RCSSST2024

32nd REGIONAL CONFERENCE ON SOLID STATE SCIENCE AND TECHNOLOGY 2024

Conference Programme Book

17-19 SEPTEMBER, 2024

HOTEL GRAND CONTINENTAL
KUALA TERENGGANU, TERENGGANU,
MALAYSIA

Advancing Materials Frontiers: Bridging Science, Technology, Industry and Sustainability

CONTENT

MESSAGE FROM THE DEPUTY MINISTER OF THE MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION (MOSTI)

In the name of Allah, the Most Gracious and Most Merciful and blessings upon Prophet SAW.

With pride, firstly I would like to congratulate the organizers, Universiti Malaysia Terengganu (UMT) for successfully holding the Regional Conference of Solid-State Science and Technology (RCSSST) for the year 2024. RCSSST 2024 is the 32nd year and it is jointly organized with National Nanotechnology Centre (NNC), Ministry of Science, Technology and Innovation (MOSTI), Mass Chapter and Research Group (RIG) of Advanced Nanomaterials (ANoMa) in Faculty of Science and Marine Environment, UMT, not to forgetting the cooperation with Malaysian Solid-State Science and Technology Society (MASS).

This conference relates to MOSTI's National Science, Technology and Innovation Policy (DSTIN) 2021-2030, in the concept of Science, Technology, Innovation and Economy (STIE) with the objective, to create and strengthen the foundation to innovate and apply science and technology for the benefit of various levels of communities in our Malaysia. DSTIN really emphasizes a national agenda to create an ecosystem, where there are empowering development and the application of local technology and foster innovation toward ensuring economic growth, societal well-being and quality of life. Through the organization of RCSSST2024, hopefully we can achieve some of the policy goals of DSTIN to ensure our country becomes a high-tech nation through empowerment of local talent in Research and Development (R&D).

Finally, it gives me great pleasure to warmly welcome every participant to RCSSST2024. I am sure this conference will be an excellent opportunity for academicians, researchers, technologists and industry professionals to gather for networking and exchanging ideas towards innovation and new technology locally and globally.
Thank you.

Best regards,

YB Dato' Haji Mohammad Yusof Bin Apdal
Deputy Minister of Science, Technology and Innovation

MESSAGE FROM THE PATRON OF RCSSST2024

Assalamu'alaikum warahmatullahi wabarakatuh and Greetings,

It is with great pleasure that I welcome you to the 32nd Regional Conference of Solid State Science and Technology (RCSSST 2024), hosted from 17th to 19th September 2024 in Kuala Terengganu, Malaysia. We are delighted to have all participants joining us, representing a diverse array of national and international backgrounds. This year's conference theme, "Advancing Materials Frontiers: Bridging Science, Technology, Industry and Sustainability," captures our collective ambition to push the boundaries of material science while integrating technological advancements and sustainability practices.

I would like to extend my heartfelt thanks to our main sponsor - Ministry of Science, Technology and Innovation (MOSTI). The generous support has been crucial in bringing this conference to life. A special thank you to the Board Committee of the Malaysian Solid State Science and Technology Society (MASS), including its President, Prof. Dr. Abdul Halim Shaari, for the opportunity to host this event. Your collaboration has greatly contributed to the success of RCSSST 2024. We are delighted to welcome Prof. Dr. Mohamed Shaban Said Fadel from the Islamic University of Medina, Saudi Arabia, as our keynote speaker. We also extend our deepest gratitude to all plenary and invited speakers. Your valuable insights and expertise will greatly enhance the scope of this conference, enriching our discussions and guiding us toward breakthroughs in our field.

A special acknowledgment is due to the organizing committee, especially the MASS Chapter UMT and the Research Interest Group (RIG) Advanced Nanomaterials (ANoMa) from the Faculty of Science and Marine Environment (FSSM), Universiti Malaysia Terengganu (UMT). Your dedication and hard work have been instrumental in ensuring the success of this conference. Through events like this, we can create opportunities for collaboration between academia, industry, and government. We invite all researchers, scientists, and experts to engage in enriching discussions and share their groundbreaking work. Furthermore, we are pleased to share that during this event, a Memorandum of Understanding (MoU) exchange ceremony will take place. I would like to extend my heartfelt congratulations to all parties involved in this MoU exchange. This significant milestone symbolizes the formalization of our collaboration and shared vision in advancing material science and technology.

Once again, welcome to RCSSST2024. I wish you a productive, inspiring, and rewarding conference experience. May our time together here lead to meaningful discoveries and lasting partnerships.

Thank you.

Professor Ts. Dr. Mohd Zamri bin Ibrahim
Vice Chancellor,
Universiti Malaysia Terengganu

MESSAGE FROM THE ADVISOR I RCSSST2024

Assalamu'alaikum wrh. wbt. and Salam Sejahtera,

On behalf of the conference committee, I welcome you to the 32nd Regional Conference on Solid State Science and Technology (RCSSST) 2024. This year's conference, co-organized by Universiti Malaysia Terengganu (UMT) and the Malaysian Solid State Science and Technology Society (MASS), is set to explore the theme "Advancing Materials Frontiers: Bridging Science, Technology, Industry, and Sustainability." We gather here from September 17th to 19th, 2024, united by our commitment to pushing the boundaries of materials science and contributing to sustainable development.

This year's conference highlights the critical role that solid-state science and technology play in tackling global challenges such as Artificial Intelligent (A.I) technology. As members of MASS, we have a distinct opportunity to lead innovation where science, technology, industry, and sustainability converge. This conference provides an essential platform for exchanging ideas, sharing research findings, and forming collaborations that will drive significant advancements in materials science, with profound effects on energy, environmental sustainability, and industrial innovation.

I encourage all participants to engage fully in the discussions and activities that RCSSST2024 has to offer. The knowledge and connections we build here will be instrumental in shaping the future of our field and contributing to a more sustainable and prosperous world. I extend my deepest gratitude to the organizing committee for their hard work and dedication in bringing this conference to fruition.

Thank you.

Prof. Dr. Abdul Halim Shari
The Malaysian Solid State Science and Technology Society (MASS)

MESSAGE FROM THE ADVISOR II RCSSST2024

Assalamualaikum Warahmatullahi Wabarakatuh and good day,

With great pleasure and honor, I warmly welcome all speakers, participants, and distinguished guests of the 32nd Regional Conference of Solid State Science and Technology (RCSSST) 2024. This event, deeply rooted in the tradition of scientific excellence, has become a vital platform for exchanging knowledge and ideas in the ever-evolving field of solid state science and technology.

This year, Universiti Malaysia Terengganu (UMT), in collaboration with the Malaysian Solid State Science and Technology Society (MASS) Chapter UMT and the Research Interest Group (RIG) on Advanced Nanomaterials (ANoMa), is proud to serve as the host for this prestigious conference. Our collective efforts, in cooperation with MASS, aim to ensure that RCSSST2024 serves as a beacon of innovation, fostering interdisciplinary collaboration and inspiring future advancements in solid state research.

At UMT, we are committed to advancing research and innovation in fields that address national priorities and global challenges. The topics at this conference align with our vision to lead in marine and environmental sciences while embracing the broader scope of physical sciences and advanced technology. We believe the knowledge shared here will catalyze new bonds, reactions, and applications that will greatly benefit society.

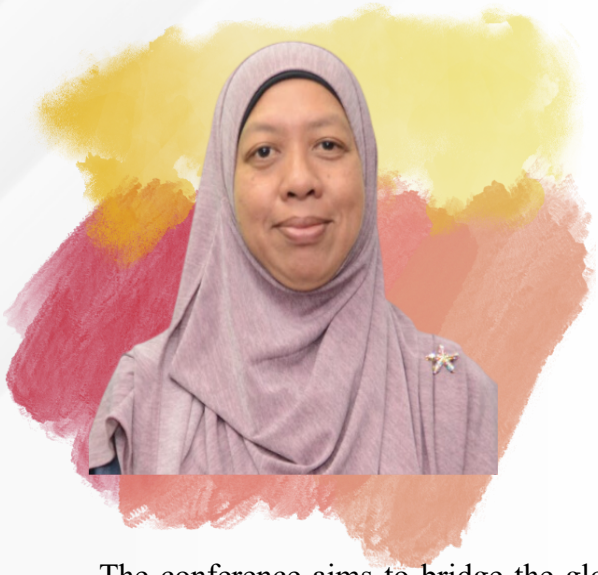
I want to express my deep gratitude to the organizing committee, sponsors, and everyone who has been the catalyst for making RCSSST2024 a success. Your dedication and tireless efforts have united a diverse group of distinguished participants from around the world, fostering an environment where innovation and collaboration can thrive.

Once again, welcome to RCSSST2024. I wish you a conference filled with productive interactions and inspiring discoveries, as well as an unforgettable stay in Terengganu. May this event be a source of energy and momentum for all your future endeavors.

Thank you.

Professor ChM. Dr. Marinah binti Mohd Ariffin
Deputy Vice-Chancellor (Research & Innovation)
Universiti Malaysia Terengganu

MESSAGE FROM THE ADVISOR III RCSSST2024



BISMILLAHIRRAHMANIRRAHIM

Alhamdulillah, with His Will, The 32nd Regional Conference of Solid State Science and Technology (RCSSST), with the theme of "Advancing Materials Frontiers: Bridging Science, Technology, Industry and Sustainability" takes place from 17 – 19th September 2024. The Faculty of Science and Marine Environment (FSSM), Universiti Malaysia Terengganu is truly honoured to collaborate with Malaysian Solid State Science and Technology Society (MASS) in organizing this biennial event of RCSSST2024.

The conference aims to bridge the global and local researchers to move forward hand-in-hand towards our mission to promote science and technology for the benefits of humankind, the creation of wealth and national development.

RCSSST covers a wide spectrum of topics related to solid state science and technology, from advanced material synthesis to biotechnology. We are excited to gather a diverse group of scientists, technologists, academicians in the fields of science and technology for discussion, collaborations and discovery in a relevant platform, and contribute to innovate solutions towards sustainable development.

FSSM extends a sincere gratitude to the dedicated organizing committee, and the esteemed sponsors for their relentless efforts in making this conference a success. Your presence and contributions are very much appreciated and together, we look forward to a rewarding and enjoyable gathering.

Have a great time in Terengganu.

Assoc. Prof. Dr. Faridah binti Mohamad
Dean FSSM
Universiti Malaysia Terengganu

MESSAGE FROM THE CHAIRMAN RCSSST2024

Assalamualaikum and Greetings to all.

With sincere gratitude, I welcome each of you to the 32nd Regional Conference on Solid State Science and Technology (RCSSST) 2024. Being here, surrounded by others who share a passion for advancing materials science, is a true honor and privilege. This year's theme, "Advancing Materials Frontiers: Bridging Science, Technology, Industry, and Sustainability," is not just a guiding principle but a call to action.

It challenges us to push the boundaries of what is possible in materials science, to explore new intersections between scientific discovery and practical application, and to ensure that our advancements contribute to a more sustainable and prosperous future.

As we come together at RCSSST2024, I would like to express my deepest appreciation to Prof. Ts. Dr. Mohd Zamri bin Ibrahim, Vice-Chancellor of UMT, Professor Dr. Abdul Halim Shari, President of the Malaysian Solid State Science and Technology Society (MASS), Prof. ChM. Dr. Marinah binti Mohd Ariffin, Deputy Vice-Chancellor (Research & Innovation) of UMT, Assoc. Prof. Dr. Faridah binti Mohamad, Dean of FSSM, UMT, MASS Chapter UMT, the Advanced Nanomaterial (ANoMA) Research Interest Group, FSSM UMT, and all committee members for their unwavering support and dedication. Alhamdulillah, we made it happen. I also extend my heartfelt gratitude to our sponsors for their invaluable contributions in ensuring that RCSSST2024 is a cornerstone of knowledge and collaboration.

With the start of this conference, I hope that the ideas and discoveries we generate here will not only shape the future of materials science but also contribute significantly to achieving the Sustainable Development Goals (SDGs), ensuring our work benefits both society and the planet. Thank you for being a part of this journey; I am excited to see what we will achieve together.

Dr. Aima Ramli
Chairman of RCSSST2024

ORGANIZING COMMITTEE

Advisor I	:	Prof. Dr. Abdul Halim Shaari *MASS President*
Advisor II	:	Prof. ChM. Dr. Marinah binti Mohd Ari *Deputy Vice Chancellor (Research and Innovation), Universiti Malaysia Terengganu*
Advisor III	:	Assoc. Prof. Dr. Faridah binti Mohamed *Dean Faculty of Science and Marine Environment, Universiti Malaysia Terengganu*
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Virtual	:	Dr. Ahmad Nazif bin Aziz Assoc. Prof. ChM. Dr. Mohd Aidil Adhha bin Abdullah PED representative
Banquet	:	Assoc. Prof. ChM. Dr. Mazidah binti Mamat Puan Suhaila binti Abu Samah

MAIN SPONSOR ACKNOWLEDGMENT

We extend our heartfelt gratitude to our main sponsor,
Ministry of Science, Technology and Innovation of Malaysia
for their generous support and invaluable contributions to the success of the 32nd Regional Conference on Solid State Science and Technology (RCSSST2024).

KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

MOSTI

SPONSORS ACKNOWLEDGMENT

We are deeply grateful to the following sponsors for their invaluable support to the 32nd Regional Conference on Solid State Science and Technology (RCSSST2024)

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PROGRAM OVERVIEW

DAY 1: 17 SEPTEMBER 2024 (Tuesday)			
Time	**Event**		**Venue**
8.00 – 08.45 am	**Registration**		Registration Counter
8.45 – 09.00 am	**Welcoming Speech**		Redang Hall
9.00 – 09.30 am	**PLENARY LECTURE 1** **Prof. Dr. Rusli Bin Daik** *Universiti Kebangsaan Malaysia* Mesoporous Molecularly Imprinted Poly(vinylbenzyl chloride) as EDLC Electrode Material		Redang Hall
9.30 – 10.00 am	**PLENARY LECTURE 2** **Prof. Ts. Dr. Mohd Ikmar Nizam Mohamad Isa** *Universiti Sains Islam Malaysia* From Trees to Tech: Harnessing Cellulose-Based Electrolytes for a Greener Future		Redang Hall
10.00 – 10.15 am	Break - Refreshment		
	PARALLEL SESSION 1		
	Session 1A (Redang Hall) **Online Oral Presentation I**	**Session 1B** (Lang Tengah) **Materials and Energy**	Redang Hall **(Session 1A)** Lang Tengah **(Session 1B)**
10.15 – 10.30 am	VP-001	***Invited Speaker 1*** **Assoc. Prof. Dr. Mohd Mustafa Awang Kechik**	
10.30 – 10.45 am	VP-002	***Invited Speaker 2*** **Assoc. Prof. Dr. Lim Kean Pah**	
10.45 – 11.00 am	VP-003	***Invited Speaker 3*** **Dr. Nurul Asyikin Bt Kamaruzaman**	
11.00 – 11.15 am	VP-004	***Invited Speaker 4*** **Dr. Aima binti Ramli**	
11.15 – 11.30 am	VP-007	ID-005	
11.30 – 11.45 am	VP-008	ID-008	
11.45 – 12.00 pm	VP-009	ID-010	
12.00 – 12.15 pm	VP-010	ID-029	
12.15 – 12.30 pm	VP-011	ID-030	
12.30 – 12.45 pm	VP-012	ID-040	
12.45 – 02.00 pm	Break – Lunch		
2.00 – 2.45 pm	**KEYNOTE SESSION** **Prof. Dr. Mohamed Shaban Said Fadel** *Islamic University of Medina, Saudi Arabia* Nanoengineered Photocatalysts for Green Hydrogen Production		Redang Hall
2.45 – 3.15 pm	**PLENARY LECTURE 3** **Prof. Ts. Dr. Mohammad Ismail** *Universiti Malaysia Terengganu* Solid-State Hydrogen Storage Materials for Hydrogen-Energy Applications		Redang Hall
3.15 – 3.45 pm	**TECHNICAL TALK 1** *RGS Corporation Sdn Bhd*		Redang Hall
	PARALLEL SESSION 2		
	Session 2A (Redang Hall) **Online Oral Presentation II**	**Session 2B** (Lang Tengah) **Ceramic and Glass**	
3.45 – 4.00 pm	VP-013	***Invited Speaker 5*** **Assoc. Prof. Dr. Khamirul Amin Matori**	Redang Hall **(Session 2A)** Lang Tengah **(Session 2B)**
4.00 – 4.15 pm	VP-014	***Invited Speaker 6*** **Dr. Mohd Hafiz bin Mohd Zaid**	
4.15 – 4.30 pm	VP-015	ID-003	
4.30 – 4.45 pm	VP-016	ID-028	
4.45 – 5.00 pm	VP-017	ID-032	
5.00 – 5.15 pm	VP-018	ID-038	
5.15 – 5.30 pm	Coffee & Tea Refreshment		
8.00 – 11.00 pm	**GALA DINNER & OPENING CEREMONY RCSSST2024**		Perhentian Hall
End of Day 1			

DAY 2: 18 SEPTEMBER 2024 (Wednesday)			
Time	**Event**		**Venue**
9.00 – 9.30 am	**PLENARY LECTURE 4** **Prof Dr. Erhashov Yokub Suvonovich** *National University of Uzbekistan, The Republic of Uzbekistan* Physical and Technological Principles of Formation and Electronic-Optical Properties of Nano-Sized Structures Created Based on Materials of Various Nature		Redang Hall
9.30 – 10.00 am	**PLENARY LECTURE 5** **Prof. Dr. Abdul Halim Shari** *Universiti Putra Malaysia* Superconductivity: A brief Timeline exploration of Room Temperature Superconductors		Redang Hall
10.00 – 10.15 am	Break - Refreshment		
	PARALLEL SESSION 3		
	Session 3A (Redang Hall) **Superconductors**	**Session 3B** (Lang Tengah) **Nanoscience and Nanotechnology/ Thin Films and Nanostructures/ Biotechnology**	Redang Hall **(Session 3A)** Lang Tengah **(Session 3B)**
10.15 – 10.30 am	***Invited Speaker 7*** **Prof. Ts. Dr. Azhan bin Hashim @ Ismail**	***Invited Speaker 9*** **Assoc. Prof. Ts. Dr. Mohd Sabri Mohd Ghazali**	
10.30 – 10.45 am	***Invited Speaker 8*** **Prof. Dr. Chen Soo Kien**	***Invited Speaker 10*** **Tuan Haji Ismarul Nizam Bin Haji Ismail**	
10.45 – 11.00 am	ID-006	ID-014	
11.00 – 11.15 am	ID-007	ID-027	
11.15 – 11.30 am	ID-031	ID-012	
11.30 – 11.45 am	ID-033	ID-035	
11.45 – 12.00 pm	ID-034	ID-013	
12.00 – 12.30 pm	**TECHNICAL TALK 2** *Novatiq Scientific Sdn Bhd*		Redang Hall
12.30 – 2.00 pm	Break - Lunch		
	PARALLEL SESSION 4		
	Session 4A (Redang Hall) **Polymers and Composites/ Optical and Dielectric Material**	**Session 4B** (Lang Tengah) **Organic Materials & Application /Advanced Material Synthesis & Crystal Growth Technology/ Devices & Materials for Biology and Medicine**	Redang Hall **(Session 4A)** Lang Tengah **(Session 4B)**
2.00 – 2.15 pm	***Invited Speaker 11*** **Prof. Dr. Zainal Abidin Talib**	***Invited Speaker 14*** **Datuk ChM. Dr. Soon Ting Kueh**	
2.15 – 2.30 pm	***Invited Speaker 12*** **Assoc. Prof. Dr. Wan Yusmawati Wan Yusoff**	***Invited Speaker 15*** **Dr. Norazila Binti Ibrahim**	
2.30 – 2.45 pm	***Invited Speaker 13*** **Dr. Chiu Wee Siong**	ID-002	
2.45 – 3.00 pm	ID-009	ID-024	
3.00 – 3.15 pm	ID-018	ID-039	
3.15 – 3.30 pm	ID-026	ID-011	
3.30 – 3.45 pm	ID-021	ID-020	
3.45 – 4.00 pm	ID-023	ID-025	
4.00 – 4.15 pm	-	ID-036	
4.15 – 5.30 pm	**CLOSING CEREMONY RCSSST2024**		Redang Hall
End of Day 2			

DAY 3: 19 SEPTEMBER 2024 (Thursday)	
7.30 am – 5.30 pm	Excursion trip to Redang Island (optional with extra cost)

OPENING CEREMONY

17 SEPTEMBER 2024 (TUESDAY)

VENUE : PERHENTIAN HALL, GRAND CONTINENTAL HOTEL, KUALA TERENGGANU

Time	Event
7.30 pm	Arrival of delegates and participants
7.40 pm	Arrival of YBhg. Prof. Ts. Dr. Mohd Zamri bin Ibrahim, Vice Chancellor, Universiti Malaysia Terengganu
7.50 pm	Arrival of YBhg. Dato' Haji Mohammad Yusof bin Apdal, Deputy Minister of Science, Technology and Innovation
8.00 pm	National Anthem Do'a Recital
8.10 pm	Welcoming Speech by YBhg Prof. Dr. Abdul Halim Shaari The President of Malaysia Solid State Science and Technology (MASS)
8.20 pm	Speech by YBhg. Prof. Ts. Dr. Mohd Zamri bin Ibrahim, Vice Chancellor, Universiti Malaysia Terengganu
8.30 pm	Officiating Speech by YBhg. Dato' Haji Mohammad Yusof bin Apdal, Deputy Minister of Science, Technology and Innovation
8.45 pm	Memorandum of Understanding (MoU) exchange between - Universiti Malaysia Terengganu and Malaysian Institute of Chemistry. - Malaysia Solid State Science and Technology and Hi-Tech Instruments Sdn. Bhd.
9.00 pm	The Malaysia Solid State Science and Technology Award Ceremony - MASS Best Undergraduate Thesis Award - MASS Micrograph Award - MASS Young Researcher (Special) Award - MASS Young Researcher Award - President Cup MASS Golf Tournament - MASS Fellow Award - MASS Honorary Fellow Award - MASS Lifetime Achievement in Materials Research Award
9.20 pm	Photo Session Press conference
9.30 pm	Dinner starts Cultural Performance from UMT Culture and Arts Center
11.00 pm	Adjourn

Dress Code: Batik

LIST OF KEYNOTE, PLENARY AND INVITED SPEAKER

KEYNOTE SPEAKER

Prof. Dr. M. Shaban

Professor M. Shaban, affiliated with the Islamic University of Madinah, stands among the top 2% highly cited scientists. He earned his Ph.D. in experimental Physics (Nanophotonics and applications) through a prestigious scholarship program between Chonnam National University (South Korea) and Beni-Seuf University (Egypt). From 2011 to 2020, he served as the director of the Nanophononics and Applications (NPA) labs at Beni-Suef University. Additionally, he held the position of vice dean in the Faculty of Navigation Science and Space Technology until 2020. In 2021, he achieved the rank of Full Professor in materials science and nanotechnology. His extensive expertise spans various domains, including Nano/RO/FO membrane design, Nanophotonics, nanomaterials synthesis and characterization, adsorbents and photocatalyst design, water desalination, wastewater treatment, sensors design, renewable energy, and PEC water splitting for green hydrogen production. Prof. Shaban actively contributed to approximately 65 international and national research projects related to water, energy, and the environment. His prolific publication record includes over 250 articles in highly regarded journals, covering topics such as nanomaterials design, membrane fabrication, water desalination and treatment, sensors, and PEC hydrogen production. Notably, he holds six granted patents from the USA, Germany, and Egypt, spanning areas such as sensors, water treatment, and PEC hydrogen generation. Prof. Shaban also edited several influential books on topics such as nanoporous membranes, RO membranes, PEC hydrogen generation, and sensors. His impactful contributions extend beyond academia, as he has organized multiple international conferences in these specialized fields. His outstanding scholarly work has garnered over 10,000 citations, with an impressive h-index of 56, as recognized by Google Scholar.

Nanoengineered Photocatalysts for Green Hydrogen Production

M. Shaban[1,2,*]

[1]*Department of Physics, Faculty of Science, Islamic University of Madinah, Madinah, 42351, Saudi Arabia*
[2]*Nanophotonics and Applications Lab, Physics Department, Faculty of Science, Beni-Suef University, Be-ni-Suef, 62514, Egypt*

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Abstract. Hydrogen, a clean energy carrier with high energy content and zero emissions, is pivotal for transitioning to sustainable energy systems. Its importance lies in its potential to replace fossil fuels and reduce environmental impact. Hydrogen is traditionally produced through steam methane reforming and electrolysis, processes that often rely on non-renewable energy sources. Green hydrogen is produced via electrolysis powered by renewable energy, resulting in zero greenhouse gas emissions. It's a cornerstone for eco-friendly energy solutions. The photoelectrochemical method utilizes nanostructured photocatalysts and solar energy to split water molecules, directly generating hydrogen without additional energy input. Our research demonstrates enhanced hydrogen production efficiency using novel nanoengineered photocatalysts, contributing to the feasibility of green hydrogen as a renewable energy source. Current limitations include catalyst stability and cost. Future work focuses on material innovation and scalable production techniques. Therefore, the advancement of nanostructured photocatalysts for green hydrogen production marks a significant step towards sustainable energy, promising a cleaner future with reduced reliance on fossil fuels.

