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VIRTUAL EVENT

7th EDITION OF

ADVANCED MATERIALS SCIENCE WORLD CONGRESS

MARCH 24-26, 2025

SCIENTIFIC PROGRAM

DAY 01
MONDAY

MARCH 24, 2025

GMT - Greenwich Mean Time

07:20-07:30	**Inaugural Ceremony**

Sessions: Materials Science and Engineering | Nanomaterials and Nanotechnology | Smart Materials | Biomaterials | Energy Materials | Crystallography | Graphene Technology | Chemistry | Carbon and 2D Materials | Semiconductors | Optics | Green Technologies | Metals and Alloys | Perovskites | Artificial Intelligence | Robotics | Catalysis

Distinguished Speaker Talks

07:30-07:50	Title: Chemical Design of Magnetic Switchable Molecular Materials **Giordano Poneti,** *Università degli Studi della Tuscia, Italy*
07:50-08:10	Title: Efficient Mapping of the Thalamocortical Monosynaptic Connectivity *in vivo* by Tangential Insertions of High-Density Electrodes in Cortex **Jeremie Sibille,** *Charité-Universitätsmedizin Berlin, Germany*
08:10-08:30	Title: Comparison and Critical Review of Durability Design in Design Codes **Diala Basim Al-Haddad,** *The British University in Dubai, UAE*
08:30-08:50	Title: Development and Performance Analysis of Microwave Planar Sensor for Food Quality Assessment **Kalindi Shivaji Shinde,** *Sardar Vallabhbhai National Institute of Technology, India*
08:50-09:10	Title: Enhancement in Optical and Electrical Characteristics of GaN-Based HEMT by SiNx Nano-Mask **Tu Huynh Pham,** *National Yang Ming Chiao Tung University, Taiwan*
09:10-09:30	Title: Theoretical and Numerical Study of the Decay in a Viscoelastic Bresse System **Mohammad El-Hindi,** *Beirut Arab University, Lebanon*
09:30-09:50	Title: Optical Properties and Band Gap Analysis of Perovskite Thin Films **Arevik Asatryan,** *A.B. Nalbandyan Institute of Chemical Physics, Armenia*

09:50-10:10	Title: An Overview of Design and Development of Biomimetic Bone Scaffolds Using Heterogeneous TPMS Lattice Structures
	Gangaram Mandaloi, *Rewa Engineering College, India*
10:10-10:30	Title: Nanotechnology: An Emerging Field for Enhancing Micronutrient Enrichment in Millets *via* Biofortification Strategies-Present Knowledge and Prospects for the Future
	Anbu Malar. M, *Stella Maris College (Autonomous) Chennai, India*
10:30-10:50	Title: Phytochemicals Screening, Antimicrobial Activities and Statistical Validation of Bioactive Compounds of *Morella Rubra Sieb. Et Zucc*
	Susan Sharma, *Kathmandu University, Nepal*
10:50-11:10	Title: A Biogenic Approach to Develop Guava Derived Edible Copper and Zinc Oxide Nanocoating to Extend Shelf Life and Efficiency for Food Preservation
	Susmita Dey Sadhu, *University of Delhi, India*
REFRESHMENT BREAK 11:10-11:30	
11:30-11:50	Title: Developments in Directed Metal-Catalyzed C-H Bond Functionalization
	Hamad H. Al Mamari, *Sultan Qaboos University, Oman*
11:50-12:10	Title: EDISnet: Enhanced Detection of Image Splicing Manipulations Using Siamese Networks
	Khawla Hussein Ali, *University of Basrah, Iraq*
12:10-12:30	Title: Stable and Efficient Data Transfer in Disaster Scenarios
	Ashwani Kush, *Kurukshetra University (KUK), India*
12:30-12:50	Title: Revitalising Golshan and Sharifiyeh Caravanserais: A study in Adaptive Reuse and Urban Preservation
	Faezeh Hoursan, *Sapienza University of Rome, Italy*
12:50-13:10	Title: Powering Rural Entrepreneurship Through Energy Production and Storage
	Rakesh Suryadevara, *ICFAI Law School, India*
LUNCH BREAK 13:10-13:50	
13:50-14:10	Title: Development of a Durable and Stable Optical Fiber Probe Using Polyvinyl Alcohol Hydrogel for Enhanced Sensing Applications
	Kavita Sharma, *Indian Institute of Technology Bombay, India*

