **Venue: Annapoorna Auditorium, VMKVEC**
11.30 AM to 11.45 AM	**HIGH TEA**
11.45 to 12.15 AM	**Venue: Annapoorna Auditorium, VMKVEC** **Keynote Lecture-I** **Prof. Dr. Myong Yong Choi,** Director, Core-Facility Center for Photochemistry & Nanomaterials, Research Institute for Green Energy Convergence Technology (RIGET), Gyeongsang National University, Republic of Korea. **Title:** Advances in Pulsed Laser Process for Energy Conversion **Chairperson: Prof. Dr. Deepti Shastri,** Deputy Dean, Vinayaka Mission's Kirupananda Variyar Medical College and Hospitals, Salem

12.15 to 1.00 PM	**Venue: Annapoorna Auditorium, VMKVEC** **Keynote Lecture-II** **Prof. Dr. J. Theerthagiri** Senior Scientist – Brain Pool Fellow, Core-Facility Center for Photochemistry & Nanomaterials, Research Institute for Green Energy Convergence Technology (RIGET), Gyeongsang National University, Republic of Korea **Title:** Pulsed Laser-Synthesized Nanocatalysts for Ammonia Production **Chair Person: Prof. Dr. P. Gnanasekar** Director - IIE, VMRF-DU, Salem		
1.00 to 2.00 PM	**LUNCH** **Venue: AC Auditorium, VMKVEC**		
PARALLEL SESSIONS **(Invited Lectures)**			
	Parallel Sessions I **Venue: Annapoorna Auditorium, VMKVEC**	**Parallel Sessions II** **Venue: Data Science Lab, Computer Science Block ,VMKVEC**	**Parallel Sessions III** **Venue: Hi-Tech Lab-1, Administrative Block VMKVEC**
2.00 to 2.45 PM	**Prof. Dr. M.L. Aruna Kumari** Assistant Professor, Department of Chemistry, The Oxford College of Science, Bangalore, India **Title:** Titanium – Based Hetero structures for Sustainable and Biomedical Innovations **Chairperson:** **Prof. Dr. N. Thangadurai,** Additional Director – Research, VMRFDU, Salem	**Prof. Dr. S. Anandan** Professor, Department of Chemistry, NIT, Trichy. **Title:** Current Scenario of Dye-sensitized Solar Cells – Modifications and Large-Scale Production **Chair Person:** **Prof. Dr. M. Nithya,** Vice Principal, Vinayaka Mission's Kirupananda Variyar Engineering College, Salem	**Prof. Dr. K. Sakthipandi** Professor, Department of Physics, SRM Trichy Campus, Trichy. **Title:** Advanced Functional Materials for Energy, Environment and Biomedical Applications **Chair Person:** **Prof. Dr. Dr. R.S. Shanmugasundaram,** Director - Student Welfare, VMRF-DU, Salem
2.45 to 3.30 PM	Oral Presentation	Oral Presentation	Oral Presentation

2.45 to 3.00 PM	**HIGH TEA**		
TECHNICAL SESSION II – 08.11.2024			
3.00 PM to 4.45 PM	Oral Presentation	Oral Presentation	Oral Presentation
Technical Session – III **Day 2: 09-11-2024**			
10.00 AM to 10.45 AM	**Venue: Annapoorna Auditorium, VMKVEC** **Keynote Lecture-III (Online Mode)** **Prof. Dr. Soorathep Kheawhom** Professor of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Thailand. **Chairperson: Dr. S. Anandan,** Scientist 'F', International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI), Hyderabad, India.		
PARELLEL SESSIONS **(Invited Lectures)**			
	Parallel Sessions I **Venue: Annapoorna Auditorium, VMKVEC**	**Parallel Sessions II** **Venue: Data Science Lab, Computer Science Block, VMKVEC**	**Parallel Sessions III** **Venue: Hi-Tech Lab-1, Administrative Block VMKVEC**
10.00 AM to 10.45 AM	**Prof. Dr. Shankar Lal Garg** FRSC, FWRA, Ex Principal, Holkar Science College, Indore and Editor, Research Journal of Biotechnology **Title**: Metal-alloys as efficient catalysts for hydrazine-coupled energy-saving hydrogen production **Chair Person:** **Prof. Dr. Renganathan,** UGC-Emeritus Fellow, School of Chemistry, Bharathidasan University, Tiruchirappalli	**Dr. M. Senthil Pandian** Research Scientist, Department of Physics, SSN Research Centre SSN Institutions (Autonomous) Chennai, Tamil Nadu **Title:** Development of Highly Efficient & Unidirectional Technologically Important Nonlinear Optical (NLO)Materials for Practical Device Applications **Chair Person:** **Dr. M. Sridevi,** Professor & Head Vinayaka Mission's Kirupananda Variyar Engineering College, Salem	**Prof. Dr. G. Murugadoss** Scientist, Sathyabama Institute of Science and Technology Chennai, Tamil Nadu **Title:** Perovskite Materials (ABX3) and Solar Cells: Current Strategy **Chair Person:** **Prof. Dr. E. Saravanan,** Principal, Vinayaka Mission's College of Physical Education, Salem

10.45 AM to 11.15 AM	**HIGH TEA**		
	Parallel Sessions I **Venue: Annapoorna Auditorium, VMKVEC**	**Parallel Sessions II** **Venue: Data Science Lab, Computer Science Block, VMKVEC**	**Parallel Sessions III** **Venue: Hi-Tech Lab-1, Administrative Block VMKVEC**
11.15 AM to 12.00 PM	**Dr. S. Anandan,** Scientist 'F', International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI), Hyderabad, India. **Title:** Strengthening Indian Mission Towards Self-Reliance in Energy Storage (Li-ion Battery & Supercapacitor) Materials: Lab to Semi-Pilot Scale Demonstration Srinivasan Anandan **Chairperson:** **Prof. Dr. B. Jaykar,** Director-Clinical Trials, VMRF-DU, Salem	**Prof. Dr. P. Rajamalli** Assistant Professor, Materials Research Centre, Indian Institute of Science, Bengaluru. **Title:** Structure–property relationship of organic dyes in titania solar cells **Chair Person:** **Dr. Anusuya,** Professor & Head Vinayaka Mission's Kirupananda Variyar Engineering College, Salem	**Dr. Gopalakrishnan Mohan** Researcher, Advanced Materials for Energy Storage and Conversion, Chulalongkorn University, Bangkok, Thailand. **Title:** MOF derived Efficient Electrocatalyst Enables Robust Rechargeable Zin-Air Batteries **Chair Person:** **Prof. Dr. Divya,** Associate Professor, Department of Prosthodontics and Crown & Bridge Vinayaka Mission's Sankarachariyar Dental College, Salem
TECHNICAL SESSION - IV			
	Parallel Sessions I **Venue: Annapoorna Auditorium, VMKVEC**	**Parallel Sessions II** **Venue: Data Science Lab Computer Science Block VMKVEC**	**Parallel Sessions III** **Venue: Hi-Tech Lab-1, Administrative Block VMKVEC**
12.00 AM to 1.00 PM	Oral Presentation	Oral Presentation	Oral Presentation
1.00 PM to 2.00 PM	**LUNCH** **Venue: AC Auditorium VMKVEC**		
2.00 PM to 4.00 PM	Oral Presentation Poster Presentation	Oral Presentation	Oral Presentation
4.00 PM	**VALEDICTORY FUNCTION**		

ISBN: 978-93-341-2774-4

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Proceedings of iNEEBA-2024, November 8-9, 2024
ISBN: 978-93-341-2774-4

Advances in Pulsed Laser Processes for Energy Conversion

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Abstract

The global energy crisis is increasing the demand for innovative materials with high purity and functionality for the development of clean energy production and storage. The development of novel photo- and electrocatalysts significantly depends on synthetic techniques that facilitate the production of tailored advanced nanomaterials. The emerging use of pulsed laser in liquid synthesis has attracted immense interest as an effective synthetic technology with several advantages over conventional chemical and physical synthetic routes, including the fine-tuning of size, composition, surface, and crystalline structures, and defect densities and is associated with the catalytic, electronic, thermal, optical, and mechanical properties of the produced nanomaterials. Herein, we present an overview of the fundamental understanding and importance of the pulsed laser process, namely various roles and mechanisms involved in the production of various types of nanomaterials, such as metal nanoparticles, oxides, non-oxides, and carbon-based materials. Herein, mainly cover the advancement of photo- and electrocatalytic nanomaterials via pulsed laser-assisted technologies with detailed mechanistic insights and structural optimization along with effective catalytic performances in hydrogen fuel and value-added chemical production processes.

Enhanced Zinc-Ion Battery Performance through NH_4^+ Preintercalation: Stabilizing MnO_2 Cathodes via Hydrogen Bond Formation

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Nonaqueous zinc-ion batteries (NZIBs) with manganese dioxide (MnO_2) cathodes show great promise for large-scale energy storage, but their widespread adoption is hindered by charge disproportionation effects that limit performance. Here, we present a novel approach utilizing ammonium (NH_4^+) preintercalation to overcome these limitations in MnO_2-based cathodes. Through strategic implementation of a wet dimethyl sulfoxide (DMSO) electrolyte system, we achieved a remarkable specific capacity of 247 mAh/g. Using advanced in situ characterization techniques, including synchrotron X-ray diffraction (XRD) and X-ray absorption spectroscopy (XAS), we discovered that NH_4^+ cations form stable NH−O−Mn hydrogen bonds within the MnO_2 structure, effectively stabilizing the MnO_6 octahedra during cycling. This structural stabilization results in exceptional cycling stability, maintaining 85% capacity retention over 500 cycles. The NH_4^+ preintercalation strategy enhances both ion diffusion and surface kinetics, facilitating more efficient Zn^{2+} insertion while suppressing detrimental proton-based reactions. Our findings not only demonstrate a practical solution for improving MnO_2-based zinc-ion batteries but also establish a new design principle for high-performance cathode materials in next-generation energy storage systems.

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Strengthening Indian Mission Towards Self-Reliance in Energy Storage (Li-ion Battery & Supercapacitor) Materials: Lab to Semi-Pilot Scale Demonstration

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Lithium-ion batteries (LIBs) are currently used in most electric vehicles (EVs) due to their high energy density, better nominal voltage, enhanced temperature stability, low maintenance, eco-friendliness, long cyclic stability and low self-discharge. The first part of the presentation highlights the development of. indigenous electrode materials technology that are essential for the manufacturing of Li-ion batteries within the country. Among the cathode chemistries used in LIBs, Lithium ferrous phosphate (LFP) cathode material has a safer chemistry because it avoids self-oxidation and thermal runaway due to strong covalent bond between P and O in PO_4 structure of LFP. ARCI has developed an innovative and low-cost high energy milling process for the synthesis of in-situ carbon modified LFP for Lithium-ion batteries. In continuation with the effort to synthesize large quantities, 15-20 Kg C-LFP/batch has been successfully carried out in collaboration with Industry under public private partnership (PPP) mode. The electrochemical performance of large-scale synthesized C-LFP delivers a capacity of 1.45Ah at 1C current rate with capacity retention >80% after 1000 cycles. An Indian patent and foreign applications are filed related to this invention.[1] Technology Know-how for the production of LFP has transferred to M/s. Allox Minerals (Non-exclusive Rights-India), and M/s. ALTMIN (Exclusive rights- Global and Non-exclusive rights-India), and the technology has successfully demonstrated. M/s. ALTMIN established a LFP semi-pilot plant of 50kg/day production capacity at ARCI incubator and producing LFP cathode powder material that is being supplied to various Li-ion cell making companies for validation. Further, ARCI also developed a simple, economical scalable, and energy-efficient process for the production of lithium titanium oxide (LTO) anode material with a performance at par with commercial LTO. 15 kg batch of LTO synthesized initiated in collaboration with Industry and the resulting LTO delivers a superior rate capability of 145 mAh/g at 4C with good cyclic stability. The LTO innovation has been filed in National and worldwide[2] and technology transfer is in progress

The second part of the presentation will focus on the development of graphene-like activated porous carbons[3] by a low-cost chemical activation process using petcoke, a by-product of the oil refining process. Petcoke is a rich carbon source material but contains a significant amount of sulfur as an impurity making it unsuitable as fuel in cement and steel industries due to the emission of CO_2 and SO_2. Its alternative use in supercapacitors can abate the emission problem while finding a high-value addition to it. We synthesized activated graphene like structured carbon carbon with a surface area of 2394 m^2/g by chemical activation process. Then, an indigenous Supercapacitor device (60 mm dia & 80 mm height) with the specifications of 1200 F, 2.7V, and with a stored energy of 1.22 Wh and a gravimetric energy density of 5.05 Wh/Kg has successfully fabricated using petcoke-derived carbon.[4] 16 numbers of 1200F indigenous Supercapacitors were connected in serial to assemble the module with specifications of 75F, 43V, 19.2 Wh for E-Bicycle demonstration. The developed supercap-Bike have been successfully demonstrated for the driving range of 1 km range with charging time of >5 min.

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Pulsed Laser-Synthesized Nanocatalysts for Ammonia Production

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Abstract

High purity and functionality-driven nanomaterials demand diverse applications in energy and environment-related fields, which have become an intensive research topic of interest. The production of novel electro- and photo-active nanomaterials is significantly subjected to the synthetic routes that make the development of surface and crystalline-tuned advanced materials possible. The significant size and tailored textural properties of materials synthesized by the interaction of laser with matter have emerged as a promising synthetic technique. Pulsed laser-assisted synthesis of nanomaterials in liquids, powered by high-power laser, offers many degrees of parameter control (i.e., pulsed laser power, wavelength, reaction time duration, laser pulse repetition rate, and solvent) and owns numerous advantages over traditional physical and chemical synthetic methods such as high purity, no byproducts, simple, non-toxic, no need of surfactants and reducing agents. Thus, the fundamental insights into the mechanism of pulsed laser techniques in depth by considering various experimental conditions to accelerate hypotheses that are appropriate for the production of electrocatalytic nanomaterials for electrocatalytic nitrate /nitrite reduction to ammonia production.

Universal Thermally Activated Delayed Fluorescence Emitters for both Doped and Non-Doped Organic Light Emitting Diodes

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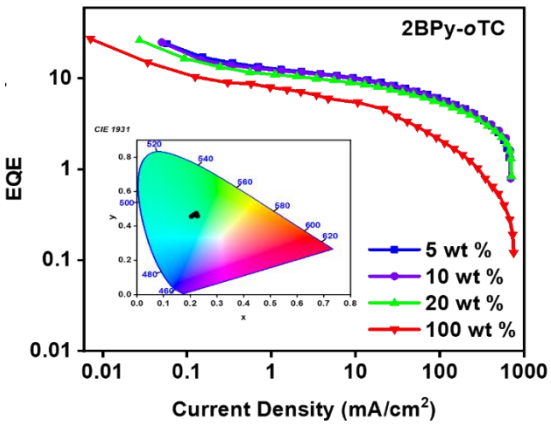
Abstract: Thermally activated delayed fluorescence emitters have garnered much attention on account of 100% exciton utilization and toxic metal-free design. However, most of the TADF emitters experience a concentration-quenching effect due to which emitting layers are dispersed into the host matrix. Herein, two TADF emitters (2BPy-pTC and 2BPy-oTC) were designed and synthesized. 2BPy-pTC exhibits a charge transfer pathway exclusively by through bond charge transfer (TBCT) while 2BPy-oTC possesses a combination of through space charge transfer (TSCT) along with TBCT. On account of a higher twist angle in 2BPy-oTC, a reduced singlet-triplet energy gap (ΔEST) of ~ 0 eV was obtained as compared to 2BPy-pTC possessing 0.18 eV. In the case of 2BPy-pTC, upon increasing the concentration of the emitters, the emission maxima shifting from 467 to 495 nm and EQEmax dropped from 12% to 5%. On the other hand, in the case of 2BPy-oTC, emission maxima and device performance remain same and retains the performance of 26% in both doped and non-doped percentage. Hence, 2BPy-oTC act as a universal emitter for both doped and non-doped devices and simplify the device fabrication process.



Keywords: TADF emitters, OLEDs, non-doped device, green emitters.

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Titanium-Based Heterostructures for Sustainable and Biomedical Innovations

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Abstract:

The fundamental principles of photocatalysis rely on the utilization of photogenerated charge carriers. To enhance photocatalytic efficiency, it is essential to efficiently separate photogenerated charge carriers (electron-hole pairs) and minimize their recombination, ensuring their movement across the surface/interface. In this context, the electronic coupling of two different bandgap semiconductors to form heterojunctions has gained attention due to their unique properties arising from interfacial interactions that are not present in the pure counterparts. This presentation focuses on the development of titanium-based heterostructures, highlighting their potential for sustainable and biomedical innovations. By leveraging the unique properties of heterojunctions formed from titania and semiconductors with varying bandgaps, we aim to enhance photocatalytic efficiency through improved charge carrier separation and reduced recombination.

Employing advanced synthesis techniques such as ball milling and pulsed laser processes, we characterize these heterostructures using a range of analytical methods. Theoretical predictions of band edge positions are examined in relation to their photocatalytic activity, providing insights into their functional mechanisms. Additionally, we explore the implications of these titanium-based heterostructures for sustainable applications and biomedical advancements, discussing the critical factors that govern their performance and effectiveness in various contexts.

Biodiversity and Environment with special reference to Keshar Parvat

Dr. Shankar Lal Garg,

Founder Director, World Researchers Associations, Indore, INDIA

Biodiversity is the variety of all life on Earth - animals, plants, fungi and microorganisms like bacteria. Together they provide us with everything necessary for survival including fresh water, clean air, food and medicines. However, humans cannot get these benefits from individual species - a rich variety of living things must work together in tandem. Plants are very important for improving the physical environment: cleaning the air, limiting rising temperatures and providing protection against climate change. The UN's biodiversity body - known as IPBES estimates that at least one million plant and animal species are at risk of extinction - and humanity is largely to blame. Between 2001 and 2021, the world lost 437 million hectares of tree cover - 16% of which was primary forest. The destruction of mature forests, which have taken hundreds - if not thousands - of years to develop, can have a very serious impact on biodiversity. Land and ocean ecosystems act as “carbon sinks”, absorbing more than half of all carbon emissions. Combined with skyrocketing levels of pollution, the degradation of the natural habitat and biodiversity loss are having serious impacts on communities around the world. As global temperatures rise, once fertile grasslands turn to desert, and in the ocean, there are hundreds of so-called “dead zones”, where scarcely any aquatic life remains. The loss of biodiversity affects the way an ecosystem functions, leading to species being less able to respond to changes in the environment and making them increasingly vulnerable to natural disasters. To save biodiversity, to save the environment and to prevent natural disasters, the only solution is to plant trees and to maintain them. I have developed Keshar Parvat near Indore where I have planted 40000 trees of 500 species in the last eight years on the rocks and stones on a barren rocky hillock of 22 acres to convert it into a beautiful dense forest.

Current Scenario of Dye-sensitized Solar Cells - Modifications and Large-Scale Production

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Abstract

Dye-sensitized solar cells (DSSCs) are gaining much attention mainly because of the ease of fabrication and the materials employed are low-cost, and environmentally friendly. Modification of key components of DSSCs and large-scale production is in progress nowadays. Replacing Pt electrodes in conventional DSSCs by 2D transition metal dichalcogenides (TMDCs) are of MX_2 type semiconducting materials where M denotes Mo, W, or Zr and X denotes S, Se, or Te have been discussed in this lecture. Further, migration from DSSCs towards perovskite solar cells has also been highlighted here.

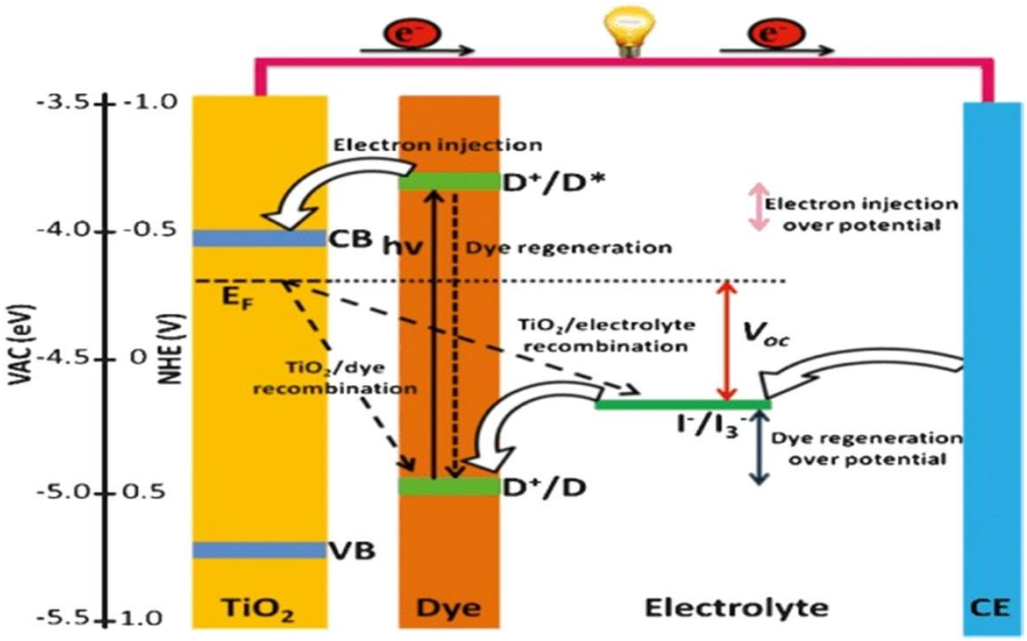

Diagram showing DSSC's energy levels

Electromagnetic Shielding effectiveness – Rare Earth based Materials

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Abstract

Electromagnetic shielding refers to the practice of reducing electromagnetic field interference within a space by blocking the field using conductive or magnetic materials. This is a critical consideration in various technological applications, ranging from consumer electronics to aerospace systems, where electromagnetic interference (EMI) can lead to degraded performance, signal disruption, or equipment malfunction. Research in this field focuses on materials with optimal shielding effectiveness (SE) while minimizing limitations associated with weight, cost, and environmental factors. High electrical conductivity is a key property for effective electromagnetic shielding. Materials such as copper, aluminum, and silver are commonly used due to their ability to reflect and absorb electromagnetic waves. Conductive polymers and composites have also emerged as viable alternatives in lightweight applications. Ferrites are widely used in EMI suppression and magnetic shielding due to their low conductivity, which prevents eddy current losses. Polyaniline, polypyrrole, and graphene-based composites provide flexibility and reduced weight but may not match metals in SE for certain applications. Materials with high dielectric loss or magnetic loss properties, such as ferrite composites, can absorb EM waves efficiently. Conductive materials reflect EM waves based on the skin effect, where higher-frequency waves penetrate less deeply into the material. Materials with high magnetic permeability, such as ferrites and Mu-metal (nickel-iron alloys), are used to shield against low-frequency magnetic fields. These materials are especially important in applications involving magnetic field interference, such as transformers and electric motors. Highly effective for magnetic shielding in the MHz to GHz range but can be sensitive to mechanical stress, which may alter its properties. The effectiveness of electromagnetic shielding also depends on the material's thickness and the use of multi-layer configurations. Thicker materials provide higher SE but at the cost of increased weight and bulk. Layered structures, combining conductive and absorptive materials, optimize performance across a broader frequency range. Rare earth-based materials, owing to their superior magnetic, dielectric, and conductive properties, represent a highly effective solution for electromagnetic shielding, particularly in specialized applications that demand high performance across a wide frequency spectrum. Despite challenges related to cost, availability, and environmental impact, advancements in nanotechnology and composite materials are

likely to expand their use in future EMI shielding technologies. These materials hold significant potential in telecommunications, aerospace, defense, and electronic applications, where reliability and high shielding effectiveness are paramount.

Ongoing research in the field of electromagnetic shielding focuses on developing lightweight, flexible, and cost-effective materials with high SE across a broad range of frequencies. Nanomaterials, such as carbon nanotubes, graphene, and MXenes, have shown promise in this regard. These materials offer a high surface area, tunable electrical properties, and potential for incorporation into flexible or wearable electronics. Furthermore, the integration of smart materials capable of dynamic shielding—adjusting their properties in real-time to changing electromagnetic conditions—presents an exciting frontier for future applications, especially in fields like telecommunications, defense, and medical devices. Electromagnetic shielding is a critical technology for ensuring the reliability and functionality of modern electronic systems. While traditional materials such as copper and aluminum continue to play a dominant role, emerging materials, including composites and nanomaterials, offer promising alternatives. However, challenges related to weight, cost, and environmental impact remain significant limitations that researchers are striving to overcome. The presentation will delve into the latest advancements and challenges in electromagnetic shielding.

Development of Highly Efficient & Unidirectional Technologically Important Nonlinear Optical (NLO) Materials for Practical Device Applications

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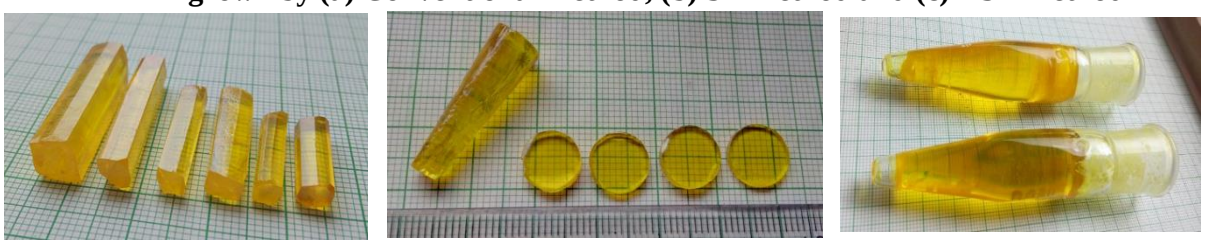
Gravity driven concentration gradient is used in the uniaxially solution-crystallization method of Sankaranarayanan-Ramasamy (SR). TGS, GPI, KAP, SSDH, DGZCD, DGBCM, benzophenone and many more crystals have been successfully grown by SR method. Longest benzophenone crystal having dimension of 1350 mm length and 55 mm diameter was grown for the first time in solution growth by SR method. Starting with a thin plate as seed a large size crystal can be grown. The physical properties and crystalline perfection of the SR method grown crystal is normally superior to the conventional method grown crystals. The quality of the SR method grown crystals has been improved by several modifications made in SR method. The impurity segregation cannot be avoided in the existing SR method. So we planned to introduce the RSR method for growing good quality, unidirectional single crystals. The effect of rotation on unidirectional crystal growth method (Rotational Sankaranarayanan - Ramasamy (RSR)) has been proposed for the first time. The organic nonlinear optical 2-Aminopyridinium 4-nitrophenolate 4-nitrophenol (2APNP) crystals have been grown by (i) conventional slow evaporation, (ii) Sankaranarayanan-Ramasamy (SR) method and Rotational SR (RSR) method. The grown 2APNP crystals were subjected to various studies like HRXRD, laser damage threshold, chemical etching, Vickers microhardness, birefringence, UV-Vis NIR, dielectrics and piezoelectrics. The Rotational Sankaranarayanan-Ramasamy (RSR) method grown crystals show excellent optical, mechanical, dielectric and piezoelectric behavior and higher laser damage threshold capability compared to the conventional and normal SR method grown crystals. HRXRD and etching studies showed that the quality of the RSR method grown crystal is better than conventional and normal SR method grown crystal. The Rotational Sankaranarayanan-Ramasamy (RSR) method can be used to grow single crystals along a specific crystallographic direction such as the phase matching direction in nonlinear optical (NLO) crystals. The unidirectional crystal growth method is ideally suited for crystal growth along this direction to obtain large size crystals required for obtaining SHG elements with minimum wastage. In addition, the unidirectional solution crystallization usually occurs at around room temperature; much lower thermal stress is expected in these crystals over those grown at high temperatures. Successful development of this unidirectional method will provide the technology to produce crystals at a yield close to 100% and easy scaling-up process.

2AP4N grown by (a) Conventional method, (b) SR method and (c) RSR method



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Perovskite Materials (ABX_3) and Solar Cells: Current Strategy

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In third-generation photovoltaics, perovskite solar cells are considered to be the best alternative for the expensive silicon solar cells now on the market. The materials used in perovskites have an ABX_3 crystal structure. They are made up of an A^+ cation, a B^{2+} divalent cation, and an X-halide. Generally incorporating of Pb^{2+} or Sn^{2+}, they achieve high power conversion energy suitable for commercial application. In an effort to boost efficiency, a number of research groups first concentrated mostly on controlling the concentration of the perovskite materials, the perovskite deposition method, the device architecture, and stability. The efficiency of perovskite solar cells has surpassed that of silicon solar cells, at roughly 26%. The PSCs have low production costs and are easily processed into solutions; nevertheless, their poor stability and element toxicity must be addressed before they can be commercialised. Here, we present a simple chemical process for producing large-scale, very stable perovskite materials for commercial use. The structural, optical, and morphological characteristics of a number of perovskite powders, including $MAPbI_3$, $MAPbBr_3$, $FAPbI_3$, $FAPbBr_3$, $CsPbI_3$, and $CsPbBr_3$, were synthesised and examined. Moreover, this talk covered the structural stability, optical properties, perovskite device structure and operation principle, key information to reach high efficiency PSCs and perovskite powder production for diverse application.

Keywords: Perovskite, band gap, crystal structure, stability, fast crystallization

MOF derived Efficient Electrocatalyst Enables Robust Rechargeable Zinc-air Batteries

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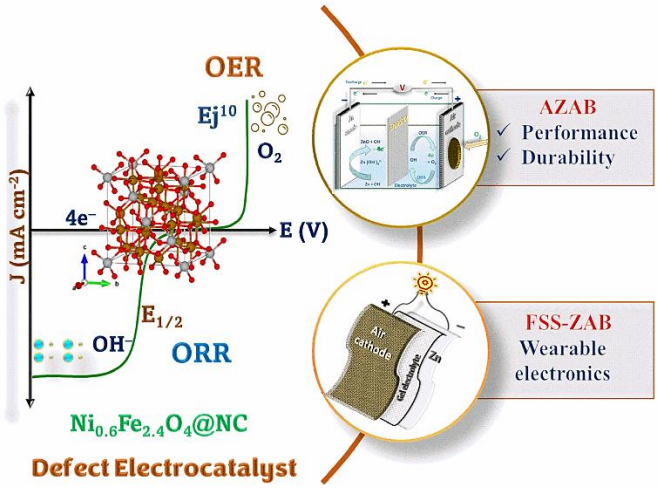
Abstract

Electrochemical energy storage devices with consistent performance, high power output, and energy density are urgently required to meet global energy demand. Zinc-air batteries are quickly gaining popularity as potential energy sources for green energy storage technologies. The air electrodes, combined with some oxygen electrocatalysts, have a significant impact on the cost and performance of Zn-air batteries. However, designing and fabricating efficient electrocatalysts remains a challenge. Because of their unique structural flexibility and uniformly dispersed active sites, metal-organic frameworks (MOFs) have emerged as appealing precursors for the synthesis of a wide range of advanced functional materials. Our research suggests using flexible multi-carboxylic acids and bipyridine ligands to create nanorods like NiFe@MOFs with multiple coordination modes and fascinating architectures. MOF precursors were post-annealed in argon at 750 °C, yielding a cation-deficient $Ni_{0.6}Fe_{2.4}O_4$@NC electrocatalyst. This 3D electrocatalyst effectively reduces oxygen ($E_{1/2}$ = 0.85 V) and evolves oxygen (η_{10} = 207 mV@10 mA cm^{-2}). Furthermore, a rechargeable zinc-air battery with $Ni_{0.6}Fe_{2.4}O_4$@NC as the cathode demonstrated a high open circuit voltage (OCV) of 1.5 V, a peak power density of 194.6 mW cm^{-2}, and exceptional long-term cycling stability over 300 h (1800 cycles, 10 mA cm^{-2}). The flexible solid-state zinc-air battery demonstrated power density of 68.5 mW cm^{-2} and long-term durability over 35 h at 5 mA cm^{-2}. The proposed strategy allows for the rational design of cation defect-rich spinel structures attached to ultra-thin, N-doped graphitic carbon sheets in order to enhance active site availability and mass electron transport.



Key words: MOFs derived, Spinel structures, Cation defect, ORR/OER, Rechargeable ZABs

OP-ESC-01

NITRATE REDUCTION TO AMMONIA USING HIGH-ENTROPY ROCK SALT OXIDE: ADVANCING THE DEVELOPMENT OF THE Zn-NITRATE BATTERY

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Abstract

The electrochemical synthesis of ammonia through nitrate reduction offers a more efficient alternative to the traditional Haber-Bosch process, operating under low pressure and temperature. Additionally, using nitrate-based voltaic cells presents an attractive method for reducing wastewater pollutants while simultaneously generating energy and producing ammonia. In this study, we successfully converted high entropy spinel oxide into a single-phase high entropy rock-salt oxide (HEO) using laser irradiation, resulting in highly efficient electrochemical nitrate reduction to ammonia. Our system, featuring an HEO catalyst, achieved ammonia production via a direct eight-electron process, yielding 22 mg h^{-1} cm^{-2} at 0.5 V vs. RHE, with an impressive faradaic efficiency (FE) of 92%. Further from Insitu raman analysis the electrode, among all element Co and Cu severed as active site and followed by N-end mechanism for nitrate reduction to ammonia by analysing the electrolyte. Building on this high-efficiency nitrate-to-ammonia conversion, we further explored its application in a zinc-nitrate battery system. This battery demonstrated a high output voltage of 1.25 V, a power density of 1.75 mW cm^{-2}, and an NH3 FE of 64%. This work highlights the significant impact of high entropy oxides on nitrate reduction reaction (NO_3^-RR) and presents a promising approach for ammonia production, while also expanding the potential of Zn-based batteries.

Keywords: Spinel oxide, Rock-salt oxide, High entropy material, Nitrate reduction, Ammonia synthesis, electrochemical process, Zn-nitrate battery.

OP-ESC-02

ELECTRODEPOSITED CoP_2 ON A LASER-INDUCED CARBON PLATFORM FOR EFFICIENT NITRATE /NITRITE TO AMMONIA CONVERSION

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The current research aimed to design an advanced electrocatalyst for the nitrate and nitrite reduction reaction (NO_3RR/NO_2RR). Here, we developed a cobalt phosphide (CoP_2) on graphite felt via an electrodeposition technique. Characterization tools such as FE-SEM, XRD, and XPS showed the successful formation of CoP_2 on the carbon surface. The laser treatment transformed the graphitic surface into graphene oxide, enabling the electrodeposition of CoP_2. The CoP_2/GF electrode showed enhanced catalytic efficiency toward nitrate/nitrite reduction reaction to ammonia formation. Such surface modification with CoP_2 has proven advantageous compared to graphitic felt and laser-induced graphitic felt. Thus, this system enables a new pathway for developing an electrocatalyst for renewable energy storage and can lead to environmentally sustainable processes to enhance energy production efficiency.

OP-ESC-03

IN SITU FABRICATION OF NiFe LDH/$Ni(OH)_2$ ON NICKEL FOAM VIA PULSED LASER FOR OXYGEN EVOLUTION REACTION

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The strategic design of efficient catalysts is crucial for enabling sustainable water-splitting reactions. In this study, we developed a new method for fabricating binder-free electrode materials using the pulsed laser irradiation (PLIL) technique. The laser beam was directed onto the surface of nickel foam (NF), causing it to oxidize and transform into nickel hydroxide ($Ni(OH)_2$). Subsequently, the use of microwaves facilitated the formation of NiFe layered double hydroxide (LDH) on the NF surface. The enhanced catalytic efficiency of NiFe LDH/$Ni(OH)_2$/NF, compared to IrO_2, is demonstrated by its low overpotential (292 mV at 10 mA cm^{-2}), high current density, and improved charge transfer kinetics in a 1 M KOH solution for the oxygen evolution reaction (OER).

The synthesized materials were characterized using XRD, Raman, FE-SEM, and XPS analytical techniques. The results also showed that the inclusion of Fe led to manipulation of the electronic structure, resulting in high performance in the OER. These findings underscore the promising potential of laser-mediated and microwave-assisted techniques in fabricating efficient and cost-effective NiFe LDH/NF electrocatalysts for sustainable energy production.

OP-ESC-04

EFFICIENT HYDROGEN PRODUCTION AT LOW VOLTAGE USING CO_2 LASER DEVELOPED $RuO_2/FeCo_2O_4$ ELECTROCATALYST VIA OVERALL HYDRAZINE SPLITTING

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ABSTRACT

In this study, we utilized a CO_2 laser, renowned for its precision and rapid heating capabilities, to calcine Ru-CoFe-LDH nanosheets into a $RuO_2/FeCo_2O_4$ composite. This $RuO_2/FeCo_2O_4$ composite was then employed as a dual-functional electrocatalyst in both hydrogen evolution reactions (HER) and hydrazine oxidation reaction (HzOR). which was subsequently applied as an electrocatalyst and in a Zn-hydrazine battery. The calcination process enhanced the surface area and porosity of the $RuO_2/FeCo_2O_4$ while preserving its nanosheet-like structure, thereby maximizing the exposure of electrochemically active sites and boosting catalytic performance. Notably, the $RuO_2/FeCo_2O_4$ catalyst demonstrated excellent dual-functional performance, achieving a low overpotential of 85 mV at 10 mA cm^{-2} for HER in 1 M KOH solution and a very low oxidation potential of –0.021 V vs. RHE at 10 mA cm^{-2} for HzOR in 1 M KOH/0.5 M hydrazine solution. This superior bifunctional activity of $RuO_2/FeCo_2O_4$ is attributed to the effective synergistic coupling between the RuO_2 and $FeCo_2O_4$, which offers excellent conductivity and a large surface area. Furthermore, the overall hydrazine splitting (OHzS) system assembled using the $RuO_2/FeCo_2O_4$ catalyst required only 0.094 and 0.69 V to supply current densities of 10 and 100 mA cm^{-2}, respectively. These findings underscore the potential of $RuO_2/FeCo_2O_4$ as a highly efficient and durable dual-functional electrocatalyst for efficient hydrogen production.

Keywords: $RuO_2/FeCo_2O_4$ composite; CO_2 laser calcination; Dual-functional electrocatalyst; Hydrazine oxidation reaction; Efficient Hydrogen production

OP-ESC-05

GROWTH OF MnFe-PRUSSIAN BLUE ANALOGUES ON NICKEL FOAM AS AN EFFICIENT ELECTROCATALYST FOR ECO-FRIENDLY HYDROGEN PRODUCTION VIA HYBRID ELECTROLYZER

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The focus on hydrogen production via water electrolysis is increasing as a result of the environmental harm caused by fossil fuel usage. Prussian Blue Analogues (PBAs) are gaining significant interest in the field of batteries and catalysts due to their high electrical conductivity and numerous active sites. Furthermore, PBAs are created on Ni Foam (NF), known for its high surface area because of its porous structure and displaying efficient catalytic activity. The intention is to utilize it as an electrochemical catalyst in water electrolysis with increased effectiveness after undergoing a heat treatment process for structural transformation. In this work, the distinct physicochemical characteristics of the Mn@Fe PBAs alloy created on Ni Foam were validated using X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), Raman spectroscopy, and X-ray photoelectron spectroscopy (XPS). Moreover, the electrochemical analysis demonstrated an ultralow overpotential towards hydrogen and oxygen evolution reactions (HER and OER). This led to improved electrochemical efficiency, suggesting their potential as a catalyst for environmentally friendly hydrogen production via hybrid water electrolysis.

OP-ESC-06

MONITORING HYDROGEN EVOLUTION VIA RAMAN SPECTROSCOPY ON PULSED LASER-ENGINEERED Pt-INFUSED BLACK TiO_2

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Oxygen vacancy (O_v)-enriched black TiO_2 (BTO) is a promising material for supporting well-studied noble metals in the hydrogen evolution reaction (HER). Incorporating O_v into TiO_2 significantly alters the electronic state of BTO, enhancing HER catalytic performance compared to pristine TiO_2. This defect formation induces deviations from a single anatase phase on a localized scale and promotes the formation of localized rutile segments, creating a heterojunction. While synthesizing a biphasic (rutile and anatase) BTO with abundant O_v and optimized Pt-metallic clusters significantly improves electrochemical HER kinetics, it requires a complex multistep synthesis. In contrast, we present a solvent-free, single-pot green synthesis route using pulsed laser irradiation to achieve the desired O_v -enriched BTO structure. Controlled irradiation of anatase TiO_2 with a Pt precursor under optimized conditions in an air environment generates O_v and decorates the metal oxide with Pt nanoclusters. This defect formation reduces the activation energy of BTO, favors the anatase phase, and forms localized rutile phases, enhancing HER activity through localized heterojunctions. The combined effects of Pt nanoclusters and O_v result in an exceptional catalyst with a HER overpotential of 169 mV at 10 mA/cm² and a Tafel slope of 73.3 mV/dec. Notably, long-term stability during overall water splitting was also achieved. This approach provides valuable insights into designing highly efficient catalysts and their supporting structures for various energy-related applications.