Keywords: Renewable energy; Green hydrogen; Photoelectrochemical method; Nanostructured photocatalysts; Hydrogen production efficiency; Photoelectrode stability

PLENARY SPEAKER

Prof. Dr. Yokub S. Ergashov

Prof. Dr. Yokub S. Ergashov, DSc, PhD, is a professor at the National University of Uzbekistan named after Mirzo Ulugbek (NUUz), Almazar District, Tashkent, The Republic of Uzbekistan. He holds a prominent position as the Vice-Rector for Scientific Affairs and Innovations at the National University of Uzbekistan named after Mirzo Ulugbek (NUUz). He is a leading academician and researcher, and his research has significantly advanced our understanding of complex topics such as electron spectroscopy, nanostructures, and their various applications. Throughout his career, he has published a wide array of scholarly articles in respected journals and presented his findings at numerous international conferences. He is also the author of key textbooks, including "Fizika 1" and "Fizika 2," published in 2022, which are used extensively in academic settings. Professor Ergashov's work not only contributes to scientific knowledge but also supports the digitalization and modernization of higher education in Uzbekistan as a project leader.

Physical and Technological Principles of Formation and Electronic-Optical Properties of Nano-Sized Structures Created Based on Materials of Various Nature

Yokub S. Ergashov*

Faculty of Physics, National University of Uzbekistan named after Mirzo Ulugbek, Tashkent, Uzbekistan

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Abstract. The development of technology for modifying surface properties of materials, synthesizing new compounds, and creating nanocrystals, nanofilms, and multilayer hetero-epitaxial systems with specific physical properties has been achieved. The fundamental mechanisms underlying the formation of these materials have been elucidated, and their properties have been comprehensively studied. Key mechanisms of formation for both single- and multi-component nanocrystals and nanofilms have been clarified. A method has been proposed to estimate nanostructure sizes, as well as the relationship between nanocrystal sizes and band gap and crystal lattice parameters. The critical sizes of crystalline phases at which quantum-size effects, such as electron tunnelling, become significant have also been determined. Additionally, optimal conditions for ion bombardment and annealing to produce multilayer heterostructures have been established.

Keywords: Nanotechnology; material science; physical electronics; semiconductor; ion implantation; nanostructures

PLENARY SPEAKER

Prof. Dr. Rusli Daik

Professor Dr. Rusli Daik graduated from Universiti Kebangsaan Malaysia in 1993 with a Bachelor of Science (Hons.) in Chemistry. He later earned his PhD in Polymer Chemistry from University of Durham, UK in 1997. Professor Rusli Daik is a polymer chemistry expert, he contributes mainly in polymer synthesis, nano-structured polymers and bio-synthetic polymers.

He also focuses on application of polymers in opto-electronics, sensors, energy and health sciences. He has delivered more than 45 invited talks in Malaysia, Asian Countries, Middle East and USA, received more than 30 awards from national and international organizations, and owned 8 Intellectual Properties. He has written 145 manuscripts in refereed journals, 7 books and 21 book chapters. Professor Rusli Daik contributed not only to the academia community, but also to the public at large. He has been appointed as a member of the SIRIM Technical Committee and the Committee Chairman on General Purpose Chemicals, and Paints and Coatings, respectively for preparing the Malaysian Standard. He was actively involved with activities organized by the Malaysian Institute of Chemistry (IKM), for which he has been a registered member since 2000. Professor Rusli Daik is the Chairman of Pro-Team Committee for the Persatuan Polimer Malaysia (Malaysian Polymer Society) and Persatuan Alumni Sains Kimia Universiti Kebangsaan Malaysia (Universiti Kebangsaan Malaysia Chemical Science Alumni Society). Currently he is the elected chairman of both societies.

Professor Rusli Daik has also been involved in entrepreneurship, specifically on teaching and training on aspects related to social media marketing and e-commerce. He has been selected as a Malaysian Representative to the Council of Federation of Asian Polymer Societies since 2012, of which he became the General Secretary of the council for the period of 2016 – 2017. He is also a member of the Council of Asian Science Editors (CASE) since 2017, for which he contributes as a member of the Education and Training Committee for 2018 – 2020, and the Information and Publication Committee for 2022 - 2024. He has been appointed as an Associate Member of the Cheminformatics Data Standards (CPCDS) Standing Committee of the International Union of Pure and Applied Chemistry (IUPAC) for the term 2020-2021. He was awarded the Fellowship of the Akademi Sains Malaysia (ASM) in 2019, Fellowship of the Malaysian Institute of Chemistry (IKM) in 2022, and Fellowship of the Malaysian Association of Solid-State Science and Technology (MASS) in 2023. Professor Rusli Daik has been a registered Professional Technologist (Chemical Technology) with the Malaysian Board of Technologist (MBOT) since 2022. Prof Rusli Daik is now a Council Member of the Malaysian Institute of Chemistry (IKM) since 2023, for which he has been the Chairman of the Division of Polymers and Materials Chemistry for 2023 - 2027. He is also the National Representative of Malaysia to the Polymer Division of the International Union of Pure and Applied Chemistry (IUPAC) for 2024-2025.

Mesoporous Molecularly Imprinted Poly(vinylbenzyl chloride) as EDLC Electrode Material

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Abstract. This work involved the synthesis of mesoporous molecular imprinted poly(vinylbenzyl chloride), MIP(VBC), as EDLC electrode material. Toluene was used as a template as well as the solvent. Fourier transform infrared spectroscopy (FTIR) confirmed the cavity formation after the template removal. Specific surface area (SSA), pore volume (P_v) and pore size distribution (PSD) of MIP(VBC) that contributed to the final physical properties of electrode materials were studied. N_2 adsorption-desorption isotherm disclosed the presence of cylindrical-shaped pores in the MIP(VBC) enhanced the performance of the fabricated cell. Cells with MIP(VBC) and acetylene black (AB) composite electrodes produced a specific capacitance (C_{sp}) of 4.53 Fg^{-1}, increased by 0.39 Fg^{-1} when compared with the one without MIP(VBC). The relaxation time (τ_o) decreased to 1.883 Hz, reduced by 3.897 Hz. Conductivity (σ) escalated up to 0.121 $\Omega^{-1}cm^{-1}$, rising about 0.073 $\Omega^{-1}cm^{-1}$. The maximum energy (E_{max}) and maximum power (P_{max}) were enhanced to 2.27 $Whkg^{-1}$ and 0.343 Wkg^{-1}, increased by 0.2 $Whkg^{-1}$ and 0.138 Wkg^{-1} respectively.

Keywords: Mesoporous material; molecularly imprinted poly(vinylbenzyl chloride); trimodal pore size distribution; cylindrical pore shape; EDLC electrode.

PLENARY SPEAKER

Prof. Ts. Dr. Mohammad Ismail

Professor Ts. Dr. Mohammad Ismail was awarded a bachelor's degree in applied physics from University of Malaya in 2003. In 2008, he further his doctorate studies in advanced materials in the University of Wollongong, Australia. Mohammad's research interest in the field of materials science, particularly in the modification of solid–state hydrogen storage materials such as metal hydrides, complex hydrides and chemical hydrides for hydrogen–energy applications. He has published 108 articles in ISI (WoS) indexed journals (95 articles as a first author/corresponding author) with h-index of 41 and 4023 citations from Scopus. Mohammad has received awards in both research and academia, such as a recipient for international award where he received "International Magnesium Award for Youth of the Year 2022" from International Mg Society. He is also recognized as a "IJHE Juan Carlos Bolcich Award for the most cited paper in Hydrogen Storage & Distribution category of the year 2018" from International Journal of Hydrogen Energy. He is also recipient for "Most Valuable Paper Award for Journal of Magnesium and Alloys 10th Anniversary 2023" and "2021 Outstanding Paper Award of Journal of Magnesium and Alloys". Mohammad is also listed among the Top 2% scientist in the world in the field of energy based on the Scopus citation rank studied by Stanford University. Mohammad has also demonstrated academic leadership through appointment as a Visiting Professor at Institute Technology Sepuluh Nopember, Surabaya by Ministry of Research, Technology and Higher Education, Republic of Indonesia in the "World Class Professor" programme and appointed as a "Prominent Visiting Researcher" at Universiti Teknologi Malaysia. He is also admitted as a Fellow of International Association of Advanced Materials (FIAAM) in recognition for his contribution to "Hydrogen Energy" research. He has also invited as a Keynote Speaker for several international conference, giving an international guest lecture and international public lecture.

Solid-State Hydrogen Storage Materials for Hydrogen-Energy Applications

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Abstract. Hydrogen is an ideal energy carrier currently under consideration as an alternative fuel for the future, such as in automotive applications. Although hydrogen has a promising, bright future in the energy field, the application of hydrogen requires a safe and efficient storage technology. On the other hand, storage of hydrogen is one of the key challenges in developing the hydrogen economy, especially on-board hydrogen storage in transportation applications. There are three main on-board hydrogen storage approaches including, high pressure storage, cryogenics, as well as chemical compounds that reversibly release hydrogen upon heating (solid-state storage). Among these methods, solid-state hydrogen storage has become an attractive option due to its high volumetric hydrogen capacity and favorable safety considerations. However, there are disadvantages that limit the widespread use of solid-state hydrogen storage materials for applications such as their high decomposition temperature with slow sorption kinetics and high thermodynamic stability. Thus, the purpose of our research is to enhance the kinetics and tailor the thermodynamics of light metal hydrides and complex hydrides, using different types of catalyst and the destabilization concept. A series of single light metal hydrides such as metal halides-catalyzed MgH_2, metal oxides-catalyzed MgH_2, and CNTs-metal halides-co-catalyzed MgH_2 have been studied for solid-state hydrogen storage materials. A combined system such as secondary hydride systems (MgH_2-$NaAlH_4$, MgH_2-$LiAlH_4$, $NaAlH_4$-$Mg(BH_4)_2$, $NaAlH_4$-$Ca(BH_4)_2$, and Na_3AlH_6-$LiBH_4$) and ternary-hydride system ($NaAlH_4$-MgH_2-$LiBH_4$) also have been systemically investigated for hydrogen storage.

Keywords: Hydrogen energy; hydrogen storage; solid-state storage; light metal hydrides

PLENARY SPEAKER

Prof. Ts. Dr. Mohd Ikmar Nizam Hj. Mohamad Isa

Prof. Ts. Dr. Mohd Ikmar Nizam Bin Hj. Mohamad Isa is an award-winning Professor in the Faculty of Science, Universiti Sains Islam Malaysia (USIM) since 2019. He previously works as senior lecturer at the School of Fundamental Science, Universiti Malaysia Terengganu (UMT) since 2006. He obtained his bachelor's degree (B.Sc. Computational Physics and Electronics) in 2002 and in 2006 he obtained his Doctor of Philosophy degree at the age of 28. His Ph.D. focused on the development and application of novel gel-type polymeric materials as conductive electrolytes for application in energy storage system or battery. The key strategy in his research activities is to bridge the gap between green/natural materials and energy. His main current research interest deals with the development and application of novel solid-state bio-polymer materials as conductive electrolytes for application in energy storage system (battery) and electrochemical devices.

Currently, his areas of lecturing and research are focusing on solid state ionics, biopolymeric materials, advanced materials, electric and electronics technology, and electronic design. His accumulated total research fund of over RM2 million, funded by numerous agencies includes the research on the prototype development of hydron-battery from cellulose bio-polymers electrolytes through nine (9) research grants as principal investigator and twenty-three (23) research grants as co-researcher. He was awarded the Best Research Project 2010 by the Ministry of Higher Education Malaysia (MOHE) in 2013 with fund of RM120,000.00 which greatly encouraged him to continue researching. Currently, he had just been awarded a research grant on "Fundamental Study On Ionic Transport Of Enhanced CMC Solid Biopolymer Electrolytes Via FTIR Deconvolution Approach". The outcomes of his research have been presented and published in many article journals on materials study, analytical physics engineering and technology at various international and national refereed journals, symposiums, and conferences. Presently, more than 150 articles in refereed international journals/book (2006–2024), more than 80 proceedings and numerous research abstracts have been published as result from his research. The highlight of his research publication is the publication in Scientific Report of Nature Publishing (Q1; IF: 5.578). In 2016, he won 7 international awards i.e. Korean Invention News (KINEWS) 2016 Invention King Crown Award, Visiting Professor of Korea Invention Academy, World Youth Scientist Grand Award in World Scientist Awards 2016; Korean Invention News (KINEWS) 2016 Invention Academics Order of Merit, Creative Inventor Grand Award - World Inventor Award Festival, Korean Invention News (KINEWS) 2016 Green Technology Order of Merit, Innovative Inventor Grand Award - Korea Inventor Award Festival, Korean Invention News (KINEWS) 2016. During British Invention Show 2012, he was awarded for his research contribution with International Invention of the Year (Double Gold) (CAMBRO BESt: Green Rechargeable Battery), World Inventor Award Korean Invention News (KINEWS) - Material Invention Order of Merit (Division 7). In

addition, during KINEWS 2012, he also bags the World Inventor Award Korean Invention News (KINEWS) - Industry Invention Order of Merit (Division 36).

Due to his expertise in solid state science and technology, he was often invited by conferences committee to deliver and share his vast knowledge. Some of the conferences he had given speeches were the 2nd World Congress on Biopolymers 2016 (Manchester, UK), International Symposium on Micro+Nano Materials, Device and Applications 2015 (Sydney, Australia), International Conference On Materials And Engineering Technology (ICMET) 2014 (Chicago, USA), 27th Regional Conference on Solid State Science & Technology (RCSSST27) (Sabah, Malaysia) and 2nd International Conference on Material Science, Engineering Technology (ICMSET) 2013 (London, The United Kingdom), keynote speech at International Tropical Renewable Energy Conference (i-TREC) held in Bogor, Indonesia in 2016.

Recently he was invited to give keynote speech at The International Conference on Solar Photovoltaic Technology (CSPT 2021), Sanyang (China). In addition, he is also being invited as a judge in numerous research competitions. Previously, as a member of the School of Fundamental Science, UMT, he has been involved in administrative duties and activities. He was the coordinator of Final Year Project (PITA) and coordinator of internship program (LI) in the department. He was also the coordinator of Skim Bimbingan Siswazah (SBS) and currently the advisor of the Physics Student's Club (KEMAFIZ) since 2006. He was also selected as committee member in numerous activities in the faculty and university level before officially appointed as the Head, Department of Physical Sciences in December 2008 until 2013 and Director of Corporate Communication and Image Development Centre in December 2013 until 2014. He had been appointed as Director of Research Management Centre (RMC) from January 2015 to September 2015 before stepping down to focus in his Professorial. During his time at USIM, he was elected to be university senate member in 2020. He is currently the Dean of Faculty of Science and Technology, Universiti Sains Islam Malaysia.

Prof. Ts. Dr. Mohd Ikmar Nizam Bin Hj. Mohamad Isa's services are also extended as the International Member of SPIE - The International Society For Optics And Photonics, the International Colleagues & Editorial Board of SCICON: The International Association of Science & Engineering Congress, member of the Institute of Materials Malaysia (IMM), board of editors of Journal of Experimental Sciences (ISSN: 2218-1768) and International Journal of Recent Scientific Research (ISSN: 0976-3031) and Regional editor of six (6) other journals. In the larger academic community, he also has served as a reviewer for more than 30 article journals such as the international journal of Ionics (Q1), the Electrochimica Acta (Q1) and the Carbohydrates (Q1) to name a few. In addition, he managed to establish research collaborations with the University of Malaya (UM), MARA University of Technology (UiTM) and Universiti Malaysia Terengganu (UMT). He has also successfully ignited the associations of MoU with Universita Degli Studi de Messina situated in Italy, where 2 of BSc (Electronic and Instrumentation Physics) undergraduates have successfully done their industrial internship there. He is also the Honorary Member of Golden Key International Honor - UMT Chapter. During his participation in an international competition in Korea (KINEWS 2016), he was awarded the title Visiting Professor of Korea Invention Academy due to his achievement in the competition.

From Trees to Tech: Harnessing Cellulose-Based Electrolytes for a Greener Future

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Abstract. The escalating impact of synthetic, predominantly oil-based materials on ecological and environmental systems underscores the urgent need to transition away from non-renewable resources. This imperative has intensified focus from policymakers and researchers on exploring alternative materials. Biopolymers, particularly cellulose-based electrolytes, have emerged as a promising solution due to their renewability and biocompatibility, which are often lacking in synthetic counterparts. Current battery technologies, while crucial for energy storage, are hampered by issues such as limited resource sustainability, environmental toxicity, and inadequate recyclability. These challenges accentuate the necessity for innovative materials that mitigate these drawbacks. In this context, cellulose-based electrolytes offer significant advantages, providing a sustainable alternative that addresses the environmental and performance limitations of conventional batteries. This presentation will provide a comprehensive overview of cellulose-based electrolytes, highlighting their properties, benefits, and potential applications in sustainable energy technologies. Special emphasis will be placed on how these biopolymers can enhance battery performance and sustainability. Additionally, we will present insights from our ongoing research, showcasing recent advancements and achievements in developing and implementing cellulose-based electrolytes. Through this discussion, we aim to underscore the pivotal role of biopolymers in advancing sustainable technological solutions and contributing to global environmental stewardship efforts.

Keywords: Green technology; energy storage; biopolymers electrolyte.

PLENARY SPEAKER

Prof. Dr. Abdul Halim Shaari

Prof. Dr. Abdul Halim Shaari is a professor in the Faculty of Science, UPM. His research concentrated in the core area of physics, glass ceramics and advanced optical materials. He received the B.Sc. degree in physics from the National University of Malaysia in 1976, the M.Sc. degree in physics from the University of Southampton, Southampton, U.K., in 1978, and the Ph.D. degree in physics for work in the area of cryogenics and magnetic materials from the University of Hull, Hull, U.K., in 1982. Currently, he is a Professor of Physics and Chairman for the Centre of Advanced Materials (CAM), Faculty of Science, Universiti Putra Malaysia, Serdang. He leads research work in various ceramics materials, such as cuprate, titanate, and the manganite systems, looking into both the fundamentals and applied properties. His research activity is focused on the application of magnetic materials for sensor devices. He is also a team member of the Engineering Institute for Micro and Nanoelectronics, National University of Malaysia, which does research on the development of sensors and sensor materials for MEMS applications. His current research interest is in the interplay between magnetism and superconductivity. Magnetic or superconducting materials are prepared in bulk form with the appropriate doping, addition or substitution to see the interplay behaviour. It can also be in thin heterogeneous films or multilayered films prepared via PLD or sputtering methods. Another research area is in Multiferroic materials. Again, the interest is in the coexistence of ferroelectric and ferromagnetic behaviour.

Superconductivity: A brief Timeline exploration of Room Temperature Superconductors

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Abstract. The discovery of superconducting materials, in the early twentieth century, have fascinated scientists with their unique attributes. This review provides a brief timeline exploration of superconductivity aiming to trace the evolution of different superconductors, term as conventional and non-conventional superconductors or low T_c, high T_c and Room Temperature superconductors including detailing their specific characteristics. Central to the review is the examination of theoretical foundations, particularly the BCS theory to explain the behaviour of conventional type. The complete microscopic theory of superconductivity proposed in 1957 by John Bardeen, Leon N. Cooper, and Robert Schrieffer explained the superconducting current as a superfluid of Cooper pairs, pairs of electrons interacting through the exchange of phonons; while Resonating valence bond (RVB) theory of high T_c superconductivity, an electron correlation-based mechanism, began as a response by Anderson, to Bednorz and Muller's discovery of high Tc superconductivity in cuprates in late 1986. A theoretical framework for quantum spin liquids and superconductivity was developed to explain the unconventional type of superconductor. Iron-based superconductors are interesting due to their intrinsic magnetism, which often precedes superconductivity. In the early 2024 there was a huge surge of interest among scientists over a material called LK-99 after it was claimed to be a superconductor at room temperature and ambient pressure by a group of researchers in South Korea. However, after follow-up experiments by scientists around the world, it seems LK-99 is not a superconductor. Very recently, prior to a claim on LK-99, room temperature superconductivity, which had always been a dream of researchers over the past 100 years, was reported in a carbonaceous sulphur hydride with a critical temperature up to 287.7 K (~15°C) under an extremely high pressure of 267 GPa (Snider et al., 2020). Thus, the practical deployment of superconductors is limited by challenges, notably their operation at extremely low temperatures and pressures hindering widespread use. The diverse applications of superconductors such as in high-performance magnets, energy transmission, and quantum computing will be highlighted Furthermore, economic and technical difficulties in production and maintenance persist. To advance superconductors' potential, research must focus on enhancing critical temperatures and current density and developing cost-effective manufacturing techniques. This will enable novel applications in energy, transportation, and healthcare, driving technological progress.

Keywords: Superconductivity; BCS theory; cuprates; hydrides; applications.

INVITED SPEAKER

Dr. Norazila Binti Ibrahim

Dr Norazila Binti Ibrahim has completed her PhD in Physics (Magnetic Materials) from the Faculty of Applied Sciences, University Teknologi MARA, Shah Alam, Malaysia in 2015. She has been working as a Senior Lecturer of Physics, School of Physics and Materials Studies, Universiti Teknologi MARA, Shah Alam, Malaysia, since 2010-present. Her research disciplines include Materials Physics, Solid State Physics and Materials Science. Currently, she actively doing research related to Magnetoresistance, Electroreristance effect, Temperature Coefficient Resistance and Microwave Absorption properties in manganite materials and others properties such as optical properties and dielectric behaviour of magnetic materials prepared by solid state method. The potential application based on research findings are such as for next generation of magnetic sensor element, temperature sensor and microwave. She has published more than 34 Scopus indexed journal with 223 citations and 10 h-indexed Scopus. She also actively participated more than 15 conferences locally and internationally and has received more than 15 awards related to research innovation activities. For the professional membership, she is one of the members of Malaysia Board of Technologies and one the member of The Malaysian of Solid State Science and Society. At university level she involves with others group of research activity such as a Member of Ultrasonic of Novel Metals and Oxide Research Group and Associate member of Microwave Research Institute (MRI).

Study of Temperature Coefficient of Resistivity for Doped Manganites Towards Sustainability of Magnetic Based Temperature Sensor

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Abstract. The temperature coefficient of resistivity (TCR) in perovskite manganite ceramics is a key parameter that characterizes the sensitivity of resistivity to temperature changes. However, many studies report that these materials typically exhibit a low TCR peak temperature (T_k) and limited maximum TCR values, which restricts their practical applications. Notably, the resistivity of these materials increases sharply near the metal-insulator transition temperature, T_{MI} leading to a significant rise in TCR. This unique behavior has been attributed to MnO_6 distortion, indicating that further research is needed to clarify the role of lattice distortion in influencing TCR. To explore this, $La_{0.8-x}M_xNa_{0.2}MnO_3$ (M = Eu^{3+}, Dy^{3+}, Er^{3+}, x = 0, 0.1) monovalent-doped manganites was prepared using the solid-state method, aiming to investigate how lattice distortion affects TCR. Specifically, we focused on the substitution of smaller ionic radius elements, such as Eu^{3+} (1.12 Å), Dy^{3+} (1.07 Å) and Er^{3+} (0.89 Å) compared to La^{3+} (1.216 Å). Our findings revealed that all substituted samples exhibited a metal-insulator transition with an increase in resistivity. In contrast, the parent sample exhibited metallic behavior across the entire measured temperature range (30 K – 300 K), with lower resistivity than the substituted samples. Interestingly, our results indicate that TCR values are significantly influenced by the type of elemental substitution. The maximum TCR increased from 0.83 % K^{-1} at ~118 K for the x = 0 sample to 0.93 % K^{-1} at ~220 K for the Dy-substituted sample, 1.012 % K^{-1} at ~280 K for the Er-substituted sample and 6.21% K^{-1} at 260 K for Eu-substituted sample. These findings highlight the impact of rare earth element substitution on the transformation of manganites from a ferromagnetic metal to a paramagnetic insulator and the corresponding MnO_6 octahedral distortion as well as on TCR values, making these materials promising for advanced uncooled device applications.

Keywords: La-site substitution; Manganites; Temperature Coefficient of Resistivity.

INVITED SPEAKER

Assoc. Prof. Ts. Dr. Mohd Sabri Mohd Ghazali

Assoc. Prof. Ts. Dr. Mohd Sabri Mohd Ghazali is an Associate Professor of Material Sciences at Universiti Malaysia Terengganu, where he leads a research field focused on understanding varistors's performance, anticorrosive coatings and solar cell. Dr. Mohd Sabri received his Ph.D. in Applied Optics from Universiti Putra Malaysia in 2013, where he conducted groundbreaking research on the Zinc-Oxide Based Varistor Ceramics using Solid State Route and Co-Precipitation Processing. His work on the role of varistor ceramic and plant-based anticorrosive coatings has been published in several top-tier scientific journals and has received widespread recognition within the respective field. After completing his Ph.D., Dr. Mohd Sabri became an academic fellow at Universiti Malaysia Terengganu, where he shifted his focus on multiple research areas, while attending numerous conferences.