14:10-14:30	Title: Microbial Production of N-Acetyl-D-Glucosamine (Glcnac) for Versatile Applications: Biotechnological Strategies for Green Process Development **Sancharini Das,** *Savitribai Phule Pune University, CSIR National Chemical laboratory, India*
14:30-14:50	Title: Degradation of Energetic Material 2,4,6, Trinitro Toluene Using Integrated Approach **Garima Upreti,** *Delhi Technological University, India*
14:50-15:10	Title: A Review of the Effect of Magnetic Field Using Nanofluids and Ultrasonic Amplification Technology on Water Desalination by Solar Stills **Kimya Samadi,** *Islamic Azad University, Iran*
15:10-15:30	Title: Universal Law of Response **Ugur Saglam,** *Istanbul University, Turkey*
15:30-15:50	Title: An Efficient Methodology for the Prediction and Improvement of Multi-Laser Shock Peening on Fatigue Life **Dawood Ahmed Desai,** *Tshwane University of Technology, South Africa*
15:50-16:10	Title: On Some Features of Complex Mechanical Systems Analysis **Alexander Trubayev,** *National Technical University "Kharkiv Polytechnic Institute", Ukraine*
REFRESHMENT BREAK 16:10-16:30	
16:30-16:50	Title: Water-Activated Polymers to Mitigate Growing Global Challenges in the Healthcare and Environmental Sectors **Richard J. Spontak,** *North Carolina State University, USA*
16:50-17:10	Title: Creating a Blockchain-Based Audit Trail for IoT Device Interactions and Data Exchanges to Enhance Transparency and Security **Firend Alan Rasch,** *American International Institute, USA*
17:10-17:30	Title: Engineering Conducting Polymer Interfaces for Enhanced Organic Photovoltaic Performance **Sugirtha Krishnamurthy,** *Apple Inc, USA*
17:30-17:50	Title: Analysis of Permanent Deformation in Asphalt Mixtures Using Mohr–Coulomb Criteria **Fabiano Pereira Cavalcante,** *JBR Engineering, Brazil*

17:50-18:10	Title: Guided Fantasy: Research for Innovation **Adriano Bernardo Renzi,** *MobileLIve Research Lab, Canada*
18:10-18:30	Title: On the Development of a Constitutive Model for Steel Subjected to Fire **Gustavo Provençano Vilardo,** *Federal University of Rio de Janeiro, Brazil*
END OF DAY 1	

SCIENTIFIC PROGRAM

DAY 02
TUESDAY

MARCH 25, 2025

GMT - Greenwich Mean Time

07:20-07:30	**Introduction**

Sessions: Materials Science and Engineering | Nanomaterials and Nanotechnology | Smart Materials | Biomaterials | Energy Materials | Crystallography | Graphene Technology | Chemistry | Carbon and 2D Materials | Semiconductors | Optics | Green Technologies | Metals and Alloys | Perovskites | Artificial Intelligence | Robotics | Catalysis

Distinguished Speaker Talks

07:30-07:50	Title: Electrosynthesis of Organic 2D Conducting Polymer Films **Luiza Aguiar do Nascimento,** *La Trobe University, Australia*
07:50-08:10	Title: The Performance of Handmade Silk Product's from Shkodra Region, Albania **Blerina Kolgjini,** *Polytechnic University of Tirana, Albania*
08:10-08:30	Title: First-Principles Insights on Si-Binder Interface for Next-Gen Lithium-Ion Batteries **Rita Maji,** *Università di Modena e Reggio Emilia, Italy*
08:30-08:50	Title: An Assessment and Mapping of Groundwater Potential Zones in Darjeeling Himalayan Region Using Frequency Ratio and Analytical Hierarchy Process **Kabirul Islam,** *Karajgram High School, India*
08:50-09:10	Title: Additive Manufacturing of Mo-SiC Multimaterial Component **Marina Aghayan,** *A.B. Nalbandyan Institute of Chemical Physics, Armenia*
09:10-09:30	Title: Cell Death Induction in 2D and 3D Prostate Cancer Models Through Green Nanoparticles Synthesized from *Stephania Glabra* **Reena Vohra Saini,** *MMEC, Maharishi Markandeshwar (Deemed to be University), India*
09:30-09:50	Title: The (TAWOCK) Model and their Effect on Training of Female Computer Teachers **Remsh Nasser Alqahtani,** *King Saud University, Saudi Arabia*