OP-ESC-07

HIGH-ENTROPY ALLOY ENCAPSULATED N-DOPED POROUS CARBON AS A BIFUNCTIONAL ELECTROCATALYST FOR OER AND ORR APPLICATIONS

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High entropy alloys (HEAs), with their adjustable alloy compositions and remarkable synergistic interactions among various metals, have garnered considerable interest in the field of electrocatalysis. However, their potential application is hindered by stability issues during electrochemical reactions and inefficient usage of high-cost metals. This study introduces an innovative and facile Pulsed laser ablation in a liquid (PLAL) method to synthesize the ZIF-8 which can be further calcinated into N-doped porous carbon acting as a substrate for HEA nanoparticles encapsulation (HEA@NC). This straightforward and efficient method is solvent-free, making it environmentally friendly. The encapsulation of HEA nanoparticles within the N-doped porous carbon helps to prevent the aggregation of alloy particles and improves its stability during long-term usage. In a 0.1 M KOH solution, the HEA@NC catalyst shows better ORR catalytic activity than the commercial standard Pt/C. Also, the ORR stability test for 24h demonstrates higher durability of the catalyst by showing only a 6% drop in the current density as compared to 14% of the Pt/C catalyst. Bifunctional HEA@NC catalyst also shows a decent OER activity in 1M KOH solution with the overpotential at 10 $mA*cm^{-2}$ being 396 mV. Thus, this material can be used for assembling the rechargeable Zn-Air battery.

Keywords: Pulsed laser technology; High-entropy alloy; Electrocatalysts; Oxygen reduction reaction; Oxygen evolution reaction

OP-ESC-08

IRIDIUM NANOCLUSTERS ON NITROGEN-DOPED CARBON: A RELIABLE BIFUNCTIONAL ELECTROCATALYST FOR HYDRAZINE-ASSISTED SEAWATER ELECTROLYSIS AND RECHARGEABLE Zn-HYDRAZINE BATTERIES

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Abstract

Seawater splitting has been proposed as an efficient and cost-effective method for generating green hydrogen without relying on clean water sources. However, its widespread adoption is hindered by significant energy demands and the anodic competition from chlorine electro-oxidation reaction (ClER). To address these challenges, we have developed a rapid and straightforward technique involving pulsed laser ablation in liquid (PLAL), followed by pyrolysis, to synthesize iridium nanoclusters (Ir) on a nitrogen-doped carbon matrix (NC matrix). This composite material acts as a dual-functional electrocatalyst, facilitating chlorine-free hydrogen production by engaging in the hydrogen evolution reaction (HER) and hydrazine oxidation reaction (HzOR) in alkaline seawater. The Ir-NC catalyst boasts high electrical conductivity, a porous structure, abundant active sites, nitrogen-rich carbon, a strong Ir-NC interaction, and a minimal iridium content, all of which enhance mass transfer and electrochemical performance. Remarkably, the Ir-NC-2 catalyst exhibits a low overpotential of 24 mV for HER and a minimal working potential of 26 mV (vs. RHE) for HzOR to achieve a current density of 10 mA cm^{-2} in an alkaline seawater electrolyte, outperforming the benchmark Pt/C catalyst. Importantly, the Ir-NC-2 catalyst also functions as a dual-functional electrocatalyst for overall hydrazine-assisted seawater splitting (OHzS), requiring only a small cell voltage of 0.1 V at 10 mA cm^{-2} and demonstrating long-term stability. Additionally, the Ir-NC-2 catalyst is highly effective in a Zn-hydrazine battery, achieving an energy efficiency of 95.5% and showing excellent cyclic stability over 120 hours (360 cycles), indicating its potential for practical applications.

Keywords: Pulsed laser ablation in liquid; NC matrix; Ir nanoclusters; seawater; overall hydrazine splitting; Zn-hydrazine battery

OP-ESC-09

UNRAVELING THE ABILITY OF CO_2 LASER IN DEVELOPING HIGH-ENTROPY OXIDE ELECTROCATALYSTS WITH SUPERIOR OXYGEN EVOLUTION REACTION ACTIVITY

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Abstract

Water electrolysis presents a promising approach for producing clean hydrogen fuel by utilizing renewable energy sources to split water molecules without emitting harmful byproducts. However, widespread utilization of this technology is limited by the high overpotential required for the anodic oxygen evolution reaction (OER), largely due to the lack of highly efficient electrocatalysts. In this study, we developed a $Cr(NiFeCoV)_2O_4$ high-entropy oxide (HEO) with a spinel structure using an innovative and rapid CO_2 laser technique. The resulting $Cr(NiFeCoV)_2O_4$ HEO demonstrated outstanding OER performance with a lower overpotential of 278 mV at 10 mA cm^{-2}, surpassing both bimetallic $CrCo_2O_4$ (398 mV) and the standard IrO_2 catalyst (369 mV) in a 1 M KOH electrolyte. Furthermore, the $Cr(NiFeCoV)_2O_4$ HEO catalyst exhibited remarkable stability over 100 h. Specifically, an alkaline water electrolyzer assembled with the $Cr(NiFeCoV)_2O_4(+)||Pt/C(–)$ couple required just 1.57 V to achieve 10 mA cm^{-2}, compared to 1.61 V for an $IrO_2(+)||Pt/C(–)$ electrolyzer. This research introduces a novel approach for developing highly efficient and durable OER electrocatalysts, advancing the potential for more effective hydrogen production.

Keywords: CO_2 laser synthesis; High-entropy oxide; Electrocatalyst; Oxygen evolution reaction; Hydrogen production.

OP-ESC-10

ELECTROCATALYTIC NITRITE REDUCTION TO AMMONIA SYNTHESIS ON PULSED LASER-PRODUCED Ru DOPED CoFe-LDH NANOSHEETS USING A Zn-NITRATE BATTERY

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ABSTRACT

Ammonia (NH_3) is a crucial compound in various industries, but its traditional synthesis via the Haber-Bosch process is both energy-intensive and environmentally harmful. Therefore, developing low-energy, sustainable methods for ammonia synthesis methods is essential, especially those that can utilize pollutants like nitrate (NO_2^-). In this study, we synthesized Ru-doped cobalt-iron layered double hydroxides (CoFe-LDH) using pulsed laser technology and applied to the nitrite reduction reaction (NO_2RR) for ammonia production from contaminated water. The Ru-doped CoFe-LDH catalyst achieved a remarkable Faradaic efficiency of 93% at -0.7 (V vs. RHE), demonstrating high ammonia production efficiency with significantly lower energy consumption compared to conventional methods. Additionally, the catalyst was applied in a Zn-nitrite battery system, where it maintained a Faradaic efficiency of 93% at a current density of 6 mA cm^{-2}, showcasing its excellent electrochemical performance. This study highlights the potential of Ru-doped CoFe-LDH synthesized by pulsed laser technology to advance both ammonia synthesis and sustainable energy conversions

Keywords: Pulsed laser technique; Layered double hydroxide (LDH); Electrocatalyst; Nitrite reduction reaction; Ammonia synthesis; Zn-nitrite Battery.

OP-ESC-11

ENHANCED PHOTOCATALYTIC HYDROGEN PRODUCTION WITH LASER-

FABRICATED TiO_2/g-C_3N_4 COMPOSITES FOR VISIBLE LIGHT ABSORPTION

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ABSTRACT

This study focuses on the development of visible-light-responsive composites to efficiently utilize solar energy for hydrogen production, a clean energy source. We employed laser technology to fabricate hierarchical TiO_2/g-C_3N_4 heterostructures, simultaneously transforming them into black to enhance light absorption in the visible range, thereby increasing the hydrogen evolution reaction (HER). The absorbance of the fabricated composites was verified through ultraviolet-visible (UV-vis) spectroscopy, and various analytical techniques were used to perform physical property analyses. Additionally, cyclic voltammetry (CV) measurements were conducted to observe the enhanced HER performance. The significance of this research lies in the efficient maximization of visible light absorption by simultaneously blackening hierarchical TiO_2 and g-C_3N_4 during the composite fabrication process using pulsed laser process. This method greatly enhances the efficiency of hydrogen production in comparison to traditional techniques, and it is anticipated to play a major role in advancing the development of future energy conversion materials.

Keywords: Pulsed laser technique; black TiO_2; hydrogen evolution reaction(HER); visible-light-responsive composite; TiO_2/g-C_3N_4

OP-ESC-12

ASSEMBLING A Zn-NITRATE BATTERY FOR EFFICIENT AMMONIA SYNTHESIS WITH ELECTRICITY GENERATION USING A LASER-MADE AgCu-BASED ELECTROCATALYST

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Abstract

Nitrogen fertilizers play a critical role in ensuring global food security, but their production, particularly through the Haber-Bosch process, presents significant environmental and energy-related challenges. While effective, this method is highly energy-intensive and heavily reliant on fossil fuels, accounting for approximately 1-2% of global energy consumption and about 1.5% of global CO2 emissions. Moreover, the excessive use of nitrogen fertilizers has led to elevated nitrate levels in groundwater, posing substantial environmental concerns. To address these challenges, this study introduces a novel, sustainable method for ammonia synthesis by creating an $Ag/Ag_2O/CuO$ composite using a simple and efficient pulsed laser ablation technique. This newly developed composite serves as an effective electrocatalyst in the nitrate reduction reaction (NO_3^-RR), achieving an impressive faradaic efficiency of 89% at –0.3 V vs. RHE and an ammonia production rate of 2.95 mg h^{-1} mg^{-1}. Additionally, the study demonstrates the utility of this catalyst in a Zn-nitrate battery, achieving a power density of 5.085 mW cm^{-2} and ammonia production with a faradaic efficiency of 55% at 6 mA cm^{-2}. These findings are pivotal for advancing the development of viable catalysts for sustainable and large-scale ammonia production, significantly contributing to energy and environmental sustainability.

Keywords: Pulsed laser ablation, $Ag/Ag_2O/CuO$ catalyst, Nitrate reduction reaction, Zn-nitrate battery; Ammonia electrosynthesis

OP-ESC-13

AIE ACTIVE TETRAPHENYLETHYLENE DERIVATIVE FOR RAPID DISCRIMINATION OF COPPER(II) ION AND LATENT FINGERPRINT IMAGING

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ABSTRACT

The devise and development of aggregation induced emissive probe with high sensitivity and selectivity for Cu^{2+} ion is fascinating research in biomedical sciences. In this work, we have successfully synthesized a novel AIE active tetraphenylethylene tethered 1-(pyridine-2-yl)imidazo[1,5-a]pyridine probe for the selective detection of Cu^{2+} ions in aqueous medium. The photophysical properties in solution state as well as in aggregates were systematically examined using the steady-state and time-resolved fluorescence measurements. The aggregation property of the probe has been meticulously investigated and spherical shaped particles with a size of 90 nm were observed. Owing to the high affinity, TPE-1 probe poses an excellent selectivity and sensitivity towards Cu^{2+} ions even during the presence of other interfering ions with an LOD of 83 nM. Furthermore, the probe exhibited excellent efficacy over various environmental water samples rendering it optimal for practical applications. In addition, the type of quenching was delineated to be static in nature due to the ground state complex formation as a result deaggregation was found to be an overall quenching mechanism. Furthermore, high contrast latent fingerprint powder was developed with TPE-1 aggregates for the recognition of level 2 and 3 information, thereby playing a substantial role in forensic investigations.

Keywords: Tetraphenylethylene, Aggregation induced emission, Copper sensor, Latent fingerprint analysis.

OP-ESC-14

SUSTAINABLE POLYMER COMPOSITE MATERIAL FROM BANANA-JUTE-PALM FRUIT FIBRE: FABRICATION AND ACOUSTIC CHARACTERIZATION

ABSTRACT

Noise has become one of the four major pollution types in the world. Constant exposure to noises can cause all kinds of health problems, such as hearing loss, cardiovascular disease, and sleep disorder for human beings and harmful to our surrounding. Initially, synthetic acoustic material was used, but it not a good choice. In recent times, production of environmentally friendly materials has been growing. Fiber plays a significant role in acoustic material. In these natural fibers are more readily available, biodegradable, inexpensive, minimal health hazards and environmentally friendly than synthetic fibres. Here, natural fiber was used for acoustic bio composite polymer material. According to researchers who are looking to improve the performance of composites, pointed out that use of filler materials basically improves the mechanical characteristics of a composite, which reduces the amount of organic material in the composite. The composite samples were fabricated in three different of combination of materials such as banana -jute -palm fruit fiber-reinforced epoxy composites with MgO (Magnesium oxide) and nano clay as filler material. The mechanical properties of the fabricated composite materials, including tensile strength, flexural strength, compression, ILSS, impact strength and water absorption were measured by ASTM standards. One of the best compositions based on the mechanical properties can be further characterized its properties by SEM with EDX, Zeta potential, FTIR for structural properties and analysis potential application by impedance tube for acoustic properties ,TGA -DTA/DSC for thermal analysis, water angle contrast for water resistance, electrical surface resistivity for check the electrical resistivity of a material.

Keywords: Banana- jute- palm fruit fiber, filler (MgO, nano clay), epoxy resin, Acoustic material.

OP-ESC-15

NANOPARTICLES EMBEDDED POLYMERIC NANOFIBERS AS CARRIERS TO CONTROL THE GROWTH OF CANCER CELL LINE AND PATHOGENS THROUGH CONTROLLED DRUG RELEASE

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ABSTRACT

The polymeric nanofiber mats were produced from polylactic acid, methylcellulose and polyethylene glycol with 5-Fluorouracil drug and iron oxide nanoparticles. Spectral and crystallographic studies clearly elucidated the ionic interactions, structure and nature of the mats. Fe_3O_4 nanoparticles with the size of <10 nm along with methylcellulose and polyethylene glycol have significantly reduced the size of nanofiber mats. The mechanical properties for the mats was found challenging; however, surface wettability, swelling capacity and drug encapsulation efficiency results were promising. Controlled drug release pattern was observed from *in vitro* drug release study, zero order kinetics and Higuchi model. Nanofiber mats showed higher anticancer activity (78%) against MDA-MB 231 cancer cells which reveal that a small amount of 5Fu drug (15.86 %) with high levels free radicals produced from Fe_3O_4 have catalysed the Fenton's reaction to eradicate the cancer cells, in a shorter span of 24 hours, itself. In addition, the apoptosis assay by dual AO/PI staining method clearly exhibited the apoptotic cancer cells by fluorescence microscopy. Embedded Fe_3O_4 nanoparticles enhanced the anticancer activity of the mats compared to commercially available standard 5Fu drug. Nanofiber mats significantly controlled the growth of selected pathogenic microbial strains by the action of 5Fu drug and Fe^{3+} ions. The degradation of mats was investigated by *in vitro* mass loss study for a period of 360 days. In a nut shell, promising nanofiber mats were produced as targeted drug delivery device for chemotherapy.

Keywords: *nanofibers, nanoparticles, drug delivery, anticancer and apoptosis assay, antimicrobial screening*

OP-ESC-16

INNOVATIVE WEARABLE SUPERHYDROPHOBIC TEXTILES CRAFTED FROM SILICA SAND NANOPARTICLES AND ECO-FRIENDLY MODIFIERS FOR ENHANCED ANTI-WETTING APPLICATIONS

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ABSTRACT

Eco-friendly superhydrophobic textiles are of superior research interest owing to their functional properties like anti-wetting, anti-stain, anti-icing, flame-retardancy, anti-microbial and UV protecting effects. However, the wide usage of hazardous and non-degradable low surface energy materials like fluoro-derivatives and silane is considered environmentally non-preferable and unsafe in wearable textiles. Henceforth, a sustainable and simple immersion method for superhydrophobic cotton textiles is developed based on low-cost natural silica materials and appropriate combination of low surface energy modifiers. Initially, silica nanoparticles were prepared from unconventional silica sand using ball milling technique optimized by Response Surface Methodology. The obtained sand nanoparticles were utilized as surface roughness enhancer and with further tuning of surface energy, a higher water contact angle greater than 155° was achieved. The silica sand-based superhydrophobic textiles were characterized for their chemical composition, morphology, surface roughness, thermal stability, and water contact angle using FT-IR, FE-SEM, Elemental analysis, 3D Optical Profilometer, Thermo gravimetric analyzer and Contact angle meter respectively. The obtained coatings have good stain resistance, self cleaning action, better chemical durability and retained superhydrophobicity after more than 5 washing cycles, adhesive peel test, exposure to oxygen plasma and Ultraviolet irradiation. The coated textile is light-weight, breathable, retained the whiteness level and the developed coating regained hydrophobicity after heat treatment and therefore self-healable. The proposed eco-friendly superhydrophobic coating presents the future scope of extending to multifunctional textile with suitable additives for synergistic applications. This research holds significant promise for military personnel and healthcare professionals. For military personnel, the development of advanced materials and technologies can enhance protective gear, improve operational efficiency, and contribute to overall mission success. Similarly, healthcare professionals can benefit from these innovations through the creation of more effective medical devices, ultimately leading to improved patient care and outcomes. By addressing the specific needs of these sectors, this research aims to foster advancements that enhance safety and efficacy in both military and healthcare environments. The development of anti-wetting textiles through this research is not only significant for advancing material science but also holds substantial implications for the Indian economy. By enhancing the textile industry, which is a crucial sector contributing approximately 2% to India's GDP and employing millions, this innovation can help revitalize job opportunities and foster economic growth. As India strives for self-reliance and sustainability, such research initiatives can contribute to the country's economic resilience, ultimately supporting the vision of a stronger and more self-sufficient India.

Keywords: silica nanoparticles, response surface method, ball milling, superhydrophobicity.
OP-ESC-17

LOW ION BEAM IRRADIATION-INDUCED STRUCTURAL MODIFICATIONS IN GO-CNT-PANI ELECTRODE MATERIALS FOR SUPERCAPACITOR

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Abstract

This study investigates the structural changes in Graphene Oxide-Carbon Nanotubes-polyaniline (GO-CNT-PANI) spin-coated thin film samples induced by low-ion beam irradiation. The samples were irradiated with Argon (Ar^{8+}) ions at an energy of 10 keV, a current of 500 µA, and a fluence of 1×10^{16} ions/cm². Characterization techniques including X-ray diffraction (XRD) and scanning electron microscopy (SEM) were employed to analyse these changes. XRD analysis revealed a decrease in crystallinity post-irradiation. SEM images indicated morphological changes, with irradiated GO-CNT-PANI displaying a less damaged and more uniform surface structure. These findings suggest that GO-CNT-PANI maintains higher structural stability under low-ion beam irradiation, making it a promising candidate for durable and efficient supercapacitor Application.

Keywords: Low Ion Beam Irradiation, GO-CNT-PANI Composite, Structural Modifications, Supercapacitor Electrode Materials

OP-ESC-18

ENHANCED PSEUDOCAPACITIVE TWO DIMENSIONAL NTO BASED HIGH-DENSITY SUPERCAPACITORS

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ABSTRACT

Supercapacitors have garnered significant attention as promising energy storage devices owing to their exceptional performance and environmental sustainability. In this investigation, we synthesized sodium titanate $Na_2Ti_4O_9$ (NTO) nanosheets utilizing the mechanochemical method and applied them as efficient electrodes for supercapacitors. Rigorous physical characterization techniques, including X-ray diffraction (XRD), Raman spectroscopy, and Energy dispersive X-ray spectroscopy (EDAX), unequivocally validated the successful formation of NTO nanosheets characterized by superior phase purity. Scanning Electron Microscope (SEM) studies unequivocally affirmed the development of NTO in the distinct nanosheet morphology. The pseudocapacitive behavior of NTO nanosheets was comprehensively investigated through cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). Galvanostatic charge-discharge studies underscored the outstanding properties of NTO nanosheets, demonstrating a specific capacitance of 670 F/g at 1 A/g and 175 A/g at 10 A/g sustained over 5000 cycles. Notably, at a high current density of 10 A/g, the material exhibited remarkable coulombic efficiency and retentivity values. In conclusion, our findings strongly support the expectation that the NTO nanosheet-based electrode can achieve superior energy density and power density in supercapacitor applications. This research contributes to advancing environmentally friendly energy storage technologies, with the synthesized nanosheets showcasing exceptional electrochemical performance.

Keywords: High-density supercapacitor, $Na_2Ti_4O_9$ (NTO) nanosheets, Sodium Titanates, Green Energy Technology, Mechanochemical method.

OP-ESC-19

TWO-DIMENSIONAL Ti_3C_2TiX-CONTAINING COMPOSITE POLYMER ELECTROLYTES (CPEs) FOR ALL-SOLID-STATE LITHIUM-BASED BATTERIES

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ABSTRACT

Solid electrolytes present promising options for the development of future-generation battery technology, primarily because they eliminate concerns related to leaking, combustibility, and chemical resistance. Inorganic particles serve as substances within solid polymeric material electrolytes, combining with polymer compounds and lithium salts to enhance electrochemical efficiency and stability in structure. The addition of Ti_3C_2TiX (15 wt %) ceramic powder makes Composite Polymer Electrolyte membrane (CPE-15) exhibit excellent electrochemical performance, demonstrating an ionic conductivity of 1.08×10-4 S cm-1 at ambient temperature, a lithium exchange number of 0.63, an electrochemical window of 4.0 V, thermal shrinkage up to 250°C, the porosity of ~93%, electrolyte uptake of ~230%, and activation energy of 0.23 eV. The prepared CPE-15 demonstrates excellent electrochemical performance, providing an effective design strategy for solid state lithium based battery.

Keywords: 2D, ionic conductivity, composite polymer electrolyte, Li battery.

OP-ESC-20

TRANSPARENT AND CONDUCTIVE ELECTRODE FOR FLEXIBLE AND WEARABLE DEVICES

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ABSTRACT

The future of the flexible electronics industry relies on developing a pliable substrate with a mechanically stable conductive electrode. Conventional ITO-coated flexible substrates are not recommended for commercial production due to high material costs, production complexity, and poor mechanical integrity. Among alternative materials such as graphene, single-walled carbon nanotubes (SWCNT), and PEDOT, silver nanowires (AgNW) have showed better results for flexible and wearable applications. Silver nanowires were synthesized using polyol method and spin coated on PET substrates. Spin coating deposition technique was used to reduce production cost, which was performed at different RPMs. Conductivity of the spin coated AgNW based flexible thin film electrodes were measured using four-point collinear probe, while the mechanical robustness was assessed using linear motor setup. The fabricated AgNW based thin film flexible electrode exhibited a sheet resistance of 8.3 Ω/□ with 67.5% transmittance. After 500 bending cycles, the AgNW based TCE showed an acceptable increase in sheet resistance from 8.68 to 11.11 Ω/□.

Keywords: flexible transparent conductive electrode, silver nanowires, polyol synthesis, opto-electronics

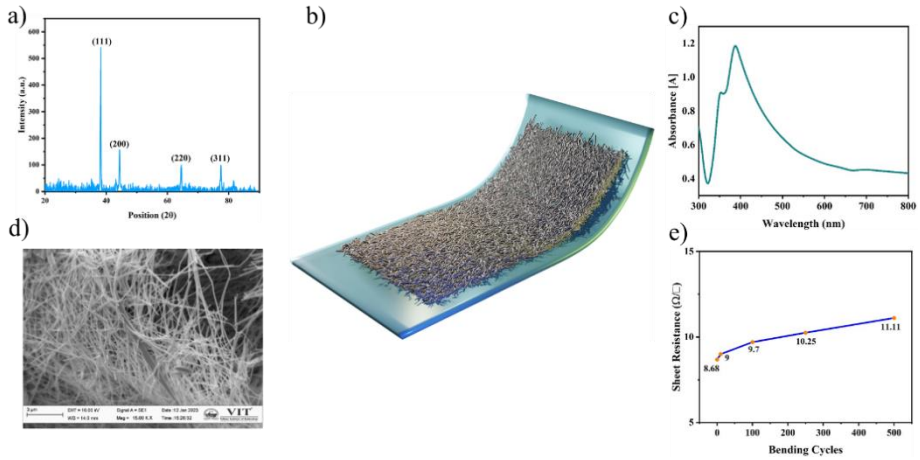

Fig 1: a) XRD analysis b) Illustration of AgNW on PET sheet c) UV- visible spectroscopy analysis d) SEM analysis e) Bending analysis

OP-ESC-21

INVESTIGATION OF STRUCTURAL STABLITY AND OPTICAL PROPERTIES OF LEAD SULFIDE NANOPARTICLES UNDER ACOUSTIC SHOCKWAVES

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Lead Sulfide (PbS) nanoparticles due to their high performance, is an interesting semiconducting material for solar cell applications. In the present work, the synthesis of PbS by co-precipitation method due to a low-cost synthesis process. Also, performed XRD technique for as-synthesized PbS to analyze the structural information, and the crystallite size was found to be ~16.29nm, Quantum Dots (QDs) with face-centered cubic structure. The excitonic Bohr radius of PbS is reported as 18nm. For the elemental composition, SEM/EDAX confirms the existence of Pb and S signals in the as-prepared sample and the compositional purity of the as-synthesized sample is confirmed. This Opto-electronic material is widely studied to calculate its optical band gap E_g by Absorption and Photoluminescence studies.

To check the stability of the sample under high-pressure conditions, shock waves are imposed on the PbS QDs and its stability is analyzed on various conditions. For this work, a semi-automatic Reddy tube was used to create high pressure atmosphere to study in detail about the characteristics of PbS under shockwave-loaded conditions. The pure PbS was subjected to shock pulses in the series of 200 and 400 with a transient pressure of 2MPa. XRD, UV-Vis-NIR Spectroscopy, Photoluminescence (PL) were used to analyze and characterize the Pure -PbS and Shockloaded -PbS. The XRD study confirms the variation in crystallite size particularly but no phase transitions were observed. The optical properties were determined using UV-Vis and PL. The bandgap and PL intensity were changed for the number of shock pulses. Our findings reveals the phase stability of PbS nanoparticles shows no significant changes in structure. It proves its mechanical stability under Shock-exposed conditions may pave a way for advancements in technology. It can be used not only for fabricating tandem heterojunction solar cells but also for the fabrication of aerospace applications.

Keywords: Lead Sulfide, XRD, SEM/EDAX, UV-Vis Absorption, PL, Shockwaves.

OP-ESC-22

METAL/CARBON/ MAGNETITE NANOCOMPOSITE FOR SYMMETRIC SUPERCAPACITOR

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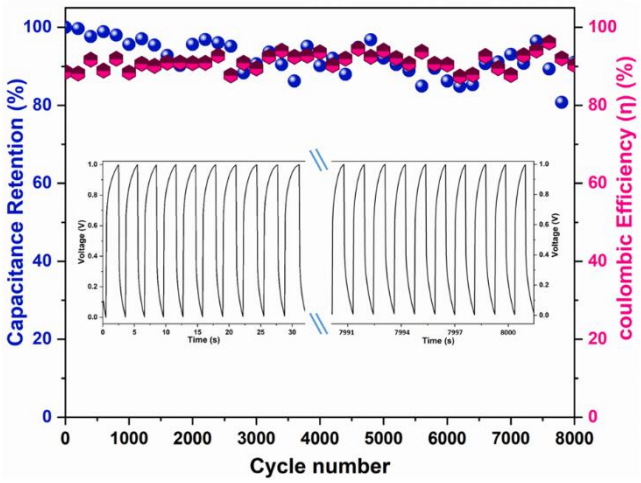
Abstract:

The present study reports the successful preparation of magnetite (Fe_3O_4) nano materials with single and co-dopants (F), (FC), (FR), and (FCR) using the simple co-precipitation process. The produced samples were subjected to morphological, optical, FTIR, and structural analyses. XPS- Photo electron spectroscopy indicates the presence of relevant elements and oxidation states. BET surface analysis shows the enhanced surface area with the addition of carbon materials in conjointly doped Fe_3O_4 (FCR) and C doped Fe_3O_4 (FR). From the chronopotentiometry analysis a high specific capacitance of 920 Fg^{-1} was observed at a current density of 1 Ag^{-1} and from the CV analysis, the measured capacitance was 508.67 Fg^{-1} for a three-electrode configuration for 1 M KOH. The symmetric device has been constructed using metal/C co doped (FCR) nano composite and it exhibited a specific capacitance of 193 Fg^{-1}, specific energy of 26 W h Kg^{1}, and specific power of 1999 W Kg^{-1} at a current density of 1 Ag^{-1} and had average capacity retention of about 90% and excellent coulombic efficiency which is about 91% up to 8000 cycles.

Keywords: Supercapacitor, Hummers method, Fe_3O_4, Magnetites.

Graphical Abstract:



OP-ESC-23

AN EXPERIMENTAL AND THEORETICAL NCI APPROACH TO CARBON DOT-ACICLOVIR INTERACTIONS

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This study investigates the interaction between Carbon dot (CDs) and aciclovir (ACV) through a combination of experimental and theoretical infrared (IR) spectroscopy, supported by Density Functional Theory (DFT) analysis. CDs, known for their potential to enhance drug solubility and stability, are examined in the context of drug delivery systems, with a focus on their interaction with ACV, an antiviral drug. The study applies various computational techniques, including

Atoms in Molecules (AIM) theory, Molecular Electrostatic Potential (MEP) anlysis, Natural Bond Orbital (NBO) analysis, Intrinsic Bond Strength Index (IBSI), and the Independent Gradient Model (IGM), to evaluate the electronic properties and molecular interactions of the CDs-ACV complex. Additionally, HOMO-LUMO analysis is conducted to explore the electronic structure and reactivity of the system. These combined analyses provide a comprehensive understanding of the CDs-ACV interaction, revealing key insights into its stability, bioavailability, and potential applications in drug delivery. The findings from this study offer a foundation for future research aimed at optimizing drug formulations and therapeutic efficacy.

Keywords: Carbon dot, Aciclovir, DFT approach, bioavailability

OP-ESC-24

DEVELOPMENT OF FLEXIBLE THIN FILM BASED PRESSURE SENSOR FOR TACTILE REMOTE SENSING APPLICATIONS USING PVD METHOD

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Abstract

The fabrication and characterization of flexible piezo resistive type pressure sensing device using ZnO thin film as the sensing active layer and PDMS (polydimethylsiloxane)/ZnO composite as the protection flexible layer. Optimized evaluation ratio of prepared PDMS/ZnO polymer nanocomposite substrate is employed flexibility for pressure sensor design. Then the optimized sensing layer with patterned physical masking and above ZnO formed of about 200nm by reactive dc sputtering technique, further removal of mask gives designed sensing pattern. Apart, the sensing output of the sensor are digitized by using appropriate microcontroller unit and tested. Here like wise a source of the fabrication of this flexible type ZnO thin film pressure sensor with polymer nanocomposite is suggested and fabricated. Also this includes the characterization and various stages of optimizations in relation between verified sensor output and piezo resistivity to ensure developing a prototype. The ability of the fabricated device to sense the pressure due to the tactile movement is analyzed through the working prototype having a sensitivity of 0.15 mV/psi, the responds time of 10 ms and piezo resistance of 0.008ohm/cm to 0.233 ohm/cm. Obtained results from the responds of the device optimal property shows the capability of material to act as a sensor.

Keywords: Piezo resistance, Zinc oxide (ZnO), Flexibility, Polymer nanocomposite.

OP-ESC-25

STRUCTURE, OPTICAL, DIELECTRIC AND MAGNETIC PROPERTIES OF $GdFeO_3$:x%$BiFeO_3$ (x = 2%,5%,10%) COMPOSITES

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ABSTRACT

Multiferroics are a class of "smart materials" that possess unique properties, displaying a combination of ferroelectric, ferromagnetic, and ferroelastic order. The specific properties and structures of these materials play a crucial role in determining their applications, which include converters, information storage devices, spintronics, sensors, and resistive switching devices. In this study, we synthesized perovskite multiferroic composites of $GdFeO_3$(GDFO) and $BiFeO_3$(BFO) ($GdFeO_3$:x%$BiFeO_3$ (x = 2%,5%,10%)) using an auto-combustion sol-gel method. The composite powders were characterized through powder X-ray diffraction (PXRD) to confirm the presence of pure phases. X-ray photoelectron spectroscopy (XPS) analysis was conducted to estimate the individual elements present in the GDFO-BFO composites. Additionally, changes in the band gap energies of the composite powders, due to the inclusion of BFO, were determined using Tauc plots. A significant increase in the dielectric constant of the composites was observed compared to pure GDFO. Furthermore, the variation in magnetization with increasing BFO concentration suggests the presence of canted antiferromagnetism in the composite materials. The magneto-electric properties of GDFO can be effectively tuned through the formation of composites, revealing the strong coupling between the individual phases.

Keywords: Multiferroic composites; Bismuth ferrite; Dielectric; Magnetism.

OP-ESC-26

HARNESSING THE ELECTROCHEMICAL BEHAVIOUR OF BIO-DERIVED REDUCED GRAPHENE OXIDE FOR HIGH-PERFORMANCE SUPERCAPACITORS

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ABSTRACT

The exploration of reduced graphene oxide (rGO) derived from plant sources is particularly significant in the context of sustainable materials and their applications in energy storage and sensing technologies. This research highlights the potential of bio-derived rGO, which exhibits exceptional properties such as high electrical conductivity, substantial surface area, and remarkable mechanical strength. These characteristics make rGO a promising candidate for various applications, including supercapacitors, sensors, and composite materials.

In developing countries like South Africa, there is a pressing need for accessible and indigenous materials in educational institutions. The Journal of Chemical Education has emphasized the importance of promoting affordable experiments that can be conducted by students and researchers who may not have access to expensive materials. This aligns with our research objectives, where we aim to contribute to the field by developing low-cost electrodes utilizing rGO. These electrodes can be employed in a variety of electronic devices and sensors, thus enhancing both educational opportunities and practical applications in renewable energy integration.

The electrochemical performance of the rGO-based supercapacitors has demonstrated promising results, confirming their pseudocapacitor behaviour with specific capacitance values reaching up to 99 Fg^{-1} at a scan rate of 0.05 mVs^{-1}. Furthermore, the development of a cost-effective, disposable electrode using modified carbon paste combined with rGO nanosheets aims to improve conductivity and sensing capabilities. By integrating green chemistry principles into this research, we aspire to advance sustainable energy storage technologies while also addressing the economic barriers faced by many in South Africa.

In summary, our research not only contributes to the scientific community but also serves a dual purpose: fostering educational initiatives and providing affordable technological solutions that can empower local communities in their pursuit of renewable energy

Keywords: Reduced graphene oxide, green synthesis, supercapacitors, specific capacitance.

OP-ESC-27

MODELLING AND SIMULATION OF ORGANIC (SEXITHIOPHENE) FIELD EFFECT TRANSISTORS (OFETs)

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Abstract

This paper investigates the performance of Organic Field Effect Transistors (OFETs) using sexithiophene as the active organic semiconductor. The study focuses on two key device architectures: Bottom Gate Top Contact (BGTC) and Bottom Gate Bottom Contact (BGBC). Using advanced simulation techniques with the Silvaco Atlas tool, we examine the electrical properties of both configurations, including charge carrier mobility and contact resistance. Results show that the BGBC configuration significantly outperforms the BGTC structure due to its reduced contact resistance and improved charge transport efficiency. The enhanced mobility and lower resistance of the BGBC structure make it a promising candidate for high-performance OFET applications, particularly in flexible and large-area electronics. This comparative analysis provides valuable insights into optimizing OFET design for future organic semiconductor devices.

Keywords: *Organic Field-Effect Transistors (OFETs), organic semiconductors, carrier mobility, fabrication techniques, Sexithiophene, Bottom Gate Top Contact (BGTC), Bottom Gate Bottom Contact (BGBC), Silvaco Atlas Simulation, High-Performance OFETs.*

OP-ESC-28

SILVER NANOWIRES AND REDUCED GRAPHENE OXIDE HYBRID TRANSPARENT CONDUCTIVE ELECTRODE WITH HIGH FLEXIBILITY AND MECHANICAL STABILITY

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ABSTRACT

The advancements in flexible electronic and optical devices require flexible transparent conductive electrodes with better properties. The conventionally used Indium/Fluorine doped tin oxide (ITO/FTO) has certain setbacks including high cost, brittleness, and degradation over time. So, there is a demand for alternative materials which can serve the same purpose. This study presents the fabrication of a flexible transparent conductive electrode (TCE) using silver nanowires (AgNWs) and reduced graphene oxide (rGO) on polyethylene terephthalate (PET) substrate. The AgNWs/rGO electrode displayed a favourable results of 5.9 Ω/sq. sheet resistance and 71% optical transmittance. Addition of a layer of PEDOT:PSS helped to improve the mechanical stability by withstanding up to 500 bending cycles. This work contributed a successful method for manufacturing a flexible, transparent, and conductive electrode with improved durability and stability for a lot of applications like smart sensors, flexible displays, wearable technology.

Keywords: Polymer electrode; Flexible transparent electrode ; nanomaterial synthesis

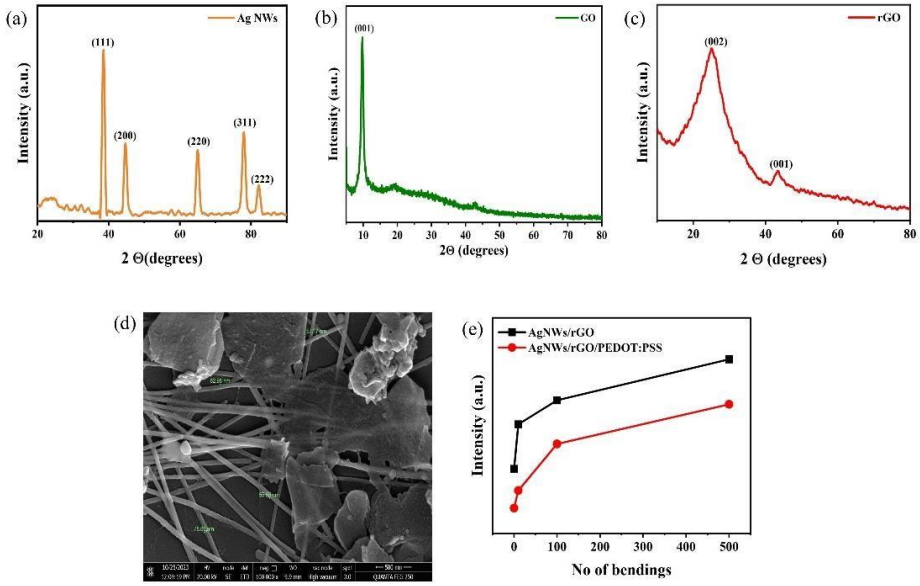

Figure 1 – (a) XRD of AgNWs, (b) XRD of GO and (c) rGO, (d) FESEM of AgNWs/rGO, (e) bending cycles v/s sheet resistance

OP-ESC-29

A REVIEW STUDY ON DOPED NiO THIN FILMS AND THEIR OPTICAL AND ELECTRICAL PROPERTIES

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ABSTRACT

Nickel oxide (NiO) has emerged as a versatile oxide in advanced materials research, with applications ranging from energy storage and sensing technologies to optoelectronics devices. The intrinsic properties of NiO as a broad bandgap (3.5 to 4 eV) p-type semiconductor are well known, but doping can substantially alter the properties of NiO, enhancing its performance in various applications. By introducing different metal dopants, especially transition metals such as Zn, Co, Fe, Mg, Al, and Cu, the bandgap energy of NiO can be effectively tuned to meet specific requirements. This modification allows for improved optical characteristics, making the material more suitable for diverse technological uses. The optical and electrical characteristics of doped NiO thin films are thoroughly reviewed. The doping in NiO thin films can significantly change their optical and electrical structural characteristics. The narrower bandgap of NiO after doping enhances its visible light absorption and makes it useful for photovoltaic applications. Doped NiO for transparent conductive films can attain an important balance between high transparency and electrical conductivity, which is required for touch screens and display technologies. The study indicates that doping NiO can modify its optical, electrical, and structural characteristics; as a result, these films may find use in various technological applications.

Keywords: Thin Films, Doping, PVD, CVD, Optical properties, Electrical properties

OP-ESC-30

STUDY OF ZnO-BASED THIN FILMS: OPTICAL, ELECTRICAL, AND STRUCTURAL PROPERTIES FOR OPTOELECTRONIC APPLICATIONS

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ABSTRACT

Zinc oxide (ZnO)-based thin films have emerged as promising materials for optoelectronic devices due to their tunable optical, electrical, and structural properties. This review provides a detailed analysis of ZnO based thin films, focusing on their synthesis, characterization, and potential applications. Deposition methods such as sputtering, pulsed laser deposition (PLD), and sol-gel techniques have been employed, yielding films with thicknesses ranging from 100 nm to 500 nm. Optical studies reveal that ZnO thin films exhibit high transparency (above 85%) in the visible range, with a slight blue shift in the absorption edge, while the bandgap widens to approximately 3.45 eV compared to pure ZnO (~3.37 eV). ZnO films show improved UV absorption with a bandgap slightly reduced to 3.30 eV due to Cu incorporation.