His current research interest builds on the application of perovskite oxide to enhance the performance of varistors. This work aims to unravel the effects of perovskite materials to increase the dielectric properties, giving the varistor a superior capability to withstand electric surge energy. Dr. Sabri's lab uses a combination of cutting-edge techniques, including X-ray diffraction and electron microscopy. Dr. Mohd Sabri is a recognized researcher in the field of Material Sciences, and has received numerous awards and honors for his research, including the prestigious Gold Award at the Invention, Innovation and Technology Exhibition of Malaysia. He has also been invited to speak at conferences and symposia around the world, where he shares his insights on the latest developments in the field of varistor ceramics. In addition to his research, Dr. Mohd Sabri is also actively involved in mentoring and teaching. He is passionate about promoting diversity and inclusion in STEM fields, and works to create an inclusive and supportive environment for his students and colleagues. Dr. Mohd Sabri is a dedicated teacher and mentor, and has been recognized for his excellence in teaching and mentoring with awards from both his university and national organizations. Overall, Dr. Mohd Sabri is a dynamic and accomplished researcher whose work has significantly advanced our understanding of the perovskite material impacts on surge protection devices. His research interest is at the forefront of the field of semiconductors, and his dedication to teaching and mentoring has inspired and influenced the next generation of scientists.

Revolutionize Paints: Exploring Nano-scale Manipulation for Enhanced Performance

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Abstract. "Revolutionize Paints: Exploring Nano-scale Manipulation for Enhanced Performance" delves into the cutting-edge advancements in nanomaterials science, focusing on the innovative use of zinc oxide nanopowder. This revolutionary research opens new frontiers in coatings applications, showcasing the immense potential of nanotechnology in shaping the future of paint industry. In the realm of coatings, this talk highlights the transformative properties of zinc oxide nanopowder. Through precise manipulation, this material offers coatings with exceptional durability, corrosion resistance, and self-cleaning capabilities. Industries such as automotive, aerospace, and construction as well as for marine applications such as marine vessel and oil and gas industries stand to benefit significantly from these developments, as coatings become more resilient and long-lasting, even in the harshest environmental conditions. It is also very crucial to make positive collaborative efforts between academia, research institutions, and industries, driving the nano revolution forward. By fostering interdisciplinary partnerships, scientists and engineers are pushing the boundaries of materials science, leading to innovative solutions that were once deemed impossible. The presentation emphasizes the need for continued research and knowledge exchange to unlock the full potential of zinc oxide nanopowder, paving the way for even more groundbreaking applications in the future. In summary, the presentation encapsulates a transformative era in nanomaterials science, showcasing the profound impact of zinc oxide nanopowder in coatings applications. As industries embrace these advancements, they not only enhance the performance of their products but also contribute significantly to the evolution of technology and materials science. The nano revolution is not just a scientific concept; it represents a tangible shift towards a more resilient, efficient, and technologically advanced future for various sectors worldwide.

Keywords: Coatings applications; corrosion resistance; industry collaboration; nanotechnology; zinc oxide nanopowder

INVITED SPEAKER

Dr. Mohd Hafiz bin Mohd Zaid

Dr. Mohd Hafiz bin Mohd Zaid gains his PhD in field of Materials Science at Universiti Putra Malaysia the year of 2016. Although still new in academic and research career, practically already have been involved significantly in international research with the world top researcher in glass and ceramics field. He also has managed to publish more than 220 ISI journals with high-impact factors and with a total of 4521 citations with h-index of 37 based on the Scopus, and thus those publications can be pertinently regarded as internationally recognized research work. He has received various research honours at the university and national levels. In addition, he has earned various accolades, including the Outstanding Employee Award, the Young Researcher Award, Excellent Young researcher Award, Outstanding Researcher Award, and recently he has been named one of the World's Top 2% Scientists from 2021 to 2024.

Fabrication and Elastic Properties of Lithium Bismuth Aluminotellurite Glass System

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Abstract. Novel quaternary tellurite-based glasses with varying compositions of Li_2O–Bi_2O3–Al_2O_3–TeO_2 were synthesized using the melt-quenching method to examine their physical and elastic properties. X-ray diffraction analysis confirmed the amorphous nature of the glass system, indicated by the absence of sharp peaks in the spectra. Fourier transform infrared spectroscopy analysis identified the presence of four key bonds: BiO_3, TeO_4, TeO_3, and BiO_6, corresponding to absorption bands at 507, 648, 763, and 838 cm^{-1}. Deconvolution of the FTIR spectra revealed that the relative area ratio of non-bridging oxygen in TeO_3 bonds increased from 0.233 to 0.985 as Bi_2O_3 content increased. This incorporation of Bi_2O_3 also led to a rise in density, from 4.68 to 5.06 g/cm^3. Concurrently, both longitudinal and shear wave velocities decreased, with values ranging from 3680.55 to 3485.37 ms^{-1} and 2188.43 to 2046.43 ms^{-1}, respectively. The elastic moduli-including longitudinal, bulk, shear, and Young's modulus which exhibited a non-linear decrease, with values declining from 63.41 to 61.44 GPa, 33.52 to 33.20 GPa, 22.41 to 21.18 GPa, and 54.99 to 52.39 GPa, respectively.

Keywords: Glass; Density; Molar volume; Elastic properties

INVITED SPEAKER

Prof. Dr. Zainal Abidin Talib

In 1982, Prof. Dr. Zainal Abidin Talib earned his BSc in Physics, followed by an MSc in Physics in 1985, both from Southern Illinois University, USA. He completed his PhD in Molecular Science at the same institution in 1990. Serving as a Professor of Materials Physics at Universiti Putra Malaysia, he also held the position of Dean in the Faculty of Science from 2011 to 2017. Additionally, he served as an adjunct professor at the Department of Physics, Joenbuk National University, South Korea, from 2021 to 2023. Dr. Zainal Abidin Talib's research interests cover a wide range, including phonon-electron transport, dielectric physics, and applied optics. Currently, he serves as a visiting professor at Jeonbuk National University and holds the role of application/technical consultant at RGS Corporation.

Approaches to Materials Synthesis for Photovoltaic Cell

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Abstract. There are overwhelming evidences that over-reliance on fossil fuels is one of the primary causes of greenhouse effect that causes global warming which could lead to catastrophic climate change. To mitigate global warming and for energy security, alternative energy with low carbon emission is urgently needed to replace fossil fuels and solar energy is the key source to power our daily modern needs. The work that we do in the lab to develop a greater fundamental science and engineering basis for the development of the Third-generation solar cells is paving the way towards large scale electricity generation. And we hope that this brighter path to solar cells can lead to a more sustainable future.

Keywords: Materials Synthesis; Photovoltaic Cell; alternative energy; solar cells

INVITED SPEAKER

Assoc. Prof. Dr. Wan Yusmawati Wan Yusoff

Prof. Madya Dr. Wan Yusmawati Wan Yusoff is a distinguished lecturer and researcher at Universiti Pertahanan Nasional Malaysia (UPNM). With a robust academic background in physics and material sciences, she has made significant contributions to both educational and scientific communities. An expert in physics, particularly focused on the mechanical properties of materials such as solder joints and the effects of gamma radiation, she is proficient in conducting high-level research. This is demonstrated by her numerous publications in esteemed journals and conference proceedings, where her studies on micromechanical properties, solder joint behaviors under various conditions, and the impact of environmental factors on materials are prominently featured. Dr. Wan Yusmawati has also made substantial contributions to academic writing and publication, with multiple textbooks and research papers enriching the academic resources in her field. Her extensive experience in teaching undergraduate and postgraduate courses includes guiding students through complex scientific concepts and supervising seven postgraduate students as both supervisor and co-supervisor.

As a senior lecturer, Dr. Wan Yusmawati has been instrumental in developing and delivering course content, particularly in physics for defense foundation studies, while also updating curricula to reflect scientific advancements. She has led and participated in 14 research projects with a combined funding of RM1, 003,900.00 funded by the university and KPT. These projects often focus on the mechanical properties of materials under various stress conditions, providing valuable insights into material durability and reliability. Dr. Wan Yusmawati regularly presents her findings at national and international conferences, showcasing her research expertise. Additionally, she engages in collaborative research with other universities, such as UKM and USM, and industry like RedRings Solder (M) Sdn. Bhd. and the Nuclear Malaysia Agency, fostering a multidisciplinary approach to problem-solving in electronic materials. Her publication record includes 41 articles in respected WOS and SCOPUS journals and 14 conference proceedings. Furthermore, she has co-authored several editions of "Physics for Defence Foundation Studies," essential textbooks for students in the foundation studies program at UPNM.

Effect Rare-earth on Mechanical Properties of Solder Joint

Wan Yusmawati Wan Yusoff[1*], Muhammad Mukhzani Muhammad Hanifah,[2] Nor Azlian Abdul Manaf[1], Azuraida Amat[1], Nurazlin Ahmad[1], Norliza Ismail[1]

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Abstract. Microstructure plays a critical role in determining the properties of solder joints, which are influenced by the solder composition. This study examines the microstructure of SAC305 solder with varying rare-earth (RE) weight percentages (0.01, 0.02, and 0.03 wt.%) using optical microscopy and field emission scanning microscopy (FESEM). The SAC305 solder matrix consists of the primary β-Sn phase, near-eutectic phase (a mixture of β-Sn and Ag_3Sn), and intermetallic compound (IMC) phase Cu_6Sn_5. The addition of RE affects the evolution of these phases, particularly promoting the coarsening of β-Sn grains. Nanoindentation tests were performed to measure the load (P) and depth (h) responses of the samples. The load-depth (P-h) curves revealed that SAC305 solder joints with 0.02 wt.% and 0.03 wt.% RE additions exhibited wavy shapes, indicating localized irregularities. These findings suggest a transition in the mechanical response of the solder joints from elastic to plastic deformation with increasing RE content. Hardness and reduced modulus values were derived from the load-depth profiles. For the control SAC305 solder, the hardness and reduced modulus were 0.26 GPa and 66.5 GPa, respectively. With the addition of RE, hardness initially increased at 0.01 wt.% RE but decreased at 0.02 wt.% and 0.03 wt.% due to the coarsening of Ag_3Sn phases, which reduces the material's resistance to plastic deformation. The reduced modulus values followed a similar trend, increasing to 83.5 GPa at 0.01 wt.% RE but dropping significantly at higher RE concentrations. These results underscore the complex interplay between microstructural evolution and mechanical properties in SAC305 solder joints with RE doping. The study highlights the importance of optimizing RE content to enhance the mechanical performance of solder joints.

Keywords: Solder Joint, Rare-earth; Micromechanical properties; Nanoindentation

INVITED SPEAKER

Dr. Chiu Wee Siong

Dr. Chiu Wee Siong is currently a senior lecturer at Department of Physics in University Malaya. He received his Bachelor of Science and Master of Science (major in Materials Science) in UKM. Thereafter, he enrolls his Ph.D. degree in Chemical Engineering at University of Nottingham. His research interests mainly focus on the synthesis and characterization of solid-state nanostructural materials, which consisted of oxide-based semiconductor- and magnetic-nanomaterials, graphene nanocomposite, novel metal nanoparticles as well as photocatalyst nanocomposite. His current research work mainly focuses on the design of value-added nanostructural photocatalyst materials for photoelectrochemical application in simultaneously producing photocurrent and hydrogen gas through water splitting reaction. He has 92 ISI-cited publications with total citation of 2200 and h-index of 25. He has led 13 external grants and 6 internal grants with the sum over 2-million. Moreover, his well-recognized expertise in semiconductor physics has renders him to be invited as both plenary speaker and invited speaker in numerous of international conferences. He also serves as peer reviewers for international scientific fundings and scientific journals, which has been awarded with honour of Trusted Reviewer by Institute of Physcis in UK. Furthermore, he has been elected as as Young Scientist Award by Malaysia Association for Solid State Science and Technology. For the number of postgraduate students, he has successfully produced 10 PhD students and 2 master students. In terms of teaching, he has reflected multi-tasking and can diversify his teaching philosophy to wide range of subjects that ranges from materials physics to modern physics. For management wise, he has led numerous task force inclusive of faculty quality manager and auditor. Additionally, his excellence contribution to department has rendered him to be awarded with excellent service certificate thrice.

Trinary Nanohybrid (Ag/MoS_2/ZnO) Photoelectrode: A Plausible Approach for Unbias Photoelectrochemical Water Splitting in Producing Hydrogen Gas

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Abstract. Current work reports the synthesis trinary nanohybrid composite (Ag/MoS_2/ZnO) and investigate its feasibility to be used as photoanode to produce hydrogen gas without supplying any external voltage. Combination of structural analysis via microscopy analysis and elemental spectroscopy has proven the successful in integrating Ag/MoS_2 dispersion onto ZnO nanorods matrix. Optical characterization of the as-prepared Ag/MoS_2/ZnO reveals there is an improvement of light absorption towards visible light region, which is benefiting the photoelectrochemical process. Photoelectrochemical performance analysis reveals that the performance of trinary nanohybrid composites exhibits better water splitting efficiency as compared to its single component counterpart (ZnO). Among all the samples, 20 wt% Ag/MoS_2 depicts the best photoelectrochemical performance (under condition without any applied voltages) with short circuit current of 0.70 mA/cm^2 and hydrogen gas yield of 54.49 µL in accordance to the chronoamperometry- and gas chromatography-analysis. Moreover, under the condition of bias by varying applied voltage, it exhibits the lowest onset potential of 0.3 V (vs. RHE) and applied bias photoconversion efficiency of 1.15% at peak voltage of 0.85 V (vs. RHE). The enhancement of photoelectrochemical performance has been discussed and accredited to the presence of MoS_2 and Ag nanoparticles. Current study is expected to serve as a platform for exploring the potential in using multi-compounds integration approach for bias-free water splitting application.

Keywords: Trinary; bias free; photoelectrochemical; Ag/MoS_2/ZnO; water splitting

INVITED SPEAKER

Assoc. Prof. Dr. Lim Kean Pah

Assoc. Prof. Dr. Lim Kean Pah is an accomplished physicist with extensive experience in the field of material science, particularly in the study of manganite compounds with colossal magnetoresistance. He earned his B.Sc., M.Sc., and Ph.D. in Physics from Universiti Putra Malaysia (UPM). His academic career began at UPM's Department of Physics in December 2002 as a Postdoctoral Research Fellow, transitioning to a lecturer role in August 2003. Currently, he holds the position of Associate Professor at the same department. Lim's research expertise includes the synthesis of manganite compounds using techniques such as solid-state reaction, sol-gel processing, and pulsed laser deposition. He is skilled in operating various advanced scientific instruments, including RF Magnetron Sputtering Systems, AC magnetic susceptometers, and X-ray powder diffraction systems. Throughout his career, Lim has published 93 research papers, earning an H-index of 11, with his work cited over 421 times. His contributions to the field have significantly advanced the understanding of magnetic materials and their potential applications.

The Role of High Sintering Temperature on $Pr_{0.7}Ca_{0.3}MnO_3$ Prepared via Solid-State Reaction Method

Kean Pah Lim*, Xiao Tong Hon, Lik Nguong Lau, Mohd Mustafa Awang Kechik, Soo Kien Chen, Muhammad Kashfi Shabdin and Abdul Halim Shaari

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Abstract. Manganite materials have attracted considerable attention in scientific research for their potential in developing advanced electronic applications such as magnetic sensors and memory devices. Among them, praseodymium calcium manganese oxide ($Pr_{0.7}Ca_{0.3}MnO_3$/ PCMO) stand out due to its charge ordering, which is highly influenced by changes in composition, temperature and external field. The solid-state reaction method is well-known synthesis techniques involving high-temperature treatment to facilitate the diffusion of constituent elements and achieved the desired phase purity and microstructure. Therefore, this study focuses on investigating the effect of sintering temperatures on the physical behaviour of the PCMO, particularly when samples are sintered at even higher temperatures. X-ray diffraction (XRD) patterns revealed that all samples exhibited a pure PCMO phase regardless of the sintering temperatures. Scanning electron microscope (SEM) images showed that the grain size increases while porosity decreases as the sintering temperature rises. Electrical measurements demonstrated that the resistivity becomes smaller with increasing sintering temperature, while the metal-insulator transition temperature (T_{MI}) remains unaffected. Additionally, the sharpness of this metal-insulator transition can be defined by temperature coefficient of resistance (TCR), which is a key factor in the performance of infrared bolometers.

Keywords: PCMO; microstructural change; temperature coefficient of resistance; grain boundary effect

INVITED SPEAKER

Prof. Ts. Dr. Azhan bin Hashim@ Ismail

Professor Ts. Dr. Azhan bin Hashim @ Ismail is a Professor in Physics. He obtained a PhD in Materials Science from Universiti Putra Malaysia in year 2000. His area of expertise is High Temperature superconductor (HTS) and mainly focussed on cuprates superconductor such as YBCO and BSCCO system. This research involved many fabrication techniques such as solid-state reaction, sol-gel and co-precipitation. Characterisation of this material was carried out by XRD, SEM, FTIR, RMS and ACS. Currently he is working on computational method for superconductor materials. He is a fellow of Malaysian Solid-State Science and Technology Society (MASS) and was also appointed as council member of this society until today. He was awarded as Professional Technologist by Malaysian Board of Technologies (MBOT) in 2019. He is active in research and publication. Professor Azhan previously held the position of Deputy Rector of Research and Industrial Linkages (2009-2017) and Deputy Rector of Academic Affairs (2018-2020) at UiTM Cawangan Pahang. Currently he is a dean of Faculty of Plantation and Agrotechnology at UiTM Cawangan Melaka Jasin Campus.

Density Functional Theory Analysis on Electronic Behavior of Dy-Doped $Y_{1-x}Dy_xBa_2Cu_3O_{7-\delta}$ Superconductors

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Abstract: The impact of Dy doping at the Y-site of the $YDy_xBa_{2-x}Cu_3O_{7-\delta}$ superconductor on its electronic properties was examined using Density Functional Theory (DFT) through a first-principles study. Computational simulations were performed utilizing the CASTEP computational code. The crystal structure was modeled and calculated with the Visual Crystal Approximation (VCA) employing the Generalized Gradient Approximation Perdew-Burke-Ernzerhof for Solids (GGA PBEsol) exchange-correlation and ultrasoft pseudopotential. Geometry optimization at a 4×4×1 k-point grid showed energy convergence at 400 eV. Band structure analysis revealed the smallest bandgap at x = 0.15 between the conduction band (CB) and the valence band (VB). Electron density was found to be more concentrated near the Fermi level based on the density of states distribution. Electron density difference images displayed the merging of orbital configurations from each atom upon doping at x = 0.15. This indicates that at this specific Dy concentration, $Y_{1-x}Dy_xBa_2Cu_3O_{7-\delta}$ achieves optimal performance.

Keywords: Superconductor; Density Functional Theory; First Principle; YBCO; Dysprosium and Dopant

INVITED SPEAKER

Assoc. Prof. Dr. Mohd Mustafa Awang Kechik

Assoc. Prof. Dr. Mohd Mustafa Awang Kechik is currently a Head of Department at the Physics Department, Faculty of Science, UPM. He obtained his PhD in Superconductor from the University of Birmingham, UK in 2011. His work mainly focuses on flux pinning in HTS superconducting films. Dr Mustafa Awang Kechik joined the School of Electrical, Electronic and System Engineering, University of Birmingham, in January 2014-January 2016 as a Postdoctoral Research Fellow. He works to evaluate the impact of random uncertainties in measurements of the relative permittivity of thin films on the design of microwave devices. He has published 155 journal publications so far and of these 155 journals, he has become a corresponding/senior author of 60 journal publications, with 30 published in the Q1/Q2 journals. He is a member of the Institute of Physics, London, the European Society for Applied Superconductivity (ESAS), and a Fellow Malaysian Solid State Science and Technology (FMASS). He was awarded the Sakura Science Program, Nagoya Japan, in 2020. The Sakura Science Exchange Program is one of the prestigious programs sponsored by the Japan Science and Technology Agency (JST) to embrace the culture of innovation and promote advanced science. He was elected as a Fellow of the Malaysian Association of Solid-State Science and Technology Society in 2021. He was awarded the ERASMUS+KA17 EU International Credit Mobility Award 2022 at the University of Minho, Portugal. Currently, he has attracted over RM 562, 691 in research grants as a Principal Investigator and RM 2.2 million as Co-Investigator. His current research interests include High Temperature Superconductor, which focus on fundamental studies of both the fabrication and characterization of YBCO 123 thin films grown on Strontium Titanate (STO) substrate by the Pulsed Laser Deposition and RF Sputtering methods, with emphasis on the improvement of critical current density through optimizing the processing conditions and through the addition of nano pinning inclusions. He also works on microwave properties of electronic materials for the influence of uncertainty in dielectric properties on the design performance of a tunable composite right/left-ended leaky wave antenna in collaboration with Emerging Device Technology, School of Electrical, Electronic and System Engineering, University of Birmingham.

Novel synthesis method for bulk Y-123 polycrystalline: thermal decomposition method

Siew Hong Yap, Mohd Mustafa Awang Kechik *, Soo Kien Chen, Kean Pah Lim, Muhammad Kashfi Shabdin, Nurul Farizah Hisamuddin, and Abdul Halim Shaari

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Abstract. Fabricating high-quality high-temperature superconductors, particularly Y-123, for large-scale industrial applications poses significant challenges due to the complex and time-consuming heating processes involved. This qualitative study discusses the fabrication of bulk $YBa_2Cu_3O_{7-\delta}$ (Y-123) using a novel modified synthesis method, the thermal decomposition method, which is conducted entirely in ambient conditions. Notably, the decomposition method uses a single precursor of metal acetates for synthesis without employing any other catalysts. Research on this method reveals distinct results in phase formation, microstructure, electrical transport, and superconducting properties. XRD analysis indicates a good orthorhombicity value of the crystal structure (~ 0.008) and high oxygen content close to the theoretical value (~ 6.8). The predominant phase consists of the highest composition of Y-123 (98.3 %), along with non-superconducting phases such as Y_2BaCuO_5 (Y-211) and $BaCuO_2$. Surface morphology analysis shows a well-homogeneous distribution, compact, elongated grains with an average size of ~ 1.830 (± 0.707) µm. The elemental ratios of Y:Ba:Cu are close to the ideal 1:2:3 ratio. DC resistivity measurements indicate excellent electrical transport and superconducting properties, with parameters close to theoretical values and previous studies, including a $T_{c\text{-onset}}$ value, ~ of 92.20 K, a sharp transition width of 'T$_c$ (3.78 K), and a mean-field transition width of $\Delta T_c^{\text{onset-MF}}$ (1.48 K). This study emphasizes the importance of prompt grinding and brief heat treatment processes for producing high-quality Y-123 materials. The thermal decomposition method, as a novel and advanced modified dry synthesis approach, demonstrates significant advantages such as cost-effectiveness, time-saving benefits, and environmentally friendly practices. These attributes make it a promising candidate for large-scale industrial applications of high-temperature superconductors like Y-123.

Keywords: Decomposition method; oxygen content; non-superconducting phases; critical temperature; transition width

INVITED SPEAKER

Prof. Dr. Chen Soo Kien

Chen Soo Kien is a professor at the `Department of Physics, Faculty of Science, Universiti Putra Malaysia (UPM). He received the BSc and MSc in Applied Physics from Universiti Kebangsaan Malaysia in 1999 and 2002, respectively. He attained his PhD from the University of Cambridge in 2006. Since then, he has been serving UPM. His research is primarily on superconductors. He has been working on various types of superconducting materials like magnesium diboride, the cuprates and iron-based superconductors. Particularly, his focus is on material processing for enhancing critical current density of superconducting materials. He has written more than 100 high impact journal papers at the international level. Currently, his Scopus h-index is 23 with more than 2000 citations.

Phase Dynamics and Superconducting Properties of the Thermo-Processed Mg Added Ex Situ MgB_2

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Abstract. *Ex-situ* MgB_2 is chemically stable, and it has a higher packing density as compared with that synthesized via the *in-situ* reaction approach. Nevertheless, the former exhibits lower critical current density, J_c because of its weaker grain coupling. To address the issue, Mg was mixed with the *ex-situ* MgB_2 powder before the subsequent heat treatment. This work aims to investigate the role of heat treatment conditions in influencing the J_c of Mg added *ex-situ* MgB_2. The heat treatment was carried out in the temperature range of 600 °C - 1000 °C for 1 – 7 h. As the sintering temperature and time increased, the emergence of MgB_4 was noticeable. With the addition of Mg, formation of MgB_4 was suppressed due to the increased partial pressure of Mg vapor. In those samples, J_c was enhanced significantly attributable to improved grain connectivity. This study demonstrates a means of optimising J_c without degrading the superconducting transition temperature.

Keywords: *ex-situ* MgB_2, heat treatment, Mg addition, grain coupling, critical current density

INVITED SPEAKER

Tuan Haji Ismarul Nizam Bin Haji Ismail

Tuan Haji Ismarul Nizam bin Haji Ismail studied Applied Chemistry and Materials Science in UiTM Shah Alam dan USM Penang. He started his career in year 2000 as QA Engineer in Merck Electronic Chemicals, Kulim Hi-Tech Park (KHTP), Kedah and later joined Advanced Materials Research Centre (AMREC), SIRIM Berhad as a Senior Research Officer from 2002 until 2016. He is currently working as Principal Assistant Director at National Nanotechnology Centre (NNC) Division, Ministry of Science, Technology and Innovation (MOSTI), Putrajaya, overseeing the implementation of National Nanotechnology Policy & Strategy 2021-2030, National Nanotechnology Product and Technology Roadmap 2021-2025 and Hydrogen Economy and Technology Roadmap 2022-2050. He is the Head of Research Development and Corporate Section, NNC MOSTI where this section developed National Nanotechnology Laboratory Network Programme, National Nanotechnology Olympiad Programme, Promotional and Awareness Program for Nanotechnology and Netwoking and Collaboration with National and International Nanotechnology Agency. He is the Fellow Member of the Malaysian Association of Solid-State Science and Technology (MASS).