Electrically, ZnO thin films demonstrate significant improvements in conductivity, with resistivity values as low as 1.2 x 10^{-3} Ω·cm, attributed to Al's role as a donor dopant. On the other hand, ZnO films exhibit resistivity in the range of 10^{-2} Ω·cm, offering a balance between conductivity and transparency, making them suitable for transparent conductive oxide (TCO) applications. These enhancements in optical, electrical, and structural properties make ZnO-based thin films attractive for applications in solar cells, transparent electrodes, and UV detectors.

Keywords: Thin film, Optical, Electrical, Structural properties, Optoelectronic devices

OP-ESC-31

MgO-BASED THIN FILMS: A REVIEW ON STRUCTURAL AND OPTICAL PROPERTIES FOR OPTICAL DEVICE APPLICATIONS

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ABSTRACT

MgO-based thin films have emerged attention as valuable materials for optical devices, owing to their distinctive structural and optical features, such as high transparency and a wide bandgap. This review focuses on recent research in the deposition methods, characterization, and applications of MgO based thin films in optical technology. Techniques like sputtering, sol-gel, and chemical vapor deposition (CVD) have been utilized to create films with uniform thicknesses, generally between 100 nm and 500 nm, and smooth surface profiles. MgO-based thin films demonstrate over 80% optical transparency in the visible range (300-800 nm), while their bandgap varies between 4.12 eV and 7.3 eV, influenced by factors like deposition conditions and film thickness. X-ray diffraction (XRD) results indicate that MgO thin films predominantly exhibit a cubic crystal structure with a preferred (200) orientation. This review emphasizes how doping MgO with elements such as Al, Zn, and Ti can modify its properties. The adaptability of these thin films enhances their potential use in devices like lasers, photodetectors, and light-emitting diodes (LEDs), indicating promising future advancements in optical device applications.

Keywords: Thin Film, Optical property, Structural property, Optical devices

OP-ESC-32

STUDY ON MIXED METAL OXIDE THIN FILMS: SYNTHESIS, PROPERTIES, AND APPLICATIONS

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ABSTRACT

Titanium dioxide (TiO2)-based mixed metal oxide thin films have garnered significant attention in recent years due to their versatile optical, electronic, and catalytic properties. This review presents a comprehensive study of the synthesis techniques, properties, and diverse applications of TiO2-based mixed metal oxide thin films. Various deposition methods, including sol-gel, chemical vapor deposition, and pulsed laser deposition, are explored, with each technique offering distinct advantages in terms of film quality and structural control. Key properties such as high refractive index (~2.4), wide bandgap (3.0-3.2 eV), and strong UV absorption make TiO2-based thin films ideal for optical applications. The incorporation of secondary metal oxides (e.g., ZnO, SnO2, and Al2O3) into TiO2 matrices has been shown to enhance electrical conductivity by up to 25%, improve photocatalytic efficiency by nearly 30%, and expand the bandgap tunability up to 3.6 eV. The study concludes that TiO2-based mixed metal oxide thin films demonstrate promising optical properties and can be tailored for a range of applications, including photocatalysis, sensors, and optical coatings.

Keywords: Mixed metal oxide, Doping, Optical bandgap, preparation methods

OP-ESC-33

COMPUTATIONAL INVESTIGATION OF TUNING THE CATALYTIC TRANSFER OF H_2 AS H^-/H^+ ON MOS_2 SURFACE

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ABSTRACT

In this study, we theoretically explored a unique process by which a sulfur-vacant MoS_2 surface can induce polarization of H_2 molecules, facilitating their transfer as H^-/H^+ and potentially enabling the MoS_2 material to function as a dual redox catalyst. Using density functional theory (DFT) with most reliable Perdew-Burke-Ernzerhof (PBE0) functional and the well-balanced def2-TZVP basis set. We investigated how varying the levels of sulfur vacancies induce the polarization of H_2 molecules. Our findings reveal that when the number of sulfur vacancies increases, the ability of MoS_2 to polarize H_2 molecules also increases, as measured by the electron density difference. The MoS_2 surface with a single sulfur vacancy demonstrated a marked enhancement in hydride transfer compared to pristine MoS_2 and two sulfur-vacant MoS_2 surfaces. This suggests that the introduction of a single vacancy optimizes the electron density around the active sites, thereby facilitating a better H^- transfer. However, when three sulfur vacancies were introduced, the catalytic behaviour of the material shifted, favouring proton over hydride transfer. This indicates that the dual functionality of sulfurvacant MoS_2 surfaces, whether dominated by hydride or proton transfer, depends on the number of sulfur vacancies. This knowledge enhances our understanding of how manipulating vacancies in MoS_2 can modify its catalytic characteristics for hydrogen-related processes.

Keywords: DFT Study; Sulfur vacancy; Electron density; Catalytic transfer.

OP-ESC-34

FABRICATION OF SMART WEARABLE TRIBOELECTRIC SENSOR TO DEVELOP INTELLIGENT TELEMETRY SYSTEM FOR GERIATRICS

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ABSTRACT

A smart wearable Triboelectric sensor (SWTS) based on dual-channel triboelectric nanogenerator is to be fabricated to develop an intelligent health monitoring system for geriatrics. Geriatrics refers to medical care for older adults The SWTS can be worn on wrists, ankles, shoes, or other parts of the body and cloth, converting mechanical triggers into electrical output. By analyzing these signals, the SWTS can precisely and constantly monitor and distinguish various motion states, including stepping, walking, running, and jumping. Based on the SWTS, a fall-down alarm system and a sleep quality assessment system for geriatric is proposed to provide personal healthcare monitoring and alert family members or doctors via communication devices. It is important for the health monitoring and medical care of the geriatric and recovered patients. Wearable devices play a great role in the acquisition and analysis of health information in recent years. It is an effective method for early detection, early diagnosis, and early treatment of diseases. For example, long-term monitoring of body signs such as electrocardiogram, heart sounds, blood pressure, and pulse is considered in the diagnosis and analysis of cardiovascular diseases .However, the electricity required for wearable devices is mainly generated by traditional electrochemical batteries. They not only make wearable sensors bulky and uncomfortable to wear, but also requires frequent charging or regular replacement. As an energy harvester device, triboelectric nanogenerator (TENG) based on a coupling effect of triboelectrification and electrostatic induction was proved to be very effective to precisely convert mechanical energy (especially low frequency) in the environment into electricity.

Keywords: Smart wearable Triboelectric Sensor, Triboelectric Nanogenerator , Telemetry , Geriatrics.

OP-ESC-35

ENHANCED ELECTROCHEMICAL ENERGY STORAGE USING A

SYNERGISTIC COMPOSITE OF UzMWCNT/$NiFe_2O_4$/PANI

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ABSTRACT

This study presents the synthesis and characterization of unzipped multiwalled carbon nanotubes/Nickel Ferrite/Polyaniline (UzMWCNT/$NiFe_2O_4$/PANI) ternary hybrid composite. The two-stage synthesis process involves, converting multiwalled carbon nanotubes (MWCNTs) to oxidized MWCNTs using a modified Hummers method, followed by a Hydrothermal method. The resulting ternary composite was extensively characterized using XRD, IR, Raman spectroscopy, SEM, and TEM analysis. The ternary composite's potential for environmental and energy applications, particularly as a supercapacitor, was evaluated through electrochemical performance tests including cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS). The GCD analysis shows that the UzMWCNT/$NiFe_2O_4$/PANI composite exhibits a specific capacitance of 910 Fg^{-1} at 1 Ag^{-1} of current density, retaining 78% of its initial capacitance after executing 2000 cycles. A symmetric supercapacitor was also constructed using UzMWCNT/$NiFe_2O_4$/PANI composite material as the electrode, with results consistently supporting its promising electrochemical properties.

Keywords: UzMWCNT; Polymer; Supercapacitor; hybrid material

OP-ESC- 36

HARNESSING ENERGY FROM LOW-FREQUENCY AND LOW-AMPLITUDE VIBRATING SOURCES USING TRIBOELECTRIC NANO GENERATOR

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ABSTRACT

The ability to transform mechanical energy into electrical power is an innovative feature of Dielectric Elastomer Generators (DEGs) that have emerged as promising electromechanical devices for harvesting energy from unexpected sources. DEGs are different from conventional energy harvesting techniques in that they are compact, have an easy-to-fabricate structure, and are devoid of any revolving parts. One self-powered subclass of DEGs that excels in extracting energy from low-frequency and low-amplitude mechanical sources is the triboelectric nanogenerator (TENG). Nevertheless, many of the current models that forecast TENG performance make constant assumptions about variables like relative permittivity, amplitude, and frequency that can change according on the application. In order to fully examine the performance of TENGs in practical circumstances, this work presents a modified model that accounts for variations in amplitude, frequency, and the relative permittivity of the layers of elastomer. The results indicate that increasing the frequency to 65 Hz leads to a notable rise in the output voltage, as a result of the higher energy release rate from the increased velocity. The study emphasizes the significance of the relative permittivity of TENG layers, demonstrating that elastomers with higher dielectric constants yield 95% increase in voltage and power compared to those with lower constants, particularly at a separation distance of 0.2mm. These conclusions align with previous research and offer a valuable foundation for researchers seeking to enhance energy generators for improved performance and accuracy in capturing energy from low-frequency and low-amplitude sources.

Keywords: Non-conventional energy; Green energy; Triboelectric nanogenerator; dielectric elastomers.

OP-ESC-37

ELECTROCATALYSTS FOR EFFICIENT HYDROGEN GENERATION IN HYBRID ELECTROLYSIS

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ABSTRACT

Efficient and cost-effective electrocatalysts are essential for advancing water electrolysis, a promising method for producing sustainable hydrogen. This study presents the synthesis and characterization of nickel-molybdenum-based electrocatalysts prepared via a hydrothermal method. The resulting materials exhibit a crystalline nano-bar morphology, providing a high surface area for enhanced catalytic activity. To optimize performance, we investigated the effects of urea and ethanol additives on the electrocatalytic properties of these materials. Our findings demonstrate that both additives significantly reduce overpotentials and improve the overall efficiency of water splitting. Additionally, urea and ethanol electrolysis produce valuable byproducts, further enhancing the economic viability of the process. The synthesized NiMo-based electrocatalysts exhibit superior activity for both the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) in an alkaline environment. These results highlight the potential of NiMo-based materials for efficient water electrolysis, contributing to a sustainable energy future.

Keywords: Hydrogen evolution reaction; Oxygen evolution reaction; Hybrid water electrolysis.

OP-ESC-38

PVP ASSISTED MN BASED PRUSSIAN BLUE ANALOGUES FOR AQUEOUS Zn ION BATTERIES

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ABSTRACT

Manganese-based Prussian blue analogs (Mn-PBAs) have gained significant attention as promising cathode materials for aqueous zinc-ion batteries (AZIBs) due to their high specific capacity and favorable operating potential. However, Mn-PBAs faces challenges such as excessive water content in its crystal structure and structural distortion from ion intercalation and the Jahn-Teller effect, which limits its energy density and cycling stability. In this study, a polyvinylpyrrolidone (PVP)-assisted synthesis method was employed to create Mn-Co-PBA and Mn-Fe-PBA using a simple hydrothermal approach. Mn-Co-PBA exhibited a distinctive cubic frame-like structure with a large surface area and reduced zeolitic water content in the lattice. Meanwhile, PVP enhanced the structural rigidity of Mn-Fe-PBA, helping to mitigate Jahn-Teller distortions and improve stability during Zn^{2+} ion insertion and extraction. As a result, Mn-Co-PBA||Zn and Mn-Fe-PBA||Zn cells achieved specific capacities of 95 mAh g^{-1} and 117 mAh g^{-1} at 1 A g^{-1}, respectively, along with good cycling stability. These structures facilitated more Zn diffusion pathways and reduced structural strain during Zn^{2+} ion intercalation and deintercalation. Ex-situ XRD analysis confirmed that the Zn^{2+} ion insertion/extraction process in both Mn-Co-PBA and Mn-Fe-PBA was highly reversible. These findings demonstrate that Mn-PBAs have significant potential for enhancing AZIBs and advancing sustainable battery technology.

Keywords: Prussian blue analogues; Zn battery; Cathode.

OP-ESC-39

FLUORESCENT SCHIFF BASE SENSOR FOR SELECTIVE DETECTION OF Co(II):APPLICATION IN REAL SAMPLE ANALYSIS.

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ABSTRACT

In this study, we designed and synthesized a novel and highly selective fluorescent optical sensor, N'1– ((E)-3,5-dibromo-2 hydroxybenzylidene) - N'6- ((Z)-3,5-dibromo-2-hydroxybenzylidene) adipohydrazid, via a condensation reaction in the presence of ethanol. The sensor was developed for rapid detection of Co^{2+} in an ethanol medium through a charge transfer mechanism . The stoichiometry of the complexation was determined to be 1:1 using Job's plot analysis. This work highlights the development of an ESIPT (excited-state intramolecular proton transfer) active fluorescent probe, which generates fluorescence through ESIPT and a combination of fluorescence mechanisms such as aggregation-induced emission (AIE) and ESIPT . Due to keto-enol tautomerism, the fluorophore exhibits fluorescence in both solution and solid states. The sensing mechanism was validated through experimental calculations. Importantly, the sensor demonstrated high selectivity towards Co^{2+}.

Keywords: ESIPT /AIE, fluorescence sensing,Cobalt selectivity, Cytotoxicity studies

OP-ESC-40

DIFFUSION LIMITED AGGREGATION OF POLYMERS WITH ANISOTROPIC INTERACTIONS AND PHASE TRANSITION

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ABSTRACT

We model polymers with anisotropic sites on a square lattice, consisting of head monomers that are hydrophobic (labelled as A) and neutral tail monomers (labelled as B). Our study focuses on diffusion-limited aggregation through on-lattice simulations involving polymers with anisotropic interactions. In this work, we consider four different types of copolymers with aspect ratio, a = 4: ABBB, AABB, BAAB, and ABBA and also varied the number hydrophobic monomer, A from 1.0 to 3. 0. We found that grafted polymers, specifically ABBB, undergo aggregation in solution and form micellar-like structures, in contrast to polymers with isotropic interactions. However, this system leads to an 'absorbing state,' similar to phenomena observed in non-equilibrium phase transitions. Additionally, we observed that the growth rate of clusters is higher in di-block AABB copolymers compared to triblock BAAB copolymers. Interestingly, the ABBA type copolymer exhibits a constant growth rate and reaches an 'active' state. We also show that the number of particle depositions increases as the proportion of hydrophobic head monomers increases. Our study is relevant for understanding the aggregation of anisotropically interacting polymers under nonequilibrium conditions.

Keywords: DLA; Polymers; Monte Carlo simulation; Absorbing state.

OP-ESC-41

SOLVOTHERMAL SYNTHESIS OF FLUORINE (F) AND NITROGEN (N) CO-DOPED TiO_2 NANOSTRUCTURES AND ITS PERFORMANCE AS ELECTRON TRANSPORT LAYER (ETL) IN DYE-SENSITIZED AND PEROVSKITE SOLAR CELLS

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ABSTRACT

Abstract

The electron transport layer (ETL) plays a critical role in dye-sensitized solar cells (DSSC) and perovskite solar cells (PSC) by facilitating the transport of photo-generated electrons to the external circuit. The selection of a suitable ETL is essential for achieving high power conversion efficiencies. In this study, fluorine (F) and nitrogen (N) co-doped TiO_2 nanostructures were synthesized using a simple solvothermal method. The structural properties of the nanostructures were investigated through X-ray diffraction (XRD) and Raman spectroscopy, confirming the anatase phase. Field-emission scanning electron microscopy (FE-SEM) revealed morphology variations dependent on preparation conditions. The optical properties were analyzed through UV-Vis absorption and photoluminescence (PL) spectroscopy. The nanostructures exhibited absorption in the UV region, consistent with their wide-bandgap nature. PL spectra showed defect-related emissions, highlighting intrinsic material defects. The synthesized nanomaterials were processed into a paste and coated onto fluorine-doped tin oxide (FTO) glass substrates using the doctor blade method, followed by annealing at 450°C for two hours. The annealed films were sensitized with N19 dye and integrated into DSSC devices. Their photovoltaic performance was evaluated under standard 1 Sun (1000 W/m²) illumination. Additionally, the co-doped TiO_2 nanostructures were utilized as the ETL in perovskite solar cells. The study provides insights into the potential of F and N co-doped TiO_2 as a multifunctional ETL for advanced solar cell architectures.

Keywords: DSSC; Perovskite solar cells; TiO_2 nanostructures; photoanodes.

OP-ESC-42

COMPUTATIONAL ANALYSIS OF STRUCTRAL AND ENERGETIC ASPECTS IN SUPERCAPACITOR VIA MOLECULAR DYNAMICS SIMULATION

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Abstract.

Two-dimensional carbon materials, such as graphene, have gained significant attention in energy storage applications due to their unique physical, chemical, and electronic properties. Among these, graphene stands out for its high surface area, excellent electronic conductivity, and mechanical strength, making it a prime candidate for supercapacitor electrodes. On the other hand, biocompatible ionic liquids (ILs), like those formed by choline and glycine, are being increasingly studied as environmentally friendly alternatives due to their lower toxicity. This work utilized molecular dynamics simulations to investigate the properties of electrolytes based on aqueous mixtures of the biodegradable IL [Ch][Gly] in graphene supercapacitors. Through energetic, structural, and electrostatic analyses, the formation and behavior of the Electric Double Layer (EDL) near the graphene electrodes were thoroughly examined. The study found that while the structure and formation of the EDL are influenced by a complex interplay of electrostatic and van der Waals (vdW) interactions, the interaction with the graphene electrode is predominantly governed by vdW forces. The results indicate that choline-based electrolytes can perform comparably to conventional ILs, with the added benefit of being less toxic. A detailed analysis of the energy and organization of electric charges in the system confirmed the effective performance of the graphene electrode in conjunction with the [Ch][Gly] IL, highlighting its potential in sustainable energy storage solutions.

OP-ESC-43

INVESTIGATION ON CYCLOHEXYL AMMONIUM HYDROGEN TARTRATE HEMIHYDRATE SINGLE CRYSTAL FOR NONLINEAR OPTICAL APPLICATIONS

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Abstract

A novel Cyclohexyl ammonium Hydrogen Tartrate Hemihydrate Single Crystal (CYHTH) single crystals were grown by solvent evaporation technique with distilled water as solvent. The CYHTH was in monoclinic crystal system with space group C2/c and its structure consists of a unique cyclohexylamine and an independent benzoic acid molecule with all atoms placed in general positions. The final cell constants values are a = 24.109(2) Å, b = 5.5157(4) Å, c = 18.6739(14) Å, β = 110.807(3) °, volume = 2321.2(3) Å. The grown CYHTH crystal was subjected to various characterization studies like UV-Vis-NIR spectral analysis, TG/DTA analyses, CHN analysis, third order nonlinear optical properties and etching. From the UV-Vis-NIR studies it is found that the cut off wavelength of CYHTH is 352 nm and CYHTH single crystal shows good transparency in the entire visible region. Nonlinear optical parameters were calculated using Z scan technique. The nonlinear response $\chi 3 = 4.09 \times 10^{-6}$ esu was found which is suitable for optical applications.

OP-ESC-44

SINGLE WALLED CARBON NANOTUBES DOPED LIQUID CRYSTAL FOR LOW POWER CONSUMPTION

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Abstract

Objectives: Design of a LC nanocomposite for display applications with low power consumption and improved dielectric properties.

Materials and Methods: The LC was dissolved in dichloromethane (1ml). Single Walled Carbon Nanotubes (SWCNT) were mixed with 1 ml chloroform followed by ultrasonication for 30 minutes. For doping, the SWCNT solution was mixed with LC solution and the resulting mixture was ultrasonicated for 4 hours followed by complete evaporation of solvents [7]. The designed LC nanocomposites were investigated using polarizing optical microscopy, dielectric spectroscopy and photoluminescence study.

Results: A remarkable reduction in threshold voltage for Freedericksz transition is recorded for doped LC. It was found that a minute concentration of SWCNT is sufficient to reduce the threshold voltage effectively that of undoped BPLC. The strong interaction between the guest SWCNT and host LC molecules lead towards better result in frequency dependent dielectric behaviour, with considerable enhancement in the value of dielectric permittivity and dielectric anisotropy along with a decrease in dielectric loss in low frequency region. An enhancement in photoluminescence intensity after doping with SWCNT is another good feature acquired by LC.

Conclusion: The present results pave way for developing LC displays with low cost and minimum power consumption.

Keywords: Threshold voltage, Freedericksz transition.

OP-ESC-45

Synthesis of Copper Iodide from Cabbage Extract as a Hole Transport Material for Lead Halide ($CH_3NH_3PbI_3$) Perovskite Solar Cells

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ABSTRACT

Organic, inorganic ABX_3 perovskite materials plays a crucial role in recent energy conversion research since it started in 2009 (~3.1%) by Miyasaka and his group. The highest Power Conversion Efficiency (PCE) and cost effective processing techniques turned it as unavoidable replacement for Silicon solar cells. Methylammonium Lead Iodide ($CH_3NH_3PbI_3$) absorbing material is the mostly optimized composition which gives better PCE upto ~25.6%. However, polymer based hole transport material increase the device manufacturing cost. Therefore, researchers focusing on cost effective hole transport materials such as carbon, and copper based compounds. Here, we synthesized copper iodide (Cu_2I) nanoparticles by red cabbage extract. Structural, optical and morphological analysis confirmed that the synthesized Cu_2I nanoparticles have similar structural, optical and morphological properties of commercial Cu_2I. Finally, methylammonium lead iodide perovskite solar cells were fabricated using synthesized Cu_2I as HTM and its photovoltaic properties were measured by using Keithely source meter.

OP-ESC-46

Boosting Oxygen Transfer in Pt-Sn Alloy Catalysts with $NiTiO_3$ Support for Methanol Oxidation in Alkaline Medium

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Abstract

Pt-based electrocatalysts have garnered significant attention for their superior electrochemical properties, particularly when combined with tin (Sn) to form Pt-Sn nanoalloys. This study builds on the enhanced catalytic performance of Pt-Sn alloys, aiming to develop an efficient electrocatalyst for methanol oxidation. Using a microwave-assisted polyol method, $Pt_{1-x}Sn_x$ nanoalloys were synthesized and supported on nickel titanate ($NiTiO_3$), forming the $Pt_{1-x}Sn_x$-$NiTiO_3$ catalyst. Structural and compositional analyses of the electrocatalyst were conducted using X-ray diffraction (XRD), UV-visible spectroscopy, Raman spectroscopy, and transmission electron microscopy (TEM), with X-ray photoelectron spectroscopy (XPS) further confirming the bimetallic Pt-Sn alloy formation. Charge transfer between Pt and Sn was observed, influencing the alloy's valence states and promoting catalytic activity. $NiTiO_3$ served as a robust support material, providing redox-active sites through its Ti^{2+}/Ti^{4+} and Ni^{2+}/Ni^{3+} oxidation states, which are stabilized by surface oxygen species. This unique electronic environment enhanced charge transfer from $NiTiO_3$ to the Pt-Sn alloy, accelerating the methanol oxidation reaction. Electrochemical performance assessments, including cyclic voltammetry and chronoamperometry, revealed that $Pt_{1-x}Sn_x$-$NiTiO_3$ achieved a high current density, demonstrating high stability in acidic conditions. This electrocatalyst's robust support, combined with its resistance to CO poisoning due to active surface oxygen, positions $Pt_{1-x}Sn_x$-$NiTiO_3$ as a promising candidate for efficient methanol oxidation in fuel cell applications.

.

Keywords: Electrocatalyst; Methanol oxidation; Active support; Pt1-xSnx -$NiTiO_3$/C

PP-ESC-01

ANTHRACENE BASED AGGREGATION INDUCED EMISSIVE PROBE FOR HYDROXYLAMINE DETECTION AND LATENT FINGERPRINT IMAGING

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Aggregation-induced emission (AIE) has emerged as a promising photophysical phenomenon for the development of functional luminescent materials, particularly in systems where conventional fluorophores suffer from aggregation-caused quenching (ACQ). In this work, we explore an anthracene-based derivative which exhibits AIE characteristics. The probe was characterized for its strong fluorescence behavior in the aggregated state using steady-state and time-resolved spectroscopic methods and microscopic techniques like SEM and TEM. The utility of the AIE-active probe was successfully demonstrated into two key applications. First, it was employed as a highly sensitive and selective probe for hydroxylamine (HA) detection. Upon binding to HA, the probe undergoes a notable fluorescence enhancement with a blue shift due to specific interactions, with a detection limit of 541 nM, showcasing excellent sensitivity and selectivity over other interfering analytes. Secondly, the AIE characteristics was applied in the imaging of latent fingerprints (LFPs) for forensic investigations. The probe provided high-contrast and durable imaging of latent fingerprints, allowing for clear visualization of ridge details on non-porous glass surface. This dual application of the anthracene derivative highlights the versatility of AIE materials and offering a powerful platform for both sensor and forensic applications.

PP-ESC-02

Synthesis and Electrochemical Characterization of Nanocomposite material (3D $MnNi_2S_4$-MOF-67@rGO) for high performance electrodes for Supercapacitors

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ABSTRACT

The present research work focuses on the synthesis and characterization of a novel composite material, 3D $MnNi_2S_4$-MOF-67@rGO for high-performance supercapacitor applications. The composite was synthesized using a simple hydrothermal method followed by a solvothermal process, which resulted in the successful integration of $MnNi_2S_4$, MOF-ZIF-67, and reduced graphene oxide (rGO) into a single material. The improved electrochemical performance is attributed to the synergistic effect of the high conductivity of rGO, the porous structure of MOF-ZIF-67, and the high specific surface area and electrochemical activity of $MnNi_2S_4$. These results suggest that the 3D $MnNi_2S_4$-MOF-67@rGO composite is a promising material for high-performance supercapacitor applications.

Keywords: $MnNi_2S_4$-MOF-ZIF-67, reduced Graphene oxide, nanocomposite material and supercapacitor applications, hydrothermal method

PP-ESC-03

MOLECULAR DYNAMICS SIMULATION OF H_2 RECEPTOR BLOCKERS FAMOTIDINE AND NIZATIDINE WITH GOLD AND PLATINUM NANOPARTICLES FOR TARGETED DRUG DELIVERY

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ABSTRACT

Targeted drug delivery systems employing nanoparticles have shown significant promise in enhancing the efficacy and bioavailability of therapeutic agents. In this study, molecular dynamics simulations were conducted to explore the interactions between H2 receptor blockers, specifically famotidine and nizatidine, with gold and platinum nanoparticles. Utilizing the GROMACS package, key parameters including root mean square deviation (RMSD), radius of gyration, solvent-accessible surface area (SASA), interaction energy, and radial distribution functions (RDF) were analysed to evaluate the stability and binding efficiency of drug-nanoparticle conjugates. Results revealed stable drug-nanoparticle assemblies, with notable differences in interaction energies and binding affinities between the two drug molecules on gold versus platinum surfaces. Additionally, principal component analysis and free energy landscape calculations provided insight into the preferred binding conformations, supporting the potential of these conjugates in achieving enhanced drug stability and sustained release. This work advances our understanding of nanoparticle-mediated drug delivery mechanisms, paving the way for optimized nanomaterial-based therapies in gastrointestinal and related disorders.

Keywords: Molecular dynamics simulation, Famotidine, Nizatidine, Nanoparticles.

PP-ESC-04

CdS NANOSTRUCTURES, AN EXCITING CANDIDATE FOR OPTO-ELECTRONICS

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ABSTRACT

Semiconductor nanostructures hold tremendous potential for studying the impact of size and dimensionality on material properties, enabling innovations in nanoscale electronic and optoelectronic devices. Cadmium sulfide (CdS), a prominent II–VI group semiconductor, has gained considerable scientific and industrial interest due to its distinctive and unique electronic and optical characteristics. These properties make CdS an exciting candidate for high-performance applications in the field of promising optoelectronic devices, electrochemical cells, biological labelling, e.t.c. This poster presents a detailed review of recent progress on CdS nanostructures, covering advancements in synthesis, exploration of unique properties, and their integration into diverse applications (e.g. photoluminescence, photocatalysis, laser systems, waveguides, solar cells, and photodetectors, e.t.c) highlighting their significant role in advancing nanotechnology.

PP-ESC-05

SYNTHESIS AND CHARACTERIZATION OF POLY ANILINE, POLY PARA-AMINO BENZOIC ACID AND POLY VINYL PYRROLIDONE BASED BLEND POLYMER ELECTROLYTE AND ITS ELECTROCHEMICAL APPLICATIONS

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ABSTRACT

A novel solid polymer electrolyte based on polyvinyl pyrrolidone (PVP), poly aniline, and blend with a poly p-amino benzoic acid (PPA), have been synthesised by solution casting method by using the solvent dimethyl formamide (DMF). PPA and PANI were synthesised from its monomer by oxidation polymerisation method using potassium per sulphate in an acidic medium. IR spectral analysis confirms the formation of PPA and PANI from the monomer and also proves the blend polymerisation. Structural characterisation of thin films has been done by UV, FTIR, XRD, and SEM with EDX spectroscopy, which confirms the complex formation and blending nature of these polymers effectively. Electrochemical studies have been done by using AC impedance analysis and it was shows that the PVP: PPA and PANI had the maximum conductivity and function as a suitable blend polymer electrolyte in battery applications. The relaxation time and dielectric property of the electrolyte also proves the same. 75 mol% of (PVP: PPA) and 25 mol% of PANI in DMF system possesses highest conductivity 1.52 x 10^{-4} S/cm and also possess low relaxation time.

Keywords: Impedance, Relaxation time, Poly aniline, Poly para – amino benzoic acid, Poly vinyl pyrrolidone, dielectric property, Blend polymer electrolyte.

PP-ESC-06

PREPARATION, CHARACTERIZATION & DC ELECTRICAL CONDUCTIVITY PROPERTIES OF $xBaWO_4/ (1-x) CaWO_4$ NANOCOMPOSITES

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Abstract:

$xBaWO_4/(1-x)CaWO_4$ nanocomposites were prepared by co-precipitation method by first time. Structural characterization was confirmed by XRD, FTIR, SEM, EDS and HRTEM images. HRTEM images confirm the interface formation in C2 ($0.5BaWO_4/ 0.5CaWO_4$) nanocomposites. Room temperature (RT) study on DC electrical conductivity properties of $xBaWO_4/(1-x)CaWO_4$ nanocomposites are reported here first time. In the present study non-linear current density J

(A/cm^2) – electric field E (V/cm) characteristics of prepared $xBaWO_4/(1-x)CaWO_4$ nanocomposites were studied to evaluate their electrical properties including breakdown voltage, non-linearity coefficient and grain boundary resistance for determining varistor properties. This non-linearity of current density J (A/cm^2)–versus electric field E (V/cm) characteristics arises for the $xBaWO_4/ (1-x) CaWO_4$ nanocomposites due to the presence of insulating layer between the grain boundaries except C2 ($0.5BaWO_4/0.5CaWO_4$) nanocomposite. The DC conductivity at room temperature (RT) from 8Volts or (27.5 Volts/cm) onwards is found to be maximum for C2 ($0.5BaWO_4/ 0.5CaWO_4$) nanocomposite and is approximately 40times ($\sigma = 1.11x10^{-5}\ \Omega^{-1}\ cm^{-1}$) greater than that of C0($\sigma = 2.76x10^{-7}\ \Omega^{-1}\ cm^{-1}$) and 1008 times greater than that of C4 ($BaWO_4$) [$\sigma = 0.11x10^{-7}\Omega^{-1}\ cm^{-1}$] single phase samples respectively. It is observed that the non-linear coefficient alpha (α) for nanocomposites are less than the single phase C4 ($BaWO_4$) and C0 ($CaWO_4$) samples and is maximum for C4 ($BaWO_4$) sample. The calculated non-linearity coefficient alpha (α) values lie in the range of 3.44 to 4.70 for the samples. The space charge layer (SCL) formation is suitable mechanism to explain high conductivity and lower nonlinearity in the C2 ($0.5BaWO_4/0.5CaWO_4$) nanocomposite. C2 ($0.5BaWO_4/0.5CaWO_4$) nanocomposites with optimized atomic ratio (Ba/Ca=1) may be considered as an efficient multifunctional material because of its enhanced electrical properties (DC conductivity) at room temperature (RT).

Keywords: room temperature; space charge layer; non-linear coefficient; electrical properties

PP-ESC-07

EXPLORING STRUCTURAL AND OPTICAL PROPERTIES OF TIO_2 BASED THIN FILMS FOR ADVANCED OPTICAL DEVICES: A SHORT REVIEW

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ABSTRACT

This review provides an overview of recent progress in the synthesis, structural characterization, and optical properties of TiO_2 based thin films, emphasizing their applications in optical technologies. Various deposition techniques, including sol-gel, pulsed laser deposition (PLD), and magnetron sputtering, have produced films. TiO_2 based thin films exhibit excellent transparency, with transmission values exceeding 90% in the visible range (400–700 nm). Their refractive index ranges from 2.4 to 2.8, depending on factors such as film thickness and deposition parameters, making them suitable for anti-reflective coatings and waveguides. The optical bandgap of TiO_2 thin films is typically measured between 3.0 eV and 3.2 eV, making them ideal for ultraviolet (UV) optical devices. Structurally, X-ray diffraction (XRD) studies show that TiO_2 thin films can crystallize in anatase or rutile phases. The review also discusses the potential for enhancing the properties of TiO_2 based thin films through doping with elements like Zn, Cu, Ni, Fe etc. which can improve conductivity and adjust optical performance. These advancements suggest significant potential for TiO_2-based thin films in future optical device innovations.

Keywords: TiO_2 thin films, Doping, Optical properties, Structural characterization.

PP-ESC-08

ECO-FRIENDLY SYNTHESIS OF FLUORESCENT CARBON DOTS FROM MUSHROOM FOR SENSING APPLICATIONS

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ABSTRACT

Carbon dots (CDs) derived from natural sources has gained significant attention due to their eco-friendly synthesis, biocompatibility, photoluminescence, tuneable optical properties and versatile applications. In this study, a novel fluorescent carbon dots (MCDs) is synthesized from mushroom by a simple one pot hydrothermal method. The synthesized MCDs are completely characterized by using various spectroscopic and microscopic techniques. The UV-Vis spectrum displayed a prominent absorption peak in the range of 280 nm and around 340 nm are typically attributed to π □ π* and *n*-π* transitions respectively, indicating the successful formation of MCDs. Infrared spectroscopy confirmed the presence of surface functional groups such as hydroxyl (□OH), C□H stretching, carboxyl (□COOH) and amine (□NH_2) groups, which contribute to their hydrophilicity and stability in aqueous media. The SEM images revealed quasi-spherical nanoparticles with uniform size distribution of 15-20 nm and the EDAS analysis expose that MCDs is mainly consist of Carbon (61%), Nitrogen (10%) and Oxygen (21%), which demonstrates that MCDs are made up of an oxygenous carbon structure. The derived carbon dots exhibits excitation-dependent emission property with the quantum yield of 2%. The unique optical properties of the synthesized MCDs make them suitable candidates for fluorescent based chemo/bio-sensing applications.

Keywords: Carbon Dots (MCDs), Green Synthesis, SEM, Quantum yield, fluorescent sensors

PP-ESC-09

ENHANCED OPTICAL AND MAGNETIC PROPERTIES OF ZnO-Ag NANOCOMPOSITES SYNTHESIZED VIA SOL-GEL METHOD: A PROMISING MATERIAL FOR OPTOELECTRONICS AND SPINTRONICS

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Abstract

This study investigates the synthesis and characterization of ZnO-Ag nanocomposites using the sol-gel method. Zinc oxide (ZnO) is known for its unique optical properties, and silver (Ag) has been explored for its potential to enhance these properties in nanocomposites. ZnO-Ag nanocomposites were synthesized by mixing zinc chloride ($ZnCl_2$), silver nitrate ($AgNO_3$), and sodium hydroxide (NaOH), followed by calcination at 500°C. The resulting nanocomposites were subjected to various characterization techniques, including X-ray diffraction (XRD), UV-Vis spectroscopy, scanning electron microscopy (SEM), energy-dispersive spectroscopy (EDS), transmission electron microscopy (TEM), and X-ray photoelectron spectroscopy (XPS).

The XRD analysis confirmed the wurtzite hexagonal phase of ZnO, with silver incorporation indicated by distinct peaks corresponding to face-centered cubic (FCC) Ag. The crystallite sizes were found to range from 16 to 38 nm. UV-Vis spectra revealed a redshift in the absorption peak due to Ag doping, reducing the bandgap energy from 3.48 eV to 2.70 eV. This redshift was attributed to the strong interaction between ZnO and Ag, which alters the electronic band structure. SEM and TEM analyses demonstrated that the nanocomposites had uniform spherical morphology and porosity reduction, suggesting tighter packing due to Ag incorporation.

Magnetic measurements showed enhanced ferromagnetism in the Ag-doped ZnO samples, likely due to exchange interactions between Ag ions and ZnO's conductive electrons. Raman spectra indicated the presence of oxygen vacancies and zinc interstitials, further confirming structural modifications caused by Ag doping. The study concludes that the ZnO-Ag nanocomposites exhibit improved optical, structural, and magnetic properties, making them suitable for various industrial applications, including dye-sensitized solar cells.

This study explores the synthesis and characterization of ZnO-Ag nanocomposites using the sol-gel method. XRD confirmed the wurtzite hexagonal structure of ZnO with silver incorporation, producing crystallite sizes between 16 and 38 nm. UV-Vis spectroscopy revealed a redshift in the absorption peak, reducing the bandgap from 3.48 eV to 2.70 eV, due to Ag doping. SEM and TEM analyses showed uniform spherical morphology and reduced porosity. Enhanced ferromagnetism was observed in Ag-doped samples, attributed to interactions between Ag ions and ZnO's conductive electrons. Raman spectra confirmed the presence of oxygen vacancies. The ZnO-Ag nanocomposites exhibit improved properties, making them suitable for applications in solar cells and optoelectronics.

PP-ESC-10

COBALT FERRITE-MESOPOROUS CARBON NANOCOMPOSITE; A BROADBAND MICROWAVE ABSORBER

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Nowadays, developing high-performance microwave absorbers with thin layer thickness, strong absorbing capabilities and broad frequency bandwidth is of immense importance for solving the electromagnetic pollution. Therefore, a variety of novel microwave absorbers have been developed, among which carbon-based materials have become one of the most promising alternatives, with low density, tunable electrical properties and high stability.

Herein, cobalt ferrite/mesoporous carbon nanocomposites were prepared via a facile hydrothermal method. Moreover, the influence of contents of mesoporous carbon (MC) on the electromagnetic parameters and microwave absorption properties of $CoFe_2O_4$/MC nanocomposites were systematically investigated in the K and Ka-band (18-40 GHz) frequencies. The structural analysis confirmed the pure phase formation of cobalt ferrite ($CoFe_2O_4$) nanoparticles and a strong interaction among $CoFe_2O_4$ and mesoporous-carbon. Mainly microwave absorbing capability depends on three factors, viz. dielectric loss, magnetic loss, and impedance matching characteristics. The effect of the mesoporous carbon on the magnetic properties of nanocomposite was investigated by VSM studies to justify the microwave absorption performance of different nanocomposites. Among various nanocomposites, $CoFe_2O_4$/MC-60 nanocomposite (MC-60 stands for 60 mg mesoporous-carbon in the nanocomposite) shows the excellent microwave absorbing performance with RL value of −51 dB at 2.5 mm thickness and effective absorption band-width of 4.2 GHz. Generally, too high permittivity is damaging for impedance matching, resulting in strong reflection as well as weak microwave absorption. Therefore, excess amount of mesoporous carbon in the nanocomposite exhibits a reduction in microwave absorption, which is consistent with our results [1]. This work is likely to advance the development of different types of magnetic/carbon absorber systems for advanced communication and military fields especially in very high frequency range.