National Nanotechnology Policy and Strategy 2021-2030

Ismarul Nizam Ismail*, Nurul Asyikin Kamaruzzaman, Mohd Helme Mohd Helan, Norita Mohd Yusoff

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Abstract. Nanotechnology Policy and Strategy (DSNN 2021-2030) has been developed by the National Nanotechnology Center (NNC), Ministry of Science, Technology and Innovation (MOSTI) in collaboration with strategic partner the Academy of Sciences Malaysia (ASM). The National Nanotechnology Policy and Strategy (NSNN) 2021-2030 is the Government's commitment to increase, accelerate and advance nanotechnology towards driving the nation's socioeconomic growth. The potential that exists through nanotechnology is seen to be able to solve various challenges facing the country, among which is the dependence on foreign workers in the manufacturing, construction and agricultural sectors, environmental pollution problems, renewable energy generation, agricultural products and food security as well as various other priority areas of the country. With a main mission to mainstream nanotechnology in everyday life, it also acts as an enabler across various disciplines to support and achieve the widespread use of technology by 2030. In addition, nanotechnology is able to improve the well-being of society and the environment and develop science, technology, industry and the economy sustainable country. Various strategies and initiatives will be implemented over a period of 10 years to ensure that the goals of this policy are achieved. This policy outlines the strategic direction of the nation's nanotechnology development agenda and further boosts local technology development through programs and action plans that have been drawn up. In order to ensure that the nanotechnology industry in Malaysia is able to remain competitive and move forward, the objective of DSNN 2021-2030 is to coordinate the sustainability of development across various sectors through nanotechnology. In addition, research, technology, products, talents and commercialization activities specialized in nanotechnology are able to increase the contribution of the national economy. Next, stimulate the growth of the local nanotechnology industry through programs and action plans and create a comprehensive safety and regulatory framework for the development of nanotechnology. In order to realize this wish and support the DSNN 2021-2030 vision which is Nanotechnology: Building a high-tech nation 2030, this policy includes 4 Strategic Cores supported by 15 Strategies and 32 Initiatives that cross various economic sectors. The implementation of this policy will benefit the formation of a dynamic and progressive national nanotechnology ecosystem. In addition, it is able to increase the more efficient use of resources while optimizing the cost of research and development of technology and products for the progress of the country for the people, industry and economy. In this conference, we will present the current progress on the implementation of DSNN 2021-2030.

Keywords: Nanotechnology, policy, strategy, Malaysia, MOSTI, NNC, DSNN 2021-2030

INVITED SPEAKER

Assoc. Prof. Dr. Khamirul Amin Matori

Assoc. Prof. Dr. Khamirul Amin Matori is an Associate Professor at Department of Physics, Faculty of Science, Universiti Putra Malaysia (UPM). He received the BSc in Physics and MSc in Materials Science from Universiti Putra Malaysia in 1995 and 2000 respectively. He attained his PhD from the University of Sheffield in Materials Engineering in 2007. He joined UPM after BSc at Matriculation Canter for 5 years before become UPM Science faculty member in 2000 until now. Due to his outstanding research activities, UPM have appointed him as a Head of Materials Synthesis and Characterization Laboratory at Institute of Advanced Technology in 2012-2016 and Deputy Dean (Development, Finance & Industry Community Relations Staff) at Faculty of Science from 2016-2022 and then appointed as Deputy Dean (Research & Postgraduate) at Faculty of Science from 2024-until now.

He has wide ranging research interests in glass and ceramic science, with particular emphases on the processing, microstructures and properties as well as waste immobilisation. Current research topics include development of nanostructured mullite-base ceramic composites from waste, design of phase change material composites for high-temperature ceramics. Other work includes on fabrication, synthesis, structural and optical properties of willemite-based glass ceramic doped transition metal and rare earth for future optical and photoluminescent devices. Studies are also underway on the fabricating macro- and nano-porous 45S5 bioglass® -derived reinforced hydroxyapatite glass–ceramic scaffolds. He has written more than 280 high impact journal papers at the international level. His current number of citations is 5,703 with an h-index of 39 in the Scopus database.

Effect of Nano-Ceramics and Nano-Bioceramics on Glass Ionomer Cement Derived from Soda Lime Silica Glass and Clam Shell Waste

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Abstract. Glass ionomer cement (GIC) or namely known as glass polyalkenoate cement is produced from a reaction between calcium fluoroaluminosilicate (CFAS) glass powder and polyacrylic acid (PAA). These kinds of cement have been widely used primarily in dentistry for a long time ago in various applications such as adhesive and tooth restorative. GIC usually used for the prevention of dental caries caused by oral bacterial such as S. mutans species. In this research, the GIC is designed to perform good mechanical properties and well in fluoride release that prevents the oral bacteria that causes oral caries. It started from the selected metal oxide compound that fulfills the best combination for tooth structural. The combination of SiO_2–CaO–CaF_2–Al_2O_3–P_2O_5 is selected for the base of the glass to fabricate GIC. This glass system is seen as a suitable combination due to its structure related to the natural tooth and has the ability to release fluoride ions which inhibit the growth of bacterial. Some of the metal oxides such as SiO_2 and CaO in the glass system are replaced by waste materials to achieve the usability of waste materials in this research. Soda Lime silica (SLS) glass and Clam shell (CS) are used to act as SiO_2 and CaO sources respectively. The SLS–CS–CaF_2–Al_2O_3–P_2O_5 glass system was used to synthesized CFAS glass by the conventional melt-quench technique and act as a based glass in fabricating GIC. Then, GIC was fabricated using three main components of CFAS based glass ceramics, PAA and water. The ideal requirements that must be satisfied by a material to pose as dental cements in terms of biological, chemical, thermal and mechanical. Instead of having excellent properties as restorative material, the use of GIC is still limited since it performs poor mechanical properties. To overcome these drawbacks, the addition of nano-ceramics or nano-bioceramics materials is one of the efforts that was made to overcome the issue. In conclusion, GIC shows a potential candidate for clinical applications in dentistry due to its excellent adhesion and good biocompatibility towards the biological system.

Keywords: Waste; glass ceramics; melt-quenching; structural properties; fluorapatite

INVITED SPEAKER

Dr. Nurul Asyikin Kamaruzaman

Dr. Nurul Asyikin Kamaruzaman holds a bachelor's degree in industrial chemistry, a master's degree in analytical chemistry, and a PhD in chemistry. Her responsibilities as Assistant Director at the National Nanotechnology Centre (NNC) include overseeing the Hydrogen Economy Technology Roadmap (HETR), which exemplifies the intersection of her scientific and policy development expertise. She also manages the Hydrogen Economy and Technology Roadmap, as well as identifying potential Carbon Capture, Utilization, and Storage (CCUS) technologies for development.

She was involved in the development of the Hydrogen Economy & Technology Roadmap, which aimed to make the country a leading Hydrogen Economy by 2050 while also meeting global decarbonization targets. It focuses on policies that promote the potential development of hydrogen technology, such as production, conversion, storage, transportation, and end-user and industrial applications, in order to move toward a hydrogen economy.

One of her areas of focus in advancing technology is hydrogen production and conversion technology, as well as renewable energy technology such as solar, wind, wave, and bioenergy/biomass as a source of green energy, with an emphasis on innovation and sustainability.

Hydrogen Technology and Economy Roadmap: "Build-Some, Buy-Some" Strategy

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Abstract. The National Nanotechnology Center (NNC), under the Ministry of Science, Technology and Innovation (MOSTI), is at the forefront of developing Malaysia's hydrogen ecosystem. The Hydrogen Technology and Economy Roadmap (HETR), launched in October 2023, serves as a crucial supporting document to the New Energy Policy and the National Energy Transition Roadmap (NETR). HETR outlines Malaysia's ambitious vision to become a global leader in the hydrogen economy by 2050, aligning with the country's broader decarbonization efforts. This roadmap provides a clear framework for the strategic development of hydrogen technologies, infrastructure, and markets, positioning Malaysia as a key player in the global shift towards sustainable energy solutions. HETR highlights the strategic importance of a comprehensive approach to developing Malaysia's hydrogen economy through 5 strategic thrusts, supported by 9 strategies and 29 initiatives. The "Build-Some, Buy-Some" strategy is particularly crucial, as it allows Malaysia to balance the advancement of domestic capabilities with the acquisition of proven technologies from external sources. This strategy ensures that the country can make informed decisions on where to allocate resources, either towards developing infrastructure for local hydrogen production and technology innovation or opting for ready-made solutions when more cost-effective or time-efficient. The inclusion of a broad range of hydrogen chain technologies covering production technologies like electrolysis, pyrolysis, and Steam Methane Reforming (SMR), as well as innovative storage solutions such as solid-state hydrogen carrier, metal hydride, nano-composites materials and nano porous membranes highlights Malaysia's commitment to comprehensive technology assessment. By evaluating each step in the hydrogen value chain, from production to market development, HETR ensures that the country can develop a resilient and scalable hydrogen ecosystem. This approach will be key to realizing Malaysia's long-term goal of becoming a leader in the global hydrogen economy by 2050. The focus on Research, Development, Innovation and Commercialization (R&D&I&C) through public-private partnerships further strengthens this initiative, fostering a collaborative environment that accelerates technological advancements and commercial viability in the hydrogen sector. This commitment underscores the country's strategic focus on technology and innovation as key drivers for achieving its hydrogen economy objectives, as outlined in the HETR.

Keywords: Policy; Development; Hydrogen technologies; Build-Some, Buy-Some strategy

INVITED SPEAKER

Datuk ChM. Dr. Soon Ting Kueh

Datuk Dr Soon Ting-Kueh graduated from University of Malaya with B. Sc. Hons (Chemistry) in 1972 and obtained his Ph. D. majoring in physical organic chemistry from the same university in 1975. His areas of research and work include physical organic chemistry, atmospheric chemistry, oils and fats chemistry and technology, oleochemicals and biofuels, and chemistry education. Dr Soon has presented lectures on palm oil, oleochemicals and biofuels at many international conferences and meetings including the ICIS–LOR Second World Oleochemicals Conference in Amsterdam in 2000 and the Lipidex Europe at Rotterdam in 2001. He also presented many lectures in the area of chemistry education in many international conferences and meetings.

Datuk Dr Soon has been awarded The Federal Awards for P.J.N. (Awarded the Panglima Jasa Negara which carries the title "Datuk", by His Majesty Yang Di Pertuan Agong in 2001) and K.M.N. (Awarded the Kesatria Mangku Negara by His Majesty Yang Di Pertuan Agong in 1995). Datuk Dr Soon has received numerous academic and professional awards, including the Institut Kimia Malaysia Gold Medal in 2002, the MSA Golden Jubilee Meritorious Award in 2005, the Tan Sri Dato' Seri Law Hieng Ding Award in 2010, an Honorary Doctorate from Kazan National Research Technological University in 2012, an Honorary Fellow from Singapore National Institute of Chemistry in 2013, and the FACS Citation Award in 2015.

Datuk Dr Soon has been playing a very active role in Institut Kimia Malaysia (IKM) since he first joined the IKM Council in 1988. He became IKM President from 2007 and served until 2014. In 2018, he returned as IKM President and served until present. He is actively involved in chemistry education both within and outside Malaysia. He is the Chairman of IKM Chemical Education and Community Section Committee since 1988. Under his chairmanship, the Section publishes 21 volumes of Kimia Kini which is distributed free to all secondary schools in Malaysia. At the tertiary level, Datuk Dr Soon serves in the Academic Advisory Board of a number of universities in Malaysia. He was also the Chairman of the IKM Examination Board that conducts the IKM Parts I & II Examinations for IKM Membership until 2013. For his contribution to chemical education and public understanding of chemistry, IKM presented him with the Tan Sri Dato' Seri Law Hieng Ding Award in 2010.

Datuk Dr Soon plays an active role in the International Union of Pure & Applied Chemistry (IUPAC). He played an active part in the International of Chemistry (IYC) 2011 where he served as a member of the IUPAC IYC Management Committee and also in the Global Stamp Competition. In 2011, IKM organized the IUPAC International Conference on Chemical Research Applied to World Needs (ChemRAWN XIX) in Kuala Lumpur, Malaysia in 2011 and also the 24th IUPAC International Conference in Chemistry Education (ICCE) in Kuching, Malaysia in 2016. He served as a Titular Member of IUPAC ChemRAWN Committee from 2011 – 2018. Datuk Dr Soon is Titular Member of the IUPAC Committee on Chemistry Education (CCE) from 2018. At CCE, he brought the Young Ambassadors of Chemistry (YAC) program to Malaysia in 2012 and is currently involved in the Flying Chemist Program (FCP) and YAC. In 2019 at the IUPAC 50th General Assembly (50GA) in Paris, IKM won the bid to organize the IUPAC 53rd General Assembly (53GA) and 50th World Chemistry Congress (50WCC) in Kuala Lumpur, Malaysia in 2025. At the same function, IKM also won the right to organize the 50th IUPAC World Polymer Congress (MACRO 2026) in Kuching, Malaysia in 2026.

Chemistry As a Profession in Malaysia

Ting-Kueh Soon

Institut Kimia Malaysia, Malaysia.

Abstract. Institut Kimia Malaysia, or IKM, was first registered with the Registrar of Society in 1967 and subsequently incorporated under the Chemists Act 1975 on 1st November 1977. This meant that IKM is a professional scientific organisation that regulate the practice of chemistry in Malaysia. In addition, IKM also promote the further development of the chemistry profession and the advancement of chemical sciences in Malaysia. For the past 50+ years, IKM has grown in tandem with the rapid development of Malaysia and established itself as a strong, influential and dynamic scientific organisation, enjoying a prominent place among the scientific & academic establishments in Malaysia and recognised by the chemistry community worldwide. This lecture traces the functions, activities and development of IKM over the years and looks into the future directions of IKM and how it can play an important role in the social-economic development and well-being of the Malaysian people. It also relates to chemistry playing a key role in the Sustainable Development Goals (SDG) in ensuring a sustainable future for planet earth.

Keywords: Chemistry profession, Institut Kimia Malaysia, Chemists Act 1975, Code of Ethics & Chemist Rules 2024

INVITED SPEAKER

Dr. Aima Ramli

Dr. Aima Ramli is a Senior Lecturer in the Department of Nanophysics at the Faculty of Science and Marine Environment, Universiti Malaysia Terengganu (UMT). She received Bachelor of Science (Honours) in Physics in 2004 from Universiti Putra Malaysia (UPM), and continued with a Master of Science in Physics at Universiti Kebangsaan Malaysia (UKM). She has professional experience as a Metrologist in 2006 at the National Metrology Laboratory (NML), now known as the National Metrology Institute of Malaysia (NMIM), SIRIM Berhad, located in Salak Tinggi, Sepang Selangor. Following this, she embarked on a career as a lecturer at Universiti Teknologi MARA (UiTM) Kuala Terengganu in 2009.

Dr. Aima Ramli furthered her education and received a Ph.D. in Nanoscience from Faculty of Science, Universiti Putra Malaysia in 2015. Although the field of Nanoscience is extensive, she focused her research on high-temperature superconducting materials. These superconductors exhibit perfect diamagnetism, zero electrical resistance, and the ability to conduct electricity without energy loss, which supports significant advancements in current technology.

Her teaching experience includes subjects such as nanomaterials processing, marine physics, measurement and instrumentation, and materials characterization. Additionally, she regularly participates in research seminars and conferences to share her knowledge and findings, and to collaborate with prominent researchers both locally and internationally. She has also published articles and journals recognized in MyCite, Scopus and Web of Science (WoS). Moreover, she has taken part in various research innovation competitions and has received several awards.

Overall, Dr. Aima Ramli is recognized for her strong work ethic, dedication, and commitment to every task assigned to her, and she consistently supports and collaborates with her colleagues. As a dynamic academician and researcher, she is committed to delivering the best for her students while remaining actively involved in research and open to collaborating with other researchers to develop and enhance research networks.

Role of CaO Addition on Microstructural Properties of $YBa_2Cu_3O_{7-\delta}$ Superconductor

Nurulnabihah Aqilah Zulkarnain[1], Aliah Nursyahirah Kamarudin[2], Nurhidayah Mohd Hapipi[2], Mohd Mustafa Awang Kechik[2], Nurul Huda Abd Kadir[3], Nora Salina Md. Salim[4], Aima Ramli[4,*]

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[2]*Department of Physics, Faculty of Science, Universiti Putra Malaysia, Serdang 43400, Selangor, Malaysia*
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[4]*ANOMA Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*

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Abstract. High-temperature superconductors are materials that can conduct electrical current without energy loss. However, their performance can be affected by several factors, including weak link between particles. The addition of impurities materials into superconductors is believed can enhance their performance by improving and strengthening the bonding between particles. This research discusses the synthesizing of $YBa_2Cu_3O_{7-\delta}$ **(**Y-123) by adding CaO from natural resources using a solid-state method. The novelty of this research is that the CaO is obtained from the extraction of cuttlefish bones from *Sepia officinalis* species. This preliminary research not only focuses on phase changes and the formation of the YBCO structure when added with CaO but also on an initial analysis of cuttlefish bone. Notably, cuttlefish bone has flexural stiffness and compressive strength, which positions it as a viable biomaterial. The XRD results have represented that the cephalopod bone crystallite size at temperatures of 0°C to 900°C decrease from 55.52nm to 23.30nm. Carbon (C), and Oxygen (O) are the main component elements that are abundant in cephalopod bone obtained from SEM-EDX analysis. In XRD analysis of Y-123 samples, it reveals that all samples are polycrystalline, predominantly in Y-123 phase with secondary phase of Y-211 and unreacted CaO emerged with addition of the CaO in the range of 0.2 wt.%–1.0 wt.%. Surface morphology analysis shows a randomly irregular and elongated dense structure with a fine-grain connectivity. The grain size particle obtained from Image J software increasing from 3.34 µm to 8.25 µm as addition of CaO increase. The addition of CaO into polycrystalline YBCO has promoted its grain growth resulting in well-linked between the particles.

Keywords: $YBa_2Cu_3O_{7-\delta}$ superconductor; addition; calcium oxide; cuttlefish bone

LIST OF PARTICIPANTS (PRESENTERS, NON- PRESENTER AND DELEGATES)

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Time	**ID**	**Presenter & Title**
10.15 – 10.30 am	VP-001	**Dr. Efenji Godwin** *Universiti Sains Malaysia* Sensitivity of X-Ray Response Potential of Dy^{3+} Activated Al-Li-Zn Borate Glass and TLD-100 Chips for Radiation Dosimetry Applications
10.30 – 10.45 am	VP-002	**Syazana Binti Othman** *Universiti Teknologi Malaysia* Effect of Heat Treatment on Microwave Dielectric Properties of Erbium Doped Borotellurite Glass-Ceramics
10.45 – 11.00 am	VP-003	**Nur Farah Asyiqa Binti Abu Zaibidin** *Universiti Sains Malaysia* Effect of Embedding TiN NPs on Optical Properties of Nd^{3+}/Tm^{3+} Co-doped Tungsten-Bismuth-Zinc-Tellurite Glass
11.00 – 11.15 am	VP-004	**Dr. Chin Siew Xian** *Universiti Kebangsaan Malaysia* Cuprous Oxide Nanoparticles: Synthesis, Characterization, and Antibacterial Efficacy
11.15 – 11.30 am	VP-007	**Dr. Fatin Saiha Omar** *Universiti Kebangsaan Malaysia* Modification of Manganese Sulfide by a-C:H Thin Film via Hydrogen Flowrate for Supercapattery
11.30 – 11.45 am	VP-008	**NurFarhana binti Mohd Noor** *Universiti Putra Malaysia* The Influence of Mg and Li Dopant on Transport Properties of 1T, 2H and Defect TiS_2
11.45 – 12.00 pm	VP-009	**Nur Maisarah Batrisyia binti Mohd Bahaudin Bokhari** *Universiti Sains Islam Malaysia* Impact of Polyethylene Glycol plasticizer on the Conductivity and Dielectric Properties of 2-Hydroxyethyl Cellulose Doped with Ammonium Thiocyanate Electrolytes
12.00 – 12.15 pm	VP-010	**Nurul Faeqah Binti Mazalan** *Universiti Sains Islam Malaysia* Electrical Properties of Bio Based Polymer Solid Electrolyte Influence by Ammonium Carbonate Doped 2-Hydroxyethyl Cellulose
12.15 – 12.30 pm	VP-011	**Dr. Azuraida Binti Amat** *Universiti Pertahanan Nasional Malaysia* Enhancing Radiation Shielding in Bismuth-Boro-Tellurite Glass with Thulium Doping: Evaluations Using WinXCom and PHY-X/PSD Programme
12.30 – 12.45 pm	VP-012	**Nurul Aisya Nadhirah Binti Yusmadi** *Universiti Putra Malaysia* Structural, Electromagnetic, and Microwave Absorption Properties of Lightweight α-Fe_2O_3/AC Nanocomposites

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SESSION 1B (MATERIALS AND ENERGY) – LANG TENGAH		
Time	**ID**	**Presenter & Title**
10.15 – 10.30 am	**Invited Speaker 1**	**Assoc. Prof. Dr. Mohd Mustafa Awang Kechik** *Universiti Putra Malaysia* Novel Synthesis Method for Bulk Y-123 Polycrystalline: Thermal Decomposition Method
10.30 – 10.45 am	**Invited Speaker 2**	**Assoc. Prof. Dr. Lim Kean Pah** *Universiti Putra Malaysia* The Role of High Sintering Temperature on $Pr_{0.7}Ca_{0.3}MnO_3$ Prepared via Solid-State Reaction Method
10.45 – 11.00 am	**Invited Speaker 3**	**Dr. Nurul Asyikin Bt Kamaruzaman** *National Nanotechnology Centre (NNC), MOSTI* Hydrogen Technology and Economy Roadmap: Build-Some, Buy-Some" Strategy
11.00 – 11.15 am	**Invited Speaker 4**	**Dr. Aima binti Ramli** *Universiti Malaysia Terengganu* Role of CaO Addition on Microstructural Properties of $YBa_2Cu_3O_{7-\delta}$ Superconductor
11.15 – 11.30 am	ID-005	**Prof. Dr. Ab Malik Marwan Bin Ali** *Universiti Teknologi MARA* Investigating Halide Substituent Effects on Two-Dimensional Hybrid Perovskites for Optoelectronic Applications
11.30 – 11.45 am	ID-008	**Alina Irwana Binti Muhamad A'srai** *Universiti Malaysia Terengganu* Layered WS_2/WO_3 Z-Scheme Photocatalyst for Hydrogen Gas Production Through Water Splitting Reaction
11.45 – 12.00 pm	ID-010	**Dr. Monther Alsboul** *Al Hussain Bin Tala University* Effect of Eribum Oxide and Cobalt Oxide as A Heat Transfer Fluid on Thermal Performance of Parabolic Trough Collector
12.00 – 12.15 pm	ID-029	**Seri Nian Binti Akmad** *Universiti Teknologi MARA* The Effect of PTFE Filler on the Ecoflex Composites as Trapping Layer in Triboelectrification of Nanogenerator.
12.15 – 12.30 pm	ID-030	**Ts. Dr. Mohd Saiful Asmal Bin Abdul Rani** *Universiti Putra Malaysia* Magnesium Ion-Conducting Biopolymer Electrolytes Based on Carboxymethyl Cellulose Derived from Palm Oil Empty Fruit Bunch Fibre
12.30 – 12.45 pm	ID-040	**Muhamad Syaizwadi bin Shaifudin** *Universiti Malaysia Terengganu* Effect of Two-Step Sintering Temperature and Time on Microstructure and Electrical Properties of Low-Voltage $BaTiO_3$-Based ZnO Varistor Ceramics

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SESSION 2A (ONLINE ORAL PRESENTATION) – REDANG HALL		
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3.45 – 4.00 pm	VP-013	**Bello Murtala Alhaji** *Universiti Putra Malaysia* Microwave Absorption Characteristics of Spinel Fe_2O_3/Biochar Composites for Improved Electromagnetic Wave Attenuation
4.00 – 4.15 pm	VP-014	**Mohd Hilmi Bin Johari** *Universiti Putra Malaysia* Effect of Hybrid NiF/MWCNTs Materials Thickness on EMI Shielding Performance
4.15 – 4.30 pm	VP-015	**Makiyyu Abdullahi Musa** *Universiti Putra Malaysia* Advances in Wastewater Treatment for Irrigation Purposes; A Case Study of Nigeria
4.30 – 4.45 pm	VP-016	**Dr. Ebenezer Ekow Mensah** *Universiti Putra Malaysia* Measurement and Numerical Simulation of Transmission and Reflection Characteristics of Recycled Hematite/OPEFB Fiber/Polycaprolactone Nanocomposites using Microstrip Line and Finite Element Method
4.45 – 5.00 pm	VP-017	**Chen Hongxu** *Universiti Putra Malaysia* Enhanced Magnetic and Microwave Absorption Properties of Mn-Ni Substituted $BaTiCoMn_{0.5-x}Ni_x Fe_{10}O_{19}$ in 8-18 GHz
5.00 – 5.15 pm	VP-018	**Dr. Mohd. Amir Radhi Othman** *Universiti Kebangsaan Malaysia* Effect Of Gamma Radiation on Crystallinity and Size of Crystallites Entity in Black Pepper

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Time	**ID**	**Presenter & Title**
3.45 – 4.00 pm	**Invited Speaker 5**	**Assoc. Prof. Dr. Khamirul Amin Matori** *Universiti Putra Malaysia* Effect of Nano-Ceramics and Nano-Bioceramics on Glass Ionomer Cement Derived from Soda Lime Silica Glass and Clam Shell Waste
4.00 – 4.15 pm	**Invited Speaker 6**	**Dr. Mohd Hafiz bin Mohd Zaid** *Universiti Putra Malaysia* Fabrication and Elastic Properties of Lithium Bismuth Aluminotellurite Glass System
4.15 – 4.30 pm	ID-003	**Karima Amer Mohamed Almasri** *Universiti Putra Malaysia* Elastic Properties and Structural Studies on New Formulation Bismuth-Zinc-Borate Glass System Doped with Samarium Oxide
4.30 – 4.45 pm	ID-028	**Dr. Husniyah Aliyah Binti Lutpi** *Universiti Kebangsaan Malaysia* Effect of ZnO-MgO on the Physico-Mechanical Properties of Lithium Aluminosilicate Glass-Ceramics
4.45 – 5.00 pm	ID-032	**Dr. Loh Zhi Wei** *Universiti Putra Malaysia* Synthesis of Waste-Derived Fluoride-containing Glass-Ceramics as Promising Dental Materials
5.00 – 5.15 pm	ID-038	**Prof. Dr. Md Rahim Sahar** *Universiti Teknologi Malaysia* Modification Strontium Oxide Concentration Stimulated Optical Properties of Er^{3+} /Gd^{3+} /Yb^{3+} Tri-doped Phosphate Glass

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Time	**ID**	**Presenter & Title**
10.15– 10.30 am	**Invited Speaker 7**	**Prof. Ts. Dr. Azhan bin Hashim @ Ismail** *Universiti Teknologi MARA Pahang* Density Functional Theory Analysis on Electronic Behavior of Dy-Doped $Y_{1-x}Dy_xBa_2Cu_3O_{7-\delta}$ Superconductors
10.30– 10.45 am	**Invited Speaker 8**	**Prof. Dr. Chen Soo Kien** *Universiti Putra Malaysia* Phase Dynamics and Superconducting Properties of the Thermo-Processed Mg Added Ex Situ MgB_2
10.45– 11.00 am	ID-006	**Peh Hoo Keong** *Universiti Putra Malaysia* Superconductivity of Mg Incorporated Ex-Situ MgB_2 with Co-Addition of B_4C and Dy_2O_3
11.00– 11.15 am	ID-007	**Arebat Ryad Alhadei Mohamed** *Universiti Putra Malaysia* Optimizing Superconducting Properties of $YBa_2Cu_3O_7$-δ Added Nd_2O_3 Via Modified Thermal Decomposition Method
11.15– 11.30 am	ID-031	**Rabiatul Adawiyyah Binti Rosli** *Universiti Teknologi MARA* Electronic Behavior of Lu-Doped $Y_{1-x}Lu_xBa_2Cu_3O_{7-\delta}$ Superconductor: A Density Functional Theory Study
11.30– 11.45 am	ID-033	**Dr. Nurhidayah Binti Mohd Hapipi** *Universiti Putra Malaysia* Effect of Nano-Si and LaB_6 Co-addition on the Critical Current Density of MgB_2 Superconductor
11.45– 12.00 pm	ID-034	**Aliah Nursyahirah Binti Kamarudin** *Universiti Putra Malaysia* Enhancing Superconducting Properties of Critical Current Density in Bulk (Y,Er)BCO Superconductors via Infiltration Growth Technique

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Time	**ID**	**Presenter & Title**
10.15– 10.30 am	**Invited Speaker 9**	**Assoc. Prof. Ts. Dr. Mohd Sabri Mohd Ghazali** *Universiti Malaysia Terengganu* Revolutionize Paints: Exploring Nano-scale Manipulation for Enhanced Performance
10.30– 10.45 am	**Invited Speaker 10**	**Tuan Haji Ismarul Nizam Bin Haji Ismail** *National Nanotechnology Centre (NNC) Division, MOSTI* National Nanotechnology Policy and Strategy 2021-2030
10.45– 11.00 am	ID-014	**Malia Athirah Binti Badruddin** *Universiti Malaysia Terengganu* Fabrication Of Superhydrophobic $Cu(OH)_2$/Cu Mesh For Efficient Oil-Water Separation
11.00– 11.15 am	ID-027	**Dr. Siti Aisyah Binti Shamsudin** *Universiti Kebangsaan Malaysia* Synthesis and Characterization of Surfactant-Stabilized Zinc Sulfide Nanoparticles
11.15– 11.30 am	ID-012	**Dr. Nur Dalilah Binti Johari** *Universiti Teknologi Malaysia* Effect of Sol-Gel Stirring Temperature Parameters on The Phases and Crystallite Size of TiO_2 Thin Film
11.30– 11.45 am	ID-035	**Prof. Dr. Zulkarnain Zainal** *Universiti Putra Malaysia* Nanoheterostructure Ag_2S/CdS/ZnO and Bi_2S_3/Ag_2S/ZnO for Solar Photoelectrochemical Cells
11.45– 12.00 pm	ID-013	**Assoc Prof Ts Dr Sarifah Fauziah Syed Draman** *Universiti Teknologi MARA* Integrated Phyto-Adsorption: A Different Approach for Acid Mine Drainage Remediation

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SESSION 4A (POLYMERS AND COMPOSITES / OPTICAL AND DIELECTRIC MATERIAL) – REDANG HALL		
Time	**ID**	**Presenter & Title**
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2.15 – 2.30 pm	**Invited Speaker 12**	**Assoc. Prof. Dr. Wan Yusmawati Wan Yusoff** *Universiti Pertahanan Nasional Malaysia* Effect Rare-earth on Mechanical Properties of Solder Joint
2.30 – 2.45 pm	**Invited Speaker 13**	**Dr. Chiu Wee Siong** *University Malaya* Trinary Nanohybrid (Ag/MoS_2/ZnO) Photoelectrode: A Plausible Approach for Unbias Photoelectrochemical Water Splitting in Producing Hydrogen Gas
2.45 – 3.00 pm	ID-009	**Intan Qhuzairin Binti Zaharuddin** *Universiti Teknologi MARA* Studies on Lithium Doped-Poly(Methyl Methacrylate) Based Solid Polymer Electrolyte Plasticised with Deep Eutectic Solvent
3.00 – 3.15 pm	ID-018	**Dr. Jibrin Alhaji Yabagi** *Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria* Thermal Decomposition Behavior and Kinetic Studies of Polystyrene Silver (PS/Ag) Nanocomposites
3.15 – 3.30 pm	ID-026	**Nursabrina Amirah binti Mohd Nasir** *Universiti Malaysia Terengganu* Effects of Carica Papaya Leaves Extract as an Additive in Waterborne Polyurethane Coatings for Stainless Steel 316L Protection in Artificial Seawater.
3.30 – 3.45 pm	ID-021	**Assoc. Prof. Ts. Dr. Abd Rahman Tamuri** *Universiti Teknologi Malaysia* Role of Zinc Ions in Europium Doped Zinc Aluminate Phosphor
3.45 – 4.00 pm	ID-023	**Nur Shakila Othman** *Universiti Kebangsaan Malaysia* Tailoring NBT Ceramics via Bi-site Al^{3+} Incorporation: Synergistic Effects on Structure, Microstructure and Dielectrics properties

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SESSION 4B (ORGANIC MATERIALS AND APPLICATION /ADVANCED MATERIAL SYNTHESIS AND CRYSTAL GROWTH TECHNOLOGY/ DEVICES AND MATERIALS FOR BIOLOGY AND MEDICINE) – LANG TENGAH		
Time	**ID**	**Presenter & Title**
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2.15 – 2.30 pm	**Invited Speaker 15**	**Dr. Norazila Binti Ibrahim** *Universiti Teknologi MARA* Study of Temperature Coefficient of Resistivity for Doped Manganites Towards Sustainability of Magnetic Based Temperature Sensor
2.30 – 2.45 pm	ID-002	**Ts. Dr. Mohd Hafizuddin Bin Ab Ghani** *Universiti Putra Malaysia* Waste Engine Oil: Pollution and Potential
2.45 – 3.00 pm	ID-024	**Wan Muhammad Zulhilmi Bin Wan Mohd Kharul Anwar** *Universiti Malaysia Terengganu* Crystal Structure, HOMO-LUMO, Hirshfeld Surface Analysis and Conductivity Studies of 4-(diphenylamino)benzaldehyde-4-(ethyl)thiosemicarbazone
3.00 – 3.15 pm	ID-039	**Dr. Wan Mohamad Ikhmal Bin Wan Mohamad Kamaruzzaman** *Universiti Malaysia Terengganu* Andrographis Paniculata as a Corrosion Inhibitor for Mild Steel in Artificial Seawater: Electrochemical, DFT and MD Simulation
3.15 – 3.30 pm	ID-011	**Assoc. Prof. Dr. Goh Boon Tong** *Universiti Malaya* Novel Synthesis of Graphene Nanoplatelets and Tungsten Carbides (WC/W_2C) Nanosheets Via Hot-Wire Chemical Vapour Deposition
3.30 – 3.45 pm	ID-020	**Dr. Muhammad Aminu** *Sule Lamido University, Kafin-Hausa* Enhancement of Photodetection Parameters Using Fluorine and Silver Co-Doping in ZnO
3.45 – 4.00 pm	ID-025	**Dr. Istikamah Subuki** *Universiti Teknologi MARA* Mechanical Properties of Moulded Specimen of Different Particle Size Hydroxyapatite-incorporated with Different Propolis Composition
4.00 – 4.15 pm	ID-036	**Nur Adibah Binti Roslan** *Universiti Malaysia Terengganu* Fabrication And Characterization of TiO_2 Nanoparticles Incorporated Biopolymers Film and Scaffold for Bone Tissue Regeneration

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2	PP-002	**Nur Azmina Roslan** *Malaysian Palm Oil Board (MPOB)* SBE-Modified Iron (iii) Oxide Photocatalyst for Removal of Aniline
3	PP-003	**Asma Liyana binti Shaari** *Malaysian Palm Oil Board (MPOB)* Ecotoxicology Perspective of Epoxidised Palm Methyl Oleate (EPMO): A Potential Low Toxicity Plasticizer
4	PP-006	**Assoc. Prof. Dr. Raba'ah Syahidah Azis** *Universiti Putra Malaysia* Microwave Absorption Characteristics of Spinel Fe_2O_3/Biochar Composites for Improved Electromagnetic Wave Attenuation
5	PP-008	**Dr. Engku Abd Ghapur bin Che Engku Ali** *Universiti Malaysia Terengganu* Influence of Graphene Nanoplatelets (GNP) Size to the Mechanical and Electrical Properties of High-Density Polyethylene (HDPE) Composite
6	PP-009	**Norzarul Asri Bin Kamis** *Universiti Malaysia Perlis* Effect of Sintering Temperature on Hardness of Zr, Sm Co-Doped Ceria Solid Electrolyte
7	PP-010	**Assoc. Prof. Dr. Mahani Binti Yusoff** *Universiti Malaysia Kelantan* Enhanced Structure Properties of Al_2O_3-TiO_2 Nanocomposites Through Eggshell Incorporation for High-Temperature Applications
8	PP-011	**Ts. Dr. Khadijah Hilmun Kamarudin** *Universiti Malaysia Terengganu* Investigation of Ion Conduction Mechanism in 2-HEC-AN-PC Conductive Bioplastic Using Impedance and FTIR Deconvolution Techniques
9	PP-012	**Dr. Nurul Izrini Binti Ikhsan** *Universiti Teknologi MARA* Reduced Graphene Oxide-Silver Nanocomposite: A Novel Approach to High-Quality Conductive Paint
10	PP-013	**Dr. Nora Salina Md Salim** *Universiti Malaysia Terengganu* The Impact of Ball Milling on Morphology and Colour Attributes in the Preparation of Pineapple Pomace Superfine Powder
11	PP-014	**Dr. Siti Khadijah Binti Mohd Bakhori** *Universiti Sains Malaysia* The Larvicidal Activity of Irradiated ZnO Nanoparticles against *Aedes Aegypti* Larvae
12	PP-015	**Dr. Nur Asyikin Binti Ahmad Nazri** *Universiti Teknologi MARA* Investigating the Magnetic Properties of Millscale Waste: Opportunities for Sustainable Applications
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14	PP-017	**Prof. Dr. Mohamad Deraman** *Universiti Kebangsaan Malaysia* Crystallinity and Size of Crystallites Entity in Black Pepper (*Piper Nigrum L.*) Dried with Different Drying Methods

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ABSTRACTS
(Physical Oral Presentation)

ID-002

Waste Engine Oil: Pollution and Potential

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Abstract. Waste engine oil poses significant environmental and health hazards due to its complex chemical composition and improper disposal methods. The hazardous nature of waste engine oil from its contamination with heavy metals, polycyclic aromatic hydrocarbons (PAHs), and other toxic substances, which can leach into soil and water sources, leading to adverse impacts on ecosystems. This paper reviews current regulations and technologies aimed at minimizing the environmental and health impacts of waste engine oil, including recycling, re-refining, and treatment methods into valuable products. By addressing the hazards associated with waste engine oil and promoting effective waste management strategies, it will contribute to the ongoing efforts towards environmental sustainability and public health protection. By highlighting both the pollution and potential facets, this review aims to foster a comprehensive understanding of waste engine oil dynamics and pave the way for informed policy interventions and technological innovations towards a cleaner and more resource-efficient future.

Keywords: Waste engine oil; pollution; potential; environmental; health; hazards

ID-003

Elastic Properties and Structural Studies on New Formulation Bismuth-Zinc-Borate Glass System Doped with Samarium Oxide

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Abstract. Bismuth zinc borate glass is known for its unique properties, which make it suitable for various applications. The method used in preparing this glass is by conventional melt-quenching technique. Samarium oxide (Sm_2O_3) has been used as a doping which can have significant effects on the physical, structural, and elastic properties of bismuth zinc borate glass. The empirical formula that has been prepared is $x(Sm_2O_3)$- $1Bi_2O$- (44-x) ZnO－$55B_2O_3$ where x = 0.5, 1.0, 1.5, and 2.0 mol%. The X-ray diffraction (XRD) analysis confirmed the amorphous nature of the glass. Fourier-transform infrared spectroscopy (FTIR) highlighted the impact of Sm_2O_3 doping on chemical bonds and functional groups. Density and molar volume increase as the concentration of Sm^{3+} increases. Longitudinal velocity, shear velocity, and elastic modulus increased with increasing the Sm_2O_3.

Keywords: Borate glass; Elastic moduli; Samarium oxide.

ID-005

Investigating Halide Substituent Effects on Two-Dimensional Hybrid Perovskites for Optoelectronic Applications

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Abstract. This study investigates the complex influence of halide substitutions on the chemical, structural, and optical properties of two-dimensional (2D) hybrid perovskites, specifically focusing on the compounds 2AMPPbX$_4$ (X=Br and I). Through meticulous synthesis and characterization techniques, including FT-IR and X-ray diffraction analysis, we elucidate the impact of halogen variation on the molecular structure and crystal lattice parameters of the materials. Surprisingly, despite the distinct halides, both compounds exhibit an orthorhombic crystal structure, though with significant differences in lattice parameters and space group arrangements. Notably, our UV-Vis analysis reveals a remarkable tunability of the band gap, spanning more than 66 nm across the visible spectrum, showcasing the potential for tailored optical properties in optoelectronic applications. This comprehensive exploration sheds light on the intricate interplay between halogens and 2D hybrid perovskites, offering valuable insights into their potential as light-sensitizers and paving the way for further advancements in the field of optoelectronics.

Keywords: Halide substitutions; Two-dimensional hybrid perovskites; Optoelectronic properties; Band gap tuning; Crystal structure.

ID-006

Superconductivity of Mg Incorporated Ex-Situ MgB_2 with Co-Addition of B_4C AND Dy_2O_3

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Abstract. This study aims to introduce B_4C and Dy_2O_3 as additives to investigate their effects on superconductivity of ex-situ MgB_2 added with Mg. Two series of samples with the additions of 0.5 mol Mg + 5 wt% B_4C + x wt% Dy_2O_3, where x = 1 and 5 and 0.5 mol Mg + y wt% B_4C + 1 wt% Dy_2O_3, where y = 10 and 20 were prepared. The samples were sintered at 900 °C for 1 hour in argon gas flow. As x increased to 5, x-ray diffraction (XRD) detected the formation of DyB_4 and MgB_2C_2 whereas increasing y caused MgB_2C_2 to increase. The transition of critical temperature, T_c became broadened as B_4C increased signalling C-doping. As a result of the additions, the critical current density, J_c of the samples was enhanced significantly in the self-field and high field.

Keywords: Ex-situ MgB_2; Mg addition; B_4C and Dy_2O_3; Critical current density.

ID-007

Optimizing Superconducting Properties of $YBa_2Cu_3O_{7-\delta}$ Added Nd_2O_3 Via Modified Thermal Decomposition Method

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Abstract. This study successfully synthesized $YBa_2Cu_3O_{7-\delta}$ (Y-123) ceramics using a modified thermal decomposition method (DM), with added different weight percentages (x = 0.0, 0.1, 0.3, 0.5, 1.0, and 5.0 wt.%) of neodymium oxide (Nd_2O_3) under ambient conditions. X-ray Diffraction analysis showed the Y-123 crystal structure maintained orthorhombicity (~0.008) and oxygen content (~6.9), with secondary phases such as Y_2BaCuO_5 (Y-211) and $BaCuO_2$. FESEM analysis revealed that 5.0 wt.% Nd_2O_3 increased porosity and reduced grain size, adversely affecting superconductivity, while 0.5 wt.% Nd_2O_3 improved grain growth, enhancing critical temperature. Electrical resistivity measurements confirmed superconducting transitions, with 0.5 wt.% Nd_2O_3 displaying an optimal $T_{c\text{-}onset}$ of 94.14 K and a transition width (ΔT_c) of 4.04 K. In contrast, 5.0 wt.% resulted in a broader transition width of 7.47 K, indicating that lower doping levels enhance superconducting performance. This cost-effective method produces good -quality YBCO ceramics, with the potential for further improvement by incorporating alkali metals to reduce costs and environmental impact.

Keywords: $YBa_2Cu_3O_{7-\delta}$ Superconductor; Orthorhombic Crystal Structure; Superconducting transition width; Modified Thermal Decomposition (DM); Nd_2O_3 Addition.

ID-008

Layered WS_2/WO_3 Z-Scheme Photocatalyst for Hydrogen Gas Production Through Water Splitting Reaction

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Abstract. Photocatalyst tungsten oxide/ tungsten sulfide (WO_3/WS_2) and gold (Au) through hydrothermal process were characterized using a combination of X-ray, microscopy, and spectroscopy techniques. The amount of WO_3 strongly influences the properties of the photocatalyst, with (0.3:1) of WO_3/WS_2/Au showing optimal optical properties and photoelectrochemical (PEC) as well as photocatalytic activities for hydrogen evolution reaction (HER). Compared with (1:1) WO_3/WS_2, the optimized nanocomposite shows 11.4 times enhancement in photocurrent and 6 times increase for HER with lactic acid as a sacrificial agent. The enhanced PEC and HER activities can be attributed to Au absorption of visible light as well as the intimate contact between WO_3&WS_2 and Au that efficiently enhances charge carrier separation. This work demonstrated a promising strategy in the design and fabrication of high-performance photocatalysts for photocatalytic HER applications. In the field of photocatalytic hydrogen production, WS_2 are frequently utilized, which have the benefits of a narrow band gap and a sufficient band gap. On the other hand, WO_3 decreases the recombination rate of electron-hole pairs in metal sulfide, resulting in a greater contribution of photogenerated electrons to the hydrogen evolution reaction.

Keywords: WO_3/WS_2; Au; photocatalyst; photoelectrochemical activity; photocatalytic hydrogen evolution.

ID-009

Studies on Lithium Doped-Poly(Methyl Methacrylate) Based Solid Polymer Electrolyte Plasticised with Deep Eutectic Solvent

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Abstract. The poly(methyl methacrylate) (PMMA) film is brittle due to the physical crosslinking between the polar PMMA chain. Therefore, the physical crosslinking was hindered by incarcerating deep eutectic solvent (DES) of choline chloride (ChCl): 1,2-butanediol (1,2-BD) during the free radical polymerisation of MMA (PMMADES, M_w = ~29,631 g mol^{-1}). The newly synthesized solid PMMADES as confirmed from Fourier transform infrared spectroscopy (FTIR) analysis, has successfully produced flexible film. However, the obtained ionic conductivity, 1.12 x 10^{-8} S cm^{-1} is considered low and thus lithium triflate salt (LiTf) was further doped into the PMMADES system. Interestingly, the ionic conductivity increase to 1.10 x 10^{-5} S cm^{-1} which can be support by the smallest crystallite size (0.99 nm) and highest film's flexibility (glass transition temperature, T_g = 41.87 °C). In addition, PMMADES film also has high thermal stability. Conclusively, the novel PMMADES film has the potential to be applied in energy storage device.

Keywords: Polymer electrolyte; PMMA; deep eutectic solvent; lithium triflate; brittle

ID-010

Effect of Erbium Oxide (Er_2O_3) and Cobalt Oxide (Co_3O_4) as A Heat Transfer Fluid (HTF) on the Thermal Performance of Parabolic Trough Collector (PTC)

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Abstract. Competitive solar collectors are devices that convert solar radiation into heat, which is then transferred to working fluids. Solar collectors reduce energy costs over time since they do not rely on fossil fuels or electricity like traditional water heaters. Additionally, many of these collectors can be combined in an array and used to generate electricity in solar thermal power plants. The energy obtained from the sun is used to heat working fluid in a variety of solar collector designs. In order to achieve higher temperatures with greater efficiency, parabolic trough concentrators reflectors (PTCs) provide a more effective alternative. PTCs are solar energy collectors that capture direct solar radiation over a large surface area and focus it onto a small focal point, thereby increasing the amount of solar energy received by more than a factor of two. The installation of collector fields requires large areas of land to connect parabolic troughs. In addition, PTCs have a small absorb area and have an efficiency of around 12% with a smaller angle of view. It is possible to enhance the convective heat transfer passively by increasing the heat transfer fluid's thermal conductivity. As compared to pure liquids, modern nanotechnology provides new opportunities to improve heat transfer performance. It is an engineered colloidal suspension of nanometer-sized particles called nanoparticles in a base fluid that is referred to as a nanofluid. The general precursors for nanoparticles are metals, oxides, carbides and carbon nanotubes. Water, ethylene glycol, and oil are common base fluids. Due to their high turbulence properties and high area to volume ratio, nanofluids exhibit enhanced thermal conductivity. In many fields of heat transfer, nanofluids are used due to their novel properties. A thorough understanding of the rheological behavior of nanofluids is critical to determining their suitability for convective heat transfer. Two types of experimental tests have been achieved using cobalt oxide (Co_3O_4) and erbium oxide (Er_2O_3) heat transfer fluid. During selected days of June and July, the experimental tests were conducted at the Al-Hussein Bin Talal University - Ma'an under climatic conditions of 33.3° N and 35.68° E. Outdoor experimental measurements are conducted to evaluate the performance of the PTCs, including useful heat gain and thermal instantaneous efficiency. when the beam solar radiation is varied from 460 to 650 W/m^2 and from 410 to 560 W/m^2, respectively, the collector efficiency of Co_3O_4/DW nanofluid and Er_2O_3/DW nanofluid varies from 0.34 to 0.36 and from 0.28 to 0.39. The heat loss coefficient of the cobalt oxide/DW nanofluid has been found 7.5 W/C°m^2.

Keywords: Thermal conductivity; Nanofluid; Erbium Oxide; Er_2O_3; Thermal Analyzer; parabolic through collector

ID-011

Novel Synthesis of Graphene Nanoplatelets and Tungsten Carbides (WC/W_2C) Nanosheets via Hot-Wire Chemical Vapour Deposition

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Abstract. Lately, 2D materials has attracting a great intention among the material researchers owing to its fascinating physical, electrical, mechanical, and electrochemical properties, including high-surface area to volume ratio, high-surface mobility, high-flexibility, and high-transparency, making them an essential element in nanotechnology. These 2D materials include graphene, transition metal dichalcogenides (TMDCs), transition metal nitrides and carbides (MXenes), transition-metal diborides (MBenes), metal oxides, etc. In this work, we synthesis large-area graphene and tungsten carbide (WC/W_2C) nanosheets directly grown on tungsten nanoparticles (W NPs) coated c-Si and quartz substrates using a novel technique of hot-wire chemical vapour deposition at low substrate temperatures (<500 °C). Prior to the deposition, an argon plasma process was employed to induce the formation of W NPs, which act as a metal catalyst to facilitate the growth of large-area monolayer or multi-layer nanosheets. The average grain size of WPs was in between 24.3 nm to 7.4 nm. These 2D materials demonstrated excellent optical transparency (> 80 %), high electrical conductivity (718 – 966 Ω/sq.), and high photocurrent density under the visible light irradiation (~ 2 mA/cm^2 at 1.5 $V_{Ag/AgCl}$) for hydrogen production via water-splitting process. We are expecting that these 2D materials could give a required properties for efficient supercapacitor and hydrogen fuels in the coming future.

Keywords: Graphene; WC/W_2C nanosheet; Tungsten nanoparticles; Hot-wire chemical vapor deposition; Water-splitting.