OP-EN-01

FORMULATION AND EVALUATION OF TOPICAL CREAMS WITH THE EXTRACT OF FICUS RACEMOSA LINN

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ABSTRACT

Ficus Racemosa Linn found to be having medical uses to treat prostate cancer. Parts of the plant such as seed, leaves, flowers, fruits, roots have various medical purposes. The standar dization of fruits was carried out by powder analysis, chemical tests, fluorescence test. rom physiochemical test, water soluble extractive value of this plant was higher than alcohol soluble extractive value. The aims of the present study were to formulate topical creams containing Ficus Racemosa Linn extract and evaluate the in vitro anticancer activity of these extract in the formulations. In the research, there are three extracts used which include aqueous, hydroethanolic and hydromethanolic extract for this plant. These extract were used to formulate into 9 different topical creams with different concentration. It include aqueous 10%, 15% and 20% creams, hydromethanolic 10%, 15% and 20% creams, hydroethanolic 10%, 15% and 20% creams. The evaluation test such as appearance, pH, viscosity test, homogeneity, texture and phase separation were carried out for the creams. From the evaluation test, all formulated cream were said to be good in appearance, appropriate pH which found to be suitable for skin, no phase separation was observe, and formulation was easy to applied and slightly high viscous cream preparations. Standardization of the solvents by MTT assay showed that only extracted of fruit extract of significant profound effect on MCF7 cells. It can be concluded that fruit extract of Ficus Racemosa Linn have phytochemical potential. Moreover, identification of active phytoconstituents in the extract will pave a way for using this fruit as a natural cytotoxic agent various cancers.

OP-EN-02

A NOVEL HB-TiO_2 NANOPARTICLES FOR ENHANCED PHOTOCATALYTIC DEGRADATION OF PARACETAMOL UNDER IRRADIATION OF DIFFERENT LIGHT SOURCES

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ABSTRACT

The special qualities and prospective uses of nanoparticles in many kinds of sectors, including environmental restoration, have recently attracted more attention. The greatest pressing issue facing by our the environment currently is pollution. Both human existence and ecological balance is depend on water. Because of this, making sure that the water source is pure and uncontaminated is one of the main goals of sustainable development in the 21st century. The Greens route approach was successfully employed to synthesize a novel HB-TiO2 nanoparticle, which was then utilized as a photocatalyst using Fenton reagent to eliminate organic contaminants. The synthesized HB-TiO2 was investigated using Fourier-transform infrared (FTIR) spectroscopy, ultraviolet-visible spectroscopy (UV-Vis), photoluminescence (PL), and scanning electron microscopy/energy-dispersive X-ray spectroscopy (SEM/EDX). Degradation tests were carried out for different light sources to evaluate the activation of HB-TiO2 with fenton reagent, using paracetamol as a model pollutant. According to the results, the model pollutant was fully degraded in approximately 20 minutes, achieving a 100% degradation efficiency. It was suggested that the breakdown of pollutants is caused by the activation of the HB-TiO2-Fenton reagent. Moreover, the HB-TiO2 catalytic activity remained high even after five cycles, indicating that it could be utilized repeatedly. All of these findings point to the substance's efficiency as a catalyst in the decomposition of organic contaminants and its possible uses in environmental restoration.

Keywords: Environmental Sustainability, Diclofenac sodium, TiO_2, Advance oxidation process, Photocatalytic degradation.

OP-EN-03

SOURCES, DISTRIBUTION, AND IMPACTS OF MICROPLASTICS: A REVIEW

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ABSTRACT

Plastic is a versatile material used in various applications including agriculture, construction, packaging, health, and consumer goods. Plastics are synthetic materials (polymers) made up of polymers like Polypropylene (PP), Polystyrene (PS), Polyvinyl chloride PVC), Poly tetra fluoro ethylene (PTFC), Polyethylene terephthalate (PTE), LDPE, HDPE. Due to its durability and resistance plastic waste can persist in the environment for hundreds of years. Excessive use of plastics seriously threatens the environment and human life on the planet. Large plastic particles fragment due to environmental forces and form small particles less than 5mm in size. These tiny particles are called microplastics which become an ecological threat. Plastic takes more than 450 years to decompose. The present review mainly focused on microplastic's fate, sources, distribution, and impacts. This review article is an effort to present the current understanding of Microplastic pollution in aquatic systems, terrestrial systems, atmosphere, and human consumables by reviewing available scientific literature. The review also focuses on identifying gap areas in current knowledge and highlights the way forward for future research. This would further help in meeting the goals of this emergent pollutant management.

Keywords: Plastics, Microplastics, Sources, Distribution, Impacts

OP-EN-04

A NOVEL FABRICATION OF NON-CAPSULATED ORGANIC ACIDIC ADDITIVES AND CHITOSAN ENCAPSULATED HYBRID BEADS OF SIDA SPINOSA AS ANTI-PUTREFACTANT ON CARBON STEEL IN 0.5 M OF HCL MEDIUM

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ABSTRACT

A novel non-capsulated organic additives (citric, tartaric and lactic acids) and chitosan based hybrid beads of Sida spinosa has been fabricated were utilized as anti-putrefactant on carbon steel in 0.5M HCl. The phyto constituents, antimicrobial activity and GC-MS analysis were carried out for the plant extract. The anti-putrefaction effectiveness of Sida spinosa was evaluated using both additive and encapsulated weight loss methods, incorporating various concentrations of the extract alongside Zn^{2+} ions and the aforementioned organic acids. The variation in the IR bands, UV peaks and Fluoresence excitations confirms the formation of the resistive film. The surface morphological images (SEM) and elemental analysis (EDS) for the anti-putrefactant film clearly attributes the inhibition of putrefaction. Potentiodynamic polarization electrochemical methods affirmed the cathodic and anodic characteristics of the anti-putrefactant. The result attributes that the complex interactions between metal cations, additives, and the phytoconstituents in Sida spinosa extracts were integral to the antiputrefaction mechanism. Furthermore, the chitosan-encapsulated hybrid beads showcased improved stability and durability of the protective film, affirming their potential as effective anti-putrefactants in corrosive environments.

Keywords: Anti-putrefaction, polarization, Sida spinosa, Carbon Steel, FT-IR, SEM, GC-MS

OP-EN 5

Bifunctional Nickel Cobaltate nanoparticles decorated reduced graphene oxide ($NiCo_2O_4$/rGO) for high-performance Supercapacitor and Photocatalytic application

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Abstract

In the present work, Pristine and Bimetallic Heterostructure nanocomposites of NiO, Co_3O_4, $NiCo_2O_4$ and $NiCo_2O_4$@rGO nanocomposite by a simple One-step Hydrothermal Method followed by calcination. The crystallinity, structural, and morphological features were studied by X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), Energy dispersive X-ray (EDX), high resolution transmission electron microscopy (HR-TEM) techniques, UV–vis spectrophotometer, and X-ray photoelectron spectroscopy (XPS). The supercapacitor behaviour was studied using cyclic voltammetry, galvanostatic charge discharge and impedance analysis, respectively. The $NiCo_2O_4$@rGO nanocomposite exhibits a maximum specific capacitance (Cs) of 1823 Fg^{-1} at a current density of 5 mA g^{-1}, with a 98.6 % capacitance retention rate after 3000 cycles. To extend utility of the $NiCo_2O_4$@rGO nanocomposite, photocatalytic activity of $NiCo_2O_4$@rGO nanocomposite was studied by degradation of Fast Green (FG) and Rose Bengal (RB) dyes under UV and visible-light irradiation. The enhancement of photocatalytic properties of $NiCo_2O_4$@rGO nanocomposite attributed to the synergistic effect between $NiCo_2O_4$ and rGO nanocomposite which effectively prevents recombination of the photogenerated electron-hole pairs in Hexagonal structure. The catalyst achieved photodegradation efficiencies of 93.7% and 86.8% for Fast Green (FG) and Rose Bengal (RB) dyes under ultra-violet (UV) light, respectively. The present study provides a new approach in improving the performance of $NiCo_2O_4$@rGO nanocomposite material is an energy storage and photocatalytic applications.

OP-EN-06

HIGHLY EFFICIENT AND ECO-FRIENDLY CORROSION INHIBITOR FOR MILD STEEL IN 1.0 M HCl: AN ANTI-PITTING AND ANTI-CRACKING AGENT

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ABSTRACT

Nanoparticles of broad application spectrum are used in the industrial field as corrosion inhibitors. The use of nanomaterials as a corrosion inhibitor is of great industrial, economical, and environmental impact. Nanomaterials have higher corrosion inhibition properties because their surface-to-volume ratio has increased. In the present work the ability of *Aristolochia bracteolata* cobalt oxide (Co_3O_4) nanoparticles to prevent mild steel from corroding has been verified in an acidic medium (1.0 M HCl). The Langmuir adsorption isotherm has been found to be the main adsorption mechanism of Co_3O_4-NPs on the mild steel surface. Thermodynamic characteristics demonstrated that the adsorption of synthesised Co_3O_4-NPs was a physicochemical, spontaneous, and exothermic process. Electrochemical impedance spectroscopy and potentiodynamic polarisation were employed. The results of the investigation showed that Co_3O_4-NPs achieved the maximum level of inhibition efficiency by acting as a mixed inhibitor for both the cathodic and anodic reactions. Studies using scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) confirmed the efficiency of protecting the mild steel's surface with the suppressor. Addition of *Aristolochia bracteolata* cobalt oxide (Co_3O_4) nanoparticles enhance the adsorption and inhibition properties on mild steel surface.

Keywords: *Aristolochia bracteolata*, cobalt oxide nanoparticles, mild steel, mixed inhibitor.

OP-EN -07

$BiVO_4/g\text{-}C_3N_5$ HETEROJUNCTION FOR ENHANCED PHOTOCATALYTIC DEGRADATION OF TETRACYCLINE UNDER VISIBLE LIGHT: INFLUENCING FACTORS, AND MECHANISM

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ABSTRACT

In this study, a new photocatalyst was created by combining $BiVO_4$ with $g\text{-}C_3N_5$ nanosheets using the hydrothermal synthesis method. The composite's structure, appearance, and optical properties were extensively analyzed, and its ability to degrade TC through photocatalysis was tested. Various factors, including the weight of the catalyst, initial TC concentration, and the presence of other substances, were investigated to determine their impact on TC degradation efficiency. The remarkable photocatalytic performance of $BiVO_4/g\text{-}C_3N_5$ (2) can be attributed to the positive effects of the composite and the Z-scheme heterojunction, which widen the range of visible light absorption and improve the electron transfer and charge carriers separations between the catalysts. Photoluminescence, photocurrent, and impedance analysis further supported this finding. Additionally, the degradation mechanism and pathways were investigated. The reusability and stability of the $BiVO_4/g\text{-}C_3N_5$ (2) composite were carefully assessed and discussed. Overall, this research presents an innovative method for synthesizing photocatalysts that take advantage of Z-scheme heterojunctions.

Keywords: $BiVO_4/g\text{-}C_3N_5$ heterojunctions, Photocatalytic mechanism, Tetracycline, Reusability

OP-EN-08

FACILE FABRICATION OF A Z-SCHEME g-C_3N_5/Gd-MOF/SILVER NANOCUBE COMPOSITE AS A NEW GENERATION VISIBLE LIGHT ACTIVE PHOTOCATALYST FOR ABATEMENT OF PERSISTENT TOXIC POLLUTANTS

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ABSTRACT

Some of the persistent hazardous contaminants that readily dissolve in water with a recognizable hue are hexavalent chromium and neomycin antibiotic. Herein, a Z-scheme g-C_3N_5/Gd-MOF/silver nanocube (CNGdAg) ternary composite was successfully designed by the combination of graphitic carbon nitride (g-C_3N_5), gadolinium-based molecular organic framework (Gd-MOF), and silver nanocubes (AgNCs). Under visible light irradiation, CNGdAg outperforms individual components and binary composites in the photoreduction of hexavalent chromium (Cr^{6+}) and removal of neomycin. The maximum photocatalytic efficiency of Cr^{6+} (98%) in 150 minutes and complete neomycin removal in 25 minutes were accomplished by the CNGdAg-40% composite. A hydrothermal approach was chosen to prepare this visible light active composite. The formation of photogenerated electrons and superoxide radicals plays a major contributing factor in the efficient degradation in a short period without using any external components. The combined effect of the individual components in the composite led to the remarkable degradation via the Z-scheme pathway. This work exemplifies that the CNGdAg-40% photocatalyst can be used for the removal of heavy metal ions and organic contaminants from aquatic environments.

OP-EN-09

RASH-FREE COMPOSTABLE ECO-FRIENDLY DISPOSABLE NATURAL NANO COLORANT DIAPERS FOR MENOPAUSE WOMEN

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ABSTRACT

Nowadays many women are experiencing menopause or perimenopause problems especially difficulty with sleeping. Lack of sleep and tiredness can also make symptoms including irritability, ability to concentrate or anxiety worse. Other than hormonal imbalance, many women find that the physical symptoms of menopause have a negative impact on their mood, too. In order to overcome vaginal dryness, the present study has been designed to formulate rash free eco-friendly natural diapers loaded with copper nanoparticles synthesised from organic products -orange, neem, and turmeric for menopause women. The present study was designed to provide a platform for manufacturers and policymakers on ways to increase the adoption of eco-friendly biodegradable diapers. The aqueous extracts of neem, orange, and turmeric were absorbed into canvas cloth and sun-dried for several hours. Copper oxide nanoparticles, synthesized from neem plant extracts, were analysed by SEM and FTIR, revealing monodispersed, highly crystalline particles. UV/Visible spectrum analysis showed a stable dispersion with a surface absorbance peak at 295 nm. The antimicrobial efficacy test examined two microbial strains, E. coli ATCC 8739 and C. albicans ATCC 10231. Initial microbial counts of 2.3 x 107 for E. coli and 2.0 x 107 for C. albicans were recorded, with subsequent dry inoculum survivals reduced to 1.4 x 107 and 1.5 x 107, respectively. The layers were assembled in the sequence below: a. Layer 1: Neem-treated cotton; b. Layer 2: Banana fiber infused with nano colorant solution; c. Layer 3: Orange peel-infused cotton; d. Layer 4: Banana fiber infused with nano colorant solution; e. Layer 5: Turmeric-treated cotton. The assembled layers were then securely wrapped in canvas cloth. Finally, the edges were stitched together to form the diaper structure. The study found that organic intimate diapers made from copper oxide nanoparticles synthesized from Azadirachta indica (Neem) demonstrated significant antimicrobial properties, suggesting their potential as a novel therapeutic option for treating urinary tract infections in menopausal women.

Keywords: Diapers; Nanocolorant; Biodegradable; Copper oxide nanoparticle

OP-EN-10

PHOTOCATALYTIC CO_2 REDUCTION: TOWARDS GREEN FUEL & CHEMICAL PRODUCTION

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ABSTRACT

The photocatalytic CO_2 reduction is emerging as one of the efficient green approach to reduce energy crisis and CO_2 emission. This study investigates the photocatalytic conversion of CO_2 to value added product like CH_3OH using CeO_2 and $Ce_{0.95}Ag_{0.05}O_2$ nanoparticles under visible light at optimized conditions. Both materials were synthesized by coprecipitation method and characterized through XRD, FTIR, SEM, TEM and XPS techniques. CeO_2 as well as $Ce_{0.95}Ag_{0.05}O_2$ possess a cubic fluorite structure confirming the formation of solid solution. The incorporation of silver enhanced light absorption into the visible spectrum. The $Ce_{0.95}Ag_{0.05}O_2$ nanoparticles exhibited superior photocatalytic activity, which can be attributed to the reduction in band gap, cycling of Ce^{+3} to Ce^{+4} and the formation of oxygen vacancies. These findings suggest that silver doping significantly enhances the photocatalytic efficiency of cerium oxide, offering a promising approach for CO_2 reduction and addressing energy and environmental challenges.

Keywords: Photocatalytic; Co-precipitation; Nanoparticles; Energy

OP-EN-11

VISIBLE-LIGHT-RESPONSIVE NANOSTRUCTURED Ag_2O/SnO_2 NANOCOMPOSITES FOR ENHANCED PHOTOCATALYTIC AND ANTIBACTERIAL ACTIVITY

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ABSTRACT

Ag_2O/SnO_2 nanocomposites with varying mole ratios (1:99, 3:97, 5:95, 7:93, and 9:91) were successfully synthesized using a combination of chemical precipitation and sonication techniques. The structural, morphological, and compositional properties of the nanocomposites were characterized through X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), UV-visible spectroscopy, and X-ray photoelectron spectroscopy (XPS). The Ag_2O/SnO_2 nanocomposites exhibited a cubic phase from Ag_2O and a tetragonal phase from SnO2, with an average crystallite size ranging from 10 to 15 nm. The incorporation of Ag_2O led to a reduction in the band gap, from 3.41 eV for pure SnO2 to as low as 2.07 eV for the nanocomposite. The photocatalytic activity was evaluated by degrading Amido Black dye in an aqueous solution under visible light irradiation. Among the different compositions, the Ag_2O/SnO_2 nanocomposite with a 7:93 mole ratio demonstrated superior photocatalytic efficiency, achieving complete degradation of the dye within 30 minutes of irradiation. This enhanced activity can be attributed to the effective charge separation facilitated by the Ag_2O-SnO_2 interface, where the difference in potential energy between the two materials promotes interfacial charge transfer and minimizes electron-hole recombination. Additionally, the nanocomposites exhibited potent antibacterial activity against both gram-positive and gram-negative bacteria, highlighting their multifunctional application potential.

Keywords: Nanocomposites; Ag_2O/SnO_2; Amido black dye; photocatalysis.

OP-EN-12

FABRICATION AND CHARACTERIZATION OF CARBON QUANTUM DOTS FROM WASTE FRUIT EXTRACT AND STUDY THEIR ANTIBACTERIAL ACTIVITY

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ABSTRACT

Carbon quantum dots (CQDs) have emerged as promising materials for various applications due to their unique optical and electronic properties. In this study, we explore an eco-friendly approach to fabricate CQDs using waste fruit extract as a precursor. The fabrication process involves simple and cost-effective steps, making it suitable for large-scale production. The synthesized CQDs are characterized using spectroscopic and microscopic techniques to analyze their structural and optical properties. Besides, the antibacterial activities of CQDs were screened against aquatic Gram-positive (Staphylococcus aureus) and Gram-negative (Escherichia coli) microbial organisms. This research highlights the innovative use of agricultural waste in nanomaterial synthesis, contributing to sustainable and green chemistry practices.

Keywords: Carbon Quantum Dots; Green Synthesis; TEM; Waste fruit extract

OP-EN-13

A NOVEL QUANTUM DOT-GRAPHENE BASED FLUORESCENCE TURN-OFF/TURN-ON APTASENSOR FOR ENVIRONMENTAL DETECTION OF VIBRIO CHOLERAE O139

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ABSTRACT

Vibrio cholerae O139 is a pathogenic bacterium responsible for cholera outbreaks across the globe. This study presents the development of a novel aptamer-based fluorescent biosensor for the rapid and sensitive detection of V. cholerae O139. The developed biosensor utilises green synthesised novel quantum dots (QDs) as a fluorophore and graphene oxide (GO) as the fluorescence quencher. Citrus limetta peels were utilized for the green synthesis of quantum dots, contributing to sustainable production practices. The QDs exhibit green fluorescence with a quantum yield of 39%, which is excited and emitted at 490 and 550 nm The QD-aptamer-GO aptasensor operates on a fluorescence turn-on/turn-off mechanism, where the presence of V. cholerae induces a detachment of GO from the QD-aptamer complex and subsequent fluorescence recovery. Optimization of assay conditions, including GO concentration, incubation time, and pH, significantly enhanced the biosensor's performance. The developed aptasensor demonstrated high sensitivity, with an LOD of 449 CFU/mL, and excellent selectivity towards V. cholerae O139 over closely related bacterial species. Further validation of the aptasensor's efficacy was conducted using environmental water samples spiked with V. cholerae, showing high recovery rates ranging from 70.73% to 89.93%. The reproducibility of the assay across samples was also confirmed with low relative standard deviation (RSD) values. In summary, this study presents a fluorescence aptasensor that is label-free, rapid, sensitive and selective for the detection of V. cholerae O139 in environmental samples, offering a promising tool for water quality monitoring and public health protection in regions prone to cholera outbreaks.

Keywords: Quantum dots, Graphene oxide, Vibrio cholerae, aptasensor, fluorescence, biosensing.

OP-EN-14

STRUCTURAL AND OPTICAL ANALYSIS OF WET CHEMICAL GROWN UNDOPED AND MANGANESE DOPED MOLYBDENUM TRIOXIDE NANOPARTICLES

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ABSTRACT

Introduction: Nearly ten thousand dyes and their combinations were applied to add permanent colour to textile fibers which resist sweat, light, oxidizing agents, and microbial attack [1,2]. To fulfill the modern fashion industry's requirements, textile manufacturers produce a wide variety of coloured garments by introducing numerous toxic dye chemicals [3].These carcinogenic organic dyes put forth severe environmental problems that risk the lives of humankind [4,5].

Objectives: Semiconductor photocatalyst paves the way for the decomposition of organic compounds by the photocatalytic method

Materials and methods: A wet chemical method was utilized to synthesize Molybdenum trioxide nanoparticles and Manganese-doped MoO_3.The crystalline structure of the nanoparticles was characterized using powder X-ray diffraction, confirming the orthorhombic structure of both pure Molybdenum Trioxide and Ni-doped MoO_3.Raman spectroscopy was conducted to assess phase purity and identify the vibrational modes of the synthesized molybdates.

Results: The X-ray diffraction Spectrum of the undoped Molybdenum Trioxide was done using XPERT PRO with K_α = 1.5444 Å. The Crystallite size were found using the Debye Scherer formula. The crystallite size ranged from 47.50 nm to 57.62 nm The optical absorbance of the prepared nanocomposites were recorded using UV – 1700 series spectrophotometer in the absorbance mode with 340.8 nm light source and with a slit width of 1.0 nm.

Conclusion: The photocatalytic activity was evaluated through a dye degradation process under visible light, with Methylene blue serving as the model dye. Changes in the dye's absorbance were examined using a UV–Visible spectrophotometer, focusing on both pure and Mn-doped MoO_3 nanoparticles.

Keywords: Mn:MoO_3, Raman analysis, XRD, UV-Visible Spectroscopy, Dye degradation

OP-EN-15

ANALYSIS OF GROUNDWATER QUALITY FOR IRRIGATION PURPOSES IN ARIYALUR DISTRICT

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ABSTRACT

Hydro chemical study was carried out in Ariyalur District in Tamilnadu with the objective of understanding the suitability of groundwater quality for domestic and irrigation purposes. The grade of irrigation water available to irrigators has a significant impact on crops as well as yields. Therefore, it is a need to better understand irrigation water quality. The present study mainly focuses on the assessment of the suitability of water of forty-eight fixed bore wells of Ariyalur district, Tamil Nadu, India. Ground water samples were collected from 48 locations during premonsoon, monsoon and postmonsoon seasons (May 2015-August 2017) and analysed for physico - chemical parameters such as pH, Electrical Conductivity, Total Dissolved Solids, Total Hardness, Calcium, Magnesium, Carbonate, Bicarbonate, Chloride, Sodium, Potassium and Sulphate in order to understand the different geochemical processes affecting the groundwater quality. Water quality indices, namely sodium adsorption ratio, sodium percent (%Na), residual sodium carbonate (RSC), Kelly's ratio and permeability index have been calculated for separate bore wells. Majority of the wells are fall under moderate to suitable category of water for irrigation purposes.

Keywords: Groundwater, physico - chemical parameters and Irrigation purposes.

OP-EN-16

ONE-POT HYDROTHERMAL SYNTHESIS OF 1D/2D Bi_2O_4 NANORODS /$NiFe_2O_4$ NANOSHEET PHOTOCATALYST UNDER ENHANCED VISIBLE LIGHT IRRADIATION FOR POLLUTANT DEGRADATION

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ABSTRACT

In the present study, the advantage of broadband spectral response range and an auspicious visible-light active photocatalyst dibismuth tetraoxide (Bi_2O_4) and a significant class of semiconductor materials with an inverse spinel structure nickel ferrite ($NiFe_2O_4$) has been fabulously doped as a composite. A series of $NiFe_2O_4$/Bi_2O_4 composites are obtained by distinct amount (10, 20 and 30 wt %) of $NiFe_2O_4$, via a one-pot hydrothermal route. Further, the photocatalytic materials are studied through X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), high resolution transmission electron microscopy (HR-TEM), energy dispersive X-ray spectroscopy (EDS), Fourier transform infrared (FT-IR) spectroscopy, photoluminescence (PL), UV-vis diffuse reflectance spectroscopy (DRS), and photoelectrochemical methods. Then, the degradation experiments of the as-synthesized $NiFe_2O_4$/Bi_2O_4 composite materials in the presence of visible light irradiation (VLI) are demonstrated for the elimination of the model pollutant, methylene blue (MB). The morphological study revealed the prepared $NiFe_2O_4$/Bi_2O_4 composite exhibits 1D-Bi_2O_4 nanorod wrapped 2D-$NiFe_2O_4$ nanosheets. Among different amounts of $NiFe_2O_4$ added to the Bi_2O_4 sample, the optimized BN-1 nanocomposite (10 wt %) explicitly contributed to an excellent (94 %) photocatalytic degradation efficiency after 60 min when compared with the pure Bi_2O_4 (36 %) and $NiFe_2O_4$ (20 %). The recycling experiment also specified that the optimized BN-1 hybrid has highly stable and recyclable for photocatalytic capability. The radical trapping tests have also ensured the prominent role of $O_2^{\bullet-}$ and $^{\bullet}OH$ in the photocatalytic decomposition of MB. Based on the above observations, the plausible heterojunction mechanism of photocatalytic decomposition of MB under simulated VLI has been presented. Therefore, this work validatively proves $NiFe_2O_4$/Bi_2O_4 hybrid is an efficient photocatalyst for the removal of organic pollutants existing in the aquatic environment.

Keywords: $NiFe_2O_4$/Bi_2O_4 nanocomposite; Methylene blue; One-pot hydrothermal method; Visible light;

OP-EN-17

SYNTHESIS AND CHARACTERIZATION OF CuO NANOPARTICLES USING COUROUPITA GUIANENSIS PETAL, STEM, BARK AND LEAVES EXTRACT

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ABSTRACT

This article reports on a new route to synthesize of copper nanoparticles with aqueous extracts from Couroupita guianensis petal. This is an environmentally friendly, inexpensive and time-saving method of producing nanoparticles. The aqueous extracts of petals, stems, bark and leaves were used to synthesize the nanoparticles. Plant extracts induce the reduction of Cu^{2+} ions into CuNP and act as protection and stabilization agents. The formation of CuNPs was monitored throughout the synthesis process by absorption spectra from the UV-Vis spectrophotometer. X-ray diffraction (XRD), Fourier transfer infrared (FTIR) and Scanning Electron Microscope (SEM) were used to characterize the synthesized nanoparticles.

Keywords: Copper nanoparticles, Couroupita guianensis, X-ray, UV-Vis, FTIR, SEM

OP-EN-18

DEVELOPMENT OF MoS_2 – ZnO NANOPARTICLES INFUSED MORINGA EXTRACT WITH PABT NANOCOMPOSITE FILM FOR PRESERVATION OF FRESH FRUITS

Nefeshiya Suresh

ABSTRACT

The increasing demand for fresh fruits has necessitated innovative packaging solutions to extend shelf life and maintain quality. This study contributes to the development of sustainable packaging solutions for fresh fruits, reducing food waste and promoting environmental sustainability, the nanocomposite film's antimicrobial and antioxidant properties extend shelf life, maintaining fruit quality and safety in the development of a novel nanocomposite film, integrating MoS_2-ZnO nanoparticles, Moringa extract, and poly(butylene adipate-co-butylene terephthalate) (PBAT), for the preservation of fresh fruits. However, their short shelf life and susceptibility to microbial contamination pose significant challenges. The global demand for fresh fruits is increasing, driving the need for innovative packaging solutions. MoS_2-ZnO nanoparticles were synthesized via a microwaveassisted method, exhibiting enhanced antimicrobial and antioxidant activity. Moringa extract, rich in bioactive compounds, was infused into the nanocomposite film to provide additional antioxidant and antimicrobial activity. Molybdenum disulfide (MoS_2) is a layered transition metal dichalcogenides(TMDs) and is anistropic in nature. It has remarkable physio-chemical properties such as large surface-to-volume ratio, distinctive electronic characteristic, tunable band gap, high carrier mobility, friction, catalytic and optical properties. Zinc oxide is one of the most versatile materials due to its excellent inherent properties of wide band gap, large exciton binding energy and high chemical stability. The PBAT matrix provided biodegradability and mechanical strength to the film. The results demonstrated that this innovative nanocomposite film offers a promising solution for the preservation of fresh fruits, providing a biodegradable, antimicrobial, and antioxidant packaging material. The integration of MoS_2-ZnO nanoparticles and Moringa extract with PBAT enhances the film's performance, making it suitable for industrial applications.

Keywords: MoS_2-ZnO nanoparticles, Moringa extract, PBAT nanocomposite film, Fresh fruit preservation

OP-EN-19

EVALUATION OF ELECTROCHEMICAL TREATMENT EFFICIENCY FOR CHICKEN INDUSTRY WASTEWATER

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Abstract

Water scarcity stands out as the primary global challenge of the present century. Projections indicate that the most severe water shortage will occur in the year 2050. Consequently, water recovery has become a matter of great importance. Chicken industry wastewater releases substantial volumes of wastewater into the environment due to their extensive use of freshwater in various processing operations. These processes, such as cutting, rinsing, and packaging, as well as de-feathering, scalding, bird washing, and evisceration require significant quantities of water, resulting in the generation of a substantial amount of contaminated wastewater. In particular, the evisceration process and bird washing contribute significantly to wastewater production, with approximate volumes of 7.8 liters per bird and 4.46 liters per bird, respectively. On average, a 2.5 kg bird consumes approximately 27.8 liters of water. Electrochemical treatment of wastewater is an emerging technique that uses an anode and cathode inside the reactor to remove the contaminants. Hence, in this study an attempt has been made to examine the efficiency of batch type electrochemical reactor to purify the synthetic and raw chicken processing wastewater. Salinity (%), pH, temperature (^{o}C), conductivity (µS/Cm), and total dissolved solid (ppm) were investigated with respect to time. The obtained results indicated that increase in pH and temperature is directly proportional to time. Also, there is a considerable removal of salinity (%), conductivity (µS/Cm), and total dissolved solid (ppm). The weight change in electrode, and sludge settling time also measured for the process. In conclusion, the proposed electrochemical treatment for chicken wastewater is effective. However, for large-scale implementation, a thorough analysis of continuous flow treatment should be conducted in the future.

Keywords: Chicken industry wastewater; Electrochemical treatment; Temperature; Electrode type; Contaminant Removal.

OP-EN-20

Development composition modulated multilayer Ni-Co alloy coating of better corrosion resistance

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ABSTRACT

Electrodeposition of composition modulated multilayer (CMM) coatings of Ni-Co alloy was accomplished on mild steel using single bath technique (SBT). Multilayer coatings, having layers of alternatively different compositions have been produced on the substrate using the electrolytic bath having both Ni and Co ions by periodic pulsing of the current density between two set values, known as cyclic cathode current densities (CCCD's). The deposition conditions, in terms of the composition and thickness of alternate layers were optimized for best performance of those coatings against corrosion. Electrochemical corrosion study of alloy coatings have been made using electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization methods. It was found that CMM $(Ni\text{-}Co)_{1.0/3.0/60}$ coatings shows approximately three times better corrosion resistance than its monolayer counterparts, deposited from same bath for same duration. The experimental study demonstrated that corrosion protection efficacy of CMM Ni-Co alloy increased with number of layers up 60 layers, and then started decreasing. The observed increase of corrosion rate at high degree of layering (after 60 layers) was attributed to the diffusion of layers, affected due to rapid change of current densities during process of deposition. Improved corrosion protection efficacy of multilayer coating is attributed alternate layers of alloys having different phase structure, confirmed by Energy dispersion spectroscopy (EDS) and X-ray diffraction (XRD) techniques. The deposited coatings were analyzed for both surface and cross sectional features using scanning electron microscopy (SEM) and results are discussed.

Key words: CMM coating, Ni-Co alloy, Corrosion study, XRD and SEM study

OP-EN-21

MULTISCALE STRUCTURAL ENGINEERING OF Ni-BTEC/S NANOCOMPOSITES: A BIFUNCTIONAL ELECTROCATALYST FOR EFFICIENT WATER SPLITTING

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The multiscale structural engineering of bifunctional electrocatalysts plays a pivotal role in enhancing the efficiency of hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) processes, thus improving the overall performance of water splitting. In this study, we report the development of a three-dimensional metal-organic framework (MOF) based on a transition metal, specifically a Nickel 1,2,4,5-benzene tetracarboxylic acid (Ni-BTEC) composite, synthesized in conjunction with a sulfur source through a two-step hydrothermal process. The Ni-BTEC/S nanocomposite was systematically characterized for its structural, optical, and morphological properties using advanced analytical techniques.

Electrocatalytic performance toward HER and OER was evaluated through linear sweep voltammetry (LSV) in a 1.0 M KOH alkaline solution. The Ni-BTEC/S composite exhibited superior catalytic activity compared to pristine Ni-BTEC, demonstrating an overpotential of 124.2 mV for HER and 370 mV for OER at a current density of 10 mA cm^{-2}. The Tafel slopes for HER and OER were found to be 201 mV dec^{-1} and 38 mV dec^{-1}, respectively. In a two-electrode electrolyzer configuration (Ni-BTEC/S // Ni-BTEC/S), a cell voltage of 1.72 V was required to reach 10 mA cm^{-2}, with the system exhibiting excellent stability over a 24-hour operation. These findings provide insight into the development of cost-effective and highly efficient bifunctional electrocatalysts for both HER and OER, offering a promising avenue for non-precious metal-based water-splitting technologies.

Keywords: Metal-organic framework, Water splitting, hydrothermal synthesis, electrocatalyst, composite material.

OP-EN-22

MAGNETIC SUSCEPTIBILITY IN THE ASSESSMENT OF TOXIC HEAVY METAL ELEMENTS IN THE SURFACE SEDIMENTS OF ENNORE PORT, EAST COAST OF TAMILNADU, INDIA

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ABSTRACT

Introduction: The study of heavy metals in the Ennore ecosystem plays a vital role in determining the extent of pollution in the area. The average concentrations of heavy metals were below the world's crustal average level. These metals have a higher affinity for forming metallic bonds with ferrous materials, which enhances the magnetic susceptibility of the sediment. Therefore, magnetic susceptibility measurements (χ_{lf}, χ_{hf}, χ_{fd}) were conducted on the sediments using an MS_2B dual-frequency susceptibility meter. The study revealed that magnetic susceptibility measurements are inexpensive, fast, non-destructive, and effective for identifying sources of heavy metal pollution.

Materials and Methods: During the pre-monsoon season, 26 sediment samples were collected using a Peterson grab sampler then transported to the laboratory and air-dried before manually picking out larger stone shards or shells. For the Atomic Absorption Spectrometry (AAS) study, the wet digestion method was used for the digestion of the sediment samples and analysis.

Results and Discussions: The concentration (mg kg^{-1}) varies as follows: 298 to 5987, 11478 to 37432, 115987 to 224978, 2985 to 9850, 3792 to 23176, 540 to 49434, 3597 to 56502, 22.37 to 691, 11.5 to 198.29, 69.10 to 1227.61, 1.40 to 19.95, 11.48 to 38.63, BDL to 3.60, 11.04 to 87.99, 1.8 to 9.9, 1.1 to 11.2, 142.3 to 426.8, BDL to 214.7 and BDL to 30.7 for Mg, Al, Si, K, Ca, Ti, Fe, V, Cr, Mn, Co, Ni, Cu, Zn, As, Cd, Ba, La and Pb respectively. Among the heavy metals detected, Aluminium (Al), Iron (Fe), Calcium (Ca), Magnesium (Mg), and Silicon (Si) are the most abundant metals in the sediment, the mean concentrations of heavy metals were found in the following order: Si > Al > Fe > Ca > Ti > K > Mg > Mn > Ba > V > Cr > Zn > La > Ni > Pb > Co > As > Cd > Cu in the study area.

The χ_{lf} measurements range from 1.2145×10^{-8} m^3 kg^{-1} to 57.7217×10^{-8} m^3 kg^{-1}, with an average of 8.6295×10^{-8} m^3 kg^{-1}. The values of χ_{lf} are influenced by the local geology, sedimentation processes, and the presence of anthropogenic additives (Dearing et al., 1996; Lu et al., 2007) showed that the χ_{lf} value of natural 'nonpolluted' sediments depends on five major factors: parent material, climate, geomorphology, vegetation and time, meanwhile, the magnetic susceptibility (χ_{hf}) measurements show that they vary from 1.1039×10^{-8} m^3 kg^{-1} to 55.7733×10^{-8} m^3 kg^{-1} with an average of 7.5163×10^{-8} m^3 kg^{-1}. The sediment samples, S3, S4, S5, B2, B6, and C2 with χ_{fd} between 2% and 10% belong to an intermediate group, corresponding to a mixture of SP and SD grains.

OP-EN-23

GREEN SYNTHESIS OF SILICA NANOPARTICLES FROM CASHEW NUT SHELL ASH: CHARACTERIZATION AND APPLICATION IN HEAVY METAL ION REMOVAL

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ABSTRACT

Silica nanoparticles possess extensive applications in fields such as drug delivery, lightweight aggregates, and energy storage. This research explores the production of silica nanoparticles derived from cashew nut shell ash (CNSA), a relatively underutilized agricultural byproduct. Using a modified sol–gel extraction technique, silica nanoparticles were successfully synthesized from CNSA. The characterization of these nanoparticles was conducted using X-ray diffraction (XRD), scanning electron microscopy (SEM) combined with energy-dispersive X-ray spectroscopy (EDX), and Fourier transform infrared (FT-IR) spectroscopy. EDX analysis confirmed the presence of SiO_2, while FT-IR spectra indicated silanol and siloxane functional groups. The broad XRD peak observed at a diffraction angle of 20.9°, characteristic of an amorphous solid, further affirmed the synthesis of amorphous silica. The successful extraction of silica nanoparticles not only offers potential for advanced material applications but also contributes to reducing environmental waste associated with the disposal of cashew nut shells. Additionally, the prepared silica particles demonstrated efficacy in the removal of nickel ions from aqueous solutions, showcasing their potential use in water treatment and environmental remediation.

Key Words: Cashew nutshell ash, Silica, Sol-gel, Heavy Metal Adsorption**.**

OP-EN-24

UTILIZING ACTIVATED CHARCOAL FROM AMARANTHUS DUBIUS ROOTS FOR THE REMOVAL OF REACTIVE DYES FROM WATER

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Abstract

Pollution represents a critical challenge in today's world, with organic dyes prevalent in industrial wastewater from sectors such as paper, textiles, and apparel, leading to significant environmental degradation. This study investigates the preparation of activated carbon using sulfuric acid as the activating agent and evaluates its effectiveness as an adsorbent for the removal of azo dyes. Adsorption experiments were conducted to determine optimal conditions based on factors like contact time, initial dye concentration, adsorbent dosage, and pH levels. The findings revealed that 0.2 g of activated carbon could remove 95% of the azo dye. The adsorption data were analyzed using both Langmuir and Freundlich isotherm models, with the Langmuir isotherm best fitting the data. The equilibrium parameter (RL) was found to range between 0 and 1, indicating favorable adsorption. The dye adsorption process was consistent with pseudo-first-order kinetics, particularly concerning the rate of intraparticle diffusion. The physicochemical properties of the activated carbon were characterized using UV-Vis spectroscopy, FTIR, and XRD analyses, both before and after dye adsorption. Furthermore, the adsorbed dye was effectively desorbed (80%) using 1 N NaOH. These results indicate that Amaranthus dubius demonstrates promising adsorbent capabilities when activated charcoal is utilized for azo dye removal.

Keywords: *Amaranthus dubius*, Environmental degradation, Pseudo-first order kinetics, Activated carbon, Adsorption

PP-EN-01

DECOLOURIZATION OF CATIONIC DYE USING IMPREGNATION OF Co_3O_4 NANOPARTICLE AND A-Fe_2O_3 NANOFLAKES ON H_2SO_4 -CARBONIZED LIGNITE: KINETIC MECHANISM AND ADSORPTION ISOTHERM STUDIES

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ABSTRACT

In this research of laboratory batch adsorption study, sulfuric acid (H_2SO_4, SA) treated low rank coal Lignite from NLC India for developing acidic-rich group adsorbent with the impregnation of Iron oxide Nanoflakes from Red Mud extract and cobalt oxide nanoparticles for decolourization of cationic dye (Methylene blue dye; MB) from aqueous environment. The adsorbents were characterized by various physico-chemical techniques such as BET, XRD, SEM, FT-IR and UV-VIS spectroscopy. The adsorption process was carried out under various conditions such as different pH, dye concentrations, adsorbent dosages, and temperatures. The equilibrium adsorption isotherm was represented by the Langmuir model. The maximum Langmuir monolayer adsorption capacity of the Lignite-impregnated nanocomposite was determined to be 42.6 mg/g, which is comparable to the adsorption capacities reported for other adsorbents used in methylene blue (MB) dye removal. Measurements were taken at an adsorbent dose of 0.1 g, a solution pH of 9-10, a temperature of 37 °C, and a contact time of 40 minutes. A variety of potential interactions, including electrostatic forces, π-π interactions, and hydrogen bonding, were the primary mechanisms responsible for the adsorption of MB dye molecules onto the surface of Lignite-impregnated nanocomposite adsorbent. The lignite impregnated nanocomposite adsorbent shows promising results as a precursor for developing an effective adsorbent with potential applications in removing cationic dyes from aqueous environments.