ID-012

Effect of Sol-Gel Stirring Temperature Parameters on The Phases and Crystallite Size of TiO_2 Thin Film

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Abstract. Titanium dioxide (TiO_2) is a material widely synthesized using the sol-gel process due to its catalytic properties, photoactivity, and biocompatibility. In this study, the effect of sol-gel stirring temperature on the phases and crystallite size of TiO_2 thin film was investigated to develop brookite thin films. The stirring temperature during the synthesis of the TiO2 solution was varied at 25ºC, 60ºC, and 90ºC for 3 hours. TiO_2 layers were deposited on a glass slide by dipping for ten layers. The TiO_2 thin films were then heated at 600ºC for 3 hours. X-ray Diffraction (XRD) analyzed crystallite size, and Raman Spectroscopy confirmed the phase formation. Results show that at 25ºC, TiO_2 produced a mixture of anatase and rutile. At 60ºC and 90ºC, anatase with minor brookite phases was observed. Thus, stirring temperature affects TiO_2 crystallinity and phases, with brookite forming at higher temperatures.

Keywords: Stirring temperature; Heat treatment temperature; Green sol-gel; Titanium dioxide; Thin film; Brookite.

ID-013

Integrated Phyto-Adsorption: An Alternative Approach for Acid Mine Drainage Remediation

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Abstract. Most researchers now choose to treat heavy metal-contaminated water using green technology. This study highlights phytoremediation and an adsorption, two technologies that fall under the category of green technology named as integrated phyto-adsorption, a different approach for acid mine drainage treatment which have economic and ecological benefits. The aim of this study is to evaluate the efficacy of pilot plant-based integrated phyto-adsorption for acid mine drainage remediation. Citric acid modified cellulose (CAMC) as a alternative potential adsorbent of ferric ions marked the beginning of the pilot plant investigation of integrated phyto-adsorption together with *E. ochrostacyst*. By using integrated phyto-adsorption, the pH of the water was raised, and ferric ions were reduced by 99%. In conclusion, an integrated phyto-adsorption approach can be used to treat acid mine drainage. Additionally, this approach can serve as an industry model that can be implemented in the field.

Keywords: Acid mine drainage; *E.ochrostacyst*; phyto-adsorption; integrated; adsorption; ferric ion.

ID-014

Fabrication Of Superhydrophobic $Cu(OH)_2$/Cu Mesh for Efficient Oil-Water Separation

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Abstract. Oily wastewater poses a persistent threat to the ecosystem and human health. Massive demand for efficient oil-water separation treatment has aided in developing superoleophilic-superhydrophobic materials. This work demonstrates the fabrication of nanostructured Cu meshes via a facile chemical immersion process. High aspect ratio (length in µm: width in nm) needle-like $Cu(OH)_2$ structures were formed by 30-minute immersion of Cu mesh in NaOH, ammonium persulphate, and ethanolic stearic acid at room temperature. Combination of surface chemistry and nanostructuring significantly enhanced the superhydrophobicity of the Cu mesh, with a water contact angle of 162.49°. An oil contact angle value of 13.31° was also observed, allowing the oil droplets to spread over and pass through the mesh. Oil-water separation efficiency for oleic acid, engine oil, and diesel obtained in this work were 96%, 97%, and 98%, respectively. Hence, this work opens a new insight into synthesizing versatile nanostructures for great potential water remediation.

Keywords: Oil-water separation; superhydrophobic; copper mesh; nanoneedle array.

ID-018

Thermal Decomposition Behavior and Kinetic Studies of Polystyrene Silver (PS/Ag) Nanocomposites

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Abstract. Polymer nanocomposites containing inorganic fillers like metallic particles dispersed in polymer matrices are of great interest for electronics and dielectric applications. Polymer/inorganic such as polystyrene/silver nanocomposite (PS/Ag) can be manipulated through various treatments in fabricating desired material such as optical, sensors and microwave absorbance. PS/Ag nanocomposite was successfully synthesized using ex-situ mix solution technique. The nanocomposites were further investigated using Thermogravimetric Analysis (TGA), Differential thermal analysis (DTA) and Differential Scanning Calorimetry (DSC). TGA analysis was performed to compare weight loss, measuring the degradation of composites as it is being heated. The decomposition profile was evaluated from room temperature to 800 ºC with a nitrogen flow of 20 mL/min at three different heating rates of 10, 15 and 20 ºC/min. The Ozawa-Flynn-Wall (OFW) and Kissinger Akahira Sunose (KAS) models were exploited to calculate activation energy and determine thermal decomposition mechanism. The thermal decomposition of pure PS was investigated to drawn comparison with the mechanism of PS/AgNPs compositions. Results obtained from thermal decomposition process indicate that there are three main stages for PS whereas PS/Ag nanocomposites have two stages of decomposition due to Ag content. It was found that the main decomposition occurred at about 450 to 750ºC. However, it can also be seen clearly that there is little difference between the T_f readings of the PS/Ag nanocomposites at different ratio of Ag particles compared to PS alone. This indicates the difference ratio in Ag particles plays an important role in thermal decomposition of PS/Ag nanocomposites. In DTG thermograms, the temperature peaks at maximum weight loss rate changed with increasing heating rate. Activation energy of PS and PS/Ag nanocomposites obtained by KAS method are 76.76kJmol^{-1}, 40.73 kJmol^{-1}, 36.18 kJ mol^{-1} and 35.26 kJmol^{-1} while, the same trend was observed from FWO methods to be 78.62 kJmol^{-1}, 45.00 kJmol^{-1}, 40.12 kJmol^{-1} and 39.28 kJ mol^{-1} respectively. This enhancement might be due to the good dispersion of the AgNPs within the polystyrene matrix, which increased the interfacial interaction between the polystyrene and AgNPs. The polymer/Ag nanocomposites developed with tunable thermal properties could be used as conductive materials for electronic device applications.

Keywords: Polystyrene/silver nanocomposite; Thermogravimetric Analysis; Differential thermal analysis; Differential Scanning Calorimetry; Activation energy; kinetic parameters; Ozawa-Flynn-Wall (OFW); Kissinger Akahira Sunose (KAS).

ID-020

Enhancement of Photodetection Parameters Using Fluorine and Silver Co-Doping in ZnO

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Abstract: This study aims to dope silver (Ag) and fluorine (F) in zinc oxide (ZnO) for the improvement of photoresponse properties in ZnO since previous reports confirmed improvement of these properties using individual doping of F and Ag. The F-doped ZnO (FZO) and F and Ag co-doped ZnO (FAZO) nanorods were synthesized using a modified hydrothermal method and characterized with the Field emission scanning electron microscopy, X-ray photoelectron spectroscopy, photoluminescence analysis and Ultraviolet (UV)-Visible analysis. Two photodetectors (PD)` based on FZO and FAZO were fabricated. The FAZO PD outperformed the FZO PD in terms of photoresponse characteristics at even lower bias voltages, when irradiated at the UV-light of 365 nm, which might be related to better crystal quality in the FAZO PD. The sensitivity, responsivity, quantum efficiency, detectivity, rise and fall times at zero bias for the FAZO PD are 24463%, 8.24 mA/W, 6.47×10^{8} Jones, 2.8%, 70 ms, and 80 ms, respectively, and 9418%, 0.2 mA/W, 6.25×10^{7} Jones, 0.1%, 80 ms, and 80 ms for the FZO PD. Hence, F and Ag co-doping in ZnO have shown promising results for enhancing PD parameters characteristics.

Keywords: ZnO; Fluorine; Silver; co-doping; enhanced photoresponse parameters.

ID-021

Role of Zinc Ions in Europium Doped Zinc Aluminate Phosphor

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Abstract. The demand for efficient, reliable, and high-performance phosphor materials in solid-state lighting and optoelectronic devices has led to significant research into various doped semiconductor materials. One of the most difficult issues in this field is improving the luminous characteristics and structural stability of these materials. This study focuses on the optical and structural characteristics of europium (Eu^{2+}) doped zinc aluminate ($ZnAl_2O_4$) with at different zinc ion concentrations. The synthesis was carried out using urea as the fuel and the combustion method. The Eu^{2+} concentration was fixed at 1.0 mol%, while zinc concentration varied from 0 mol% to 0.8 mol% extra from pure zinc aluminate phosphor. Through combustion, the six samples were converted from liquid to solid fine nanoparticles. The six samples were characterized using X-ray Diffraction (XRD) spectroscopy, photoluminescence (PL) spectroscopy, and Ultraviolet-Visible (UV-Vis) spectroscopy. The X-ray Diffraction (XRD) patterns showed consistent peak positions and sharp diffraction peaks, indicating high crystallinity and phase purity of the synthesized samples. Photoluminescence (PL) analysis revealed that the highest emission intensity occurred at a zinc concentration of 0.2 mol%. The CIE 1931 analysis indicated that europium-doped zinc aluminate emitted warm yellowish-red light with correlated color temperature (CCT) values ranging from 2145 K to 2702 K. Furthermore, UV-Vis spectroscopy analysis showed major UV absorption around 200 nm for all samples, gradually decreasing towards the visible region. The sample with 0.8 mol% of zinc concentration exhibited the highest UV absorbance, while pure ZnAl2O4 displayed the lowest.

Keywords: Zinc Aluminate; Europium doped; Combustion synthesis, X-ray Diffraction (XRD), Photoluminescence (PL), color correlated temperature

ID-023

Tailoring NBT Ceramics via Bi-site Al^{3+} Incorporation: Synergistic Effects on Structure, Microstructure and Dielectrics properties

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Abstract. This study investigates the effects of Al^{3+} substitution at Bi-site on the structural, microstructural, and dielectric properties of $Na_{0.5}Bi_{0.5-x}Al_xTiO_3$ (NBT-Al) ceramics with x = 0.00, 0.04, and 0.08 were synthesized via solid-state reaction method. The structural analysis of x-ray diffraction analysis reveals subtle distortions in the rhombohedral perovskite structure with Al3+ incorporation. The scanning electron microscopy images show a non-monotonic trend in grain size evolution, initially increasing from 0.45 µm (x = 0) to 4.18 µm (x = 0.04), then decreasing to 3.25 µm (x = 0.08), suggesting complex grain growth mechanisms. The relative density improves with Al doping, exceeding 80% of the theoretical density. The dielectric properties were characterized from 27°C to 700°C and frequency at 1 kHz. The temperature of maximum dielectric constant (Tm) shifts higher with increasing Al3+ content, indicating improved thermal stability. The dielectric constant at room temperature increases from 1990 (x = 0) to 3225 (x = 0.04) but decrease to 338 at (x = 0.08). The frequency-dependent measurements show increased dielectric permittivity across the measured frequency range for Al-substituted samples. These findings demonstrate that Bi-site Al^{3+} substitution in NBT ceramics produces synergistic effects on structure, microstructure, and dielectric properties, highlighting its potential for developing advanced functional ceramics for electronic applications. This study demonstrates for the first time that decreasing the ionic radius of trivalent ions substituting for Bi-site in the NBT perovskite structure enhances its electrical properties, with optimal results observed at a substitution level of x = 0.04.

Keywords: Sodium Bismuth Titanate; NBT; Aluminium substitution; electrical properties.

ID-024

Crystal Structure, HOMO-LUMO, Hirshfeld Surface Analysis and Conductivity Studies of 4-(diphenylamino)benzaldehyde-4-(ethyl)thiosemicarbazone

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Abstract. A new single crystal of 4-(diphenylamino)benzaldehyde-4-(ethyl)thiosemicarbazone was synthesized and spectroscopically characterized by performing FT-IR, NMR and X-ray crystallography analyses. In addition, 4-(diphenylamino) benzaldehyde-4-(ethyl)thiosemicarbazone was used as an additive in solid biopolymer electrolytes mixed with carboxymethyl cellulose (CMC)polyethylene glycol (PEG) and isophthalic acid. These films were doped with different concentrations of 4-(diphenylamino) benzaldehyde-4-(ethyl)thiosemicarbazone and isophthalic acid to optimize their conductivity. The highest proton conductivity was obtained at a concentration of 15% of 4-(diphenylamino) benzaldehyde-4-(ethyl)thiosemicarbazone and isophthalic acid, with a value of 5.37 x 10^{-8} S/cm at 80 ºC . The temperature dependence of the compound obeys the Arrhenius equation. The activation energy (Ea) was calculated to be about 1.256 x 10^{-4} eV, indicating that the conduction mechanism in the thin film requires only minimal thermal energy to activate the charge carriers.

Keywords: Thiosemicarbazone; Carboxymethyl Cellulose; X-Ray Crytallography; Isophthalic Acid; Thin Films

ID-025

Mechanical Properties of Moulded Specimen of Different Particle Size Hydroxyapatite-incorporated with Different Propolis Composition

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Abstract. Incorporating hydroxyapatite (HA) with propolis would be beneficial for dental applications, providing an alternative material for root filling. The propolis is a resinous substance produced by bees that have antibacterial, antifungal and anti-imflammatory that increasing its potential as a biomaterial. This study explores the mechanical properties of different particle sizes of HA (microHA and nanoHA) by incorporating different composition propolis from 2.5 wt.% to 10 wt.%. The materials were sieved for 15 min and mixed on the mixing glass using polybasic carboxylic acid as binder to form homogenize composite HA and propolis. The composites were moulded into a 5mm x 5mm moulded. The mechanical properties show improvement of nanoHA compared to microHA due to better particle interaction and bonding. However, the incorporation of propolis to 10 wt.% decreased the compressive strength from 4.3MPa to 0.8 MPa and Vickers hardness from 500 HV to 420HV. Accordingly, the water absorption increased with addition of propolis indicates that more porous and potentially less durable in aqueous environment. The results indicated that even though the propolis appears to be compatible with HA and carboxylic acid as binder and enhances the antimicrobial properties, it decreased the mechanical properties.

Keywords: Hydroxyapatite; Propolis; Solubility; Tensile strength; Particle Size.

ID-026

Effects of Carica Papaya Leaves Extract as an Additive in Waterborne Polyurethane Coatings for Stainless Steel 316L Protection in Artificial Seawater.

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Abstract. Carica papaya leaf extracts (CPLE) improved the waterborne anti-corrosion coatings on stainless steel 316L (SS316L) immersed in artificial seawater. This research aims to study the effect of adding CPLE as an additive in waterborne polyurethane (WBPU) coating for corrosion protection. The WBPU coatings underwent a 20-day testing period and were exposed to artificial seawater with different concentrations of CPLE. Several characterizations were performed, including Fourier transform infrared (FTIR) spectroscopy, ultraviolet-visible (UV-Vis) spectroscopy, X-ray diffraction (XRD), electrochemical impedance spectroscopy (EIS), potentiodynamic polarization (PDP), scanning electron microscope with energy dispersive x-ray (SEM/EDX) as well as water contact angle (WCA) measurement. The findings indicated that the P2 coating, which consisted of 3 wt. % of CPLE yielded the most favorable result. It exhibited the most significant impedance measurement of 12.51 x 109 Ω.cm2 and a corrosion rate of 5.536 mm/year. In addition, the morphological analysis revealed that the specimen coated with P2 exhibited an intact surface with a smooth texture, which reduced corrosion products. Furthermore, the EDX and WCA analysis supported the data by the absence of chromium and a minimal presence of nickel in the P2 coating and by exhibiting hydrophobic properties of 132.62°, respectively.

Keywords: Corrosion; Water-borne coating; Papaya leaves extract; Stainless steel; Hydrophobic

ID-027

Synthesis and Characterization of Surfactant-Stabilized Zinc Sulfide Nanoparticles

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Abstract. Bulk zinc sulfide exhibits inferior exciton pair separation efficiency relative to zinc sulfide nanoparticles (NPs) due to a weaker conduction band. Consequently, nanoscale zinc sulfide is essential for enhancing optoelectronic properties. However, the colloidal stability of these NPs necessitates surface modification with surfactants to mitigate agglomeration and luminescence quenching. This study employed a hydrothermal method to synthesize zinc sulfide NPs using zinc acetate dihydrate and sodium sulfide nonahydrate as precursors and ethanol as a solvent. The reaction was conducted at 120 °C for 10 hours in an autoclave. Optical properties and band gap energies of pristine and surfactant-coated zinc sulfide NPs were investigated. Pure zinc sulfide NPs exhibited an average size of 8 nm and a band gap of 3.85 eV. Surfactant coating led to an increased band gap of 4.19 eV. All samples displayed blue emission under UV-Vis excitation, confirming their nanoscale dimensions (<15 nm). Among the surfactants tested, SDS demonstrated superior colloidal stability due to electrostatic repulsion between its negatively charged head groups. Optimal surfactant-to-NP ratios were determined to be 3:1 for CTAB, 4:1 for Brij10, resulting in emission peaks at 484.5 nm and 485.5 nm, respectively.

Keywords: Zinc sulfide nanoparticles, Hydrothermal synthesis, Surfactants, Optical properties, Band gap.

ID-028

Effect of ZnO-MgO on the Physico-Mechanical Properties of Lithium Aluminosilicate Glass-Ceramics

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Abstract. Lithium aluminosilicate (LAS) is an aluminosilicate system with an extraordinarily low coefficient of thermal expansion (CTE), making it ideal for applications involving rapid temperature changes, such as cooktops. The low CTE of LAS glass-ceramic is a well-known characteristic that has been associated with improved thermal shock resistance. By modifying the compositions of LAS parent glass, the thermal shock resistance properties can be enhanced. Therefore, this study aims to investigate the effects of ZnO-MgO on the physico-mechanical properties, which are crucial properties for determining the thermal shock resistance of LAS glass-ceramics. LAS glass with varying ZnO-MgO contents (0 - 1.45 wt.%) was prepared using the melt-quenching method at 1550 °C for 5 hours and sintered at 1100 °C for 3.5 hours. The results indicated that the addition of ZnO improved the density, porosity, flexural strength, and CTE properties of LAS glass-ceramics. Specifically, adding 1.24 wt.% ZnO to the LAS parent glass improved the density to 2.45 g/cm^3, porosity to 0.62%, and flexural strength to 158 MPa. Additionally, a low CTE $_{(25\text{-}500\ °C)}$ of 1.13 x 10^{-6} °C^{-1} was achieved with the addition of 1.24 wt.% ZnO to the LAS parent glass.

Keywords: Lithium aluminosilicate; Glass-ceramics; Physico-mechanical; Flexural strength; CTE; Thermal shock resistance.

ID-029

The Effect of PTFE filler on the Ecoflex Composites as Trapping Layer in Triboelectrification of Nanogenerator

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Abstract. Functional materials with high dielectric constant are finding widespread applications in energy conversion and storage, which may also be the key to improving the output performance of nano electric generators (TENGs) by investigating the dielectric of the charge trapping ability of triboelectric interfaces. Here, ECO/AC/PTFE composite prepared to form a layer. Due to the enhanced charge induction, a composite layer with high flexibility and charge trapping ability was developed, and the polymer layer TENG (with 0.5 wt% AC) showed an open circuit voltage of 34V, a short circuit current of 0.14μA, which is higher than pure ECO The dielectric enhancement mechanism was comparatively proven and demonstrated in ECO/AC/PTFE composites. To determine the origin of the significantly improved triboelectric performance, the permeability of the material was studied. The physical and mechanical properties of new composites including tensile test, compression set and density was defined by the ASTM D412 and ASTM D395 standards. This work provides new insights into the unique potential of dielectric output enhancement strategies to unlock the potential of TENGs in energy harvesting.
Keyword: triboelectric, charge trapping, ecoflex, freestanding mode

ID-030

Magnesium Ion-Conducting Biopolymer Electrolytes Based on Carboxymethyl Cellulose Derived from Palm Oil Empty Fruit Bunch Fibre

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Abstract. As global demands for lithium have raised concerns about the sustainability of its supply, a promising alternative to lithium batteries has been developed. This alternative utilizes biodegradable carboxymethyl cellulose (CMC) extracted from the palm oil empty fruit bunches to produce biopolymer electrolytes with magnesium iodide as ionic dopant. The biopolymer electrolytes were prepared using solution casting with varying ratios of magnesium iodide. Comprehensive studies on the structural, electrical, and electrochemical behavior of CMC were conducted using Fourier transform infrared characterization, electrochemical impedance spectroscopy, transference number measurements, and linear sweep voltammetry. The results revealed that adding 30 wt% magnesium iodide achieved the highest ionic conductivity of 5.22×10^{-4} S cm^{-1} at ambient temperature. FTIR results confirmed the interactions between CMC and magnesium iodide. The biosourced polymer electrolytes demonstrated electrochemical stability exceeding 2 V, and the transference number measurements indicated that ion conduction dominated the electrolytic process.

Keywords: Biopolymer electrolyte; Carboxymethyl cellulose; Magnesium iodide; Palm oil empty fruit bunch; Ionic conductivity.

ID-031

Electronic Behavior of Lu-doped $Y_{1-x}Lu_xBa_2Cu_3O_{7-\Delta}$ Superconductor: A Density Functional Theory Study

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Abstract. The first-principles calculations using Density Functional Theory (DFT) were used to examine the electronic characteristics effect of Lu doping at the Y-site of the $Y_{1-x}Lu_xBa_{2-x}Cu_3O_{7-\delta}$ superconductor. The crystal structure of $Y_{1-x}Lu_xBa_2Cu_3O_{7-\delta}$ was constructed on the Material Studios software and analyzed using the Virtual Crystal Approximation (VCA) approach with Generalized Gradient Approximation Perdew-Burke-Ernzerhof for Solids (GGA PBEsol) exchange-correlation. The computational simulations were performed using the CASTEP code with ultrasoft pseudopotential to simulate the structure behavior. The structure showed energy convergence at 400eV after optimization with 4×4×1 k-point grid. The amount of concentration of Lu at x=0.25 was shown to be the smallest pseudogap among all the concentrations. The electron density was observed to be more concentrated near the Fermi level, as indicated by the density of states distribution. In the electron density difference images, the merging of orbital configurations from each atom was noticeable upon doping at x = 0.25. Based on these results, it can be concluded Lu concentration at 0.25 which is $Y_{0.75}Lu_{0.25}Ba_2Cu_3O_{7-\delta}$ is optimum.

Keywords: Superconductor; Density Functional Theory; First Principle; YBCO; Lutetium; Dopant.

ID-032

Synthesis of Waste-Derived Fluoride-containing Glass-Ceramics as Promising Dental Materials

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Abstract. Nowadays, glass-ceramics, resembling natural teeth in chemical composition, face limitations in dentistry due to their inadequate strength. While various glass-ceramics are under exploration, minimal research focuses on repurposing waste materials. The global emphasis on environmental technology highlights the importance of turning waste into valuable and sustainable industrial products. Hence, this study highlighted the synthesis of fluoride-containing glass-ceramics utilising eggshells as a source of calcium through the conventional melt-quenching method. The samples were heat-treated from 600°C to 900°C for 2 hours. From the findings, X-ray fluorescence (XRF) analysis showed the purity of the CaO in calcinated eggshell is 97.90%. Additionally, X-ray diffraction (XRD) analysis confirmed the formation of fluorapatite and pseudo-wollastonite phases, with fluorapatite being a vital component in natural teeth, making it favourable for dental applications. Heat treatment at 700°C achieved the highest mechanical properties with a microhardness of 6.52 GPa and fracture toughness of 3.18 MPa·$m^{1/2}$, making the samples comparable to human teeth and commercial dental materials. The experimental results indicated that the heat treatment improved the crystallisation and mechanical of the final samples. These findings also suggest that eggshell waste holds the potential as a valuable resource for dental applications, offering an alternative to traditional dental materials.

Keywords: Eggshell waste; Glass-ceramics; Fluorapatite; Mechanical; Dental.

ID-033

Effect of Nano-Si and LaB_6 Co-addition on the Critical Current Density of MgB_2 Superconductor

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Abstract. In this study, different weight percentages of nano-Si (*x* wt.% = 0, 5, 10) and 0.03 mol LaB_6 were co-added into magnesium diboride, MgB_2. Samples with only nano-Si addition (x = 0, 5, 10 wt.%) were also prepared for comparison. All the samples were synthesized using the *in-situ* reaction method. X-ray diffraction (XRD) confirmed MgB_2 as the major phase, with MgO and Mg_2Si as minor phases in all the samples. Unreacted LaB_6 was also observed in the co-added samples. The addition of nano-Si from 0 to 5 wt.% increased the critical current density, J_c at 3 T and 20 K from 1.1 kA/ cm^2 to 2.8 kA/ cm^2, indicating enhanced flux pinning in high field. However, the co-addition of LaB_6 and nano-Si decreased the self-field and field-dependent J_c values, likely due to the excessive impurity of Mg_2Si and LaB_6 which reduced the supercurrent path in the samples. The onset critical temperature, $T_{c\text{-onset}}$ of the pure sample was 37.5 K and slightly decreased with increasing levels of co-addition. The flux pinning plot showed that the samples with nano-Si addition had a greater pinning force compared to the pure sample.

Keywords: in-situ MgB_2; nano-Si; LaB_6; co-addition; superconducting transition; critical current density

ID-034

Enhancing Superconducting Properties of Critical Current Density in Bulk (Y,Er)BCO Superconductors via Infiltration Growth Technique

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Abstract. Bulk (Y,Er)$Ba_2Cu_3O_{7-x}$ (Y,Er)123 was prepared by the infiltration growth (IG) technique, which is known as a promising and well-established technique. This method uses $(Y,Er)_2BaCuO_5$ (Y,Er)211 precursor powders and $Ba_3Cu_5O_8$ + $ErBa_2Cu_3O_x$ (Er123) as a liquid phase to produce bulks (Y,Er)123 superconductors. The Erbium (Er) contents in the (Y,Er)211 precursor powders was optimized to fabricate (Y,Er)123 bulk samples of 20 mm diameter. The microstructure of (Y,Er)211 secondary particle distributions and superconducting properties of critical temperature (T_c) and critical current density (J_c) were studied. It was found that the T_c values of bulk (Y,Er)123 samples exhibited a sharp drop superconducting transition temperature with transition width (ΔT_c) less than 2 K. The J_c value of bulk (Y,Er)123 added with Er contents were improved up to 79 kA/cm^2 and 32 kA/cm^2 at 77 K in self-field and 0.5 T respectively due to the reduction in average size of (Y,Er)211 secondary particles in the (Y,Er)123 matrix which is 0.64 µm. The formation of fine and uniform (Y,Er)211 secondary particle distributions improved the J_c values. In conclusion, the present results demonstrated that controlling the (Y,Er)211 secondary particles is necessary to improve the superconducting performance of bulk (Y,Er)123, which can be the potential superconducting for future engineering applications and technologies.

Keywords: critical current density; REBCO materials; microstructure; infiltration growth method

ID-035

Nanoheterostructure $Ag_2S/CdS/ZnO$ and $Bi_2S_3/Ag_2S/ZnO$ for Solar Photoelectrochemical Cells

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Abstract. Nanoheterostructure materials comprising metal oxides and chalcogenides are extensively studied in the pursuit of clean, low-cost, sustainable, and renewable energy generation. Photoelectrochemical (PEC) cells with zinc oxide nanorods (ZnO NRs)-based photoanodes are considered among the most promising approaches for solar-to-chemical energy conversion. The efficiency of the nanorods can be further enhanced by inorganic sensitisation using narrow-gap metal sulfides (such as Ag_2S, CdS, and Bi_2S_3). To showcase these capabilities, two stable novel ternary nanoheterostructured photoelectrodes, $Ag_2S/CdS/ZnO$ NRs and $Bi_2S_3/Ag_2S/ZnO$ NRs were fabricated using facile hydrothermal and successive ionic layer adsorption and reaction (SILAR) techniques. High-resolution transmission electron microscopy (HRTEM) revealed the formation of well-distributed and highly uniform nanosized metal sulfide particles along the ZnO nanorods. The materials' energy gaps exhibited a significant shift, with enhanced light absorption in the visible region. The photoelectrochemical efficiency increased dramatically, with a 15-fold enhancement for $Ag_2S/CdS/ZnO$ NRs and a 13-fold enhancement for $Bi_2S_3/Ag_2S/ZnO$ NRs compared to pristine ZnO NRs. These electrodes show great potential for use in photoelectrochemical solar cells and solar hydrogen generation.

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Keywords: Nanoheterostructure; photoelectrochemical cell; zinc oxide; metal chalcogenides

ID-036

Fabrication and Characterization of TiO_2 Nanoparticles Incorporated Biopolymers Film and Scaffold for Bone Tissue Regeneration

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Abstract. This research focuses on the development and characterization of titanium dioxide nanoparticles (TiO_2NPs) incorporated in various biopolymer nanocomposite films and scaffolds incorporating, aimed at advancing bone tissue engineering. The significance of this work lies in the potential of these materials to enhance bone regeneration, addressing a critical need in biomedical applications. Polyvinyl alcohol (PVA), sodium alginate (SA), carboxymethyl cellulose (CMC), Arabic gum, and Gellan gum were selected as the bio-polymers for this study. Each biopolymer was combined with 10wt% TiO_2NPs to form nanocomposite films and three-dimensional scaffolds, which were then immersed in a simulated body fluid (SBF) solution to mimic physiological conditions and promote hydroxyapatite (HA) nucleation. Scanning electron microscopy (SEM) assessed HA growth and distribution over one, two, and three weeks of immersion. X-ray diffraction (XRD) analysis provided insights into the crystallinity and phase composition of the films and scaffolds, while Fourier-transform infrared spectroscopy (FTIR) confirmed HA formation across all samples. The SEM results revealed consistent apatite-like deposition on all constructs, highlighting their potential in bone tissue engineering. FTIR analysis further demonstrated enhanced interactions between the biopolymer matrices and TiO_2NPs, which significantly bolster the materials' suitability for biomedical use. This study underscores the promise of TiO_2NPs-biopolymer composites in promoting bone regeneration, paving the way for future research and application in regenerative medicine.

Keywords: Bone regeneration; biopolymers; TiO_2 nanoparticles; film; scaffold

ID-038

Modification Strontium Oxide Concentration Stimulated Optical Properties of $Er^{3+}/Gd^{3+}/Yb^{3+}$ Tri-Doped Phosphate Glass

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Abstract. Phosphate glasses have been extensively studied in many fields such photonic applications, solid state laser, optical fiber, biomedical and many more due to their promising properties in several aspects. In particular, phosphate glasses properties such as low melting temperature, prominent transparency for visible light, low refractive index and dispersion, high luminous for ion doped concentration, and large emission and absorption cross sections are advantageous for white light emitting diodes (W-LEDs). But, conventional pure phosphate glasses relatively poor electric and thermal stability, which limits their applications. Glass composition can be optimized by adding other oxides such as Li_2O, ZnO and SrO to achieve stable network glass structure. Recently, various type of dopant is being added to achieved desires luminescence and energy transfer properties. In this work, Er^{3+}, Gd^{3+} and Yb^{3+} doped to glass system and the concentration decided so that it is compatible with and can improve its function in an application. In order to understand the influence of dopant concentration to properties, determination of the right amount of SrO as modifier in the glass system is also needed. A series of Er^{3+}, Gd^{3+} and Yb^{3+} tri-doped phosphate glasses with composition $(48.5-x)P_2O_5 - 30Li_2O - 20ZnO - (x)SrO$, where $0 \leq x \leq 5$ were prepared by melt quenching technique and their spectroscopic characterizations were made. The XRD spectra shows abroad hale which means the nature of the glass is amorphous. Glass samples are characterized via FTIR to examine the SrO concentration dependent structural properties. FTIR spectra revealed broad absorption bands (weak and strong) in wavenumber range of 1400 to 400 cm^{-1}. Thermal properties, including glass transition temperature (T_g), crystallization temperature (T_c), and crystal melting temperature (T_m) were obtained using DTA. The UV-Vis-NIR absorption spectra are recorded in the range of 200-800 nm. Using the UV absorption edge, the values of optical band gap energy (E_{opt}) and the Urbach energy (ΔE) are evaluated. It is demonstrated that SrO plays the role as an intermediate of glass formation and transforms the role to network-former or glass modifier depending on composition. The role of SrO in influencing the optical responses are analyzed and discussed. It is suggested that SrO contents assisted modification in the structure and absorption behavior is attributed to the relaxing selection rules for forbidden transitions as well as reduction in the multi-phonon relaxation rate. Meanwhile, the observed optical improvements suggest that these glass compositions are potential for development of phosphate glass based efficient solid state laser.

Keywords: Phosphate glass, strontium oxide, erbium, gadolinium, ytterbium, tri-dopant

ID-039

Andrographis paniculata as a Corrosion Inhibitor for Mild Steel in Artificial Seawater: Electrochemical, DFT and MD Simulation

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Abstract. In the field of corrosion control practices, the challenges for sustainable and environmentally friendly corrosion inhibitors have become paramount. This study focused into the potential of *Andrographis paniculata* extract, derived from its leaves, as a highly effective corrosion inhibitor for protecting mild steel surfaces exposed to artificial seawater. Multiple analytical techniques were employed to assess the inhibitory properties of this material, encompassing traditional weight loss analysis, electrochemical impedance spectroscopy (EIS), potentiodynamic polarization (PDP), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM) in conjunction with energy dispersive X-ray (EDX) analysis, field emission scanning electron microscopy (FESEM), density functional theory (DFT), molecular dynamic (MD) simulations, and antimicrobial evaluations via the disk-diffusion method. The outcomes of this investigation reveal that the inhibitors exhibit mixed-type behavior, adhering to the Langmuir adsorption isotherm. Furthermore, the study delves into the geometric optimization and computational assessment of the corrosion inhibition potential of the major compounds within the inhibitor. Notably, the inhibitor displayed excellent antimicrobial properties against six bacteria, with the highest efficiency of 65.10% was recorded against *Pseudomonas aeruginosa*.

Keywords: Corrosion inhibition; Andrographis paniculata; MD simulation; Density functional theory

ID-040

Effect of Two-Step Sintering Temperature and Time on Microstructure and Electrical Properties of Low-Voltage $BaTiO_3$-Based ZnO Varistor Ceramics

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Abstract. $BaTiO_3$-based ZnO varistor ceramics for low-voltage applications were prepared by two-step sintering. In the two-step sintering process, the range of temperature at the first stage was varied between 1100-1300 °C for 10 minutes, while in the second stage of the sintering, the temperature was in the range of 1000-1200 °C for 6-10 hours range of soaking time. Two-step sintering further enhanced microstructure and electrical properties at higher sintering temperatures, even though there was slight degradation with longer soaking times. X-ray diffraction result indicate a main ZnO phase with the presence of minor $BaTiO_3$ and BaO phases. The results showed that, increasing sintering temperature from 1100 to 1300 °C, increased the grain size and density, consequently, the breakdown field decreased. These changes, led to a switch in the varistor application to low voltage. The decreased average grain size and small coefficient of variation with longer soaking times suggests effective grain growth control by the two-step sintering, which indicates a fine-grained structure. The sample sintered at highest temperature and shortest soaking time exhibits the best varistor properties.

Keywords: ZnO varistor; Barium titanate; Two-step sintering; Low-voltage; Nonlinear electrical properties

ABSTRACTS
(Online Oral Presentation)

VP-001

Sensitivity of X-Ray Response Potential of DY^{3+} Activated Al-Li-Zn Borate Glass and TLD-100 Chips for Radiation Dosimetry Applications

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Abstract. The study investigates and compares Al-Li-Zn borate glass activated with Dy^{3+} ions for radiation dosimetry with TLD-100 chips. Melt-quenching technique was used for glass fabrication. The glass density of 2.675 g/cm^3 and a molar volume of 29.78 cm^3/mol. Amorphous nature of the glass was confirmed with X-ray diffraction. Dosimetric tests revealed an average sensitivity of 30.5, 527.7 nC/gmGy for Dy^{3+} doped and TLD-100 chips respectively, exposure to a 5–30 mGy dose of X-ray and 14.4, 1.1 nC/gmGy for Dy^{3+} doped and TLD-100 chips respectively, exposure to 40–70 mGy of X-ray radiation. The glass sample shows a dosage repeatability of 7.1 and little signal fading over time. At low X-ray levels, TLD-100 chips perform better than Dy^{3+} activated Al-Li-Zn borate glass; at high levels, the glass stays consistent. Results show that Al-Li-Zn borate glass doped Dy^{3+} as a good material for radiation dosimetry

Keywords: Thermoluminescence; X-ray Sensitivity; Dy^{3+} Activation; Al-Li-Zn Borate Glass; Radiation Dosimetry.

VP-002

Effect of Heat Treatment on Microwave Dielectric Properties of Erbium Doped Borotellurite Glass-Ceramics

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Abstract. Glasses with composition of 69TeO2-10B2O3-10PbO-10ZnO-1Er2O3 were produced using melt-quenching technique. The impact of heat treatment in modifying the spectrum characteristic of erbium doped borotellurite are investigated with varied heat treatment time from 1 to 24 h. The change in bonding of non-bridging oxygen (NBO) ions is responsible for the heat treatment time dependent alterations in density, molar volume, structural and dielectric investigations. X-ray diffraction pattern confirms the amorphous nature of BTPZE sample. FESEM micrograph reveals the nucleation of heat treated having an average diameter of grain size in the range 0.237 – 1.509µm. Resonant method at around frequency of 7 GHz had been employed to study the dielectric constant and tangent delta at glass and glass ceramics phases for different crystallization time. The experimental results show that volume fraction of the crystalline phase increased, dielectric constant with highest value of 13.6784, dielectric loss below 0.01 which indicates that the as-prepared glass-ceramic is good fit for microwave application.

Keywords: Borotellurite glass; Erbium; Dielectric constant; Tangent delta; Resonant method.

VP-003

Effect of Embedding TiN NPs on Optical Properties of Nd^{3+}/Tm^{3+} Co-doped Tungsten-Bismuth-Zinc-Tellurite Glass

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Abstract. Titanium nitride nanoparticles (TiN NPs) embedded into Nd^{3+}/Tm^{3+} doped tungsten–bismuth–zinc oxyfluorotellurite glass is prepared using melt-quenching technique with formula: $60.97TeO_2$–$28ZnF_2$–$6.7WO_3$–$3.3Bi_2O_3$–$0.015Nd_2O_3$–$0.5Tm_2O_3$–xTiN NPs where x = 0.0, 0.1, 0.2, 0.3, 0.4, and 0.5 mol% in excess. Physical parameters such as density, molar volume, molar refractivity, and electronic polarizability are calculated. The absorption of the glasses is measured using a UV-Vis-NIR absorption spectrometer and eight absorption bands were observed, centred around 467, 526, 583, 687, 794, 877, 1212, and 1691 nm corresponding to Nd^{3+} and Tm^{3+} ions transition state from the ground to their respective excited state. Inclusion of TiN NPs at 0.3 mol% significantly improved the absorbance of Tm^{3+} near 1691 nm. Seven notable luminescence peaks are evidenced around 510, 587, 626, 648, 794, 801, and 890 nm using photoluminescence spectrometer corresponding to Nd^{3+} and Tm^{3+} ion transition state. The highest luminescence enhancement is demonstrated around 794 nm for glass contained 0.5 mol% TiN NPs, about 1.19 times. The study reveals that the incorporation of TiN NPs significantly modifies the luminescence behaviour of Nd^{3+}/Tm^{3+} co-doped oxyfluorotellurite glass, showcases their potential as improved fibre optic and solid-state laser materials.

Keywords: Titanium nitride; Nanoparticle; Tellurite glass; Neodymium; Thulium; Rare-earth.

VP-004

Cuprous Oxide Nanoparticles: Synthesis, Characterization, and Antibacterial Efficacy

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Abstract. The increasing prevalence of multidrug-resistant microbes poses a significant global public health threat. Nanotechnology, a multidisciplinary field, has recently emerged as a crucial tool in combating bacterial infections. Copper-based nanoparticles are particularly effective antibacterial agents due to their excellent antimicrobial properties, affordability, and wide availability. This study focuses on the synthesis of cuprous oxide nanoparticles (CuONPs) functionalized with cetyltrimethylammonium bromide (CTAB), referred to as CTAB-CuONPs, using a rapid microwave-assisted method. The CTAB-CuONPs produced exhibit a distinct cubical shape with an average size of 96.1 ± 4.5 nm and demonstrate high crystallinity, as confirmed by X-ray diffraction (XRD) and transmission electron microscopy (TEM) analyses. The functionalization with CTAB is intended to enhance the stability and dispersibility of the nanoparticles in aqueous solutions. Antibacterial activity assays were conducted to evaluate the efficacy of CTAB-CuONPs against Escherichia coli (E. coli) and methicillin-resistant Staphylococcus aureus (MRSA). The results revealed that a low concentration of 25 ppm of CTAB-CuONPs exhibited remarkable antibacterial activity. Specifically, the CTAB-CuONPs were highly effective against MRSA at this concentration, indicating a significant potential to combat this resistant strain. In contrast, E. coli required a higher concentration of 50 ppm to achieve the minimum bactericidal concentration (MBC), highlighting a differential susceptibility between the two bacterial strains. These findings suggest that CTAB-CuONPs, synthesized via a rapid and efficient microwave-assisted method, hold great promise as a potent antibacterial agent against multidrug-resistant bacteria, particularly MRSA.

Keywords: Antibacterial activity; Cuprous oxide nanoparticles; CTAB; Microwave-assisted synthesis method.

VP-007

Modification of Manganese Sulfide by a-C:H Thin Film via Hydrogen Flowrate for Supercapattery

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Abstract. Supercapattery has emerged as one of the possibilities in the electrochemical energy storage system as a consequence of the expansion of technological advancement and the electrical vehicle sector. The hydrogenated amorphous carbon/ manganese sulfide (a-C:H/MnS) nanosheets were fabricated via hydrothermal assisted plasma-enhanced chemical vapour deposition (PECVD) at various flow rates (70, 80, 90 and 100 sccm). The existence of a-C:H/MnS revealed by the X-ray diffraction (XRD) diffractogram, and a-C:H was effectively grown on MnS. The a-C:H/MnS were seen under a field emission scanning electron microscope (FESEM). The findings of BET studies demonstrate that a-C:H/MnS-90 has the highest surface BET (SBET) and the smallest pore size distribution (PSD), which later increases the total surface area of a-C:H/MnS for an effective energy storage mechanism. Through electrochemical analyses, a-C:H/MnS-90 has a maximum specific capacity of 2559 C/g at 0.8 A/g and a 47% rate capability.

Keywords: Amorphous Carbon; Electrode; Energy Storage; Metal Sulfide; Thin Film

VP-008

The Influence of Mg and Li Dopant on Transport Properties of 1T, 2H and Defect TiS_2

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Abstract. Transition Metal Dichalcogenides (TMDCs) possess unique electrical, optical, and mechanical characteristics, which make them extremely suitable for thermoelectric applications. These features are due to their adjustable band gaps, high carrier mobility, and robust spin-orbit coupling. Furthermore, the combination of their low thermal conductivity and high Seebeck coefficient significantly improves their capacity for effective thermoelectric energy conversion. This work examines the thermoelectric characteristics of TiS_2 that have been doped with magnesium (Mg) and lithium (Li) in their 2H (hexagonal) and 1T (trigonal) phase structure. We conducted a comprehensive analysis of the impact of Mg and Li doping on the electrical conductivity, Seebeck coefficient, thermal conductivity, and power factor of transition metal dichalcogenides (TMDCs). The calculation is performed using the Quantum ESPRESSO within the framework of Density Functional Theory. The BoltzTraP2 program is used to compute the transport properties by utilising the outcomes of the DFT computations to ascertain crucial transport coefficients. This study will provide important facts into the transport properties of the material, hence facilitating further development of advanced thermoelectric devices.

Keywords: Transition metal dichalcogenides; 2D monolayers; Transport properties; Density functional theory; TiS_2.

VP-009

Impact of Polyethylene Glycol plasticizer on the Conductivity and Dielectric Properties of 2-Hydroxyethyl Cellulose Doped with Ammonium Thiocyanate Electrolytes

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Abstract. The utilization of biopolymer electrolytes (SBE) derived from natural polymers represents a promising avenue for advancing solid-state battery technology, offering safer and more efficient energy storage solutions. Implementation of salt doping and plasticizer incorporation has proven to be effective in enhancing the performance of SBE. In this research, an electrolyte system comprising polyethylene glycol (PEG) plasticized 2-hydroxyethyl cellulose doped with ammonium thiocyanate was fabricated using the solution casting technique. The resulting system exhibited an increase in ionic conductivity from 1.16×10^{-4} S/cm to 1.76×10^{-3} S/cm with the addition of 8wt.% PEG. Additionally, further studies on electrical properties of the SBE system were carried out through dielectric studies to clarify the impact of PEG on both ionic conductivity and dielectric behavior where it indicated that the SBE system is ionic as evidenced by the presence of a relaxation peak. The analysis of the conductivity was further study in relation to temperature which showed that the SBE system maintained up to 373 K and obeys Arrhenius law. Furthermore, Rice and Roth analysis was used to identify the parameters influencing conductivity. The results revealed that the diffusion coefficient (D) and ion mobility (μ) had a major impact on the conductivity of the SBE system.

Keywords: Solid biopolymer electrolyte (SBE); 2-hydroxyethyl cellulose (2HEC); Ammonium thiocyanate (NH_4SCN), Polyethylene glycol (PEG); Dielectric properties; Rice and Roth.

VP-010

Electrical Properties of Bio Based Polymer Solid Electrolyte Influence by Ammonium Carbonate Doped 2-Hydroxyethyl Cellulose

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Abstract. Solid-state biopolymer electrolytes (SBE) have been gaining popularity as viable alternatives to conventional liquid electrolytes, as they are proved to rectify the environmental issues and the limitations of liquid as the medium for electrolytes. In this study, a SBE system has been prepared by doping ammonium carbonate ($(NH_4)_2CO_3$) into 2-hydroxyethyl cellulose (2-HEC) at various weight percentage (wt%) using solution casting method. The electrical study was done through Electrical Impedance Spectroscopy (EIS), where the highest ionic conductivity achieved is 1.64×10^{-7} Scm^{-1} for SBE containing 20 wt% of $(NH_4)_2CO_3$. Based on the temperature dependence study, the SBE maintained its performance up to 70°C, while the dielectric and modulus study confirmed the non-Debye behavior of this SBE. The conduction process for this system influenced by the ionic mobility and diffusion coefficient revealed from the transport parameters study using Rice and Roth model.

Keywords: Solid biopolymer electrolyte; 2-hydroxyethyl cellulose; Ammonium carbonate; Electrical study; Rice and Roth model

VP-011

Enhancing Radiation Shielding in Bismuth-Boro-Tellurite Glass with Thulium Doping: Evaluations Using WinXCom and PHY-X/PSD Programme

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Abstract. This article reports the influence of thulium oxide on radiation shielding parameters of $\{[(B_2O_3)_{0.25}(TeO_2)_{0.75}]_{0.75}[(Bi_2O_3)_{0.25}]\}_{1-x}[Tm_2O_3]_x$ glass system. The WinXCom and Phy-X/PSD programme have been used to evaluate the radiation shielding parameters such as mass attenuation coefficient, μ_m, half value layer, HVL, mean free path, MFP, and effective atomic number, Z_{eff}. Significant variations have been observed for all parameters when changing photon energy and glass composition. The radiation shielding performance of the present glass system reaches its best when the Tm_2O_3 is at 0.030% mol. The best value for mass attenuation coefficient, μ_m at photon energy 117 keV, 133 keV, and 662 keV for WinXCom are 0.08379, 0.05616, and 0.046471 cm^2/g, while for Phy-X/PSD are 0.092943, 0.058092, and 0.053482 cm^2/g respectively. The decreasing pattern of HVL and MFP values for the present glass system is attributed to the rise in density and the mass attenuation coefficient of the glasses. The findings indicate that incorporating thulium oxide (Tm_2O_3) into the glass system enhances the radiation shielding characteristics, as the addition of this dopant effectively reduces the intensity of gamma irradiation.

Keywords: Boro-tellurite; radiation shielding; thulium oxide; mass attenuation coefficient; MFP; HVL

VP-012

Structural, Electromagnetic, and Microwave Absorption Properties of Lightweight α-Fe_2O_3/AC Nanocomposites

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Abstract. In the world of electronics and technology, there has been a recent surge in demand for the development of lightweight radar stealth technologies with strong electromagnetic interference-absorbing capabilities. This study explored the potential benefit of incorporating the Iron Oxide Nanoparticles (α-Fe_2O_3 NPs) with the Activated Carbon (AC) particles to produce a lightweight and high-absorbing efficiency of the Microwave Absorbing Materials (MAMs) prepared by the High Energy Ball Milling (HEBM) technique. By uniformly incorporating the NPs into the epoxy matrix for X-band and Ku-band absorbers with 0, 40, and 60 wt% of AC concentrations, the Fe_2O_3/AC nanocomposites loading at 1- and 2-mm thickness were fabricated. The VNA results showed that the minimum reflection loss (RL) values for Fe_2O_3/AC with 60 wt% composite were −28.84 dB at 2 mm thickness, at a peak frequency of 13.56 GHz. The impedance matching characteristic is enhanced by the porosity of the carbon and the optimum thickness of the Fe_2O_3/AC absorber. The composite's improved conductivity and polarization sites that are responsible for enhancing microwave absorption have been successfully improved due to the high value of ε' and ε" in the Fe_2O_3 nanoparticles. The Fe_2O_3/AC nanocomposite synthesized via the HEBM technique has great potential to become a lightweight MAM.

Keywords: Iron (III) oxides (Fe_2O_3); Activated carbon (AC); Microwave absorbing materials (MAMs); Vector network analyzer (VNA), Reflection loss (RL); High-energy ball milling (HEBM)

VP-013

Microwave Absorption Characteristics of Spinel Fe_2O_3/Biochar Composites for Improved Electromagnetic Wave Attenuation

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Abstract. This study presents a new, spinel Fe_2O_3/palm kernel-based biochar (BC) composite developed for electromagnetic wave (EMW) absorption. The research focuses on key components, including carbon layer structures and periodic metal oxide (Fe_2O_3) morphology. The composite microstructures were precisely controlled by adjusting the ratio of the magnetizing element to the BC activator. Intensive ball milling techniques were used to fine-tune the magnetic and conductive properties of the IO/BC nanocomposites. The resultant pores and uniform structures enhanced multiple types of interface polarizations. Sample 6:4 exhibited minimum reflectance (*RL*) values of -14.28, -13.53, -13.07, and -10.16 dB at 3 mm. The *RL* values were primarily centered in the X and Ku bands, with reflectivity ($RL \leq$ -10 dB) covering a frequency range of approximately 13 GHz. In summary, the composites demonstrated effective interface engineering, a large specific surface area, and significant magnetic and dielectric loss.

Keywords: Ball milling technique; Electromagnetic wave absorption; Fe_2O_3/biochar composites; Magnetic and dielectric loss.