Keywords: Lignite nanocomposite adsorbent, red mud nanoflakes, Methylene blue dye decolourization, Isotherm model.

OP-BM-01

BIOCOMPATIBLE BIOFIBER REINFORCED HEPARINIZED MINERAL SUBSTITUTED HYDROXYAPATITE COMPOSITES FOR BIOMEDICAL APPLICATIONS

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ABSTRACT

Hydroxyapatite is a biocompatible and bioactive material that resembles the mineral component of human bones and teeth. In this work, hydroxyapatite is substituted with samarium and ytterbium, which are rare-earth elements. The addition of these elements can potentially enhance the material's properties, such as improved biocompatibility or specific interactions with biological systems. Heparinization refers to the process of incorporating heparin, a natural anticoagulant, into the composite. This incorporation aims to impart anticoagulant properties to the material, making it suitable for applications where preventing blood clotting is crucial, such as in biomedical implants or devices. By combining the biofiber (Calotropis gigantea fibers) with the heparinized samarium and ytterbium substituted hydroxyapatite, a composite material is formed. The fibers act as a reinforcing component, providing mechanical strength, while the heparinized hydroxyapatite contributes bioactivity and anticoagulant functionality. Its improved biocompatibility, mechanical strength, bioactivity, and anticoagulant properties may promote bone regeneration and integration with surrounding tissues. The as fabricated composite can be used to develop implants for biomedical applications.

Keywords: Biofiber, Heparin, Bioceramic, Biocomposite, Biomedical applications.

OP-BM-02

TARGETING ANGIOGENESIS IN CANCER: MOLECULAR DOCKING OF DIGITOXIN WITH VEGFR IN HEAD & NECK AND BREAST TUMORS

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Calotropis procera is a perennial flowering plant of the Apocynaceae family, traditionally used in medicine to treat various diseases. Recent investigations have revealed its potential therapeutic activities such as anti-inflammatory, gastroprotective, analgesic, anti-obesity, and anti-diabetic properties. The Digitoxin glycoside from *Calotropis procera* has potential anti cancer therapy in various cancer types. Considering the anticancer and antioxidant effects of Digitoxin isolated from *Calotropis procera*, the present study was aimed to evaluate the anticancer therapeutic efficacy *in vitro* breast cancer cell line (MCF-7). *In vitro* screening using four different drug analysis done through MTT assay to analyse the cytotoxicity on MCF-7 breast cancer cell lines cells. In silico analysis (Molecular Donking) with digitoxin to find potential Inhibitors of Cancer therapy targeting angiogenesis through VEGFR , NTRK, EGFR. Digitoxin treatment led to disruption of cancer cells. Digitoxin has preclinical activity against MCF-7, and exhibited synergism with Gemcitabine. VEGFR inhibition in breast and head and neck cancer might be able to reduce the invasiveness of cancer by affecting various functions.

Keywords: *Calotropis procera*, angiogenesis, breast cancer cell lines, cancer therapy, silico analysis.

OP-BM-03

DEVELOPMENT AND CHARACTERIZATION OF M-HAP/CHITOSAN COMPOSITE COATING ON TI ALLOY IMPLANTS FOR ENHANCED DENTAL PROSTHETICS AND BONE GRAFTING

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ABSTRACT

HAP derived from marine biowaste offers a sustainable option for biomedical applications. In orthopaedics and dental prosthetics, bone grafts enhanced with promising electrochemical deposition techniques have shown significant tissue integration and wound healing capabilities while being environmentally friendly and cost-effective. The deposited surface, containing bioactive calcium, rare minerals, and biowaste-derived chitosan amine, provides enhanced corrosion resistance and cytocompatibility. This advanced composite incorporates titanium (Ti) alloy coatings, ensuring optimal functionality and compatibility with biological systems. Its facilities to regenerate tissue and foster a structure that closely mimics natural bone. The ellipsoidal morphology and microstructural characteristics were evaluated using FTIR, XRD, AFM, and SEM techniques. Biologically, it encourages cell proliferation and adhesion patterns associated with modified surfaces. Furthermore, the compatibility of the protective coatings was validated through MTT assays and in vitro bactericidal evaluations. Due to their diverse functionalities, Ti6Al4V materials are highly effective and require minimal modification in the biomedical sector.

Keywords: Hydroxyapatite, Marine biowaste, Synthetic polymer, Orthopedics, Ti_6Al_4V materials, antibacterial activity.

OP-BM-04

COMPARATIVE INVESTIGATION OF THE ANTIOXIDANT AND ANTI-INFLAMMATORY POTENTIAL OF *ALBIZIA AMARA*- MEDIATED ZINC AND COPPER OXIDE NANOPARTICLES

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ABSTRACT

In this research paper, we discussed on the synthesis and characterization of ZnO and CuO nanoparticles from *Albizia Amara* leaf extract revealed distinct physicochemical properties for each type. UV- Visible spectroscopy showed a strong absorption peak at 281 nm for ZnO nanoparticles and 207 nm for CuO nanoparticles, indicating their optical properties. FT-IR spectra confirmed the presence of functional groups such as alcohols and phenols in both, acting as stabilizers in the synthesis process. XRD analysis demonstrated the crystallinity of both ZnO and CuO nanoparticles, while SEM analysis revealed their spherical morphology. In terms of bioactivity, CuO nanoparticles exhibited stronger anti-inflammatory activity (IC50 of 51.65 μg/mL) compared to ZnO (IC50 of 90.27 μg/mL), while ZnO nanoparticles demonstrated superior antioxidant activity (IC50 of 103.50 μg/mL for CuO vs. 90.27 μg/mL for ZnO). This comparison highlights the distinct yet complementary characteristics of ZnO and CuO nanoparticles, both of which show significant promise in antioxidant and anti-inflammatory applications.

Keywords: *Albizia Amara*, Zinc Oxide nanoparticles, Copper Oxide nanoparticles, Antioxidant activity and Anti- Inflammatory activity.

OP-BM-05

WATER PURIFICATION TECHNIQUE USING *MORINGA OLEIFERA* LAM. SEEDS AS A NATURAL PURIFIER - AN ANALYTICAL PERSPECTIVE

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ABSTRACT:

Aim: Water Purification technique using ***Moringa oleifera* Lam.** Seeds as a Natural Purifier **Materials and Methods:** Parameters of water quality, There are three types like:1. Physical, 2. Chemical, 3. Biological. **Results:** ***Moringa oleifera* Lam** is one of the best known and most widely distributed and naturalized species of a monogenetic (Family: Moringaaceae). **Testing of water parameters** - pH Value @ 25ºC, Electrical conductivity @ 25ºC, Turbidity, Temperature, Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD),Total Hardness as $CaCO_3$, Calcium Hardness, Calcium as Ca, Magnesium Hardness, Magnesium as Mg, Chloride as Cl^-,Total Alkalinity as $CaCO_3$, Carbonate, Bicarbonate, Sulfate, Iron. **Conclusion:** The purification procedure reduces the concentration of contaminants such as suspended particles, parasites, bacteria, algae, viruses, and fungi. Some other common methods used for purifying water include boiling, granular activated-carbon filtering, distillation, reverse osmosis, and direct contact membrane distillation. For the water treatment traditional chemicals belonging to synthetic organic and inorganic substance category are used. With the references to history of using herbs and plants derived polymeric sources, we planned to develop an economically and feasible treatment technique using natural polymeric purifier sources to treat the water samples. This research on ***Moringa oleifera* Lam** Seeds shows a natural purifier water treatment has identify by various environmentally sound friendly technique, cost-effective for the turbidity water and also act as a traditional water purification system.

Keywords: Natural, water parameters, purification, *Moringa oleifera* L. Seeds.

OP-BM-06

AN INNOVATIVE ECO-FRIENDLY SYNTHESIS AND CHARACTERIZATION OF BIMETALLIC SILVER-IRON NANOCOMPOSITES CAPPED BY *ALANGIUM SALVIFOLIUM*: MULTIBIOMEDICAL APPLICATIONS AS ANTI-INFLAMMATANT, GLUCOSE REGULATOR, BIOFILM ERADICATOR AND MICROBE RESISTOR

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Abstract

An innovative eco-friendly approach for fabricating a bimetallic Ag-Fe nanocomposites utilizing the ethanolic leaf extract of *Alangium salvifolium* as capping agent. The bioactive components alkaloids, flavonoids, phenolic and other metabolites of the plant material facilitate the reduction of the metals to nanocomposites. By the GCMS chromatogram the presence of phytol, linolenic acid and maltol were responsible for capping and supporting diverse biomedical applications. Infrared spectroscopy (IR) confirms the stabilization of nanocomposites by flavonoids and phenolic compounds during synthesis. Scanning Electron Microscopy (SEM) images depicts the morphology of the nanocomposites, while X-Ray Diffraction (XRD) patterns and Energy Dispersive X-Ray Spectroscopy (EDS) analyses confirm the elemental composition, including O, Fe, and Ag traits the fabrication of nanocomposites. Furthermore, the bimetallic nanocomposites were internalized to multibiomedical applications as a good anti-inflammatant, glucose regulator, biofilm eradicator and microbe resistor.

Keywords: *Alangium salvifolium,* SEM, anti-inflammatant, glucose regulator, biofilm eradicator

OP-BM-07

GREEN SYNTHESIS OF ZINC NANOPARTICLES, CHARACTERIZATION, PHYTOCHEMICAL ANALYSIS AND ITS ANTIBACTERIAL ACTIVITY FROM *COROLLOCARPUS EPIGAEUS.*L

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ABSTRACT

Corollocarpus epigaeus is a climbing prostrate or monoecious plant found mostly in tropical countries such as India and Sri Lanka. The plant belongs to Cucurbitaceae family, the roots and rhizomes of this plants has many traditional claims especially in syphilitic cases, old venereal complaints, Diabetes, Rheumatism and in Cancer cases. Now-a-days, metal nanoparticles from plants and plant derived materials yields higher interest in medical applications than aqueous and phenolic plant extracts. Despite, there are many methods for the synthesis of nanoparticles, green synthesis has many advantages over chemical and physical methods such as cost effective, single step and safety. The present study focuses on the green synthesis of ZnO nanoparticles of rhizome of *Corollocarpus epigaeus*, its characterization, phytochemical analysis. The surface plasmon resonance absorbance peak at 263nm and 637nm were observed by UV spectrophotometer, the peaks at 3391.02 cm-1 and 1153.91cm-1 confirms the hydrogen bonding and the bands at 763.27 cm-1 to 529.73 corresponds to aliphatic -chloro and -iodo compounds that confirms the presence of organic compounds through FTIR and the morphology of ZnO nanoparticles were observed and confirmed through SEM for circular and cylindrical morphology within the size range from 123.8 nm to 128.9 nm. The active components were analysed by qualitative methods for glucose, proteins, phenols, flavonoids, terpenes and saponins. These phytochemical components proves that they have bioactive compounds that heal majority of the medical ailments and have anti venous properties. These phytochemicals compounds have the antibacterial activity against both gram-positive and gram-negative organisms such as *Staphylococcus sp., Enterococcus sp., Escherichia coli, Klebsiella sp.,* and *Proteus sp.*

Keywords: Nanoparticles, *Corollocarpus epigaeus,* SEM, Antibacterial activity.

OP-BM-08

ASSESSMENT OF SHEAR BOND STRENGTH AND ANTIMICROBIAL PROPERTY OF ORTHODONTIC COMPOSITE ON INCORPORATION WITH NANO CURCUMIN

Ashna

BACKGROUND

In recent years addition of antimicrobial properties to orthodontic adhesives have been developed to prevent white spot lesions.

AIM AND OBJECTIVE

The purpose of the study was to investigate the shear bond strength and antimicrobial property of orthodontic composite incorporated with Nano curcumin.

MATERIALS AND METHODS

Enlight TM orthodontic composite resin was modified by addition of Nano curcumin particles of different concentrations (0%, 1%,3%,5% and 10%). Antimicrobial activity against streptococcus mutans was tested using disk diffusion method for different concentrations without curing (group -A) and with curing (group- B). Metal brackets were bonded using different concentrations to 45 extracted premolars which were divided into group-I (0%), group-II (1%) and group-III (3%) (n=15). Universal testing machine was used to record the shear bond strength for different groups.

RESULTS

Disk diffusion method showed an increase in antimicrobial property with increase in concentration of curcumin in the modified resin without curing (group-A). 10% concentration has the highest zone of inhibition followed by 5%, 3%, 1% and 0% concentration has no zone of inhibition. No zone of inhibition was noted in curcumin modified resin disk which was cured (group-B) of concentration 0%, 1% and 3%. Shear bond strength of group I showed highest mean value (8.4 Mpa), followed by group II (6.9 Mpa) and group III (6 Mpa). The difference was statistically significant among all groups.

CONCLUSION

The shear bond strength decreases by incorporating the Nano curcumin particles to the composite resin. But the decrease in the bond strength was in the acceptable range to withstand the orthodontic force. Further studies on long term release profile and other aids to improve diffusion property of curcumin modified resin after curing are required to improve the antimicrobial property of the resin.

OP-BM-09

CHEMICAL CHARACTERISATION OF CHITOSAN–BASED NARINGIN-CAPECITABINE NANOFORMULATION AND EVALUATION OF ITS PHARMACOLOGICAL ACTIVITIES

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Abstract

Combination therapy involving plant-derived compounds can lessen the toxicity of individual treatments due to its modes of action, structural variety, natural availability, and comparatively low toxicity. The flavanone glycoside, Naringin exhibits a variety of pharmacological and biological characteristics, either by itself or in combination. Consequently, the combination of naringin and the established anticancer drug, Capecitabine might offer a promising alternative to treatment of cancer as a result of various properties. Meanwhile, the possibility of chitosan-based nanoparticles as efficient delivery systems for standard medications, providing regulated drug release. The chemical characterisation of the biosynthesised Chitosan–based Naringin-Capecitabine (Nrg-Cap/Cs) Nanoformulation was done via Scanning electron microscopy (SEM) and which is appeared to be approximately uniform spheres sizes ranging from 10 nm to 80 nm. Moreover, the antioxidant efficiency of nanoparticles was evaluated by employing DPPH, ABTS, H2O2, and FRAP assays, which exhibited significant enhancement in radicals scavenging activity with percentage values, 90.43%, 88.15%, 85.6% and 86.39% respectively. Furthermore, its anti-inflammatory activity was assessed via protein denaturation assays such as Bovine Serum Albumin (BSA) and Egg albumin (EA), showed percentage inhibition of respective values, 82% and 79%. The result outcome of the current study suggests that this Nrg-Cap/Cs is a promising nanoformulation, which has effective antioxidant and anti-inflammatory properties in order to compete the conventional drugs.

Keywords: Naringin, Capecitabine, Chitosan, Nanoformulation, Antioxidant, Anti-inflammatory

OP-BM-10

A PROSPECTIVE CLINICAL CASE SERIES STUDY ON RHEUMATOID PATIENTS TREATED WITH GAULTHERIA PROCUMBENS 3CH BY ASSESSING C - REACTIVE PROTEIN, ERYTHROCYTE SEDIMENTATION RATE & RHEUMATOID FACTOR

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Rheumatoid arthritis is one of most prevailing autoimmune diseases across the world, which affects multi dimensionally and takes a long course in the life span. The condition begins as pain and stiffness over symmetrical small joints and progressed to deformities and multisystem involvement. The protracted course of the disease demands for an early diagnosis and launch of the relevant intervention. There are many common medicines in homoeopathy which are efficacious like Medorrhinum, Ledum pal, Rhus tox, etc. among this group, Gaultheria procumbens is one of the least explored medicine for the treatment of rheumatoid arthritis. This medicine is sourced from a plant of Ericacea family, commonly known as winter green. This constitutes methyl salicylate as one of its main constituent. The anti-inflammatory and antioxidant activities of this plant helps in the management of inflammation and evidences suggests that it is been used as a natural supplement for its above functions. The aim of this study is to explore the anti-inflammatory and analgesic property of Gaultheria procumbens in 3CH potency for the treatment of Rheumatoid arthritis. The medicine is administered 5 globules morning and night in number 30 sized globules for a period of 9 months in 24 patients. After completion of the study, the mean ESR has reduced from 44mm/hr to 29.25mm/hr, CRP values are reduced from 13.35 to 9.11mg/dl, and the mean Rheumatoid factor values are decreased from 19.71 to 15.46 u/ml. The mean scores of DAS 28(ESR) have reduced from 5.29 to 3.84, and the RAID score showed reduction of values from 7.26 to 4.85.

This reduction of the above values shows that Gaultheria procumbens administration in 3CH potency is effective in the management of Rheumatoid arthritis

Key words: Erythrocyte sedimentation rate, C – Reactive protein, Rheumatoid factor, ACCP, Das – 28 (ESR), RAID, Gaultheria procumbens

OP-BM-11

FABRICATION OF ANISOTROPIC GOLD NANOPARTICLES USING SILK FIBROIN—CELL VIABILITY CHARACTERIZATION AND ITS APPLICATION ON JURKAT CANCER CELLS

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Abstract

A simple, environmentally benign and low-cost method for the synthesis of different-shaped gold nanoparticles using silk fibroin (SF) under ultraviolet (UV-B) radiation has been reported in this work. No additives such as organic solvents, surfactants, external reducing, stabilizing agents or high temperature were used for the synthesis of the particles. SF acts as a reducing and subsequently, stabilizing agent. The UV-Visible (UV-Vis) absorption spectra support the formation of different-shaped gold nanoparticles by displaying transverse and longitudinal surface plasmon bands at different wavelengths. The size and shape evolution of the nanoparticles was studied using the transmission electron microscope (TEM) to confirm the formation of different-shaped particles. Nano-crystalline structure and FCC crystal family of gold were confirmed by X-ray diffraction (XRD) measurement study. Furthermore, the proliferative activities of the synthesized colloidal gold nanoparticles were tested against lymphocyte and Jurkat cancer cell lines. The obtained results proved that the biogenic different-shaped AuNPs showed better activity in comparison with the spherical-shaped gold nanoparticles.

Keywords: Silk fibroin, AuNPs, UV-Vis, XRD, TEM, Cell viability activity.

OP-BM-12

SILVER-DOPED HYDROXYAPATITE NANOCOMPOSITES FROM *ACACIA NILOTICA*: A NOVEL QUORUM SENSING INHIBITOR AGAINST MULTI DRUG RESISTANT *PROTEUS MIRABILIS*

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ABSTRACT

Multi-drug resistant (MDR) uropathogenic bacteria *Proteus mirabilis* has become a major clinical problem. This pathogen uses the quorum sensing mechanism to coordinate its cells and regulate numerous virulence factors and biofilm formation. Nanocomposites (NCs) have recently emerged as an alternative therapeutic agent for developing novel medications. Keeping this in view, the current study focused on evaluating the anti-quorum sensing activity of synthesized Ag-HAp NCs from *Acacia nilotica* bark extract against *P. mirabilis*. The optical and morphological characterization of green synthesized Ag-HAp NPs were studied using UV-vis spectroscopy, FTIR, XRD, zeta potential, FE-SEM, HR-TEM, SAED, and EDAX. The violacein inhibition assay assessed the quorum sensing inhibitory property of the synthesized nanocomposites using bioreporter strain *Chromobacterium violaceum*. The sub-MIC concentration of 2% Ag-HAp NCs (80 μg/mL) effectively reduced the quorum sensing regulated virulence factors without affecting bacterial growth. Biofilm formation decreased visibly, with a maximum reduction of 96%. In the Congo red assay, biofilm formation was drastically reduced, forming pink colonies at 80 μg/mL, and EPS inhibition was noted at 98%. Significant reductions of urease, hemolytic activity, swarming, and swimming motility were also observed using 2% Ag-HAp NCs in a concentration-dependent manner. The present findings highlight the promising potential of 2% Ag-HAp NCs as an anti-quorum sensing agent for treating UTIs caused by P. mirabilis. Future research should focus on long-term stability, biocompatibility in clinical settings, and effectiveness against other MDR pathogens.

Keywords: Ag-HAp NCs, Anti-quorum sensing, MDR *P. mirabilis*, Urinary tract infections, Anti-biofilm activity.

OP-BM-13

BIOENGINEERED GOLD NANOPARTICLES FOR HUMAN COLON ADENOCARCINOMA AND ITS ANTIBACTERIAL EFFICACY

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Abstract

According to WHO 2023, colorectal cancer is the second leading cause of cancer-related deaths worldwide. In 2020, about 1.9 million new cases of colorectal cancer and more than 9, 30,000 deaths were estimated to have occurred worldwide. It is estimated that by 2040, the burden of colorectal cancer will increase 63 % with increased mortality rate of 73 %. Nanotechnology, a blooming research area utilizes metallic nanoparticles as therapeutic medicines, drug carriers etc., Phyto-encapsulated nanoparticles have been explored more for its biological property and in targeted drug delivery. *Cyanodon dactylon* also called Bermuda grass is reported for its antiglycemic and antilipidemic properties. Simillarly, *Plantago ovata* husk (Psyllium husk) commonly called as isabgol, basically a carbohydrate with arabinoxylan unit is proven to possess antiglycemic, antilipidemic and anticholesterolemic activity. Our research team has successfully patented the potential applications of *Plantago ovata* husk, and the patent has been officially published.

The current study focuses on the formulation of phyto-encapsulated gold nanoparticles utilizing the aqueous plant extract of *Cyanodon dactylon* and Psyllium husk. The formation of gold nanoparticles are visually confirmed by the colour change and its characteristic SPR around 520 – 580 nm. The synthesized gold nanoparticles are further characterized by FT-IR, XRD, EDS. The surface morphology of the synthesized gold nanoparticles are assessed by FESEM monograph. The anti-bacterial efficacy of the gold nanoparticles against *B. cereus, S. aureus, E. coli* and *K. pneumoniae* shows that PO-GNp shows maximum zone of inhibition 14mm against K. pneumonia and CND- GNp shows maximum zone of inhibition 15 mm against *K. pneumonia* and *E.coli*. The synthesized PO- GNp and CND-GNp is also tested for its cytotoxicity against HT29 human colon adenocarcinoma cell line. Consequently, the present study provides a foundational platform for investigating the use of gold nanoparticles in targeted cancer and tumor therapy.

Keywords: *Cyanodon dactylon*, Psyllium husk, Gold Nanoparticles, Colon cancer cell line, Antibacterial activity.

OP-BM-14

CHEMICAL STANDARDIZATION OF ROOT OF *DECALEPIS HAMILTONII*

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ABSTRACT

Decalepis hamiltonii Wight and Arn. (family - Asclepiadaceae) is a plant used traditionally by tribals for their day-to-day needs in the folk and traditional medicine in India. In the presented paper, we report the isolation of vanillin from the roots by flash chromatography and estimation by HPTLC. The developed method was validated for accuracy, precision, robustness, and limits of detection and quantification as well as repeatability and recovery as per ICH guidelines. The separation and quantification were performed on precoated silica gel 60 F254 aluminum plates. A binary mobile phase, toluene-ethyl acetate, was used for chromatographic separation. The HPTLC densitometry was carried out at an analytical wavelength of 254 nm in the absorption-reflectance mode. Antioxidant potential was evaluated by using a DPPH method, where it exhibited a radical-scavenging potential of 54.67% at a concentration of 0.1 mg/mL.

Keywords: antioxidant, Decalepis hamiltonii, flash chromatography, HPTLC, quantification, vanillin.

OP-BM-15

THE EFFECT OF POLYPHENOL ON THE SYNTHESIS OF HYDROXYAPATITE POROUS NANOPARTICLES

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Abstract

The bone is easily got fracture when an accident occurs. The bone comprises organic and inorganic mineral phase. Hydroxyapatite (HAP) is considered as an inorganic main mineral of bone and it is used in all biomedical applications due to its excellent biocompatibility and osteoconductivity. The size and morphology are the prominent key factors which reflect its efficiency in biomedical application. Nanosized HAP with porous morphology imitates the natural bone, which provides more space for cells to attach and grow through these pores to form a new tissue. In this context, the present investigation deals about the synthesis of hydroxyapatite porous nanoparticles by a combined microwave - ultrasound method using polyphenol template. The effect of concentration of Polyphenol with combined energy on purity, crystallinity and morphology of HAP was investigated. Analytical characterization like FTIR, XRD were done in order to study the formation of HAP and their phase purity. To investigate the morphology behavior and size, SEM and TEM analysis were carried out. The in vitro bioactivity of as-synthesized porous HAP was evaluated using simulated body fluid (SBF) for 7 days. The antibacterial activity of the as-synthesized HAP porous nanoparticles was investigated using both gram positive and negative bacterium. All the results confirm the formation of bioactive HAP porous nanoparticles with better antibacterial activity and the results substantiate each other. Hence the synthesized material can act as a good biomaterial for bone replacement applications once its pass the in vivo trials to be done in future.

Keywords: Hydroxyapatite, Combined, Microwave–Ultrasound, Polyphenol, Bioactivity

OP-BM-16

EMPOWERING WOMEN'S HEALTH: PROMOTING LACTATION AND WELL-BEING THROUGH FINGER MILLET, PEARL MILLET, AND RED SORGHUM

Introduction:

This study investigates the health benefits of finger millet (Ragi), pearl millet (Bajra), and red sorghum, focusing on their potential to enhance women’s health by supporting lactation and overall wellness. Known for their rich nutrient profile, these millets are high in calcium, iron, fibre, and antioxidants, which are essential for maternal health, particularly in strengthening bones, supporting immune function, and preventing anaemia during and after pregnancy.

Objectives:

The primary objective of this research is to assess the role of finger millet, pearl millet, and red sorghum in improving lactation and maternal health outcomes. Additionally, this study seeks to increase awareness of these nutrient-dense, affordable grains as sustainable alternatives to traditional lactation aids.

Materials and Methods:

This study involves a comprehensive literature review and analysis of existing nutritional data related to the galactagogue properties of finger millet, pearl millet, and red sorghum. It compares these millets' nutritional profiles to traditional lactation-promoting foods such as fenugreek, sesame seeds, and drumstick juice. The study's methodology includes dietary assessment tools and focuses on promoting knowledge dissemination through educational and community initiatives.

Results:

Initial findings suggest that finger millet, pearl millet, and red sorghum are effective in enhancing lactation due to their high content of essential nutrients beneficial for women’s health. Additionally, these millets provide a sustainable, cost-effective solution for maternal health and wellness, particularly in low-resource settings.

Conclusion:

Incorporating finger millet, pearl millet, and red sorghum into maternal diets has the potential to significantly improve lactation and overall health outcomes. Promoting awareness and education about these nutrient-rich millets can empower women and support healthier pregnancies, resulting in better long-term health for mothers and children.

Keywords

Finger Millet, Pearl Millet, Red Sorghum, Women's Health, Lactation Enhancement, Nutritional Awareness.

OP-BM-17

FABRICATION OF CHITOSAN/PVA EMBEDDED IN CERIUM OXIDE NANOPARTICLES AND THEIR IN-VITRO BIOLOGICAL ACTIVITIES FOR WOUND HEALING APPLICATION

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ABSTRACT

A significant barrier to wound healing is microbial infection, which slows down the wound healing process at different stages. Skin wound healing is a complex process that attempts to restore the original structure and functions of the skin. In order to promote the wound healing process, suitable wound dressing materials are required with ideal characteristics. In this research, we investigate the effect of adding cerium oxide (CeO_2 NPs) nanoparticles embedded into chitosan (CS) and polyvinyl alcohol (PVA) films as a wound dressing material prepared via the solution casting technique. The CeO_2 NPs were synthesised by the co-precipitation method and were scrutinized by FTIR, XRD, and SEM analysis. Various properties of PVA/CS and CeO_2 embedded films were studied, including physicochemical properties (XRD and FTIR), morphological studies (SEM and AFM), thermal and mechanical properties, contact angle measurement, swelling and degradation property. In-vitro biological evaluations (hemolysis and MTT assay) revealed the better hemocompatibility and biocompatibility nature of the polymer matrix. The excellent antibacterial activity was tested against wound pathogens (*E. coli* and *S. aureus).* An improved *in-vitro* wound healing assay was performed using fibroblast (NIH 3T3) cells. Therefore, the obtained results imply that the prepared CeO_2 embedded films are suitable candidate for antibacterial wound dressing in wound healing applications.

Keywords: CS/PVA/CeO_2 NPs, contact angle, hemocompatibility, Wound healing.

OP-BM-18

DETERMINATION OF ACTIVATED CARBON-BASED DEACTIVATION SYSTEM FOR THE ANTI-VIRAL DRUG IN FORMULATION BY UV SPECTROSCOPY METHOD

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ABSTRACT

The deactivation of drug considers as a vital play in the clinical research, disposal of the expired drug substances and control over the waste management and environment sustainability. In the formulation industries, disposal of the expired medicines, substances deactivation is carried out using activated charcoal. Activated charcoal a high surface area with numerous pores, making it effective at adsorbing molecules for drugs and drug like substances.

This method involved preparing standard and test solutions of Zidovudine, mixing with activated carbon, and determining the percentage of drug deactivated. The results showed a decrease in characteristic absorbance peaks in the UV spectrum after deactivation. The wave length of the Zidovudine was found to be 266 Nano meters.

This study focuses on deactivating a model marketed formulation using activated carbon and measuring the leaching of the drug after absorption. The overlay of the Zidovudine was found to be linear in 266 nm and no deviation caused. It was observed that the absorbance remained stable for a period of 180min and then it was decreased with increase in time and recovery of zidovudine. The drug & carbon ratios as fixed as 1:3 & 1:5 at 120°C and 45°C were used for the deactivation of zidovudine. using activated charcoal for a safety disposal and identification. The leaching absorbance percentage were 84% to 25%, this showed that the drug concentrations get reduced with the carbon mixed ratios and temperature increases this supports the drug deactivation.

Key Words: Activated charcoal, Deactivation, Disposal, UV-Spectroscopy, Zidovudine.

OP-BM-19

SYNTHESIS, SPECTROSCOPY, NLO RESPONSE, DFT, MOLECULAR DOCKING, AND ANTIBACTERIAL PROFILING OF METHOXYBENZYLIDENE DERIVATIVES

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Abstract:

This study provides a detailed analysis of ortho, meta, and para methoxybenzylidene derivatives using experimental and theoretical approaches. The derivatives were synthesized via standard condensation reactions and confirmed through FTIR, NMR, and UV-Vis spectroscopy. Solvatochromic behavior was assessed, revealing how solvent polarity influences electronic transitions. Density Functional Theory (DFT) calculations highlighted the impact of methoxy group positioning on the electronic structure, and nonlinear optical (NLO) properties were examined for their potential in optoelectronics. Molecular docking studies explored the compounds' interactions with bacterial proteins, correlating their structure with biological activity. Antibacterial testing showed promising results against both Gram-positive and Gram-negative strains. The study offers valuable insights into the structure-property relationships of methoxybenzylidene derivatives, supporting their potential applications in medicinal chemistry and material science.

Keywords: Methoxybenzylidene derivatives, Solvatochromic behavior, Density Functional Theory (DFT), Nonlinear optical (NLO) properties and Antibacterial activity.

OP-BM-20

PROBIOTIC CHARACTERIZATION OF LACTIC ACID BACTERIA FROM PANCHAGAVYA

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ABSTRACT

GABA, an amino acid that is not a protein, is an example of a component necessary for the proper functioning of the nervous system in mammals. Probiotics are living organisms that can enhance our well-being when consumed in large amounts. While probiotics are mostly associated with promoting health, they might also have an impact on the brain-gut connection. GABA might alleviate conditions like hypertension, diabetes, depression, memory loss, and fatigue. This research focuses on optimizing and analysing the synthesis of GABA using isolates derived from a combination. Fermented panchagavya is utilized as a substrate for synthesis by LAB (acid bacteria), with particular attention given to optimizing and evaluating this process. Lactic acid bacteria tend to be classified as GABA producers, making them optimal for human ingestion. Through TLC and UV-VIS analysis, significant production of GABA was observed in Panchagavya strains V2 and V7, as indicated by calorimetric data. The production of GABA by Enterococcus faecium and Alcaligenes sp. This has been confirmed through the identification of spots on a thin-layer chromatography plate. These selected species are consequently employing 16S rRNA gene sequencing for their identification objectives. The probiotic characterization by several assays, including pH tolerance, Nacl tolerance, bile salt tolerance, and phenol sensitivity, indicates a substantial proportion of probiotics in the isolated isolates (V2 and V7) of panchagavya as suitable for the synthesis of GABA in the industrial sector.

Keywords: GABA, TLC, UV-VIS Spectroscopy, Lactic Acid Bacteria (LAB).

OP-BM-21

DEVELOPMENT AND VALIDATION OF A BIOANALYTICAL TECHNIQUE FOR THE SIMULTANEOUS QUANTIFICATION OF PIPERAQUINE AND DIHYDROARTEMISNINE IN HUMAN PLASMA BY USING HYPHENATED TECHNIQUE (LC/MS)

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ABSTRACT

A simple, sensitive, robust, and specific LC-MS method was developed and validated for the simultaneous quantification of piperaquine and dihydroartemisinin in human plasma. The analysis was performed on a Chromolith RP18C column (50 x 4.6 mm, 5 µm) with an isocratic mobile phase consisting of methanol, acetonitrile, 10 mM ammonium acetate, formic acid, and ammonia (35:35:30:0.1:0.05, v/v/v/v/v) at 400 µL/min. Under the optimized conditions, the analytes were measured by LC/MS. The retention times of 1.70 min for piperaquine and 2.94 min for dihydroartemisinin. The method showed linearity over the range from 5.17 to 1000 ng/mL for piperaquine and from 10.28 to 1000 ng/mL for dihydroartemisinin, at $r^2 > 0.9808$. T and he validation parameters have been done as per USFDA guidelines and have been confirmed that the developed method was precise and accurate. For the system suitability the %CV of piperaquine and dihydroartemisinin were found at 1.187 and 3.654%, respectively, confirming reliability in the method. The developed method showed excellent recoveries of 10.42% for piperaquine and 18.21% for dihydroartemisinin, respectively, with no significant matrix effect observed. The stability investigations demonstrated the consistency in performance through freeze-thaw cycles, bench top, and auto-sampler analyses. Statistical analysis confirmed the reproducibility and selectivity of the method for estimation of piperaquine and dihydroartemisinin in human plasma. The outcome of this study will be a reliable analytical method that would be applied for therapeutic drug monitoring and pharmacokinetic studies, offering improved patient management in malaria treatment with reliable data on the optimization of dosing regimen and drug exposure.

Keywords: Artemisinin, Bisquinoline, Dihydroartemisinine, Piperaquine.

OP-BM-22

IN-VITRO ASSESSMENT OF CYTOTOXICITY AND ANTIOXIDANT PROPERTIES OF HOMEOPATHIC MEDICINE BERBERIES VULGARIS MOTHER TINCTURE ON A498 CELL LINE IN RENAL CELL CARCINOMA

ABSTRACT

Introduction: Berberis vulgaris, or common barberry, has a history of use in traditional medicine. Its key bioactive compound, berberine, exhibits antioxidant, anti-inflammatory, and anticancer properties. This study evaluates the antioxidant and cytotoxic effects of Berberis vulgaris Q on the A498 cell line, a model for renal cell carcinoma.

Objectives: The study assesses the cytotoxicity and antioxidant properties of Berberis vulgaris Q, exploring its potential as a therapeutic agent against RCC.

Materials and Methods: The Berberis vulgaris Q was prepared, and A498 cell cultures were maintained in DMEM with 10% fetal bovine serum and antibiotics. Cytotoxicity was evaluated by creating a 1 mg/ml stock solution of the tincture in DMSO, followed by serial two-fold dilutions. Antioxidant activity was measured using the DPPH assay, while cytotoxic effects were assessed through the MTT assay, measuring absorbance at 540 nm to calculate IC50 values.

Results: The DPPH assay showed that Berberis vulgaris Q exhibited strong antioxidant properties, achieving 71.67% inhibition at 1000 µL/mL, with an IC50 of 444.22 µL/mL, outperforming ethanol's 628.58 µL/mL. Cytotoxicity studies revealed reduced viability in treated A498 cells, with an IC50 of 466.94 µL/mL. Welch’s ANOVA confirmed significant differences in cell viability ($p = 0.006722$).

Conclusion: Berberis vulgaris Q demonstrates notable antioxidant and cytotoxic properties against renal cancer cells, suggesting its potential as a therapeutic agent.

Keywords: Berberis vulgaris, renal cell carcinoma, cytotoxicity, antioxidant properties, A498 cell line, homeopathic medicine.

OP-BM-23

DESIGN AND EVALUATION OF HAP/*TRIDAX PROCUMBENS*/GELATIN COMPOSITE FOR WOUND HEALING: IN SILICO INSIGHTS AND IN VITRO ANTIBACTERIAL ACTIVITY

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Abstract:

The study investigates the design and evaluation of a novel composite material composed of Hydroxyapatite (HAP), *Tridax procumbens* extract and gelatin for enhanced wound healing applications. Through in silico approaches, molecular docking and dynamics simulations were employed to explore the interactions of bioactive compounds from *Tridax procumbens* with key proteins involved in wound healing pathways, highlighting their potential to enhance tissue regeneration. The composite was synthesized and characterized for its physical properties, biocompatibility and antibacterial efficacy. In vitro antibacterial assays revealed that the HAP/T. procumbens/gelatin composite exhibited significant activity against common wound pathogens such as Staphylococcus aureus and Escherichia coli, suggesting its potential in preventing infections. The gelatin matrix provided a scaffold for cell attachment, while the bioactive properties of *T. procumbens* contributed to accelerated wound closure and tissue repair. Overall, this composite material demonstrates promise as a multifunctional wound dressing, combining antibacterial action with bioactive wound healing support, as supported by in silico and in vitro analyses.

OP-BM-24

INHIBITORY EFFECT OF *E.CONFERTA* MEDIATED SILVER NANOPARTICLES AGAINST THE INFECTION CAUSING PATHOGENS

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ABSTRACT

This study investigates the synthesis of silver nanoparticles (AgNPs) using a methanolic extract of *Elaeagnus conferta* leaves via a green synthesis method. It highlights the use of naturally occurring biomolecules from plant extracts as active agents in nanoparticle formation. Additionally, the antimicrobial activity of the green-synthesized AgNPs was evaluated against infection-causing pathogens, underscoring their potential as effective antimicrobial agents.

The synthesized nanoparticles were characterized using various techniques, including UV-Visible spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and Energy Dispersive X-ray Analysis (EDX). Qualitative analysis and UV-Visible spectroscopy revealed the presence of medicinally significant phytochemicals such as alkaloids, flavonoids, terpenoids, steroids, and phenolic compounds. The average crystalline size of the *Elaeagnus conferta*-synthesized AgNPs was found to be 26.59 nm. EDAX analysis indicated that the elemental composition of the nanoparticles consisted of 34.06% silver and 10.15% oxygen.

EC-AgNPs were tested against infection-causing pathogens, including *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans*, and *Aspergillus niger*. The biosynthesized EC-AgNPs exhibited significant inhibitory effects against all tested pathogens. These findings conclude that EC-AgNPs have strong potential as effective antimicrobial agents.

Keywords: *Elaeagnus conferta*, Infection causing pathogens, green synthesis, silver nanoparticles, characterization.