VP-014

Effect of Hybrid NiF/MWCNTs Materials Thickness on EMI Shielding Performance

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Abstract. Nanocomposites material of hybrid Nickel ferrite ($NiFe_2O_4$ (NiF))/ Multiwall carbon nanotubes (MWCNTs) successfully synthesized by a simple method, microwave-assisted combustion (MAC) using urea (CH_4N_2O) as a fuel. The prepared nanocomposite was characterized by various techniques via an X-ray diffraction (XRD), a Vibrating Sample Magnetometer (VSM) and a Field Emission Scanning Electron Microscopy (FESEM). The XRD confirmed the crystalline phase formation of the hybrid NiF/ MWCNTs nanocomposites. The FESEM images revealed irregular spherical shape of NiF deposited on MWCNTs which have a spiral curly-like and twisted fibre structure. The EMI (Electromagnetic Waves Interference) shielding effectiveness of nanocomposites were measured by a Vector Network Analyzer in the Ku-band frequency region (12 GHz – 18 GHz) at different thickness which are 1mm, 2mm, and 3mm. The highest total shielding effectiveness (SE_T) for 1mm, 2mm and 3mm thickness was achieved by $NiFe_2O_4$/2wt% MWCNTs nanocomposite. The SE_T is increasing as the thickness increases from 7.98 dB at 13.65 GHz, 13.79 dB at 13.08 GHz, and 14.73 dB at 12.0 GHz in 1mm, 2mm and 3mm thickness respectively. The obtained results indicate that the thickness of the materials and hybrid nanocomposite/MWCNTs influence the EMI shielding performance of the materials. The hybrid nanocomposite/ MWCNTs is also a promising candidate for wider applications in EMI shielding applications.

Keywords: Nickel ferrite (NiF); Multiwall carbon nanotubes (MWCNTs); Total shielding effectiveness (SE_T); Vector network analyzer; EMI (Electromagnetic Waves Interference) shielding

VP-015

Advances in Wastewater Treatment for Irrigation Purpose; A Case Study of Nigeria

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Abstract. Continuous population growth, industrialization, and advancement in agricultural activities lead to a higher rate of pollutant generation. Most of these emerging contaminants end up in the water through several means and pose great environmental and health threats. Wastewater generated from industrial, domestic, and agricultural activities is therefore considered to be contaminated and, thus, unsafe for recycling for agricultural and other purposes. As the pressure on the available freshwater sources continue to increase, wastewater recycling for irrigation purpose continue to gain more attention. To address this issue, an effective wastewater assessment and treatment technologies need to be employed. The aim of this review is to provide valuable insights and recommendations to support the advancement of wastewater recycling initiatives and contribute to the overall sustainability and water resource management efforts in Nigeria. This is to be achieved by assessing the conventional and emerging treatment technologies, in terms of their strength and weaknesses in the removal of emerging contaminants from water/wastewater. The paper covers the sources, characteristics, and quality of wastewater, effect of wastewater on soil morphology and geomorphology, the fate of heavy metals in wastewater irrigation, and comparisons of some treatment technologies.

Keywords: Water contaminants, pollution, wastewater recycling, Irrigation

VP-016

Measurement and Numerical Simulation of Transmission and Reflection Characteristics of Recycled Hematite/OPEFB Fiber/Polycaprolactone Nanocomposites using Microstrip Line and Finite Element Method

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Abstract. Recycled hematite/OPEFB fiber/polycaprolactone nanocomposites were fabricated for microwave absorbing applications in the 1 – 4 GHz range. The aim of the study was to compare the magnitudes of the measured and simulated transmission (S_{21}) and reflection (S_{11}) parameters of the nanocomposites using the microstrip line technique and the Finite Element Method (FEM), since accurate measurement of electromagnetic parameters is essential for assessing the attenuation performance of microwave absorbing materials. The FEM simulation was carried out on COMSOL Multiphysics® version 5.2 and was based on the geometry of the microstrip line used for the measurements. The comparison showed that FEM simulated S_{21} and S_{11} profiles closely matched the measured by a mean relative error of less than 2% for S_{11} and 1% for S_{21}, indicating a very good agreement between both techniques. Hence, the measured parameters could reliably estimate the microwave absorption properties of the nanocomposites in the stated frequency range.

Keywords: Recycled hematite; Finite Element Method; Scattering Parameters; OPEFB Fiber.

VP-017

Enhanced Magnetic and Microwave Absorption Properties of Mn-Ni Substituted $BaTiCoMn_{0.5-x}Ni_xFe_{10}O_{19}$ in 8-18 GHz

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Abstract. The Mn-Ni substituted $BaTiCoMn_{0.5-x}Ni_xFe_{10}O_{19}$ (x=0.1, 0.15) hexaferrite with an M-type structure were synthesized using solid-state method techniques. The main objective of this study was to investigate the impact of Mn-Ni substitution at Ti-Co sites on the structure, magnetic and microwave absorption properties. The phase composition of the M-type hexaferrite was confirmed by X-ray diffraction analysis. The morphology of M-type hexaferrite was examined using field emission scanning electron microscopy (FESM), which revealed a minimum sample size of 17 nm. The magnetic hysteresis loops were utilized to determine the saturation magnetization (M_s), remanent magnetization (M_r), and coercivity (H_c) of samples. The microwave absorbing properties of M-type composite were evaluated using a vector network analyzer (VNA). By increasing the ratio of Mn^{2+} ion from 0.3 to 0.4, the reflection loss of the hexaferrite composite improved from -39.2 dB at 12.9 GHz to – 40.5 dB at 13.7 GHz while maintaining a matching thickness of 2 mm.

Keywords: M-type, Nano-ferrite composite, Calcination, Sintering, Substitution

VP-018

Effect of Gamma Radiation on Crystallinity and Size of Crystallites Entity in Black Pepper

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Abstract. X-ray diffraction measurements are conducted on black pepper (*Piper nigrum L.*) from Semenggok variety gamma-irradiated with 1, 3 and 5 kGy dosages. The objective of this work is to determine the effect of irradiation at varying dosage on the crystallinity and size of crystallites entity in the samples. For all the dosage levels, the X-ray diffraction profiles show a similar peak intensity shape from crystallites in the samples. However, the peaks' detailed features appear to vary with the dosage levels, indicating the irradiation affects the crystallite. The quantitative analysis of the peaks' intensity shows a significant change in the values of crystallinity and size of crystallites due to irradiation applied to the sample. Knowing the variation in the crystallinity and crystallites size could be useful for researcher to optimize the physical gamma treatment procedures on the sample because the different level of crystallinity and crystallite size in the sample will require different treatment procedures.

Keywords: Gamma; Irradiation; Crystallinity; Semenggok; Crystal structure.

ABSTRACTS
(Virtual Poster Presentation)

PP-001

Study The Nicotine Exposure Towards Human Blood

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Abstract. Smoking is known as one of the leading causes of premature death. It is also a major cause that leads to mortality and morbidity like cancer and cardiovascular diseases. Based from the previous research, the effects can be seen when blood was taken directly from a smoker when examined by using FTIR and AFM. In this research, it emphasizes the findings from the previous research about the effects of nicotine exposure which was to prove does nicotine induce haemolysis, to investigate the effects of 3 different nicotine levels on blood and to study the structure of erythrocytes before and after the exposure. Blood sample was taken to be exposed to 3 different types of cigarettes which were Winston Red, Winston Green and Winston Blue with different levels of nicotine in them. FTIR, AFM, UV-VIS and microscopic study using Meiji Microscope were used. The findings from the AFM and microscopic study indicate that smoking lead to changes on the blood like potholes on the surface, swelling of shapes, darkened the red blood cell membranes, rupturing of erythrocytes or haemolysis. While UV-VIS shows the presence of NADH and FAD in the plasma are twice in concentration than the control plasma. It proved that the average life span of red blood cell for smoker is less than the non-smoker's as the red blood cell is in their abnormal shapes.

Keywords: Nicotine; Cigarette; Erythrocyte; Effects.

PP-002

SBE-Modified Iron (III) Oxide Photocatalyst for Removal of Aniline

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Abstract. The reuse of spent bleaching earth (SBE), a solid waste generated from the palm oil industry, is essential for wealth generation and environmental sustainability. Iron (III) oxide (Fe_2O_3), chosen for its abundance and environmentally benign nature, was investigated as a potential photocatalyst. This study focused on the effectiveness of SBE-modified Fe_2O_3 photocatalysts (Fe/SBE) in removing aniline from aqueous solutions. A series of Fe/SBE was prepared at 773 K *via* the impregnation method. XRD analysis confirmed the presence of both SBE and Fe_2O_3 diffraction peaks, while DR UV-Vis spectra revealed absorption peaks at *ca*. 390 nm and a wide absorption range around 500-800 nm. SEM images indicated that Fe/SBE particles had an average diameter of 20 □m. The photocatalytic performance of Fe/SBE was evaluated for aniline removal under fluorescent light irradiation for 5 hours. The results showed that SBE alone removed 10% of aniline, whereas the Fe/SBE photocatalysts showed higher activity, with the best activity achieving 37% aniline removal.

Keywords: SBE, Fe_2O_3, Photocatalyst, Palm, Waste, Aniline

PP-003

Ecotoxicology Perspective of Epoxidised Palm Methyl Oleate (EPMO): A Potential Low Toxicity Plasticizer

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Abstract. Plasticizers are compounds added to polymers to facilitate processing and increase the flexibility of the final product by modifying the polymer molecules internally. The most commonly used plasticizers worldwide are phthalic acid esters, such as di(2-ethylhexyl) phthalate or DEHP. However, these petroleum-derived plasticizers pose environmental concerns due to their tendency to leach out of the substrates, raising significant issues regarding their toxicity. An environmentally friendly alternative is the palm-based plasticizer, namely epoxidized palm methyl oleate (EPMO), which is safer for the environment over prolonged use due to the presence of ester linkages formed during the epoxidation process. Ecotoxicity studies with microalgae, the major producers in aquatic ecosystems, have shown that the 72-hour EC_{50} values for DEHP and EPMO were 45 mg/l and 98 mg/l, respectively. Therefore, in the actual environment, EPMO is expected to exhibit lower toxicity to microalgae communities compared to DEHP.

Keywords: Epoxidized Palm-based Methyl Oleate (EPMO); Ecotoxicity; Microalgae.

PP-006

Microwave Absorption Characteristics of Spinel Fe_2O_3/Biochar Composites for Improved Electromagnetic Wave Attenuation

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Abstract. This study presents a spinel Fe_2O_3/palm kernel-based biochar (BC) composite developed for electromagnetic wave (EMW) absorption. The research focuses on key components, including carbon layer structures and periodic metal oxide (Fe_2O_3) morphology. The composite microstructures were precisely controlled by adjusting the ratio of the magnetizing element to the BC activator. Intensive ball milling techniques were used to fine-tune the magnetic and conductive properties of the IO/BC nanocomposites. The resultant pores and uniform structures enhanced multiple types of interface polarizations. Sample 6:4 exhibited minimum reflectance (*RL*) values of -14.28, -13.53, -13.07, and -10.16 dB at 3 mm. The *RL* values were primarily centered in the X and Ku bands, with reflectivity ($RL \leq -10$ dB) covering a frequency range of approximately 13 GHz. In summary, the composites demonstrated effective interface engineering, a large specific surface area, and significant magnetic and dielectric loss.

Keywords: Ball milling technique; Electromagnetic wave absorption; Fe_2O_3/biochar composites; Magnetic and dielectric loss.

PP-008

Influence of Graphene Nanoplatelets (GNP) Size to the Mechanical and Electrical Properties of High-Density Polyethylene (HDPE) Composite

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Abstract. In this study, polymer composite is produced from the melt blending process of polyethylene with filler from graphene nanoplatelets (GNP). Graphene nanoplatelets (GnP) have slowly picking up as one of carbon-based materials for polymer composite filler due to its lower processing cost but having nearly the same properties as graphene and CNT. The analysis of graphene nanoplatelets size effect to mechanical and electrical properties of reinforced high-density polyethylene (HDPE) composite has been conducted. XRD analysis shows the concentration of GNP within the composite and scanning electron micrograph (SEM) results displayed a homogenous distribution GNP in polymer composite. The use of GNP improved mechanical properties, as evidenced by the increases in Young's modulus of yield strength. The presence of GNP also enhanced the conductivity of the composite and increased with the composition of GNP in composite. The nanocomposites with larger sizes of GNP exhibited increased of the dielectric constant with both higher GNP content and larger particle size.

Keywords: Graphene nano-platelets; High-density polyethylene; Electrical properties; Dielectric properties.

PP-009

Effect of Sintering Temperature on Hardness of Zr, Sm Co-Doped Ceria Solid Electrolyte

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Abstract. The primary objective of this research is to examine the impact of sintering temperature on the hardness properties of co-doped Ceria (CeO2) ceramics. Specifically, this study focuses on zirconium and samarium co-doped ceria solid electrolyte materials $Ce_{0.8-x}Zr_xSm_{0.2}O_{1.9}$ (x = 0 - 0.15) for solid oxide fuel cells, synthesized via a solid-state reaction method. The sintering temperatures investigated are 1460℃, 1480℃, and 1500℃. The study employed X-ray diffraction (XRD) to identify crystalline phases, density measurements to ascertain apparent and theoretical densities, volume-based shrinkage measurements, and Micro Vickers hardness tests to assess microhardness. XRD analysis revealed four main peaks across all sintering temperatures, indicating zirconia presence. Nearly full density was achieved for all samples, exceeding 90%, with the SDC sample sintered at 1400℃ attaining the highest relative density of 96.87%. At 1500℃, samples exhibited the greatest volume shrinkage. The Vickers hardness test indicated that microhardness was highest at 1500℃. Overall, the results demonstrate that both bulk density and hardness values increased with higher sintering temperatures.

Keywords: Hardness; Sintering Temperature; Solid electrolyte; Zirconia

PP-010

Enhanced Structure Properties of Al_2O_3-TiO_2 Nanocomposites Through Eggshell Incorporation for High-Temperature Applications

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Abstract. Aluminum oxide (Al_2O_3) matrix composites, while attractive for high-temperature applications, have toughness, ductility, and stability limitations. This study aims to address these limitations by incorporating eggshell (ES) powder into Al_2O_3-TiO_2 nanocomposites. The nanocomposite was fabricated via high-energy ball milling at different milling times (5 and 20 h) and ES compositions (2.5 and 15 wt%), followed by characterization using X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), and Fourier-Transform Infrared Spectroscopy (FTIR). The results showed that different amounts of ES introduction had considerable effects on the composite's microstructure and chemical structure. Prolonged milling for 20 h yielded a refined microstructure with less agglomerated morphology, attributed to enhanced deformation caused by the high-impact energy. FTIR analysis revealed significant alterations in the functional groups of the Al_2O_3-TiO_2-ES nanocomposite with increased milling time, suggesting modifications to its chemical structure. These findings indicate the potential of ES incorporation to enhance the properties of Al_2O_3-TiO_2 nanocomposites, making them suitable for demanding high-temperature applications.

Keywords: Al_2O_3-TiO_2; Eggshell; Ceramic matrix nanocomposite; High energy ball milling

PP-011

Investigation of Ion Conduction Mechanism in 2-HEC-AN-PC Conductive Bioplastic Using Impedance and FTIR Deconvolution Techniques

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Abstract. Conductive bioplastics (CB) have potential applications in energy storage due to their superior properties compared to liquid counterparts. In this study, 2-hydroxyethyl cellulose-ammonium nitrate-propylene carbonate (2-HEC-AN-PC) films were prepared with varying weight percentages of PC using the solution casting method. Electrical impedance spectroscopy (EIS) and Fourier transform infrared spectroscopy (FTIR) were employed to determine the structural and transport properties of the CB films. The optimal ionic conductivity of $(6.63 \pm 1.03) \times 10^{-4}$ S/cm was observed at 12 wt.% PC. Complexation between the constituents within the CB films was identified through FTIR analysis. Based on these analyses, a possible ion conduction mechanism within the CB films is proposed, involving enhanced H^+ ion transfer facilitated by the dissociation of NH_4^+ ions and their subsequent interaction with lone pair electrons on the oxygen atoms of 2-HEC, due to plasticization with PC. The combined results from FTIR deconvolution and EIS allowed for a detailed understanding of the transport mechanism in CB films, with observed trends closely correlating with the ionic conductivity of the CBs.

Keywords: Transport mechanism, conductive bioplastic, 2-HEC, impedance, FTIR

PP-012

Reduced Graphene Oxide-Silver Nanocomposite: A Novel Approach to High-Quality Conductive Paint

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Abstract. Silver nanoparticles (AgNPs) were incorporated into reduced graphene oxide (rGO) sheets, resulting in a hybrid material known as reduced graphene oxide-silver (rGO-Ag) nanocomposite. This nanocomposite was specifically designed to enhance the electrical conductivity of both constituent materials, making it versatile for applications across multiple scientific fields, including its use as conductive paint. This study demonstrated a simple method for producing rGO-Ag nanocomposite by utilizing different monosaccharides such as galactose, which served as both reducing and stabilizing agents, with varying reaction times (4 hours, 8 hours, 16 hours, and 24 hours). Characterization of the morphological and structural features of the rGO-Ag nanocomposite was performed using various analytical techniques, including Ultraviolet-visible (UV-Vis) Spectroscopy, X-Ray Diffraction (XRD), High-Resolution Transmission Electron Microscopy (HR TEM), and Raman Spectroscopy. The electrical conductivity of the rGO-Ag nanocomposite was assessed using a two-point probe method. Among the various synthesis durations, the 16-hour synthesis of the rGO-Ag sample yielded the most favorable results in the UV-Vis analysis, with a distinctive peak indicating the formation of monodispersed spherical silver nanoparticles on the rGO sheets. Additionally, the XRD analysis revealed a small crystallite size of 11.83 nm at the 16-hour mark, which was corroborated by HR TEM images and a corresponding histogram showing monodispersed silver nanoparticle sizes of 11 nm. The Raman analysis confirmed the smallest crystallite size, with the rGO-Ag nanocomposite displaying the highest D band to G band ratio. Subsequently, the study explored the electrical properties of the nanocomposite using a two-point probe, generating an I-V curve. The rGO-Ag sample synthesized over 16 hours demonstrated the lowest resistance value at 68.82 Ω and the highest conductance value at 14.52 x 10^{-3} S/m. As a result, rGO-Ag, produced using galactose as the reducing and stabilizing agent with a 16-hour reaction period, exhibited superior electrical conductivity characteristics. These properties make the rGO-Ag nanocomposite well-suited not only for various electrical device applications but also as a promising material for conductive paint, offering an innovative solution for creating electrically conductive surfaces.

Keywords: rGO-Ag Nanocomposite; Conductive Paint; Electrical Conductivity; Silver Nanoparticles; Galactose Reduction

PP-013

The Impact of Ball Milling on Morphology and Colour Attributes in the Preparation of Pineapple Pomace Superfine Powder

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Abstract. Pineapple processing generates substantial amounts of by-products, which are often discarded, contributing to increasing waste. Converting these by-products into superfine powder not only mitigates waste but also enhances their value by creating a versatile material suitable for use in various industries, including food, cosmetics, and pharmaceuticals. Among these by-products, pineapple pomace constitutes 50% of the waste generated by the juice processing industry. This research investigates the impact of ball milling on the morphology and colour attributes of pineapple pomace powder during its preparation as superfine powder, with unmilled powder as a comparison. The findings demonstrate that ball milling effectively achieves superfine pineapple pomace powder, significantly reduces the particle size, resulting in a fine, uniform powder with an average size of approximately 25.52 µm. Additionally, the process alters the powder's colour, with increased lightness and decreased yellowness, indicating changes in the natural pigment composition. These results highlight the importance of milling in optimizing the physical properties of organic materials, particularly in the production of superfine powders tailored for diverse applications. Moreover, this approach aligns with Sustainable Development Goal 12 (SDG 12) by promoting responsible consumption, sustainable waste management, and efficient resource utilization within the agricultural and food processing sectors.

Keywords: Pineapple; waste; ball milling; powder; SEM; colour.

PP-014

The Larvicidal Activity of Irradiated ZnO Nanoparticles against *Aedes Aegypti* Larvae

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abstract: Zinc oxide (ZnO) nanoparticle powder was produced using a zinc boiling furnace at 1300 °C boiling temperature. At this point, combustion occurs, and the produced vapor is cooled down in a two-meter cooling pipe. Eventually, the powders of ZnO were collected in the collected bag. Subsequently, the ZnO was mixed with water and ball milled for 24h with zirconia balls and separated into two suspensions; sediment and supernatant (ZnO-Sp). After separating, the supernatant was removed and divided into two groups; ZnO-Sp and gamma-irradiated ZnO-Sp-G. The ZnO-Sp-G samples have been exposed to Americium-241 a gamma ray source for 24 h. Then both ZnO powder was characterized for their morphology, structural, and optical properties using FESEM, XRD, and photoluminescence (PL) spectroscopy before testing larvicidal bioassay on *Aedes aegypti* larvae. Results show that ZnO-Sp and ZnO-Sp-G have slightly different average crystallite sizes, with ZnO-Sp having a lower intensity of the dominant peak in the ultra-violet region compared to ZnO-Sp-G in PL spectroscopy. On the other hand, ZnO-Sp has a lower O: Zn ratio (1.03) on ZnO surfaces compared to ZnO-Sp-G (1.33). This O: Zn ratio has been relatable to larvicidal effects because it influences the generation of oxygen species that cause larvae mortality. Deriving from larvae mortality, the lethal dose concentration at 50% (LC50) was anticipated using probit analysis. It shows that the LC50 for ZnO-Sp and ZnO-Sp-G were 74 mg/L and 66 mg/L respectively. This discrepancy may attributed to the O: Zn ratio of ZnO nanoparticle surfaces and the crystallite size reduction caused by gamma irradiation, whereby smaller particles have a bigger surface area that can react in oxygen species generation and influence the larvae mortality eventually.

Keywords: Zinc oxide, Aedes aegypti, larvicidal

PP-015

Investigating the Magnetic Properties of Millscale Waste: Opportunities for Sustainable Applications

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Abstract. Millscale waste, a byproduct of steel manufacturing, presents significant environmental challenges due to its accumulation and disposal issues. This study investigates the magnetic properties of millscale waste, with different sizes aiming to uncover its potential for sustainable applications. Through a series of experiments involving separation processes and particle size reduction, the magnetic susceptibility, hysteresis behavior, and structural characteristics of millscale samples were analyzed. Findings reveal that millscale exhibits unique magnetic properties that can be harnessed in various applications, including magnetic separation processes, construction materials, and environmental remediation techniques. By transforming this waste into a valuable resource, the potential for millscale to contribute to sustainable practices within the steel industry and beyond is highlighted. This research not only addresses waste management concerns but also opens new avenues for the utilization of millscale in innovative and eco-friendly applications.

Keywords: magnetic properties, millscale waste, ferromagtic, magnetite, hematite

PP-016

The Effect of Natural Dye Photosensitizer from Mangosteen Pericarp, Purple Grape Peel and Violet Bougainvilla Petal on Hybrid Solar Cell Zinc Oxide Nanorods Based

Nurul Alfatihah Mohd Arifin[a], Ahmad Nazri Dagang[a,b], Nik Aziz Nik Ali[c], Nur Salihah Alias[a] & Hasiah Salleh[a,b,*]

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Abstract. Hybrid solar cells are a promising potential replacement for inorganic semiconductor-based solar cells. This work focused on hybrid solar cells fabricated using grown ZnO nanorods and natural dyes extracted from *garcinia mangostana* l. pericarp (GMP), *vitis vinifera* peel (VVP), and violet *bougainvillea sp.* petal (BSP), which were used as a photosensitizer. The absorption spectrum of GMP, VVP, and BSP showed a broad absorption spectrum from 400 nm to 700 nm. The energy gap results showed that GMP has the lowest energy gap (1.824 eV) compared to VVP and BSP. The zinc oxide nanorod was successfully grown by using the hydrothermal method, with an average diameter of ~76.7 nm. The hybrid solar cell's zinc oxide nanorod fabricated using natural dye photosensitizers showed that GMP contributed the highest power conversion efficiency of 0.72%.

Keywords: Purple natural dye; zinc oxide nanorod; organic photosensitizer; hydrothermal method

PP-017

Crystallinity and Size of Crystallites Entity in Black Pepper (*Piper Nigrum L.*) Dried with Different Drying Methods

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Abstract. This work determines the crystallinity and size of crystallites entity in black pepper (*Piper nigrum L.*) from Kilas variety using X-ray diffraction technique and studies the variation of crystallinity and size of crystallites entity against the different drying methods, namely open solar drying, solar dryer and heat pump dryer. The observed X-ray diffraction profiles show the peak intensity resulting from crystallites in the samples, whose detailed features appear to vary with the drying processes. The quantitative analysis of the peak intensity shows a significant change in the crystallinity values and size of crystallites as the samples are subjected to different drying processes. These crystallinity and crystallite size data are expected to provide useful information for the researcher to perform further treatment such chemical or physical treatments on the after-heat-treated samples, because the sample with different crystallinity and crystallite size levels will have different 'responses' toward the applied treatment.

Keywords: *Piper nigrum L*; Crystallinity; Open solar drying; Solar dryer; Heat pump dryer.

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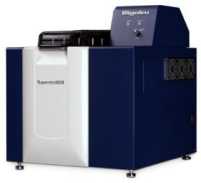

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