OP-BM-25

APPLICATION OF TERPYRIDINE Cu-COMPLEXES WITH POLYPYRIDYL LIGANDS IN ANTICANCER STUDY

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ABSTRACT

Cancer is deadly disease which involves abnormal cell growth and spreading to different parts of the body through metastesis. Among various types of cancer treatmenr procedure, Photodynamic therapy (PDT) is a very important one, which is based on the photosensitisation property of the PDT drug. PDT drug should be non toxic in absence of light and once shined with red light should kill the tumor. Due to the applealing property of absorption in visible region, transition metal complexes are used in PDT. Here, copper(II) complexes [Cu(ph-tpy)(B)](ClO4) (**1**-**3**), where ph-tpy is (4'-phenyl)-2,2':6',2"-terpyridine and B is N,N-donor phenanthroline base, viz. 1,10-phenanthroline (phen, **1**), dipyridoquinoxaline (dpq, **2**), and dipyridophenazine (dppz, **3**), are prepared and characterized from analytical and spectral data. The complexes display a d–d band near 650 nm in DMF-H_2O. The complexes show intercalative binding propensity to calf thymus DNA giving binding constant values (K_b) of ~10^5 M^{-1}, and the binding propensity follows the order: **3** (dppz) > **2** (dpq) > **1** (phen). The dpq and dppz complexes show photo-induced DNA cleavage activity in red and blue light via photo-redox pathway forming hydroxyl radicals. The cytotoxicity of the dppz complex **3** is studied by MTT assay in HeLa cancer cells. The IC_{50} values are 3.7 and 12.4 mM in visible light of 400-700 nm and in the dark, respectively. Among the ligands, ph-tpy is non toxic in the dark as well as in light, but the photoactive dppz ligand shows non-toxic behaviour in dark and cytotoxic behaviour in visible light of 400-700 nm having IC_{50} value of 60.4 mM.

Keywords: Cu-complexes, Photodynamic therapy, DNA cleavage, anticancer activity

OP-BM-26

STUDY THE EFFICACY OF HOMOEOPATHIC MEDICINES ON CANNABIS USE DISORDER BY USING CANNABIS ABUSE SCREENING TEST [CAST]

ABSTRACT

Introduction: Cannabis Use Disorder (CUD) is a complex condition characterized by psychological dependence, with significant health, social, and economic implications. Despite various conventional treatments, the psychological aspects of addiction often remain inadequately addressed, leading to high relapse rates. Homoeopathy, with its holistic approach, offers a promising alternative in managing addiction by focusing on individual symptoms and overall well-being.

Objectives: To evaluate the efficacy of individualized homoeopathic remedies in reducing the symptoms of CUD, as measured by the Cannabis Abuse Screening Test (CAST), and to assess patient outcomes over a six-month treatment period.

Materials and Methods: Thirty male patients aged 20-45 years, diagnosed with CUD according to DSM-5 criteria, were included in the study. Patients were treated with homoeopathic constitutional remedies tailored to individual symptoms, with regular follow-ups every 15 days. Pre- and post-treatment CAST scores were recorded to evaluate progress, and statistical analysis was performed using the Wilcoxon signed-rank test to determine significance.

Results: The homoeopathic treatment produced a significant reduction in CAST scores ($p < 0.001$, $V=465$), with a median decrease from 5 to 1. Marked improvement was observed in 40% of patients, moderate improvement in 33%, and mild improvement in 27%. The most frequently prescribed remedy was Cannabis Indica (53% of cases), reflecting its relevance to the specific symptomatology of CUD.

Conclusion: The study demonstrates that individualized homoeopathic treatment can significantly reduce the symptoms of CUD, making it a viable complementary therapy. Its holistic approach addresses both psychological and physical dimensions, suggesting potential benefits in long-term addiction management. Further studies, including randomized controlled trials, are recommended to validate these findings and establish standardized treatment protocols.

Keywords: Cannabis Use Disorder, Homoeopathy, Cannabis Abuse Screening Test, Wilcoxon signed-rank test, DSM-5, Cannabis Indica, addiction management.

OP-BM-27

INVITRO EVALUATION OF ANTIOXIDANT AND ENZYME INHIBITORY ACTIVITIES OF WITHANIA COAGULANS Q COMBINED WITH METFORMIN: A SYNERGISTIC APPROACH FOR SUSTAINABLE GLYCEMIC CONTROL

ABSTRACT

INTRODUCTION: Diabetes mellitus, characterized by inadequate insulin secretion or resistance, poses a formidable challenge necessitating innovative therapeutic strategies. This study explores the synergistic potential of Homeopathic Withania coagulans mother tincture (Withania coagulans Q) in combination with metformin to optimize glycaemic control while emphasizing sustainable healthcare solutions.

OBJECTIVE: To investigate the effects of Withania coagulans Q on DPPH scavenging activity and assess the impact of the 1:1 combination of Withania coagulans Q and metformin (WCQM) on αamylase and α-glucosidase inhibitory activities.

MATERIALS AND METHODS: In vitro analyses were conducted to evaluate the antioxidant potential of Withania coagulans Q using the DPPH assay. Additionally, the α-amylase and α-glucosidase inhibitory activities of WCQM were assessed across varying concentrations.

RESULTS: Withania coagulans Q exhibited significant DPPH scavenging activity, demonstrating strong antioxidant potential with an IC50 value of 75.28 µg/mL. The combination of Withania coagulans Q with metformin showed noteworthy α-amylase inhibitory activity, ranging from 35.14% to 91.60% across different concentrations. Furthermore, WCQM demonstrated α-glucosidase inhibitory activity, with inhibition percentages between 43.14% and 82.78%.

CONCLUSION: The synergistic effects observed in the combined application of Withania coagulans Q and metformin underscore the study's dual focus on therapeutic efficacy and environmental sustainability. This research advocates for integrating eco-conscious approaches into diabetes management, promoting greener trajectories in healthcare and enriching the discourse among practitioners and researchers alike.

KEYWORDS: Withania Coagulans, Metformin, Glycaemic Control, Antioxidant Activity.

OP-BM-28

BIOGENIC AMALGAMATION OF *SPIRULINA PLATENSIS* DERIVED MONOMETALLIC (Ag & Ru) AND BIMETALLIC (Ag-Ru) NANOCOMPOSITES: AN ANTI-ANGIOGENIC MODULATOR

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Abstract

A biogenic and facile approach for amalgamation of monometallic (Ag & Ru) nanoparticles into bimetallic Ag-Ru nanocomposites derived by the capping mechanism of *Spirulina platensis* algae. The bioactive metabolites of the algae extract reduces the metals to nanocomposites. The bands of Infrared spectroscopy (IR) and variation in UV-Visible absorbance peaks attributes the formation and stabilization of monometallics and bimetallic nanocomposites. The morphological images of Scanning Electron Microscopy (SEM) evidently depicts the spherical and cubic shape of the nanocomposites. X-Ray Diffraction (XRD) patterns and Energy Dispersive X-Ray Spectroscopy (EDS) signals validates the elemental composition of nanocomposites. Additionally, the bimetallic nanocomposites were effective anti-angiogenic modulator intergrated to the mimic of the micro-physiological cancer cell environment.

Keywords: *Spirulina platensis,* SEM, EDS, anti-angiogenic, amalgamation, Ag-Ru

OP-BM-29

QUEUING METHODS IN HOSPITALS USING AI AND CHATBOT

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ABSTRACT

Hospitals often face challenges in managing patient flow and minimizing waiting times, impacting patient satisfaction and staff efficiency. Traditional queuing systems can be inefficient, with patients often experiencing extended waiting times and difficulties in navigating hospital services. This paper presents a solution for an AI-powered queuing system integrated with a chatbot to optimize patient flow in hospitals. The AI system leverages machine learning algorithms to predict peak hours, classify cases based on urgency, and allocate resources dynamically. Integrated with a user-friendly chatbot interface, patients can access real-time information on wait times, check in remotely, and receive updates on their queue status. The chatbot also assists in gathering initial patient information, triaging cases, and providing essential instructions for emergency or specialized cases. Furthermore, the system can adjust schedules in real-time by analyzing patient arrival patterns and staff availability, which helps in reducing bottlenecks and optimizing resource utilization.

In vitro Screening of Plumeria alba in the Treatment of Sexually Transmitted Diseases (STDs) Plumeria alba, commonly known as white frangipani, is a tropical plant traditionally used in folk medicine. In recent years, research has focused on its potential medicinal properties, including its role in treating sexually transmitted diseases (STDs). The plant contains bioactive compounds such as alkaloids, flavonoids, and terpenoids, which are known for their antimicrobial, anti-inflammatory, and antioxidant activities.

In vitro screening methods are employed to test the efficacy of Plumeria alba extracts against pathogens responsible for STDs, such as Neisseria gonorrhoeae, Treponema pallidum, and Chlamydia trachomatis. These screening processes involve the extraction of plant materials, usually using solvents like ethanol or methanol, followed by antimicrobial testing against specific STD-causing bacteria or viruses.

Preliminary results from such studies have shown promising antimicrobial activity, suggesting that Plumeria alba could be a potential natural treatment for STDs. Its extracts could inhibit the growth of pathogens, offering an alternative to conventional antibiotics, which face increasing issues with resistance. However, further studies are required to identify the specific compounds responsible for the activity, their mechanisms of action, and potential side effects before clinical applications can be developed.

Keywords: Plumeria alba, in vitro screening, sexually transmitted diseases, antimicrobial activity, plant-based treatment.

OP-BM-30

A CATALYST FREE C-N BOND FORMATION: NITROGEN CONTAINING HETEROCYCLIC AND ITS ANTIDIABETIC EVALUATION

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Abstract

The increasing prevalence of diabetes mellitus has led to a growing demand for effective therapeutic agents. Synthetic compounds have played a crucial role in addressing this need, and the core structures of many antidiabetic drugs have been extensively studied. The research presented in the text contributes to this ongoing effort by introducing a new compound, W2, with promising antidiabetic properties. The compound, W2, was synthesized by reacting guanidine, anisaldehyde, and 2-amino-5-bromo pyridine. Characterization of W2 was performed using FTIR, ^{1}H & ^{13}C-NMR spectroscopy. In addition, the compound was evaluated for its antibacterial activity against *Shigella dysenteriae* and *Vibrio cholerae* strains and was found to be potent against both. An *in-vitro* antidiabetic assay was conducted using α-amylase as the target enzyme. The compound exhibited significant α-amylase inhibitory activity, with an IC_{50} value of 64.13 µg/ml. This suggests that W2 could be a potential candidate for the treatment of diabetes. The synthesis of W2 involved a simple and efficient reaction, making it amenable to large-scale production. The characterization studies confirmed the structure of the compound, providing a solid foundation for further investigations. The antibacterial activity of W2 against *Shigella dysenteriae* and *Vibrio cholerae* is an additional benefit, as it suggests potential applications beyond diabetes treatment. The in vitro antidiabetic assay demonstrated that W2 is a potent inhibitor of α-amylase. This enzyme plays a key role in the digestion of carbohydrates, and its inhibition can lead to a reduction in postprandial blood glucose levels. The IC_{50} value of 64.13 µg/ml is comparable to that of acarbose, a commonly used α-amylase inhibitor. Overall, the research findings suggest that W2 has the potential to be a valuable addition to the arsenal of antidiabetic drugs. Further studies are warranted to evaluate its efficacy and safety in vivo. If successful, W2 could offer a new therapeutic option for patients with diabetes.

Keywords: Diabetes mellitus, Acarbose, *Vibrio cholera,* antidiabetic, α-amylase

OP-BM-31

EFFECTS OF THE HOMOEOPATHIC MEDICINE CHIONANTHUS VIRGINICA IN HEPATOPROTECTIVE EFFECTS ON HepG2 CELL LINE

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ABSTRACT

Introduction:

This study aimed to evaluate the effects of the effects of Homoeopathic medicine Chionanthus virginica Q, Chionanthus virginica 12cH, and Ethanol on HepG2 cells, a human liver cancer cell line.

Material and Methods: Various assays were employed to measure antioxidant activity, cell viability, cytotoxicity, mitochondrial effects, and apoptosis.

Results and Discussion

The DPPH assay revealed that Chionanthus virginica Q exhibited the highest free radical scavenging activity (IC50 = 101.49 µL/mL), significantly more effective than Chionanthus virginica 12cH (IC50 = 230.83 µL/mL) and Ethanol (IC50 = 373.24 µL/mL) ($P<0.001$). In the MTT assay, Chionanthus virginica Q significantly decreased cell viability in a dose-dependent manner, whereas Ethanol maintained high cell viability across all concentrations tested ($P<0.001$). The LDH release assay indicated that Chionanthus virginica Q led to increased cytotoxicity compared to the other treatments ($P<0.01$). The Cytochrome c assay showed that Chionanthus virginica Q increased cytosolic cytochrome c levels and decreased mitochondrial cytochrome c levels, indicating induction of apoptosis ($P<0.001$). The MMP assay demonstrated a dose-dependent decrease in mitochondrial membrane potential with Chionanthus virginica Q treatment ($P<0.001$). Finally, the caspase activity assay confirmed that Chionanthus virginica Q increased caspase activity, further supporting its pro-apoptotic effects ($P<0.001$).

Conclusion

These results suggest that Chionanthus virginica Q possesses significant antioxidant, cytotoxic, and pro-apoptotic properties, making it a potential candidate for therapeutic applications in cancer treatment. Further investigation into its mechanisms and broader implications is warranted.

KEYWORDS: Chionanthus virginica Q, antioxidant activity, cytotoxicity, apoptosis, HepG2 cells

OP-BM-32

EVALUATING THE EFFICACY OF HOMEOPATHIC WITHANIA SOMNIFERA Q AND 1X IN OCD THROUGH IN VIVO STUDIES

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ABSTRACT

Introduction: Obsessive-Compulsive Disorder (OCD) is a prevalent psychiatric disorder with limited treatment options. Withania somnifera (Ashwagandha), known for its adaptogenic and neuroprotective properties, may offer potential benefits in OCD management. This study investigates the efficacy of Withania somnifera Q and 1X potencies in reducing OCD-like behaviors in an animal model.

Objectives: To assess the impact of Withania somnifera Q and 1X on repetitive and compulsive behaviors associated with OCD in animal models.

Materials and Methods: OCD-like behaviors are induced in mice using ketamine, followed by treatment with Withania somnifera Q and 1X. Behavioral assessments, including the Marble Burying, Nestlet Shredding, and Digging Behavior Tests, evaluate compulsive behaviors linked to anxiety and stress responses.

Expected Results: It is anticipated that Withania somnifera Q and 1X may demonstrate reductions in compulsive behaviors in treated mice, potentially showing a dose-dependent effect in behavioral outcomes. Data analysis will reveal any significant differences in OCDrelated behaviors between treatment and control groups.

Conclusion: This ongoing study aims to determine the potential efficacy of Withania somnifera Q and 1X in modulating OCD-like behaviors. If successful, this research could highlight a novel, complementary approach to managing OCD symptoms through homeopathy, warranting further investigation in clinical settings.

Keywords: Withania somnifera, OCD, Homeopathy, Compulsive behaviors.

OP-BM-33

IN-VITRO ANTIOXIDANT, H^+-K^+ ATPASE INHIBITION, AND CYTOTOXIC EVALUATION OF HOMOEOPATHIC PHYLLANTHUS RETICULATUS TINCTURE AGAINST HGC-27 GASTRIC CANCER CELL LINE

ABSTRACT

Introduction: Phyllanthus reticulatus, a medicinal plant in the Euphorbiaceae family, is known for its antioxidant, anti-ulcer, and anticancer properties. This study evaluates the homoeopathic mother tincture of Phyllanthus reticulatus as a potential alternative for treating peptic ulcers and gastric cancer.

Objectives: To formulate, standardize, and assess the in-vitro antioxidant, anti-ulcer, and anticancer activities of the homoeopathic mother tincture of Phyllanthus reticulatus.

Materials and Methods: Fruits of Phyllanthus reticulatus were collected and processed to prepare a 1:10 homoeopathic mother tincture. Characterization included pH, specific gravity, alcoholic content, and TDS. Antioxidant activities were assessed using DPPH, nitric oxide scavenging, lipid peroxidase, and H^+-K^+ ATPase inhibition assays. Cytotoxicity on HGC-27 gastric cancer cells was evaluated using the MTT assay at 10–500 µg/mL concentrations.

Results: The mother tincture showed a pH of 4.53, specific gravity of 0.93, alcoholic content of 5.33%, and TDS of 4.12%. Qualitative analysis detected resins, tannins, steroids, phenols, anthocyanins, and saponins; quantitative analysis showed phenolic content of 0.172 mg/mL and flavonoid content of 0.089 mg/mL. DPPH and nitric oxide assays had IC50 values of 79.13 µg/mL and 25.24 µg/mL, respectively. H^+-K^+ ATPase inhibition (IC50 = 39.00 µg/mL) indicated anti-ulcer potential. The MTT assay demonstrated significant cytotoxicity against HGC-27 cells (IC50 = 194.5 µg/mL, $p < 0.01$).

Conclusion: Phyllanthus reticulatus mother tincture shows significant antioxidant, anti-ulcer, and anticancer potential, indicating its use as an alternative therapy. Further in-vivo studies are recommended for validation.

Keywords: Phyllanthus reticulatus, homoeopathic mother tincture, antioxidant, anti-ulcer, anticancer, H^+-K^+ ATPase, MTT assay.

OP-BM-34

SYNTHESIS, CHARECTERISATION AND BIOLOGICAL STUDIES OF NOVEL 2,4-DICHLORO-6-[(4-HYDROXY-PHENYLIMINO)-METHYL]-PHENOL (DCSAP-L) AND ITS FIRST TRANSITION METAL COMPLEXES DERIVED FROM 3,5-DICHLOROSALICYLALDEHYDE WITH P-AMINOPHENOL

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ABSTRACT - The insistence for novel and more effective anti-microbial agents is inevitable, since the microbes develop immunity against the existing antibiotics. The research paper deals with combination, characteristics of novel 2,4-Dichloro-6-[(4-hydroxy-phenylimino)-methyl]-phenol (DCSAP-L) and its corresponding metal complexes and their biological applications. In this paper, mixture of DCSAP-L from 3,5-Dichlorosalicylaldehyde with p-aminophenol was prepared. Along with this DCSAP-L, various transition metal complexes were prepared, Where, metal chlorides of Co(II), Cu(II) and Zn(II) used in the coordination. DCSAP-L and metal complexes were prepared and characterized with the assistance of analytical as well as physico-chemical parameters. The synthesized compounds of DCSAP-L and metal complexes were undergone for biological studies and reported.

Keyword: 2,4-Dichloro-6-[(4-hydroxy-phenylimino)-methyl]-phenol (DCSAP-L), Spectral studies, Biological activities.

OP-BM-35

ASSESSING THE ANTICANCEROUS EFFECT OF CORDYCEP SINENSIS 30 IN HEPG2 CELL

ABSTRACT

Introduction: Cordyceps sinensis, a parasitic fungus traditionally used in Asian medicine, is recognized for its diverse medicinal properties, including immune modulation, anti-inflammatory, and anticancer effects. In homoeopathy, Cordyceps sinensis 30CH is a potentized preparation that may exhibit cytotoxic and pro-apoptotic activity against cancer cells. This study evaluates its impact on the HepG2 liver cancer cell line.

Objectives: To assess the in-vitro cytotoxicity, anti-proliferative, and pro-apoptotic effects of Cordyceps sinensis 30CH on HepG2 cells.

Materials and Methods: HepG2 cells were treated with Cordyceps sinensis 30CH at concentrations of 50, 250, 500, 750, and 1000 µL/mL. MTT assay evaluated cytotoxicity, and ethidium bromide and acridine orange staining assessed DNA damage and apoptosis. Gene expression of BAX, CASP3, p53, Bcl-2, and GAPDH was analysed using PCR.

Results: Cordyceps sinensis 30CH showed dose-dependent cytotoxicity, with a CTC50 value of 438.10 µL/mL at 50 µL/mL ($p < 0.001$). Anti-proliferative activity decreased from 84.74% to 33.67% with increasing concentrations. DNA damage and apoptosis were significant, as evidenced by longer comet tail lengths and increased red fluorescence. Gene expression analysis showed upregulation of BAX (Log2FC = 1.32), CASP3 (Log2FC = 1.58), and p53 (Log2FC = 1.0), while Bcl-2 was downregulated (Log2FC = -1.0), indicating enhanced apoptosis ($p < 0.05$).

Conclusion: Cordyceps sinensis 30CH exhibits strong anticancer potential through cytotoxicity, apoptosis induction, and modulation of apoptotic genes in HepG2 cells. Further studies are recommended for therapeutic exploration.

Keywords: Cordyceps sinensis 30CH, HepG2 cells, cytotoxicity, anti-proliferative, apoptosis, gene expression.

OP-BM-36

REPORT OF THE STUDY ON A NEW HOMOEOPATHIC TREATMENT PROTOCOL IN TREATING RHEUMATOID ARTHRITIS

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Abstract

Rheumatoid arthritis (RA) is the most common inflammatory arthritis and autoimmune disease that is associated with progressive disability, systemic complications, early death and socioeconomic costs. It occurs in 0.5-1.0% of the adult population worldwide and is more common in women. Its Indian prevalence is ranging between 0.19 - 2.50%. Complex aetiological factors like genotype (50%), environment, age, gender, family history, smoking, etc., can be the cause and triggers several inflammatory cascades leading to persistent synovial inflammation and associated damage to articular cartilages. Patients often complain of pain & early morning joint stiffness lasting >1 hour. Typically the small joints of hands and feet are affected with a polyarticular (>5 joints) symmetric distribution. It has a significant negative impact on the ability to perform daily activities, including work & household tasks, and health related quality of life. The goal of treatment is to eliminate symptoms, slow disease progression and optimize quality of life. These details intended us to undergo an exploratory study to find the effectiveness of a New Homoeopathic Treatment Protocol (Weekly a dose of Medorrhinum1M, 5 drops of Stelleria Media Mother tincture twice daily and a dose of Chininum sulphuricum. 6 CH daily) for the treatment of Rheumatoid arthritis. 40 patients were given treatment for 180 days. Pre and Post Treatment mean reduction of 19 IU/mL units of Rheumatoid Factor, 8 mg/L units of C-Reactive Protein and 9 IU/mL units of Anti-Cyclic Citrullinated Peptide are observed. These values stand as the potential evidence for the effect of the New Homoeoapthic Medicine Treatment Protocol.

Keywords: Anti-Cyclic Citrullinated Peptide, Chininum sulphuricum, C-Reactive Protein, Medorrhinum, Rheumatoid Arthritis, Rheumatoid Factor, Stelleria Media.

OP-BM-37

FORMULATION AND EVALUATION OF HOMEOPATHIC MOTHER TINCTURE

ABSTRACT

Introduction:Clitoria ternatea, is also known as `Butterfly pea' and has been reported to have many beneficial effects due to the presence of various phytochemicals bearing many flavonoids and anthocyanins. This plant has been used in traditional medicine for its potential neuroprotective and antioxidant properties

Objectives: To formulate and evaluate homeopathic mother tincture of Clitoria ternatea, evaluation of physicochemical properties, antioxidant activity, and neuroprotective effects.

Methodology: Clitoria ternatea Mother Tincture is prepared by maceration. Physicochemical and phytochemical analyses, DPPH antioxidant assay and SH-SY5Y neuroblastoma cell MTT assay evaluate its properties, with statistical analysis determining IC50 values.

Results:The DPPH scavenging activity evaluation showed great antioxidant activity indicated by an IC50 value of 291.18 µg/ml. The MTT assay was used to establish the cytotoxicity of H2O2 on the SH-SY5Y cells, establishing a CTC50 of 724.84 µg/ml. In the MTT assay which was to assess the effect of Clitoria ternate Q on SHSY5Y of H2O2 induced oxidative stress, it was observed that lower concentrations of Clitoria ternatea Q (50 µg/ml and 250 µg/ml) exhibit a protective effect and increases cell viability under oxidative stress. High concentrations (500µg/ml, 750µg/ml and 1000µg/ml) showed reduced cell viability indicating cytotoxicity.

Conclusion:The experimental findings show that the Clitoria ternateaQ has a good antioxidant and neuroprotective effect at low concentrations. This indicates the possibility of using Clitoria ternatea in oxidative stress inducing neurodegenerative therapies, however, careful administration is required to avoid cytotoxicity

Keywords:Antioxidant ,Clitoria ternatea, Homoeopathy, Neuroprotective, Phytochemicals.

OP-BM-38

DETECTING AND CLASSIFYING MYOCARDIAL INFARCTION IN ECHOCARDIOGRAM FRAMES WITH AN ENHANCED CNN ALGORITHM AND ECV-3D NETWORK

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ABSTRACT

The detection and classification of myocardial infarction (MI) in echocardiogram frames have traditionally relied on conventional 2D imaging and manual diagnosis, which often leads to delays and inaccuracies. The existing systems suffer from limited accuracy in identifying subtle changes in cardiac tissues, as well as challenges in distinguishing between different stages of MI. This project addresses these limitations by developing an Enhanced Convolutional Neural Network (CNN) algorithm integrated with the ECV-3D network. The proposed system processes echocardiogram frames in 3D, improving the extraction of temporal and spatial features critical for accurate MI detection. MATLAB is employed for model implementation, training, and validation using a large dataset of echocardiographic images. The advantages of this system include enhanced accuracy, reduced false positives, and the ability to identify MI at earlier stages. The goal of the project is to provide an automated, efficient, and scalable solution for MI detection, ultimately improving patient outcomes through faster and more reliable diagnosis.

OP-BM-39

ANTIMICROBIAL ACTIVITY OF GREEN SYNTHESIZED $ZnAl_2O_4$ NANOSPINEL

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This study presents the antibacterial and antifungal efficacy of green synthesized $ZnAl_2O_4$. Zinc is an essential nutrient that is essential for mammals' growth, development, and overall well-being. Despite being a biologically unnecessary element in living organisms, aluminium has a long history of medical use and is noticeably benign to eukaryotic cells. The combination of these two-metal oxide possesses a significant activity towards the microbial cells. The test was performed on the *Propionibacterium acnes, Pseudomonas aeruginosa*, *Staphylococcus aureus, Escherichia Coli, Aspergillus niger*, and *Candida albicans* pathogens. The results obtained show that the synthesized nanomaterial has greater antimicrobial property towards the pathogens. The value obtained is very close to the positive control used in this study by the use of very small amount of nanoparticle.

Keywords: $ZnAl_2O_4$ nanoparticle, antibacterial activity, antifungal activity

OP-BM-40

ENHANCING LUNG TUBERCULOSIS DIAGNOSIS: INNOVATIVE APPROACHES AND TECHNOLOGIES IN X-RAY IMAGE DETECTION AND ANALYSIS

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ABSTRACT

Pulmonary tuberculosis with Mycobacterium tuberculosis is the major leading cause of death due to infectious diseases in the world. Lung tuberculosis diagnosis should be precise and ideally done at the initial stages for proper treatment and management. Features for this work include techniques on filters, feature extraction, and classification techniques on lung tuberculosis using X-ray images. Image processing on the X-ray was adopted through the median filter to eliminate the noise and sharpen textural characteristics. Regarding the feature extraction, the Gray Level Co-occurrence Matrix (GLCM) was used with the contrast, correlation, dissimilarity, homogeneity, and energy features. The processed images were classified using k-nearest Neighbors (KNN), Support Vector Machine (SVM), Random Forest, and Decision Tree classifiers. The experimental evaluation proved that among all the classifiers, the Random Forest classifier performed better in terms of identifying the normal and pathological lung X-ray images affected by tuberculosis. Among all the mentioned classifiers, the Random Forest classifier has a higher accuracy and reliability in detecting lung tuberculosis. Therefore, the research findings suggest that using X-ray images of lung tuberculosis using the Random Forest classifier is highly effective for detecting lung tuberculosis. The late diagnosis and treatment of Tuberculosis have been attributed to a lack of ideal methods for identification of the disease in its early stage. Still, this method offers a promising way to early diagnosis and treatment, thereby enhancing the quality of patients' lives and contributing to the fight around the world.

Keywords: Tuberculosis, X-Ray, Median filtering, GLCM Feature extraction, Machine learning classifier.

OP-PM-41

BIOSYNTHESIS OF SILVER NANOPARTICLES BY MARINE INVERTEBRATES (ARTEMIA FRANCISCANA) AND INVESTIGATION OF ITS BIOACTIVE POTENTIAL

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ABSTRACT

The implementation of live feed resources for the biosynthesis of metal nanoparticles is an inventive area in the prevailing nanotechnology research. The current study describes a favorable, environmentally friendly method for synthesizing silver nanoparticles using the hydroalcoholic extract of the live feed, Artemia franciscana. The produced extract has a high concentration of methyl esters and fatty acids, according to the gas chromatography analysis. The formation, morphology, and crystalline nature of the synthesised silver nanoparticles were determined using UV-visible spectroscopy, scanning electron microscopy (SEM), and X-ray diffraction techniques. The creation of silver nanoparticles was confirmed by the surface resonance peak at 423 nm in the UV-visible spectrum. The bio-produced silver nanoparticles had an average size of 8.3 nm and were nearly spherical. The distinctive peaks in the X-ray diffraction patterns are clear indications of the crystalline structure of silver nanoparticles. Excellent antibacterial activity is displayed by the biosynthesised silver nanoparticles against both gram-positive and gram-negative bacteria. They exhibit excellent anti-oxidant and anti-fungal properties. Thus, it is anticipated that the green synthesised nanoparticles will be a potential option for use in a variety of fields like catalysis, wound healing, biosensors, and drug delivery.

Keywords: Artemia franciscana; biosynthesis; silver nanoparticles; biosensors

OP-BM-42

SUSTAINABLE SYNTHESIS OF SILVER NANOPARTICLES FROM AMPHILOPHIUM PANICULATUM: EXPLORING BIOMEDICAL INNOVATIONS AND COMPUTATIONAL INSIGHTS

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ABSTRACT

Diabetes mellitus is a group of chronic metabolic disorders caused by elevated blood sugar levels managed by insulin resistance or deficiency. According to Indian Diabetes Federation, the number of affected patients globally is projected to rise from 537 million (at present) to 643 million by 2030. Conventional therapies often require frequent drug administration and regular glucose monitoring necessitating enhanced or sustained drug delivery to improve diabetes management. Similarly, lung cancer remains a significant global health concern. According to WHO, approximately 2.5 million new cases and 1.8million deaths, in 2023, which is considered to be most common cancer in world wide. Highlighting the need, the emergence of nanomedicine offers promising approach to target cancer while reducing side effects.

Emerging applications of nanotechnology in health care and medicine for the beneficial use in various disease treatment, drug delivery, gene therapy and other therapeutics. Eco-friendly and sustainable approach involves the use of biological microorganisms and plant materials for the synthesis of metal nanoparticles are more preferred. In the present study, the sustainable approach involves using Amphilophium paniculatum leaf extract to synthesize silver nanoparticles. A. paniculatum plant belongs to the Bignoniaceae family, reported to have medicinal properties such as anti-inflammatory, analgesic effect, antipyretic effect, antioxidant activity, and antihyperglycemic activity. To date, there is a notable absence of studies synthesizing silver nanoparticles using extracts from the leaves of A. paniculatum and evaluating their potential biomedical applications. This represents a significant research gap in the field.

The study contributes to the eco-friendly synthesis of silver nanoparticles using A, paniculatum leaf ethanol extract by solar irradiation method. The synthesized silver nanoparticles were characterized using UV, FTIR, XRD, FESEM and EDS. Antioxidant activity of plant extracts and silver nanoparticles, shows that the synthesized silver nanoparticles possess higher percentage inhibition (IC50- 57.76µg/mL) compared with APE extract (IC50- 100.09µg/mL). Also, the antibacterial activity of APES against clinical bacterial isolates such as Staphylococcus aureus and Klebsiella pneumonia shows a good zone of inhibition against bacteria. We also investigated the in vitro antidiabetic activity of both extract and silver nanoparticles which revealed better inhibition compared with standard acarbose and metformin..

Keyword: Silver nanoparticles, Antibacterial, Anticancer, Antidiabetic, In silico, Amphilophium paniculatum

OP-BM-43

DEVELOPMENT AND VALIDATION OF RP-HPLC METHOD FOR RELATED SUBSTANCE ANALYSIS IN PROPYLTHIOURACIL TABLETS

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ABSTRACT:

This study focuses on the development and validation of the RP-HPLC method for related substances in propylthiouracil tablets. Propylthiouracil is a medication that is used to treat hyperthyroidism. A reversed-phase high-performance liquid chromatography (RP-HPLC) method was developed and optimized for the separation and quantification of impurities and related substances in Propylthiouracil tablets. The chromatographic separation was achieved on a C18 column using a mobile phase consisting of buffer and acetonitrile in 900:100 v/v. Ammonium acetate is used to make buffer, which has a pH of 6.8±0.02. The developed method demonstrated excellent linearity ($R^2 > 0.999$) over the concentration range of Propylthiouracil 0.1 – 2.0 µg/ml and Thiourea 0.06-2.00 µg/ml, with limits of detection and quantification for Propylthiouracil was 0.041 & 0.124 and for Thiourea was 0.020 &0.061. Precision studies showed % RSD values NMT 15.0%. The developed RP-HPLC method proved to be selective, sensitive, precise, and accurate for the determination of related substances in PTU. This validated method provides a reliable tool for pharmaceutical analysis, facilitating batch-to-batch consistency and ensuring patient safety.

Keywords: Propylthiouracil, Related substances, RP-HPLC, Method development, Method validation, Pharmaceutical analysis

OP-BM-44

ASSESSING THE IMPACT OF HOMOEOPATHIC MEDICINE BACOPA MONNEIRI Q AND BACOPA MONNEIRI 1X, ON SCHIZOPHRENIA IN AN IN VIVO STUDIES

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ABSTRACT

Introduction: Schizophrenia is a complex psychiatric disorder characterized by a range of symptoms, including hallucinations, delusions, and cognitive impairments, with limited treatment options available. Bacopa monnieri, a traditional herb known for its cognitive-enhancing and neuroprotective properties, may have therapeutic potential in managing schizophrenia symptoms. This study aims to investigate the efficacy of Bacopa monnieri in alleviating symptoms associated with schizophrenia in an experimental model.

Objectives: To evaluate the impact of Bacopa monnieri on the positive and negative symptoms of schizophrenia in a controlled animal study

Materials and Methods: The study will utilize an animal model where schizophrenia like symptoms are induced using a neurochemical agent. Following this, treatment with Bacopa monnieri will be administered. Behavioral assessments will include tests to measure cognitive function, social interaction, and anxiety levels, providing insights into the herb's potential therapeutic effects.

Expected Results: It is hypothesized that treatment with Bacopa monnieri will result in significant reductions in both positive and negative symptoms of schizophrenia in the treated animals.

Conclusion: This ongoing study seeks to establish the efficacy of Bacopa monnieri as a therapeutic agent for managing schizophrenia symptoms.

Keywords: Bacopa monnieri, Schizophrenia, Homeopathy, Cognitive enhancement.

OP-BM-45

AUTOMATIC LIVER DETOX SYSTEM USING THERMO ELECTRIC PLATES FOR PATIENTS

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ABSTRACT

Keeping the liver and gut healthy is central to maintaining hormone balance. The liver plays a crucial role in hormone metabolism and regulating their levels in the body. This is the case for both naturally produced hormones and those introduced via HRT/BHRT. Also, the gut, in particular the gut microbiota, is key in hormone balance, especially estrogen. In recent years, researchers have identified a set of genes present in the gut microbiota (this set of genes was named the "estrobolome") which express enzymes that can metabolise estrogens. Based on this, the aim of this experiment was to evaluate the stress-corrective and antitoxic effect of the preparation phytoglinol on the body of white rats subjected to prolonged exposure of high temperatures or low temperature using automatic timing of thermoelectric plates and microcontroller atmega.

OP-BM-46

TRANSFORMING BREAST CANCER HISTOPATHOLOGY WITH EXTERNAL ATTENTION AND FEATURE FUSION TECHNIQUES

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ABSTRACT

Breast cancer is one of the most prevalent causes of death among women worldwide. Hence, the early detection helps to save the life of the women. Mammography is the basic screening test for breast cancer. It consist many artefacts, which negatively influences in detection of the breast cancer. Therefore, removing artefacts and enhancing the image quality is a required process in Computer Aided Diagnosis (CAD) system. The accuracy and efficiency of the CAD is increased by providing exact Region of Interest (ROI). Extracting ROI is a challenging task in preprocessing because the presence of pectoral muscle influences the detection of abnormality. Here, the proposed show that the wiener filter and Contrast Limited Adaptive Histogram Equalization (CLAHE) techniques efficiently aids for enhancing the quality of the image, thereby it also removes the unwanted background and the pectoral muscle by using thresholding and modified region growing technique respectively. Furthermore, the proposed algorithm was tested on mini-MIAS database; the result obtained was compared with completeness and correctness for pectoral muscle removal and was reported as 98% and 97% respectively. Collectively, these results suggest that the proposed method is well suited for improving the quality of mammography image for Auto-CAD system.

OP-BM-47

HIGH PRECISION BLOOD CELL DETECTION VIA ENHANCED YOLOV5S NETWORK

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ABSTRACT

Detection of White Blood Cell (WBC) cancer diseases like Acute Myeloid Leukemia (AML), Acute Lymphoblastic Leukemia (ALL), and Myeloma is a complex task in medical field because they are sudden in onset. Our proposed method consists of designing and developing an automated system which will assist the medical professionals in correctly diagnosing all the types and sub-types of this disease. In this paper, we have proposed a novel method in which we have taken microscopic blood images as an input image. For segmenting, we have used the combination of Gaussian Distribution, Otsu Adaptive Thresholding and for clustering we have used K-Means method. Using Gray Level Co-occurrence Matrix (GLCM), the features are extracted and were used for classification using Convolutional Neural Network (CNN). The overall accuracy of the system obtained after processing is 97.3%.

OP-BM-48

EARLY DETECTION OF ALZHEIMER'S DISEASE USING IMAGE PROCESSING

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ABSTRACT

Image segmentation is a significant research field in medical engineering. Segmented brain images are used to visualize volume and quantitatively analyse anatomical and cortical structures. Segmented brain tissues provide an anatomical framework for visualisation which has a potential use in neuro-science research and neurosurgical planning owing to advances in Magnetic Resonance Imaging (MRI). Segmentation refers to the labeling of pixels into different regions. At a higher level these regions can be labeled as anatomical structures and then grouped across different slices to give three dimensional descriptions of these structures. The method proposed here is successful in segmenting the brain without human intervention and accurately detecting the variation in the total volume or size of the brain. The purpose of this work is to detect any subtle changes in the volume of the brain. Medical Image fusion plays a vital role in medical field to diagnose the brain tumors which can be classified as Alzheimer is present or not. It is the process of integrating multiple images of the same scene into a single fused image to reduce uncertainty and minimizing redundancy while extracting all the useful information from the source images. CNN is used to fuse two images with different vision. The fused image will be more informative than the source images. The texture and wavelet features are extracted from the fused image. The CNN Classifier classifies the alzheimer's disease based on trained and tested features. The proposed method achieved 80.48% sensitivity, 99.9% specificity and 99.69% accuracy. Experimental results obtained from fusion process prove that the use of the proposed image fusion approach shows
better performance while compared with conventional fusion methodologies.

Keywords: Neuroscience Research, Neurosurgical Planning, Automated Segmentation, Volume Variation Detection, Medical Image Fusion, Brain Tumors, Alzheimer's disease.

OP-BM-49

METHOD DEVELOPMENT AND VALIDATION FOR THE QUANTITATIVE ESTIMATION OF DOCOSAHEXAENOIC ACID IN MICROENCAPSULATED POWDER FORMULATION BY USING GC WITH FID DETECTOR

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Objective: This study aims to develop and validate a reliable gas chromatography (GC) method with a flame ionization detector (FID) for the quantification of docosahexaenoic acid (DHA) in a microencapsulated powder formulation.

Methods: The method development process involved optimizing the GC conditions, including the selection of the appropriate column, carrier gas flow rate, injector and detector temperatures, and the choice of suitable solvent and derivatization techniques to ensure the accurate and reproducible detection of DHA. The validation of the method was conducted following International Council for Harmonization (ICH) guidelines, assessing parameters such as linearity, accuracy, precision, specificity, and robustness.

Results: The optimized GC-FID method demonstrated excellent linearity over the 4251.00 to 17003.00 µg/mL concentration range with a correlation coefficient (R^2) greater than 0.999. The method showed high precision, with intra-day and inter-day relative standard deviations (RSD) of less than 5%. The method's accuracy was confirmed through recovery studies, yielding results between 95% and 105%. The method was specific to DHA, with no significant interference from the excipients present in the microencapsulated formulation. Robustness testing indicated that minor variations in flow rate and detector temperature did not significantly affect the results.

Conclusion: The developed GC-FID method is robust, accurate, and precise, making it suitable for the routine analysis of DHA in microencapsulated powder formulations. This method provides a reliable tool for quality control and ensures the consistency and efficacy of DHA-based nutraceutical products.

Keywords: DHA, Gas Chromatography, Flame Ionization Detector, Method Development, Validation, Microencapsulation, Nutraceuticals.

OP-BM-50

DEVELOPMENT OF COLON SPECIFIC VANCOMYCIN TABLETS FOR OVERCOMING GASTROINTESTINAL BARRIERS BY TIMED RELEASE APPROACH

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ABSTRACT

Vancomycin hydrochloride is a significant antibiotic for treating intestinal infections, however, it exhibits poor residence time in the intestine. Besides, it also gets degraded by gastric enzymes and pH. Hence, this study aims to develop a colon-specific, timed-release formulation that enhances drug efficacy by enteric targeting and elongating intestinal residence time. The timed-release formulations were directly compressed prior to spray coating with Eudragit S100 to impart enteric properties. Chitosan and sodium alginate were employed as mucoadhesive polymers to enhance drug retention in the colonic mucosa. We observed a λ_{max} of 204 nm with a linearity of 0.982 in UV-Visible spectrophotometry. We conducted a kinetic analysis to understand the release mechanisms that support in-vitro dissolution release studies. TR3 demonstrated the best dissolution rate among the tested formulations, achieving 96.78% drug release for six hours in phosphate buffer (pH=7.4) following non-fickian diffusion. Besides, all the developed formulations (TR1-TR6) also did not disintegrate under acidic media. Hence, no drug will be degraded in the gastric region. The disintegration rate expressed an indirect relationship with the mucoadhesive polymer. The enteric-coated tablet improves the targeting ability of vancomycin in a pH-responsive manner. It also provides a controlled release profile within a specific time frame, preventing possible adverse reactions like Dysbiosis and malabsorption. This will help in effectively eradicating gastrointestinal infections. This study emphasizes the potential of timing the release to enhance patient compliance and therapeutic outcomes in colon-targeted drug delivery systems.

Keywords: Vancomycin; Mucoadhesive Polymers; Enteric Coated Tablets; Zero-Order Kinetics

OP-BM-51

COMPARATIVE EVALUATION OF ANTIMICROBIAL EFFECTS AND SURFACE ROUGHNESS OF TISSUE CONDITIONERS AFTER INCORPORATION OF ZnO NANOPARTICLES – IN VIVO STUDY

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ABSTRACT

Aim and Objectives: The aim of this study was to evaluate the antimicrobial activity and surface roughness of tissue conditioners before and after incorporating Zinc Oxide (ZnO) nanoparticles in complete denture prosthesis. The objectives were to examine the antimicrobial effects of modified tissue conditioners after the incorporation of ZnO nanoparticles and to assess the changes in surface roughness before and after this modification.

Materials and Methods: This in vivo study was conducted on 20 subjects who were complete denture wearers. The subjects were divided into a control group, treated with tissue conditioner without ZnO nanoparticles, and a test group, treated with tissue conditioner containing 0.01% ZnO nanoparticles. The tissue conditioners were applied to the dentures, and after 48 hours, samples were sectioned and removed for microbial laboratory testing. Surface roughness was assessed using Scanning Electron Microscopy (SEM). Inclusion criteria included geriatric patients aged 50-60 years with ill-fitting dentures, while exclusion criteria included patients with cognitive impairments, diabetes, or smoking habits. Statistical analysis was performed using a paired t-test to compare the mean difference between the two groups.

Results: The results showed a significant reduction in microbial colony counts in the test group compared to the control group, indicating enhanced antimicrobial activity with the incorporation of ZnO nanoparticles. Additionally, the surface roughness of tissue conditioners was significantly smoother after the incorporation of ZnO nanoparticles, as confirmed by SEM analysis. The study concluded that ZnO nanoparticles effectively improve both the antimicrobial properties and surface smoothness of tissue conditioners used in complete dentures.

Conclusion: Incorporating ZnO nanoparticles in tissue conditioners significantly enhances their antimicrobial activity and reduces surface roughness, making them a viable option for improving denture hygiene and patient comfort. Further research with larger sample sizes and long-term studies is recommended to validate these findings.

Keywords: antimicrobial activity, complete denture, nanoparticles, surface roughness, tissue conditioners.

OP-BM-52

BIOINSPIRED ZINC OXIDE NANOPARTICLE PHYTOCHEMICAL PROFILING AND ANTIMICROBIAL EVALUATION OF SALVIA OFFICINALIS (L)

Objective: The aim of this study was to develop and evaluate a sustained-release formulation of **Teneligliptin**, a dipeptidyl peptidase-4 (DPP-4) inhibitor, for the effective management of type 2 diabetes mellitus. Sustained-release formulations reduce dosing frequency, improve patient compliance, and maintain therapeutic drug levels over an extended period. **Methods**: A matrix-based sustained-release formulation of Teneligliptin was developed using various polymers, including **hydroxypropyl methylcellulose (HPMC)**, **ethyl cellulose**, and **Eudragit**, to achieve controlled drug release. Direct compression and wet granulation methods were employed to prepare tablets. Preformulation studies, including drug-excipient compatibility and solubility assessments, were conducted to ensure the stability of the formulation. The formulated tablets were evaluated for physical parameters such as hardness, friability, weight variation, and drug content uniformity. **In vitro** drug release studies were carried out in a simulated gastrointestinal environment over 24 hours, and release kinetics were analyzed using models such as **zero-order**, **first-order**, **Higuchi**, and **Korsmeyer-Peppas** models to determine the drug release mechanism. **Results**: The optimized formulation exhibited a sustained-release profile, with drug release extending over 24 hours, following **Higuchi diffusion kinetics**. The drug release was found to be dependent on the type and concentration of the polymers used. Stability studies demonstrated that the formulation remained stable under accelerated conditions for 6 months, with no significant changes in drug content or release profile. **Conclusion**: The sustained-release formulation of Teneligliptin successfully prolonged the drug release over 24 hours, offering a promising alternative to conventional immediate-release tablets. This formulation has the potential to enhance patient compliance by reducing dosing frequency, while maintaining effective plasma concentrations for glycaemic control in type 2 diabetic patients.

OP-BM-53

NEW FORMULATION AND EVALUATION OF SUSTAINED RELEASE PHARMACEUTICAL DOSAGE FORM

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ABSTACT

Objective: The aim of this study was to develop and evaluate a sustained-release formulation of **Teneligliptin**, a dipeptidyl peptidase-4 (DPP-4) inhibitor, for the effective management of type 2 diabetes mellitus. Sustained-release formulations reduce dosing frequency, improve patient compliance, and maintain therapeutic drug levels over an extended period. **Methods**: A matrix-based sustained-release formulation of Teneligliptin was developed using various polymers, including **hydroxypropyl methylcellulose (HPMC)**, **ethyl cellulose**, and **Eudragit**, to achieve controlled drug release. Direct compression and wet granulation methods were employed to prepare tablets. Preformulation studies, including drug-excipient compatibility and solubility assessments, were conducted to ensure the stability of the formulation. The formulated tablets were evaluated for physical parameters such as hardness, friability, weight variation, and drug content uniformity. **In vitro** drug release studies were carried out in a simulated gastrointestinal environment over 24 hours, and release kinetics were analyzed using models such as **zero-order**, **first-order**, **Higuchi**, and **Korsmeyer-Peppas** models to determine the drug release mechanism. **Results**: The optimized formulation exhibited a sustained-release profile, with drug release extending over 24 hours, following **Higuchi diffusion kinetics**. The drug release was found to be dependent on the type and concentration of the polymers used. Stability studies demonstrated that the formulation remained stable under accelerated conditions for 6 months, with no significant changes in drug content or release profile. **Conclusion**: The sustained-release formulation of Teneligliptin successfully prolonged the drug release over 24 hours, offering a promising alternative to conventional immediate-release tablets. This formulation has the potential to enhance patient compliance by reducing dosing frequency, while maintaining effective plasma concentrations for glycaemic control in type 2 diabetic patients.

Keywords: Teneligliptin, sustained release, matrix tablet, dipeptidyl peptidase-4 inhibitor, in vitro drug release, release kinetics, diabetes mellitus.

OP-BM-54

IMPACT OF SILICEA POTENCIES (6CH, 12CH, 30CH) ON SOIL PHYSICO-CHEMICO-BIOLOGICAL PROPERTIES AND GROWTH DYNAMICS OF LEAFY VEGETABLES IN AGRO-HOMOEOPATHY

ABSTRACT

Introduction: The integration of homoeopathy in agriculture, termed agro-homoeopathy, offers a novel approach to enhancing soil health and plant growth. This review explores the potential impact of Silicea 6CH, 12CH, and 30CH on soil rhizosphere and the growth characteristics of leafy vegetables. Silicea, a homoeopathic preparation derived from silicon dioxide, has shown promise in optimizing plant growth through improved soil conditions.

Objectives: This review aims to assess existing research on the effects of Silicea in agro-homoeopathy and outlines the proposed study to evaluate its influence on soil physico-chemico-biological properties, growth attributes, and nutritional qualities of leafy vegetables.

Materials and Methods: The proposed field study will be conducted over a 36 sq. ft. plot, employing 12 interventions in a structured layout, each with 3 replicates. Each replicate will contain 50 seeds sown in 5 lines within 1 sq. ft. The interventions will include: control, fertilizer, organic manure, homoeopathic medicine (30CH, 200CH, 1M), and combinations of fertilizer or organic manure with each potency. Parameters such as soil fertility, microbial diversity, plant height, biomass, chlorophyll content, and nutritional/anti-nutritional factors will be monitored. Data analysis will be performed using IRRISTAT and AGSTAT statistical tools.

Expected Outcomes: Based on existing literature, Silicea is expected to enhance soil texture, fertility, and microbial diversity, leading to improved plant growth metrics and nutritional profiles. This study aims to establish Silicea as a sustainable, low-cost alternative in agriculture, potentially reducing dependency on chemical inputs.

Conclusion: This review suggests that homoeopathic interventions, particularly Silicea, hold significant potential for agricultural enhancement. The proposed study will provide empirical insights into its efficacy, paving the way for broader application in sustainable farming practices.

Keywords: Silicea, agro-homoeopathy, sustainable agriculture, field study, soil health, plant growth.

OP-BM-55

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING *FICUS RELIGIOSA* AND *CHRYSANTHEMUM PROCUMBENS* LEAVES AND EVALUATION OF ITS ANTI-BACTERIAL ACTIVITY AGAINST DRUG RESISTANCE BACTERIA

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Recent advances in nanoscience and nanotechnology have radically changed the way we diagnose, treat, and prevent various diseases in all aspects of human life. Silver nanoparticles (AgNPs) are among the most vital and fascinating nanomaterials among several metallic nanoparticles. AgNPs play an important role in nanoscience and nanotechnology, particularly in nanomedicine. Although several noble metals have been used for various purposes, AgNPs have been focused on potential applications. In this study, we synthesized AgNPs using biological methods through *Chrysanthemum procumbens* and *Ficus religiosa* leaves extract. We also studied the characteristics of the synthesized nanoparticle using UV-VIS Spectrophotometer, FTIR Spectroscopy, SEM with EDAX and XRD. In addition, we extensively examined the anti-bacterial activity of the green synthesized AgNP against drug-resistant strains of bacteria.

Keywords: Silver Nanoparticle; *Chrysanthemum procumbens*; *Ficus religiosa*; Antibacterial activity

OP-BM-56

ECO-FRIENDLY SYNTHESIS OF (Cu-Ni-Zn) OXIDE NANOCOMPOSITE MEDIATED BY *THALASSIA HEMPRICHII* AND EVALUATION OF ITS ANTIBACTERIAL ACTIVITY

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ABSTRACT

The Present study pertained to Biosynthesis, Characterization and Biomedical application antibacterial activity of (Cu-Ni-Zn) Oxide Nanocomposite (Cu-Ni-Zn NPs) from *Thalassia hemprichii* seagrass extract. The synthesized NPs were characterized *via* UV-Vis, FT-IR, XRD, FE-SEM and EDX. The UV-Vis spectra exhibited absorption peaks at around 363 nm for Cu-Ni-Zn NPs, and the FT-IR spectra also confirmed the formation of Cu-Ni-Zn NPs (628 cm^{-1}). XRD analysis of the synthesized nanomaterials revealed the CuO (cubic), ZnO (hexagonal primitive), and NiO (monoclinic) phases with an average size of 29 nm. FE-SEM with XRD morphological studies showed that the Cu-Ni-Zn NPs were irregular in shape. The antibacterial effects of the synthesized nanomaterials Cu-Ni-Zn NPs were assessed against human pathogens, and significant bacterial resistance was exhibited toward (Gram+ve) and (Gram-ve); served as a potent antibacterial agent.

Keywords: *Thalassia hemprichii* seagrass extract, UV-Vis, FT-IR, XRD, FE-SEM and EDX, Antibacterial.

OP-BM-57

GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES VITEX NEGUNDO LEAF'S EXTRACT AND EVALUATION OF ITS ANTI-BACTERIAL ACTIVITY

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ABSTRACT

In the present investigation, the clinical significance of the ZnO nanoparticle were synthesized from the Vitex negundo Linn plant extracts, which are studied and are found to be rich in phytochemical constituents, thereby offering pharmacological effects. Characterization of the synthesized ZnO nanoparticles using UV spectroscopy analysis, Scanning Electron Microscopy analysis and Fourier Transform Infra-red analysis. Investigation of the antibacterial activity of ZnO nanoparticles in comparison with the activity of the standard reference antibiotics namely rifamycin, chloramphenicol, erythromycin and amoxicillin. Vitex negundo Linn Leaf's extract is used as a reducing agent for ZnO nanoparticles synthesis at ambient conditions. This study also involves condition to ascertain the influence of plant extract as capping or protecting agent for ZnO and nanoparticles.

Keywords: Vitex negundo Leaf's, Zinc Oxide Nanoparticles, Anti-bacterial Activity

OP-BM-58

FORMULATION AND EVALUATION OF LIPOSOMAL ENCAPSULATED PEDALITIN CREAM COOKIES FROM *Pedalium Murex*

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ABSTRACT

Pedalium murex Linn (family*: Pedaliaceae*) (P. murex) commonly known as Large Caltrops and Gokhru (India) is a shrub found in the Southern part, Deccan region of India and in some parts of Ceylon. Different parts of the plant are used to treat various ailments like, cough, cold and as an antiseptic. In this work, the methanol extract of *Pedalium murex* stem was collected and silver nanoparticles were synthesized by green way synthesis method. The synthesized particles were characterized by UV-Visible Spectrophotometer. The peak was formed between 420 – 440 nm. The extract were analysed by HPLC and FTIR. The crude extract of *Pedalium murex Linn* contains ketones, Bromine and alkaloid functional groups. The HPLC analysis (254 nm) of crude extract for Flavonoids finds the 8 compounds. The peak 9.387 was confirms the presence of pedalitin. Commonly worldwide 95% of people are taking cookies as a snack. In this work the cookies were formulated with various concentrations by using Wheat flour, Horse gram flour, Sorghum flour and Flax seed flour and it gets optimized. The drug is encapsulated by Liposomal Encapsulation process. The cream is formulated by Soy Lecithin, sunflower oil and then our compound pedalitin is added. It gets incorporated with the Cookie. It has quantitatively analysed. The 9 point hedonic test has done.

Keywords: *Pedalium Murex*, Pedalitin, Stem extract, Green synthesis, Cookie.

OP-BM-59

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING *FICUS RELIGIOSA* AND *CHRYSANTHEMUM PROCUMBENS* LEAVES AND EVALUATION OF ITS ANTI-BACTERIAL ACTIVITY AGAINST DRUG RESISTANCE BACTERIA

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Recent advances in nanoscience and nanotechnology have radically changed the way we diagnose, treat, and prevent various diseases in all aspects of human life. Silver nanoparticles (AgNPs) are among the most vital and fascinating nanomaterials among several metallic nanoparticles. AgNPs play an important role in nanoscience and nanotechnology, particularly in nanomedicine. Although several noble metals have been used for various purposes, AgNPs have been focused on potential applications. In this study, we synthesized AgNPs using biological methods through *Chrysanthemum procumbens* and *Ficus religiosa* leaves extract. We also studied the characteristics of the synthesized nanoparticle using UV-VIS Spectrophotometer, FTIR Spectroscopy, SEM with EDAX and XRD. In addition, we extensively examined the anti-bacterial activity of the green synthesized AgNP against drug-resistant strains of bacteria.

Keywords: Silver Nanoparticle; *Chrysanthemum procumbens*; *Ficus religiosa*; Antibacterial activity

OP-BM-60

GREEN SYNTHESIS AND CHARACTERIZATION SeNPs OF USING LEAVES EXTRACT OF *ALLMANIA NODIFLORA* AND EVALUATION OF ITS PHOTOCATALYTIC, ANTIOXIDANT AND ANTIBACTERIAL activity

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Abstract

The current study's goals were to create, evaluate, and apply selenium nanoparticles (Se NPs) made from Allmania nodiflora leaf extract. The produced NPs were evaluated by SEM, FT-IR, XRD, UV-Visible spectra and EDX. The FT-IR spectra additionally supported the generation of Se NPs, while the UV-Visible spectra showed absorption peaks for SeNPs at about 260 nm. The synthetic nanomaterials hexagonal wurtzite structure was discovered by XRD analysis. The morphological examinations using SEM revealed that the shape of the SeNPs was spherical. SeNPs, the synthesized nanomaterial, shows strong bacterial resistance against *Staphylococcus aureus* when tested against human infections. This made SeNPs an effective antibacterial agent.

Keywords: *Allmania nodiflora*, Selenium nanoparticles, Photocatalytic, Antibacterial.

OP-BM-61

EXTRACTION AND OPTIMATION OF OIL FROM MARKET WASTE ORANGE PEEL

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ABSTRACT

Sweet orange (Citrus sinensis L.) is the most commonly grown tree fruit in India. Orange peel is considered as a waste but can be used for the extraction of essential oil which has many applications ranging from food flavouring agent, insect repellent to cosmetics. In the present study an attempt was made to extract the oil from oranges, by steam distillation. The oil extracted was brownish yellow with a tangy smell, water-insoluble, density (0.783 g/cm^3) and specific gravity (0.843 g/cm^3). In order to study the compositions of the oil extracted constituents were analysed by GC-MS method. In all 5 compounds were detected of which D- limonene was found as a dominant contributor. It could be used as a natural preservative in food or as an effective treatment against a variety of pathogenic organisms. Industries should extract oil from the waste of citrus fruits which will be beneficial from an economic point of view.

Keywords: Orange peel, essential oil, biowaste utilization, organic components.

OP-BM-62

GREEN SYNTHESIS OF SILVER NANOPARTICLE USING *SPERMACOCE ARTICULARIS* AND EVALUATION OF ITS ANTIMICROBIAL ACTIVITY

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ABSTRACT

Silver nanoparticle is well known for its antimicrobial properties. This study is focused in the synthesis of Silver nanoparticles using aqueous extract of *Spermacoce articularis* leaves, as bioactive phytochemical source which played as both reducing and capping agent. Biological method is encouraged for nano synthesis, as it is nontoxic and cost- effective in nature. The parameters involved in the green synthetic process such as reaction time, solvent, temperature, volume of plant extract, concentration of $AgNO_3$ precursor were been studied for maximizing the yields, regulates size and stability of the AgNPs. The synthesized AgNPs were been characterized using UV-Visible spectroscopy, FTIR Spectroscopy, SEM with EDAX and X - ray diffraction (XRD). This study also analyzed the antimicrobial property of the green synthesized nanoparticle.

Keywords: Silver nanoparticle; Green synthesis; *Spermacoce articularis*; antimicrobial activity

OP-BM-63

GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES USING *GLORIOSA SUPERBA* FLOWER EXTRACT AND EVALUATION OF ITS ANTIBACTERIAL, ANTICANCER AND ANTIDIABETIC ACTIVITIES

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ABSTRACT

The current study demonstrates convenient utilization of *Gloriosa superba L*. flower extract as a capping and reducing agent for the efficient synthesis of Zinc Oxide nanoparticle. This is one of the simple and cost-effective approaches among the nanoparticle synthetic processes. The synthesized nanoparticle was characterized using UV–Visible Spectroscopy, FT-IR Spectroscopy, XRD and SEM. The UV-VIS absorption spectrum reveals the peak at 326 nanometers which evidences the presence of ZnO in the product. FT-IR Spectroscopic analysis clearly shows the presence of the functional groups amide and ketone. XRD results confirmed the Crystalline nature of ZnO NPs. SEM images disclose the spherical shape of the particles. The synthesized nanoparticles were examined for their antibacterial efficacy against Gram +ve bacterium such as *Staphylococcus aureus* and *Bacillus subtilis* and Gram -ve bacterium like *Escherichia coli* and *Salmonella typhi* using Agar Well Diffusion Method. The results confirmed that the synthesized nanoparticle has potent antibacterial activity at the concentration level of 100 µg/ml. In addition, the anti-cancer activity of the ZnO NPs were also been validated by MTT assay against the skin cancer using cell line A431. Also, the anti-diabetic activity of ZnO NPs was also verified using Alpha-Amylase and Alpha-Glucosidase Assays.

Keywords: *Gloriosa superba*; Zinc Oxide Nanoparticles; Antibacterial activity; Anti-diabetic activity.

OP-BM-64

NEUTROSOPHIC SOFT γ CLOSED SETS IN NEUTROSOPHIC SOFT TOPOLOGICAL SPACES

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ABSTRACT

Smarandache [1] introduced the new concept of neutrosophic set which is a mathematical tool for handling problems involving imprecise, indeterminacy, and inconsistent data. This theory is a straightforward generalization of crisp sets, fuzzy set theory [2], intuitionistic fuzzy set theory [3], etc. Numerous researchers from different areas of mathematics have contributed to the development of neutrosophic sets theory with their work (see for example [4,5]). Many practical problems in economics, engineering, environment, social science, medical science, etc. cannot be dealt by classical techniques, because such methods have heritable complexities. These complexities may be taking birth due to the insufficiency of the theories of parametrization tools. Each of these theories has its intrinsic difficulties, as was noted by Molodtsov [6]. The combination of neutrosophic set with soft sets was first introduced by Maji [12] who defined a new mathematical notion called Neutrosophic soft set, which was later improved by Deli and Broumi [13]. Further development of the theory consisted of the introduction of a new mathematical structure known as neutrosophic soft topological spaces, which were first defined and investigated by Bera in [14]. The aim of this paper is to introduce a neutrosophic soft γ open sets in neutrosophic soft topological spaces. Finally, we introduce a neutrosophic soft γ continuity and open mapping and closed mappings in neutrosophic soft topological spaces.

OP-BM-65

ANION TUNABILITY AND THEIR BIOLOGICAL IMPLEMENTATION TOWARDS ISOQUINOLINE BASED DICATIONIC IONIC LIQUIDS

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Abstract

In this present work isoquinoline based dicationic ionic liquids with different anions (DILs) were synthesized and characterized using various physico–chemical, analytical and spectral (FT-IR, ^{1}H NMR, ^{13}C NMR, ^{31}P NMR, ^{19}F NMR, HRMS) studies. The antimicrobial activity of DILs were evaluated and the toxicity depends on the associated anion species. The results indicate that the ILs namely 1,4-bis(isoquinolinium)butyl ditetrafluoroborate (DIL-2) and 1,4-bis(isoquinolinium)butyldihexafluorophosphate (DIL-3) with tetrafluoroborate and hexafluorophosphate anions were exhibited excellent antimicrobial activity against the bacterial strains namely *Bacillus.subtilis*, *Klebsiella pneumoniae* and the fungal strain *Candida albicans.* Furthermore, the synthesized DILs were tested for their antioxidant capacity by DPPH method and showed moderate free radical scavenging activity. Additionally, the anticancer activity of DILs have been evaluated against K-562, human leukemia cancer cell line. These facts open the possibility of designing novel isoquinolinium dicationic liquids with fluorinated anions can be used as active effective anticancer agents.

Keywords. Dicationic isoquinolinium ionic liquids; Spectral characterization; Antimicrobial activity; Antioxidant capacity, Anticancer Studies.

OP-BM-66

COMPUTATIONAL ANALYSIS OF SINGLE CRYSTAL STRUCTURES TO IDENTIFY POTENTIAL DRUG CANDIDATES

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ABSTRACT

Introduction

Molecular docking has emerged as a powerful tool in drug discovery, enabling the prediction of drug-target interactions and the identification of potential compounds. This study utilizes molecular docking, Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADME/T), pharmacokinetic, and PASS analyses to evaluate the binding interactions and drug-like properties of amino group-based crystals.

Objectives

1. To investigate the binding interactions of amino group-based crystals with potential drug targets using molecular docking.
2. To evaluate the ADME/T, pharmacokinetic, and PASS profiles of the identified compounds.

Materials and Methods

Molecular docking simulations were performed using AutoDock Vina to predict the binding modes and affinities of amino group-based crystals to target proteins. The protein structures were obtained from the Protein Data Bank (PDB). ADME/T, pharmacokinetic, and PASS analyses were carried out using SwissADME to assess the drug-like properties of the compounds.

Results

The molecular docking studies revealed that the amino group-based crystals exhibited promising binding affinities to the target proteins. The analysis of ADME/T, pharmacokinetic, and PASS profiles indicated that the compounds possess favourable drug-like properties, such as good absorption, distribution, metabolism, excretion, and toxicity profiles.

Conclusion

The integration of molecular docking and computational drug design techniques has enabled the identification of potential drug candidates from amino group-based crystals. These findings provide valuable insights for further optimization and development of novel therapeutic agents.

Keywords

molecular docking, drug discovery, amino group-based crystals, ADME/T, pharmacokinetics, PASS analysis

OP-BM-67

EFFICACY OF PULSATILLA NIGRICANS IN THE MANAGEMENT OF PCOS WITH PRIMARY INFERTILITY - A CLINICAL CASE REPORT STUDY

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Polycystic ovarian syndrome (PCOS) is an endocrine disorder that affects approximately 5% of all women which are very commonly found in day-to-day (routine) practice. However, these cases present with many complications and it is difficult to cure in contemporary system and treatment is also very costly. A case of 27 years female suffering from PCOS and Primary Infertility reported here was treated successfully within 4 months by a single individualised homoeopathic medicine Pulsatilla Nigricans 0/1 with repetition as per requirement, The improvement is evident from regularity of menstrual cycle and also from the ultrasonography (USG) reports. The case was observed for further 4 months without recurrence and also reported Pregnancy Kit Positive, cure to primary infertility which suggests that permanent cure is achievable through individualised homoeopathic treatment.

Keywords: Hirsutism, Homoeopathy, Primary Infertility , Polycystic ovarian syndrome.

OP-BM-68

APPLICATION OF *MUTHUCHIPPI* AND *NATHAI PARPAM* WITH CHITOSAN SCAFFOLD IN NANOTHERAPEUTIC APPROACHES FOR FISTULA MANAGEMENT

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The Present study explores an innovative therapeutic strategy that integrates Siddha medicine with nanotechnology, concentrating on two traditional Siddha formulations: *Muthuchippi Parpam*, a calcium-based compound derived from pearls, *and Nathai Parpam*, which is calcium carbonate sourced from marine environments. They were synthesized into nanoparticles through eco-friendly methods and incorporated into a chitosan scaffold, designed to provide a targeted and sustained-release system for fistula treatment. Characterization techniques such as Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR) were employed to confirm the morphology, size and chemical composition of the nanoparticles. Antimicrobial tests like disc diffusion and well diffusion revealed significant bacterial inhibition zones, particularly against *Escherichia coli* and *Staphylococcus aureus,* thereby reducing the risk of secondary infections. Biocompatibility evaluations by protein binding assay further demonstrated the scaffold's ability to support cell adhesion and proliferation, which are essential for effective wound healing, this facilitates enhanced wound healing, reduced bacterial contamination and adjusted local pH levels, thereby enhancing fibroblast activity and promoting tissue regeneration. This dual-action therapeutic approach, which combines Siddha preparations with a chitosan scaffold, offers a promising solution for localized and controlled therapeutic delivery, effectively addressing critical challenges in the management of fistulas. Future investigations into *in vivo* applications and long-term effectiveness are suggested to confirm clinical relevance, underscoring the potential of this innovative formulation as a viable treatment option for anal fistulas.

Keywords: *Muthuchippi Parpam*, *Nathai Parpam*, Chitosan Scaffold, Fistula, Calcium-Based Nanoparticles.

OP-BM-69

FORMULATION AND EVALUATION OF INNOVATIVE POLYHERBAL OINTMENT: A NATURAL APPROACH FOR BURN TREATMENT AND WOUND HEALING

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ABSTRACT

Polyherbal formulations have become popular nowadays because of their therapeutic efficacy and fewer side effects. This research was conducted to formulate and evaluate the polyherbal ointment with antimicrobial effects by using three different plants which include Kalmegh (*Andrographis paniculata*), Neem (*Azadirachta indica*) and Turmeric (*Curcuma longa*). These plants were chosen due to their well-known anti-inflammatory, antibacterial and antifungal properties which are essential for the management of skin infections and helps in healing of wound. The ointment was designed using a straightforward fusion technique and incorporating base with both protective and soothing qualities. This formulation was finetuned for easy application, good consistency and stability. The suitability of the ointment for skin use were ensured through checking various chemical and physical properties such as uniformity, pH, viscosity spreadability, extrudability, consistency, solubility and washability. The pH was adjusted between 5.5 and 6.5 that matches the pH of natural skin. The formulation was assessed for antimicrobial effectiveness in the lab against various fungal and bacterial strains often responsible for skin infections by using agar well diffusion technique and tested against fungi including *Aspergillus niger*, *Microsporum gypseum* and *Candida albicans* as well as bacteria like *Salmonella typhi, Staphylococcus aureus* and *Escherichia coli*. The results showed reasonable antifungal activity against *Candida albicans* showing 16 mm zone of inhibition and predominant antibacterial activity against *Staphylococcus aureus* with 18 mm zone of inhibition. The research concluded that the polyherbal ointment showed broad-spectrum of antimicrobial activity which makes it promising choice for management of infections in skin. Furthermore, animal studies and clinical trials are recommended to approve the therapeutic potential and evaluate its safety and efficacy in humans. This formulation provides minimum risk of resistance and side effects and offers a natural effective alternative to regular antimicrobial treatments.

Keywords: Polyherbal ointment, *Azadirachta indica*, *Curcuma longa*, *Andrographis paniculata*, antimicrobial activity, skin infections, wound healing.

OP-BM-70

STUDY ON THE EFFECT OF TOPICAL NEPAFENAC IN PREVENTING MACULAR EDEMA AFTER CATARACT SURGERY IN PATIENTS WITH DIABETES

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ABSTRACT

Cystoid macular edema is one of the major problems in diabetes patients after cataract surgery, which leads to fluid accumulation within the macular region. Cystoid macular edema is known pathological sequel of the retina, it is supposed to do interruption in the blood retinal barrier. Topical NSAIDS are used both pre- operatively and post operatively to prevent or reduce inflammation after surgery. This study aims to evaluate the effect of topical nepafenac in preventing macular edema after cataract surgery in patients with diabetes mellitus, to find the post – operative visual outcome, and to evaluate the post operative macular edema. This prospective interventional study was conducted in the department of ophthalmology of a tertiary care hospital at Salem. 100 patients were selected based on the inclusion and exclusion criteria. Investigations includes Random blood sugar, Visual acuity, Macular thickness, and Intra ocular pressure on patients, 50 patients received sterile ophthalmic suspensions of 0.1% Nepafenac and 50 patients received 0.5% Carboxy methyl cellulose as placebo, both used thrice daily before and after cataract surgery for 30 days. Optical coherence tomography was performed both preoperatively before cataract surgery, up to 90 days of post operative. The results were statistically analysed. The results of this study shows that notable increase in the visual acuity, and lowering in the macular thickness and standard Intra ocular pressure, the Random blood sugar above 180 mg/dl people developed cystoid macular edema. This study concludes that Nepafenac was effective in preventing macular edema. It is considered to be safe and no complications was developed in patients subjected to nepafenac following cataract surgery in diabetes patients. The use of nepafenac is recommended for at least three months after cataract surgery.

Key words: Cystoid macular edema, Nepafenac, Carboxyl methyl cellulose, Macular thickness, Visual acuity.

OP-BM-71

STUDY ON THE COST-EFFECTIVENESS AND SAFETY OF TIMOLOL MALEATE AND LATANOPROST IN PATIENTS WITH GLAUCOMA IN TERTIARY CARE HOSPITAL

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ABSTRACT

In the world of eye diseases, Glaucoma is a serious chronic ocular condition that causes irreversible visual disability if left untreated can lead to sight loss. Treatment options includes various medications. Evaluation of the clinical outcomes along with pharmacoeconomic analysis offering valuable treatment approaches.This study aimed to investigate the cost-effectiveness and safety of Latanoprost against Timolol maleate in glaucoma patients, A prospective observational study was conducted on 100 patients in the ophthalmology department of a tertiary care hospital in Salem from Jan to June 2024. Out of 100 patients, 50 received Latanoprost meanwhile 50 patients received Timolol maleate. The patients were interviewed using a comprehensive questionnaire to collect the various demographic characteristics and Intraocular pressure measurements, Visual acuity and Visual field were evaluated. The patients were reviewed after 2^{nd}, 4^{th},8^{th}, and 12^{th} weeks for cure rate and cost-utilization. The outcomes were statistically analyzed and were presented in the form of percentages. Although Clinical data revealed at the end of 12 weeks, Latanoprost 0.005% shows dominance in its efficacy (36.0 % decrease in Intraocular pressure from baseline) while Timolol maleate 0.5% had a reduction in Intraocular pressure by 35.0%. Visual acuity, cup: disc ratio and Humprey field analyzer evaluation show both treatments were safe. In view of Cost-effectiveness, Timolol maleate was lower than Latanoprost. So, it would be preferable to initiate treatment with timolol maleate. This research concluded that it encourages the physician to cautiously consider while selecting the treatment options as well as regimens depending upon the patient's clinical needs and budgetary expectations.

Keywords: Glaucoma, Intraocular pressure, Visual acuity, Latanoprost, Timolol maleate, cost-effectiveness

OP-BM-72

DRUG UTILIZATION REVIEW OF CORTICOSTEROIDS IN PATIENTS WITH PSORIASIS AND ATOPIC DERMATITIS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

An observational prospective study of Drug Utilization Review of Corticosteroids in Patients with Psoriasis and Atopic Dermatitis was studied in a Tertiary Care Hospital, Salem. The study aims to assess the prescription related procedures with patient clinical features and demographics in the corticosteroid uses to assess the conditions of psoriasis and atopic dermatitis, which improves good clinical practices for the drugs to be rationally administered to improve patient care.

The study lasted for six months with the total sample size of 98, in which 78 samples had psoriasis and 20 samples had atopic dermatitis, majority of the patients aged within 41 to 60 years. According to the result, prevalence of psoriasis was higher in men, whereas in atopic dermatitis, it was higher in women. Moreover, 70% of patients affected with dry skin, while 13% had coexisting conditions. Result shows that more number of patients were presented with hyper plaques and silvery scales in psoriasis, whereas patients with atopic dermatitis presented with vesicular and leaking lesions.

From the study, it was concluded that, in both the conditions 90% of patients had been prescribed with topical corticosteroids, whereas 37% of prescriptions with medication errors have been found, mostly with improper administration of drug and interactions. The study focuses majorly on the education to enhance patient outcomes by developing rational corticosteroid utilization through reducing medication errors and emphasizing the crucial role of clinical pharmacist.

KEYWORDS: Psoriasis, atopic dermatitis, corticosteroids, drug interactions, drug-related problems, prescription error.

OP-BM-73

Innovative Nutraceutical Approaches to Oral Cancer: Functional Gummies Infused with Anticancer Herbal Extracts

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ABSTRACT

The research focuses on the development and evaluation of functional gummies derived from plants which contain curcumin, ginger extract, resveratrol and green tea extract for their efficacy in anticancer property. The fundamental objective was to build a natural product with increased bioavailability through nano emulsion technology showing antioxidant, anti-inflammatory, and anticancer property. The gummies were developed using gelatine, citric acid and natural sweeteners. Nano emulsions were incorporated to improve absorption and standardised herbal extracts ensured consistent dosing of active compounds. The nano emulsion presented optimal physicochemical properties like medium size of the particle (20-200nm), PDI < 0.3 and zeta potential of ±30 mV indicating uniformity. The nano emulsion was maintained at pH of (5.5-7.5) and released 90% of active compounds within 4-6 hours while assessed through High-Performance Liquid Chromatography (HPLC). *In-vitro* assays like MTT, Annexin V/PI staining and Trypan Blue Exclusion were done to evaluate cytotoxicity and apoptosis in cancer cell lines (KB cell line). Moreover, anti-inflammatory (COX-2 inhibition, NO inhibition) and antioxidant (DPPH), FRAP) activities were done. Stability testing was conducted for the 6 months period as per ICH guideline, which showed the profile of shelf life. The research result showed dose-dependent cytotoxicity in KB cells with IC50 values of 22 µg/mL. Induction of apoptosis was done with 45% in KB cells and. Strong antioxidant activity (IC50 = 10 µg/mL) and potential anti-inflammatory effects were exhibited by the formulation. These results recommends that the gummies produce best approach for prevention and adjunctive therapy of cancer merging with consumer-friendly formulation through therapeutic efficacy.

KEYWORDS:

Anticancer, Herbal extracts, gummies, Oral cancer prevention, Formulation development, Anticancer activity

OP-BM-74

STRESS RELIEF HERBAL LOLLIPOPS: A NOVEL APPROACH TO NATURAL STRESS RELIEF AND RELAXATION

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ABSTRACT

The research introduces a novel nutraceutical product of herbal lollipops with chamomile, lavender, and lemon balm that provides natural stress relief and relaxation. The aim of the study is to create a convenient and pleasant formulation that blends the advantage of herbal remedies with a lollipop form, targeting to support individuals going through daily stress. The key ingredients were chosen based on their mood-enhancing, cognitive-support and calming properties. The plants were collected and hydroalcoholic extracts were prepared. Phytochemical analysis was evaluated by confirming the presence of active compounds such as linalool (1 mg/mL), rosmarinic acid (1.2 mg/mL) and apigenin (0.5 mg/mL) through High-Performance Liquid Chromatography (HPLC). Furthermore, *in vitro* release studies were conducted using artificial saliva and the release was confirmed by HPLC method. It shows the result of over 80% of active ingredients being released within 10 minutes, stating rapid dissolution for effective delivery. Safety was estimated by using cytotoxicity assays on human intestinal (Caco-2) cells and liver cells (HepG2) show no lethal effects with cell viability above 90% at concentrations up to 100 µg/mL. Stability testing shows minimal active compounds degradation (less than 5%) at 25°C during six months period indicating the efficacy during storage. The research indicates that stress relief herbal lollipops deliver actual doses of stress-relieving and calming ingredients in safe, stable and user approachable format. This formulation provides feasible, natural alternatives to conventional management for stress and could entice health-conscious people who look for herbal based and noninvasive treatment options.

KEYWORDS: Stress relief, Chamomile extract, Lavender extract, Herbal lollipop, Calming effect, Therapeutic property.

OP-BM-75

GREEN SYNTHESIS OF SILVER NANOPARTICALES OF *CASSIA GRANDIS LINN* ON HEPG2 CELL LINES

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ABSTRACT

Liver cancer is one of the leading causes of death in India. Silver nanoparticles (AgNPs) have gained attention in cancer research, including liver cancer, due to their unique properties like small size, large surface area, and ability to induce cytotoxicity. Their biocompatibility, enhanced therapeutic effects, and eco-friendly synthesis make them suitable for developing safer and more effective cancer therapies to create a new way to extend survival time. Silver nanoparticles (AgNPs) were made using the aqueous extracts of *cassia grandis Linn* seeds as a stabilizing agent, and they were characterized by UV, ATR-FTIR, TEM, EDAX, and SEM analysis. The synthesized AgNPs were evaluated for their anticancer potential against HepG2 (human liver cancer) cell lines using the MTT assay. In-vitro cytotoxicity assays revealed significant dose-dependent inhibition of HepG2 cell proliferation, hence using Plant-extract-mediated AgNPs are promising for liver cancer treatment and diagnostics. This current study results the potential activity of *Cassia grandis Linn* in the green synthesis of nanoparticles.

KEYWORDS: Anti-cancer activity, HEPG2 Cell line, *Cassia grandis Linn.*

OP-BM-76

FORMULATION AND CHARACTERIZATION OF SILVER NANOPARTICLES USING THE SEEDS EXTRACT OF *BAUHINIA TOMENTOSA* AND EVALUATION OF ITS ANTICANCER POTENTIAL

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ABSTRACT

Nanotechnology is getting more and more important in various fields including medical, food, health care, consumer and industrial purposes. Due to unique properties, silver nanoparticles found to have the anticancer effect. This research deals with the green synthesis of silver nanoparticles (AgNP) using *Bauhinia Tomentosa Linn* seed extract, characterization of silver nanoparticles and its invitro anticancer potential. The standardization of seed was carried out by chemical tests and fluorescence test. Seed extract was reacted with 1mM silver nitrate (AgNO3) and the change in colour from colourless to brown indicated the reduction of silver ions to silver nanoparticles. The synthesized silver nanoparticles were characterized using UV-Visible spectrophotometer, FESEM, EDX and XRD. Optimization test was carried out to determine the optimum condition and concentration to synthesize silver nanoparticles with highest absorbance value when measured with UV-Vis spectroscopy. From the optimization test, 2ml of silver nitrate solution (1mM) with 1.5ml extract, made up to 10ml, adjusted to pH10 and heated in water bath (60°C) for 1 hour was said to be the optimum condition to synthesize silver nanoparticles. The in-vitro anticancer activity of silver nanoparticles was confirmed by MTT assay on the cell lines of breast MCF-7 carcinoma cells. The silver nanoparticles showed a concentration and time dependent decreased cell viability in cancer cells.

OP-BM-77

ASSESSMENT OF NEUROPROTECTIVE ACTIVITY USING SILVER NANOPARTICLES OF *ARISTOLOCHIA INDICA* LEAVES IN WISTAR ALBINO RATS

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ABSTRACT

This study examines the neuroprotective effect of silver nanoparticles of *Aristolochia indica* (EEAI) leaves on Wistar male rats' oxidative stress and cognitive impairments caused by lipopolysaccharide (LPS). Neurodegenerative diseases are prevalent illnesses that are the second greatest cause of death worldwide and are present in many developing nations. The impact of silver nanoparticles of *Aristolochia indica* leaves on anxiety and general locomotor activity was assessed in an open-field test. This involved counting the crossings in the centre and periphery areas, measuring the distance travelled, and measuring the time spent in each location. The results are displayed in the table. Compared to the control group, the LPS-treated animals showed a substantial decrease in the total number of central and peripheral crossings, the distance travelled, and the amount of time spent in central and peripheral areas. Dexamethasone lengthened the time spent in the central and peripheral regions. In contrast to the animals in the control group, the LPS-treated animals spent less time overall ($P < 0.001$). At high doses (400 mg/kg, b.w.), the *Aristolocia indica* considerably enhanced the amount of time spent ($P < 0.001$), hence alleviating the anxiety that the animals experienced from the LPS.

Keywords: Locomotor activity, Open field test, LPS

OP-BM-78

SYNTHESIS, CHARACTERIZATION AND IN-VITRO ANTIMICROBIAL ACTIVITY OF SPINEL COBALT CHROMITE NANOPARTICLES FOR BIOMEDICAL APPLICATIONS

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Abstract:

In the present work, spinel cobalt chromite nanoparticles ($CoCr_2O_4$ NPs) were synthesized, characterized and their antimicrobial properties were evaluated. The solution combustion method was used to synthesize $CoCr_2O_4$ NPs. The phase formation, crystallinity and morphological analysis of as-synthesized $CoCr_2O_4$ NPs were explored by Fourier Transform Infrared Spectroscopy (FTIR), X ray diffraction (XRD) and Scanning Electron Microscopy (SEM). The FTIR spectrum displayed the two main absorption bands at 507 cm^{-1} and 616 cm^{-1} confirming the formation of spinel chromite. The structural analysis by XRD technique confirmed the cubical spinal structure of $CoCr_2O_4$ NPs. SEM results revealed a porous morphology consisting of agglomerated spherical $CoCr_2O_4$ NPs. The *in-vitro* antimicrobial activity of $CoCr_2O_4$ NPs with different concentrations (30 µg, 60 µg, 90 µg, 120 µg) was examined against pathogenic strains by well diffusion method. $CoCr_2O_4$ NPs demonstrated potential antibacterial activity against gram-negative *E.Coli* and gram-positive *B.Cereus* as well as antifungal efficacy on pathogenic fungus *C. albicans*, in a dose dependent manner. Thus, the findings reveal that the as-synthesized $CoCr_2O_4$ NPs can be potentially used in biomedical applications.

Keywords: Cobalt Chromite; nanoparticles; solution combustion synthesis; SEM; antimicrobial activity

OP-BM-79

GREEN SYNTHESIS OF SILVER NANOPARTICLES AS ANTICANCER ACTIVITY BY LEAF EXTRACT OF *ALTERNANTHERA BETTZICKIANA - IN-VITRO* MODEL

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Abstract

Aim: The current study aimed to evaluate the anticancer activity potential of the silver nanoparticles of the extract of the medicinal plant *Alternanthera bettzickiana* on Hep G2 cell line and HT 29 cell line. **Background:** Green synthesis of silver nanoparticles has several advantages over its chemical synthesis and they exhibit potent cytotoxic effects against various cancer cell lines. **Objectives:** Green synthesis of silver nanoparticles as anticancer activity by leaf extract of *Alternanthera bettzickiana* mediated silver nanoparticles were prepared and tested for anti-cancer activity using Human colon cancer Hep G2 cell line and Human liver cancer HT-29 cell line **Methodology:** The synthesis of silver nanoparticles using leaf extract from *Alternanthera bettzickiana,* the extract of leaves were combined with silver nitrate solution to facilitate the reduction of silver ions and exhibited the anti-cancer activity by *in-vitro* model **Results**: The results are identified by synthesised nanoparticles in various concentration for HT-29 cell line least concentration of synthesised nanoparticles was found to be 6.25µg and the higher concentration 100µg. IC_{50} values was found to be 34.4770µg. The result of Hep G2 cell lines IC_{50} value found to be 221.39µg. The IC_{50} value of HT-29 Cell line standard drug doxorubicin was found to be 18.68µg and Hep G2 cell line was found to be 18.68 µg **Conclusion:** Silver nanoparticles synthesized from *Alternanthera bettzickiana* leaf extract demonstrated promising potential as anticancer agents. The biogenic synthesis approach not only offers an environmentally friendly method but also results in nanoparticles with desirable characteristics for biomedical applications.

Keywords: Silver nanoparticles, *Alternanthera bettzickiana*, Hep G2 cell line, HT 29 cell line, Anti-cancer activity

OP-BM-80

IN-VITRO ANTI- DIABETIC ACTIVITY OF SILVER NANOPARTICLES OF LEAF EXTRACT OF *FLACOURTIA INDICA*

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Abstract

Aim: The current study aimed to evaluate the antidiabetic activity potential of the medicinal plant *Flacourtica indica* on HEK-293cell line. **Background:** Green synthesis of silver nanoparticles has several advantages has gained attention for its potential diabetic activity. Silver nanoparticle **(**AgNPs) can enhance insulin sensitivity and glucose uptake in cells. They may reduce oxidative stress and inflammation, which are associated with diabetes complications**. Objective:** The objective of the present study is to develop a green synthesis method for silver nanoparticles using *Flacourtia indica* plant extract to evaluate their anti-diabetic activity. **Methodology:** Green synthesis of silver nanoparticles involved the extraction from *Flacourtia indica* to known for their anti-diabetic properties. Silver nitrate was then mixed with plant extract, allowing for the reduction of silver ions to form silver nitrates. The *In-vitro* anti-diabetic activity was performed by HEK-293 cell line. **Results**: The results are identified by synthesized nanoparticles in various concentration **100µg to 500µg** for HEK-293-29 cell line. The synthesis of silver nanoparticles of *Flacourtia indica* showed 50% inhibition at a concentration of **280.95 µg/ml**. These results showed that the maximum activity which are comparable with that of the standard acarbose which showed 50% inhibition at a concentration of **325.22µg/ml**. **conclusion:** The synthesized AgNPs from *Flacourtia indica* leaf extract demonstrate promising anti-diabetic activity by *in-vitro model*, indicating their potential as therapeutic agents for managing diabetes.

Keywords: Anti-diabetic activity**,** HEK-293 cell line, *Flacourtia indica,* Silver nanoparticles

OP-BM-81

Aescin-Loaded Chitosan Nanoparticles Enhance DNA Damage and Activate the cGAS Pathway in A549 Lung Cancer Cells

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The cGAS-STING pathway plays a crucial role in sensing cytosolic DNA and initiating immune responses against tumour cells. This study investigates the potential of Aescin-loaded chitosan nanoparticles (AESC-CSNPs) to enhance DNA damage and activate the cGAS pathway in A549 lung cancer cells. AESC-CSNPs were synthesized using ionic gelation and characterized for particle size, surface charge, and encapsulation efficiency. A549 cells treated with AESC-CSNPs showed increased expression of DNA damage markers, such as γ-H2AX, suggesting enhanced DNA double-strand breaks. Western blotting revealed elevated levels of cGAS, STING, and phosphorylated TBK1, indicating activation of the cGAS-STING signaling cascade. Additionally, upregulation of downstream cytokines, including IFN-β and IL-6, was confirmed by qRT-PCR, demonstrating a pro-inflammatory immune response. Flow cytometry and Annexin V/PI staining further showed that AESC-CSNPs induced apoptosis, correlating with DNA damage. The findings suggest that AESC-CSNPs can induce DNA damage in A549 cells, leading to the activation of the cGAS pathway and triggering an anti-tumour immune response. This study highlights the potential of AESC-CSNPs as a novel therapeutic approach to sensitize lung cancer cells to immune surveillance and apoptosis by modulating the cGAS-STING pathway. Further investigation is needed to understand the mechanistic details and optimize the delivery system for enhanced therapeutic efficacy.

Keywords: Aescin, Chitosan, Lung cancer, c GAS.

OP-BM-82

Green Synthesis of Silver Nanoparticles using *Garcinia gummi-gutta* aqueous fruit Extract and evaluation of their Anti-Ulcer Activity

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Abstract: *Garcinia gummi-gutta* also known as garcinia cambogia, a pulpy edible pan-tropical fruit, with wide variety of potential therapeutic properties. Metal, namely silver, nanoparticles using plant extracts is one of the most simple, convenient, economical, and environmentally friendly methods that mitigate the involvement of toxic chemicals and in recent years, several eco-friendly processes for the rapid synthesis of silver nanoparticles have been reported using aqueous extracts of plant parts such as the leaf, bark, roots, etc. This research work summarizes and elaborates the new findings on the green synthesis of silver nanoparticles (AgNPs) using *Garcinia gummi-gutta* aqueous extract and their potential applications as anti-ulcer activity. Omeprazole was used as standard drug the percentage of inhibition was taken to assess anti-ulcer activity the silver particles showed a significant percentage of inhibition on extraction of *Garcinia gummi-gutta* thus the result demonstrates promising anti-ulcer activity *in-vitro* primarily attributed to its inhibition of H+ /K+ ATPase. As *Garcinia gummi-gutta* is far from toxic with ulcerogenic potency, it could be a prospective substitute for the existing antiulcer drugs with minimal side effects.

Key words: Anti-ulcer activity, *Garcinia gummi-gutta*, H+/ K+ ATPase, Silver nanoparticles

OP-BM-83

Green synthesis and charcterization of silver nanoparicles of *Kedrostics foetidissima* (jacq.) Cogn.

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ABSTRACT

Breast cancer is the second leading cause of death in women around worldwide. Nanotechnology is more effective method for herbal drug delivery to the tumor tissues. In this present study an attempt was made to synthesis silver nanoparticle from the *Kedrostics foetidissima* (jacq.) Cogn. which belongs to the family of Curcurbitaceae. The edible portions of the plant such as tubers, rhizome, and stem, are consumed by tribal people. As an ethnomedical plant, it can be used for treating aliments, common cold, diarrhoea, and measles. The phytochemical analysis of plant extract, revealed the presence of flavonoids, triterpenoids, phenols, steroids, and glycosides. The silver nanoparticles of the plant extract were prepared and characterized by UV- visible spectroscopy, FTIR analysis SEM and HR-TEM. The synthesised silver nanopartivcles were evaluated for its *in-vitro* cytotoxic studies by using MCF-7 cancer cell line. The formation of Silver nanoparticles was confirmed by using UV–visible spectroscopy, FTIR analysis, SEM analysis. The spherical shape of silver nanoparticles of size in the range of 100-200 nm, confirmed by SEM and TEM analysis. The in-vitro cytoxicity studies of the synthesied nanoparticles showed 88 % cell viability against breast cancer cell lines using MTT assay. The study highlights the effect of synthesised silver nanoparticles of *Kedrostics foetidissima* against the MCF-7 cell lines. From the study it was concluded that the anticancer potential of synthesised silver nanoparticles of *Kedrostics foetidissima* in a rapid and eco-friendly approach.

Keywords: *Kedrostics foetidissima;* Breast cancer, Silver nanopartticles, Characterization; Invitro-cytoxicity studies; MCF-7cell line

OP-B-84

EVALUTION OF SILVER NANOPARTICALES OF *COSTUS IGNEUS* ON HEPG2 CELL LINES

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The development of eco-friendly nanomaterials for biomedical applications has gained significant interest in recent years. The green biosynthesis approach was employed to minimize the use of harmful chemicals, utilizing the bioactive compounds in *C. igneus* leaves as natural reducing and stabilizing agents. This study investigates biosynthesis of silver nanoparticles (AgNPs) derived from aqueous leaf extracts of *Costus igneus* on HepG2 cell lines. The formation of AgNPs was confirmed through UV-Vis spectroscopy, and their structural and morphological properties of the nanoparticles were confirmed using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and scanning electron microscopy (SEM) analysis. The cytotoxicity of the synthesized AgNPs was evaluated against HepG2 (human liver cancer) cell lines using the MTT assay. The results indicated dose-dependent cytotoxic effects, with significant inhibition of cell viability at higher concentrations of AgNPs. Therefore, silver nanoparticles synthesized from *C. igneus* extracts exhibit potential anticancer properties.

KEYWORDS: Anti-cancer activity, HEPG2 Cell line, *Costus igneus.*

OP-BM-85

SYNTHESIS OF CARBON NANOPARTICLES FROM THE AROMATIC MEDICINAL PLANT, *HYPTIS SAUVEOLENS* AND THEIR EVALUATION AS ANTIMICROBIAL, ANTIOXIDANT AND ANTICANCER AGENT

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Abstract

Carbon nanoparticles are widely used in biological application due to their biocompatibility. Synthesis of carbon nanoparticles from the aromatic, medicinal plant *Hyptis sauveolens* was through open incineration in the form of biosoot. The biosoot thus collected were characterized using Dynamic Light Scattering spectroscopy (DLS) Scanning Electron Microscope (SEM), X-ray diffraction spectrophotometer (XRD) Fourier Transform Infra-Red spectrophotometer (FTIR) and Brunauer Emmett Teller (BET). Further their biological activities like antimicrobia property was evaluated using the bacteria, *Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus* and *Streptococcus mutans* and the fungi, *Aspergillus flavus* and *Aspergillus niger*. The antioxidant property of the carbon nanoparticle of *Hyptis saueolens* was evaluated using DPPH free radical. The anticancer ability was evaluated against the breast cancer cell line MFC-7. The study revealed the size of the biosoot of *Hyptis sauveolens* falls between 121 to 289nm further growing in size as 344nm to 818nm and 2313nm to 5500nm through DLS, SEM revealed the size range between 30 to 50nm in size, The XRD revealed the nature of carbon nanoparticles of *Hyptis sauveolens* as both crystalline and amorphous in nature. FTIR revealed the presence of alkynes, Phosphines, Alkyl mercaptans, Aromatic hydrocarbon and secondary amines. BET revealed the total pore volume as 2.5388^{-02}cc/gm and the mean pore size as 0.8nm. The antimicrobial study revealed that CNPs of *Hyptis sauveolens* controlled all the bacteria studied except that of *Pseudomonas aeruginosa* and between the fungi, *Aspergilus flavus* was controlled when compared to *Aspergillus niger.* The EC_{50} value recorded for DPPH as at 32µg. The LD_{50} dosage for anticancer actvity against the breast cancer cell line recorded was 69.77µg. The study revealed the easiest method to synthesis Carbon Nanoparticle from the medicinal plant. The synthesized Carbon Nanoparticle of *Hyptis sauveolens* can act as a potential antimicrobial and antioxidant agent which can be successfully used in cosmetic and pharmaceutical industry as topical creams. It is highlighted that the carbon nanoparticle of *Hyptis sauveolens* can be used as an anticancer agent after proper study for their toxicity.

Keywords: Carbon Nanoparticle, Biosoot, *Hyptis sauveolens, Bioactivity*

OP-BM-86

SUSTAINABLE SYNTHESIS OF ZINC OXIDE NANOPARTICLES FROM CLEOME GYNANDRA EXTRACT AND ITS ANTIMICROBIAL EVALUATION

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Abstract:

Nanotechnology plays a crucial role in enhancing environmental sustainability and developing efficient, cost-effective energy solutions. Zinc (Zn) is an essential micronutrient that significantly contributes to the synthesis of chlorophyll, proteins, and carbohydrates. This study focuses on the synthesis of zinc oxide nanoparticles (ZnO NPs) using the stem of Cleome gynandra. The resulting ZnO NPs were characterized using UV-Vis spectroscopy, FTIR, XRD, and FESEM-EDAX analyses, and their biological activity was evaluated. The UV-Vis spectrum revealed a peak between 411-414 nm, confirming the presence of biosynthesized ZnO NPs, while XRD analysis confirmed their crystalline structure. FTIR analysis identified potential biomolecules in the Cleome gynandra extract responsible for the bio-reduction of zinc ions. The morphology of the ZnO NPs was examined through SEM, and elemental analysis validated the presence of metal ions. Additionally, the antimicrobial activity of the ethanolic extract and the synthesized ZnO NPs was assessed using the disc diffusion method, demonstrating strong antibacterial properties and biocompatibility.

Keywords: zinc oxide nanoparticles, *Cleome gynandra,* antimicrobial activity, biocompatibility, nanotechnology

OP-BM-87

AN INVESTIGATION ON THE GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES USING LEAF EXTRACTS OF *PIMENTA DIOCIA* AND ITS ANTIMICROBIAL POTENTIAL

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ABSTRACT

This study investigates the green synthesis of zinc oxide nanoparticles (ZnO NPs) using *Pimenta dioica* leaf extracts, highlighting its eco-friendly and non-toxic nature with minimal chemical usage compared to conventional physical and chemical methods. The leaf extract plays a dual role as a reducing and stabilizing agent, facilitating the synthesis through oxidation-reduction reactions. Phytochemical functional groups, such as amines and alkanes found in secondary metabolites like terpenoids, flavonoids, and alkaloids, are crucial for nanoparticle formation. Preliminary confirmation of rapid ZnO NPs synthesis was achieved through UV-Visible spectroscopy, showing maximum absorbance at 380 nm. X-ray diffraction (XRD) analysis confirmed the crystalline nature of the nanoparticles, while energy-dispersive X-ray (EDX) analysis verified the presence of zinc and oxide ions. Scanning electron microscopy (SEM) indicated that the ZnO NPs had a size range of approximately 30–50 nm. The synthesized ZnO NPs demonstrated significant antibacterial activity, suggesting their potential as an effective antibacterial agent for treating urinary tract infections.

Key words: Zinc oxide nanoparticles, green synthesis, *Pimenta dioica* (allspice), antimicrobial activity

PP-BM-01

EVALUATION OF *IN VITRO* ANTI-HYPERCHOLESTEROLEMIC EFFECTS OF SIMVASTATIN-LOADED NANOSPONGE FORMULATIONS BY SOLVENT DIFFUSION METHOD

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ABSTRACT:

The present investigation aimed to enhance the solubility, controlled release, and bioavailability of Simvastatin, a poorly water-soluble BCS Class II drug, by formulating it into a Nanosponge drug delivery system. Simvastatin-loaded Nanosponge were prepared using the solvent diffusion method with Eudragit RL 100 and Ethyl Cellulose as polymers, PVA as a stabilizer, and encapsulated in hard gelatin capsules. The prepared nanosponges underwent various evaluations, including FTIR, particle size analysis, polydispersity index (PDI), zeta potential, scanning electron microscopy (SEM), production yield, entrapment efficiency, solubility studies, *in vitro* drug release, release kinetics, stability studies, flow properties, and porosity. FTIR results indicated no interaction between the drug and excipients. The percentage yield of formulations (F1-F10) ranged from 85.83% to 99.85%, and entrapment efficiency varied between 61.68% and 91.18%. Among the formulations, F3 exhibited optimal characteristics with an entrapment efficiency of 91.18%, complete drug release (98.55%) after 12 hours, and an average particle size of 727.0 nm. Solubility improved from insoluble to slightly soluble compared to pure Simvastatin. SEM images revealed that the optimized nanosponges were spherical with numerous pores, uniform, and spongy. The release kinetics of the optimized formulation followed the Higuchi model, exhibiting zero-order release with non-Fickian diffusion. Overall, the study confirmed that both polymers effectively served as carriers for Simvastatin nanosponges.

Keywords:

Nanosponges, Simvastatin, Eudragit RL 100, Ethyl Cellulose & Hypercholesterolemia.

PP-BM-02

PREVALENCE AND PERCEPTION OF ANABOLIC STEROIDS USE AMONG GYM USERS

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ABSTRACT

Anabolic-androgenic steroids (AAS) are synthetic derivatives of testosterone used to enhance athletic performance and build muscle. Despite being available only with a valid prescription, they are sometimes misused without a physician's advice. This study assessed the knowledge, attitude, behavior, and positive and negative effects of AAS use among male gym users in Tamil Nadu, India. A cross-sectional survey was conducted among 200 randomly selected gym users using a self-administered questionnaire. The results showed that out of 200 gym users, 76 were AAS users, and 124 were non-users. Most AAS users (73.7%) went to the gym for bodybuilding, while non-users went to maintain health (35.5%) and reduce stress and bodybuilding (32.3%). Around 63% of AAS users experienced side effects such as high blood pressure, mood swings, and pimples, and 53% had gynecomastia. Additionally, almost half of the participants were unaware of the side effects of AAS use. This study highlights the need for creating awareness regarding AAS among gym users. The study concludes that AAS misuse among gym users is prevalent, and users should be educated about the potential risks associated with their use.

Keywords:

Anabolic androgenic steroids (AAS), Gym user, Testosterone, Side effects.

PP-BM-03

EVALUATION OF IN-*VITRO* ANTIOXIDANT AND ANTIOSTEOPOROTIC ACTIVITY OFETHANOLIC LEAVES EXTRACT OF *ARGYREIA CUNEATA* (WILLD.) KERGAWL

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ABSTRACT

Background: *Argyreia cuneata* a member of the Family Convolvulaceae, is characterized as a suberect, silky shrub adorned with prominent red flowers. Traditionally, *Argyreia cuneata* has been utilized as a therapeutic agent for a variety of human and veterinary health conditions. Specifically, A. cuneata has been employed in the management of arthritis, diabetes, bone fractures, and scabies. Osteoporosis is distinguished by diminished bone density and compromised quality, resulting in an elevated susceptibility to skeletal fractures.

Aim and objective: The objective of the current study is to investigate the in-vitro antioxidant and osteogenic potential of ethanolic *A. cuneata* leaf extract.

Methods: The antioxidant activity was evaluated by DPPH radical scavenging, and Nitric oxide (NO) radical scavenging. An in-vitro study, osteoblastic proliferation assay was conducted using UMR-106 cell lines.

Results: Similarly concentration dependent free radical scavenging effect was found with IC50 value of 53µg/ml for DPPH and 54µg/ml for NO radical assay. A significant increase inosteoblast cell proliferation (83% with 500 µg/ml) and alkaline phosphatase activity (70% with 500 µg/ml) was recorded with *A. cuneata* ethanolic leaf extracts in UMR-106 cell lines.

Conclusion: Plant-derived products are natural alternatives to conventional therapies that can efficiently manage bone disorders. The findings presented herein unequivocally indicate that the plant possesses significant potential for application as an agent in the treatment of osteoporosis.

Keywords: *Argyreia cuneata*, Osteoporosis, In-vitro, antioxidant, antiosteoporotic,

PP-BM-04

BREAST CANCER DETECTION USING DEEP LEARNING ALGORITHMS-A SURVEY

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ABSTRACT

Breast cancer is the most common type of cancer in women. The mortality rate can be reduced by early diagnosis. Now a days various screening techniques, risk assessment tools and public health initiatives to detect and diagnosis breast cancer. With the advent of Artificial intelligence (AI), recently, deep learning techniques have been used effectively in breast cancer detection, facilitating early diagnosis and therefore increasing the chances of patients' survival.The objective is to analyse different deep learning/Machine learning algorithms, methods of analysis, image types and performance in the literature. The papers in this study were published between 2017 to 2024. Various databases such as Kaggle, CBIS DDSM, MIAS, and others were searched for this purpose, and shortlisted articles using Machine learning and Deep learning techniques to early detection of breast Cancer.The results of the review indicated that the Deep learning techniques is the most accurate and extensively used model for breast cancer detection. Based on the comparative study, conclude that using augmented data applied to deep learning methods was improved classification accuracy.

Keywords: Deep learning algorithms, Machine learning algorithms, generative adversarial networks.

PP-BM-05

EVALUATION OF IN-*VITRO* ANTICANCER ACTIVITY OF BIO-SYNTHESIZED SILVER NANOPARTICLES OF LEAVES OF *MANSOA ALLIACEAE* LAM

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ABSTRACT

Hepatocellular carcinoma (HCC) is the most common primary liver cancer with expected increasing frequency in the next few decades. The fast-growing field of nanotechnology offers infinite possibilities to design materials in the nanoscale with unique properties due to their high surface area and small size. The growing interest in the field of cancer nanomedicine offers a promising glimpse of hope in providing effective tools for advancing both therapeutics and diagnostics of HCC. The present aim is to evaluate the in-vitro anticancer activity of silver nanoparticles of aqueous leaf extract of *Mansoa alliaceae* against HepG2 Cell lines. The silver nanoparticles were prepared and were characterized by UV, ATR-FTIR, TEM, EDAX, and SEM analysis and evaluated for anticancer activity. In conclusion, the present study demonstrates the effects of aqueous extract of *Mansoa alliaceae* leaves on the proliferation of human hepatocellular carcinoma cells. It demonstrates that the extract, inhibit cell proliferation, modulate the biochemical markers of differentiation and malignancy, and induce cell morphological changes toward more mature forms of hepatocytes of HepG2 cells. Present results strongly suggest that biosynthesized silver nanoparticles exposure showed potential anticancer activity against HepG2 Cell lines and could be used as an effective anticancer nanodrug. Nanotechnology, especially the synthesis of silver nanoparticles (AgNPs), has witnessed a pivotal shift toward green synthesis methods, prioritizing biocompatibility and sustainability.

Keywords: *Hepatocellular carcinoma, Mansoa alliaceae, Anticancer activity*

PP-BM-06

EVALUATION OF IN-*VITRO*NEUROPROTECTIVE ACTIVITY OF GREEN SYNTHESIZED SILVER NANOPARTICLES LEAVES OF *HELIOTROPIUM OVALIFOLIUAM.*

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ABSTRACT

Medicinal plants are used extensively in many countries to treat conditions related to central nervous system and there is renewed interest to explore natural products, which may exhibit CNS activities.The fast-growing field of nanotechnology offers infinite possibilities todesign materials in the nanoscale with unique properties due to their high surface area,small size.Thegrowing interest in the field of neuroprotectivenanomedicine offers a promising glimpse of hope in providing effective tools for advancing both therapeutics and diagnostics of neuroprotective activity.The present aim isto Evaluation of In-*vitro*Neuroprotective activity of greensynthesized silver nanoparticles leaves of *Heliotropium ovalifoliuam* against 5H-SY5YCell lines.Thesilver nanoparticles were prepared and were characterizedby UV,ATR-FTIR, TEM, EDAX,SEM analysis and evaluated for neuroprotectiveactivity.In conclusion, the present study demonstrates the effects of aqueous extract of *Heliotropium ovalifoliuam* leaves.It demonstrates that extract,inhibit cell proliferation, modulate the biochemical markers of differentiationand induce cell morphological changes toward moremature forms of 5H-SY5Ycells. Present resultstrongly suggest that biosynthesized silver nanoparticles exposure showed potential neuroprotectiveactivity against 5H-SY5YCell linesand could beused as an effective neuroprotectivenanodrug. Nanotechnology, especially the synthesisof silver nanoparticles,has witnessed a pivotal shift toward green synthesis methods, prioritizing biocompatibility and sustainability.

Keywords: Neuroprotective activity, *Heliotropium ovalifoliuam,*silver nanoparticles.

PP-BM-07

ANTIBACTERIAL ACTIVITY OF MINERALS -DOPED HAp COATING ON ELECTROCHEMICAL DEPOSITION

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Abstract

The preparation of bone substitutes has widely used hydroxyapatite (HAp), the primary component of bones and teeth. Over the years, various deposition techniques for applying HAp coatings to Ti metal implants were investigated, particularly to enhance its adhesion strength to the metal and improve its long-term reliability. The titanium implant substrate coating on Minerals-doped hydroxyapatite nanoparticles with high antibacterial activity was synthesized using ultrasonic coupled sol-gel techniques, followed by calcination at 600°C for 4 hours and 1100°C for 1 hour. To enhance the corrosion resistance and improve the biological performance of Ti implant substrate Minerals-doped HAp coatings were fabricated on Passivated titanium metal by electrodeposition. The corrosion resistance of Minerals-doped HaP/Ti systems was examined using the two tests (potentiodynamic polarization and electrochemical impedance spectroscopy (EIS)) in SBF solution to simulate the human body environment. The optimum conditions for deposition of the Minerals-doped HAp coatings were 30 V and 18 min. The functional groups and phase structures of the Minerals-doped HAp coatings were examined using Fourier transform infrared spectroscopy (FTIR), X-ray diffractometry (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM), and contact angle measurements. The corrosion behaviours of the Minerals-doped HAp coatings were assessed through polarization and impedance spectroscopy (EIS). Additionally, the challenges in preparing HA coating layers on Ti metal surfaces for biomedical applications include physical properties, mechanical integrity, corrosion resistance, in vitro activity tests in simulated body fluid (SBF), and antibacterial properties.

Keywords: Solgel, HAp, SBF, Biocompatible, Corrosion resistance

PP-BM-08

SYNTHESIS AND CHARACTERIZATION OF IRON(II) TRANSITION METAL COMPLEXES: EVALUATING DNA-BINDING AFFINITY, INTERCALATIVE MECHANISMS, AND ANTIMICROBIAL EFFICACY

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ABSTRACT

A series of iron(II) transition metal complexes were synthesized using various ligands, including 1,10-phenanthroline, 4-nitrophthalonitrile, 3-(2-pyridyl)-5,6-diphenyl-1,2,4-triazine, and 4-amino-4H-1,2,4-triazole. The structural properties of these complexes were characterized through techniques such as FT-IR and UV-visible spectroscopy, elemental analysis, melting point determination, and molar conductance measurements. Results indicate that the Fe(II) complexes primarily adopt an octahedral geometry. The interaction between these metal complexes and calf thymus DNA (CT-DNA) was examined through UV-Vis titration, viscosity measurements, and cyclic voltammetry. UV-Vis spectral analysis showed a strong affinity of the complexes for CT-DNA binding, enabling the determination of the binding constant (Kb). Viscosity studies demonstrated a reduction in DNA's relative viscosity in the presence of the complexes, suggesting a potential intercalative binding mode. Additionally, cyclic voltammetry revealed changes in current responses upon interaction with CT-DNA, likely due to the complexes' interaction with the bulky, slow-diffusing DNA molecules. The antimicrobial activity of these Fe(II) complexes was also evaluated against various pathogenic bacteria through in vitro assays, showing significant antibacterial properties. This comprehensive study underscores the potential applications of these complexes in biological and medicinal chemistry.

Keywords: Transition metal complexes, Octahedra geometry, Cyclic voltammetry, viscosity, DNA binding studies

PP-BM-09

DEVELOPMENT OF A DUAL DOPED HYDROXYAPATITE COMPOSITE INTEGRATED WITH κ-CARRAGEENAN AND SYNTHETIC POLYMER COATING ON SURGICAL GRADE STAINLESS STEEL FOR BONE IMPLANTS

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ABSTRACT

In a broader context, biomaterials have notably improved the efficiency and performance of drug delivery systems and medical implants. This study aims to develop a new composite material that combines polymer, bio-ceramic, and bio-polysaccharide to design an advanced coating for 316L stainless steel. Hydroxyapatite (HAp) stands out as a non-toxic, bioactive ceramic increasingly employed as a biocompatible coating material. The incorporation of rare earth minerals into HAp is expected to enhance the bioactivity of the coating and enhance mechanical strength. κ-Carrageenan, a biopolymer is well known for being utilized in drug delivery (DD), tissue regeneration (TE), and bio adhesive qualities. Additionally, the use of fluoropolymers in composite coatings aims to enhance adhesion to metal surfaces and increase durability. Advanced characterisation methods, including Fourier Transform Infrared spectroscopy (FT-IR), Scanning Electron Microscopy (SEM) with EDAX spectrum, Transmission Electron Spectroscopy (TEM) and X-ray Diffraction (XRD), corroborated the composite coatings homogenous morphology and structural integrity. By combining improved mechanical qualities with higher bioactivity and biocompatibility, this innovative composite coating signifies a significant advancement in orthopedic implant technology. It presents a promising solution to critical challenges in bone regeneration and repair, potentially leading to improved clinical outcomes.

Keywords: Hydroxyapatite, 316LSS, Rare-earth minerals, κ-Carrageenan, Fluoropolymers.

PP-BM-10

SYNTHESIS AND CHARACTERIZATION OF IRON(II) TRANSITION METAL COMPLEXES: EVALUATING DNA-BINDING AFFINITY, INTERCALATIVE MECHANISMS, AND ANTIMICROBIAL EFFICACY

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ABSTRACT

A series of iron(II) transition metal complexes were synthesized using various ligands, including 1,10-phenanthroline, 4-nitrophthalonitrile, 3-(2-pyridyl)-5,6-diphenyl-1,2,4-triazine, and 4-amino-4H-1,2,4-triazole. The structural properties of these complexes were characterized through techniques such as FT-IR and UV-visible spectroscopy, elemental analysis, melting point determination, and molar conductance measurements. Results indicate that the Fe(II) complexes primarily adopt an octahedral geometry. The interaction between these metal complexes and calf thymus DNA (CT-DNA) was examined through UV-Vis titration, viscosity measurements, and cyclic voltammetry. UV-Vis spectral analysis showed a strong affinity of the complexes for CT-DNA binding, enabling the determination of the binding constant (Kb). Viscosity studies demonstrated a reduction in DNA's relative viscosity in the presence of the complexes, suggesting a potential intercalative binding mode. Additionally, cyclic voltammetry revealed changes in current responses upon interaction with CT-DNA, likely due to the complexes' interaction with the bulky, slow-diffusing DNA molecules. The antimicrobial activity of these Fe(II) complexes was also evaluated against various pathogenic bacteria through in vitro assays, showing significant antibacterial properties. This comprehensive study underscores the potential applications of these complexes in biological and medicinal chemistry.

Keywords: Transition metal complexes, Octahedra geometry, Cyclic voltammetry, viscosity, DNA binding studies.

PP-BM-11

Breast Cancer Detection Using Deep Learning Algorithms-A Survey

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ABSTRACT

Introduction: Breast cancer is the most common type of cancer in women. The mortality rate can be reduced by early diagnosis. Now a days various screening techniques, risk assessment tools and public health initiatives to detect and diagnosis breast cancer. With the advent of Artificial intelligence (AI), recently, deep learning techniques have been used effectively in breast cancer detection, facilitating early diagnosis and therefore increasing the chances of patients' survival.

Objectives: The objective is to analyse different deep learning/Machine learning algorithms, methods of analysis, image types and performance in the literature.

Materials and Methods: The papers in this study were published between 2017 to 2024. Various databases such as Kaggle, CBIS-DDSM, MIAS, and others were searched for this purpose, and shortlisted articles using Machine learning and Deep learning techniques to early detection of breast Cancer.

Results: The results of the review indicated that the Deep learning techniques is the most accurate and

extensively used model for breast cancer detection.

Conclusion: Based on the comparative study, conclude that using augmented data applied to deep learning methods was improved classification accuracy.

Keywords: Deep learning algorithms, Machine learning algorithms, generative adversarial networks

PP-BM-12

CONSTRUCTION OF BI_2S_3/NIMO-LDH HETEROJUNCTION FOR EFFICIENT PHOTOCATALYSTS FOR ORGANIC POLLUTANT DEGRADATION

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ABSTRACT

Increasing awareness of environmental pollution, particularly water pollution, has heightened the need for effective and sustainable methods to remove harmful pollutants. Photocatalytic degradation offers a promising solution for breaking down a wide range of contaminants, including organic compounds, dyes, and industrial effluents. Continuous research and development in the field of photocatalysis have led to the creation of more efficient and cost-effective photocatalysts. This progress increases the appeal and feasibility of photocatalytic degradation for various applications. The most commonly used photocatalysts are transition metals, noble metals, and very familiar catalyst such as Titanium dioxide and Zinc oxide. These photocatalysts are low-cost, stable, highly photoactive, abundant in raw materials, and non-toxic. However, they have some limitations, such as requiring near-ultraviolet (UV) light to function effectively. Among them, bismuth sulfide (Bi_2S_3) stands out as a promising photocatalyst for environmental remediation under visible light due to its suitable band gap energy (1.28 eV) and its ability to facilitate both oxidation and reduction reactions within its band edges. Basically the unmodified Bi_2S_3 has several limitations including poor absorption capacity and the rapid recombination of light-generated electrons and holes, which restrict its photocatalytic performance. Consequently, increasing efficient photocatalysis is essential to raising Bi_2S_3 photocatalytic efficiency. Many strategies, such as metal ion doping, metal/non-metal deposition, carbon-based materials, and heterojunction building, have been developed to get around these problems and improve photocatalytic behaviour. Layered double hydroxides (LDH) are one kind of photocatalytic material that showed promise in removing both inorganic anions and organic contaminants. The LDH materials are frequently referred to as "hydrotalcite-like compounds" or "anionic clays." Generally the LDH formula is represented as,

$$[M^{II}_{1-x}M^{III}_{x}(OH)_2]^{x+}(A^{n-})_{\frac{x}{n}}yH_2O$$

The equation states that the notations of "A" for the interlayer anion, "n" for the charge on "A," "x" and "y" for the fraction constants, and "M^{II}& MI^{II}" for the divalent and trivalent metal cations, respectively. LDHs have mostly been employed as catalysts that are heterogeneous. LDH powder is one of the key components used in the water treatment process.Therefore, the in this research work, bare Bi_2S_3, Ni-Mo LDH, different wt % (1, 3, 5%) of Ni–Mo LDH was synthesized using a hydrothermal method and employed as a photocatalyst to decontaminate water from organic dye pollutants.

PP-BM-13

HETERO ATOM DOPED ACTIVATED CARBON/MNO_2 FOR ENHANCING THE CYCLIC STABILITY OF HYBRID SUPERCAPACITOR DEVICE

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ABSTRACT

About 80% of the world's energy consumption is met through fossil fuels that pollute the environment. This may lead to the exhaustion of non-renewable energy resource and also cause serious pollution to the environment. So the focus on renewable energy technology from the natural resources is the prime concern. The natural resources such as sun, wind, earth and ocean could be used for energy extraction but the storing of the extracted energy is a mere challenge. Batteries play a vital role in energy storage having high energy density. Yet another charge storage device called supercapacitors is more focused due to its high power density. Supercapacitors also called as electrochemical capacitor applied in various portable devices, electric vehicles and stationary energy storage systems. Supercapacitors have unique advantages such as high power density (>10 Wh kg^{-1}), good reversibility and long term of cycle life with 95% capacitance retention and cyclic stability of upto100000 cycles based on the materials. Supercapacitors are categorized into EDLC (Carbon based), Pseudocapacitor (metal oxides, polymers) and Hybrid capacitor (combination of metal oxides, polymers, carbon based materials). The electrode material used in the capacitor plays a vital role in enhancing the supercapacitor properties. So the development of high-performance electrode integrated with high capacitance, high energy density, power density and long-term cycle life could be achieved by hybrid supercapacitors. Generally the activated carbon is a sustainable approach that helps in waste management and reduces environmental pollution and which having very high surface area with high pore diameter to enhances the supercapacitor performance. At the same time the doping with different heteroatoms can tailor the electronic properties of activated carbon, such as work function and electronic density of states. This allows for optimization of the electrode material for specific supercapacitor configurations and applications.

In the present work it is planned to develop hybrid supercapacitor material usingactivated carbon (AC) prepared frombiowaste material (syzygiumcumini seeds). Functionalizing the AC with the Nitrogen and Sulfur atom to enhance the electron transfer and semi-conductiveproperties and thereby increasing the electrochemical performance of the activated surface. Hence the combination of Hetero atom doped activated carbon with MnO_2 was enhances the overall performance of the electrode material. A preliminary study conducted earlier on the investigation ofhetero atom doped activated carbon with MnO_2 shows the excellent capacitance nature. The pseudocapacitance nature of the metal oxide with heteroatom modified activated carbon will enhance the capacitance and good cycling stability of the composite.

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