09:50-10:10	Title: Characterization of Polyhydroxyalkanoate Films and its Application **Shina Gautam,** *Harcourt Butler Technical University, India*
10:10-10:30	Title: Damage Accumulation and Estimated Nonfailure Operating Time of Ideal Elastoplastic Structures **Yuriy Neustadt,** *Samara State Technical University, Russia*
10:30-10:50	Title: Femtosecond Laser Ablation of Decagonal and Icosahedral Quasicrystals: Synthesis and Structural Analysis of Nanoparticles **Bibek Kumar Singh,** *Sikkim University, India*
REFRESHMENT BREAK 10:50-11:10	
11:10-11:30	Title: Facile Fabrication of a Z-Scheme G-C_3N_5/Gd-MOF/Silver Nanocube Composite as a New Generation Visible Light Active Photocatalyst for Abatement of Persistent Toxic Pollutants **Varsha UshaVipinachandran,** *Vellore Institute of Technology, India*
11:30-11:50	Title: Effect of Nano Fillers on Areca Fiber Reinforced with Hybrid Composites for Aerospace Application **Sanjay Kumar S M,** *SJB Institute of Technology, India*
11:50-12:10	Title: *In-situ* Bioremediation of 1,3,5-Trinitroperhydro-1,3,5-Triazine Contaminated Sediments Using Endemic Microbial Formulation **Avantika Shukla,** *Indira Gandhi Delhi Technical University for Women, India*
12:10-12:30	Title: Applications of Machine Learning and Deep Learning in Pavement Crack Detection and Characterisation: A Comparative Approach **Harris Khan,** *Near East University, Turkey*
12:30-12:50	Title: The Synthesis, Crystal Structure, Hirshfeld Surface Analysis, Luminescence, Aggregation Behaviors, (I–V) Characteristics, and Antibacterial Assay of Cd(II) and Zn(II) Complexes Containing 2-Mercaptopyridine **Arijit Das,** *Bir Bikram Memorial College, India*
12:50-13:10	Title: Testing Artificial Intelligence to Minimize Costs in the Fashion Industry: An Approach Towards Sustainable Advertising **Nadia Atiyah Atshan,** *Middle Technical University, Iraq*
LUNCH BREAK 13:10-13:40	

13:40-14:00	Title: Contradictions in the Generally Accepted Mechanism of Thermal Runaway in Lithium-Ion Batteries **Nikolay Efimovich Galushkin,** *Don State Technical University, Russia*
14:00-14:20	Title: Water Desalination Using Atmospheric Pressure Plasma Combined with Thermal Treatment **Ayman Ahmed Saber Mohamed,** *Sohag University, Egypt*
14:20-14:40	Title: Synthesis, Characterization and Application of Metal Nanoparticles from Plant Based Terpenoids – A Review **Manisha Agrawal,** *Krishna Vikash Group of Institution, India*
14:40-15:00	Title: The Role of Probiotics in Skin Care: Advances, Challenges and Future Needs **Fatemeh Safaei,** *Iranian Research Organization for Science and Technology, Iran*
15:00-15:20	Title: Performance Evaluation of 2D and 3D Beam and Channel Tracking Using Adaptive Filtering Techniques **Ruaa Shallal Abbas Anooz,** *University of Tabriz, Iran*
15:20-15:40	Title: Assessment of the Micro-Tensile Bond Strength of a Novel Bioactive Dental Restorative Material (Surefil One) **Reham A. Alzhrani,** *King Abdulaziz University, Saudi Arabia*
15:40-16:00	Title: 2D-BioPAD: Supple Graphene Bio-Platform for Point-of-Care Early Detection and Monitoring of Alzheimer's Disease **Apostolos Tsolakis,** *Q-PLAN International Advisors PC, Greece*
16:00-16:20	Title: Lipid-Based Nanoparticles as a Promising Treatment for the Skin Cancer **Parisa Golestani,** *Università del Piemonte Orientale, Italy*
REFRESHMENT BREAK 16:20-16:40	
16:40-17:00	Title: Tailings in Abandoned Mining Sites: Impact, Treatment and Recycling for Sustainable Development **Chiraz Abdelmalak Babbou,** *University of Tunis El Manar, Tunisia*
17:00-17:20	Title: Lesion Classification by Model-Based Feature Extraction: A Differential Affine Invariant Model of Soft Tissue Elasticity in CT Images **Weiguo Cao,** *Stony Brook University, USA*
17:20-17:40	Title: Comprehensive Evaluation of Rapid-Set Concrete Mixes for Pavement Repair **Daniel D. Akerele,** *University of Washington, USA*

17:40-18:00	Title: Quantum Chemical Studies of Carbon-Based Graphene-like Nanostructures: From Benzene to Coronene
	Alberto Soares Vanny, *Federal University of Espírito Santo, Brazil*
18:00-18:20	Title: Evolutionary Algorithms Approach for Search Based on Semantic Document Similarity
	Chandrashekar Muniyappa, *University of North Dakota, USA*
18:20-18:40	Title: SBB-Chi2-A2: Stacking of Bagging-Boosting with the Blend Chi-Square for effective Prediction of Aortic Aneurysm using Biomarker Profiling
	Saurabh Aggarwal, *San Jose State University, USA*
END OF DAY 2	

SCIENTIFIC PROGRAM

DAY 03
WEDNESDAY

MARCH 26, 2025

GMT - Greenwich Mean Time

07:20-07:30	**Introduction**

Sessions: Materials Science and Engineering | Nanomaterials and Nanotechnology | Smart Materials | Biomaterials | Energy Materials | Crystallography | Graphene Technology | Chemistry | Carbon and 2D Materials | Semiconductors | Optics | Green Technologies | Metals and Alloys | Perovskites | Artificial Intelligence | Robotics | Catalysis

Distinguished Speaker Talks

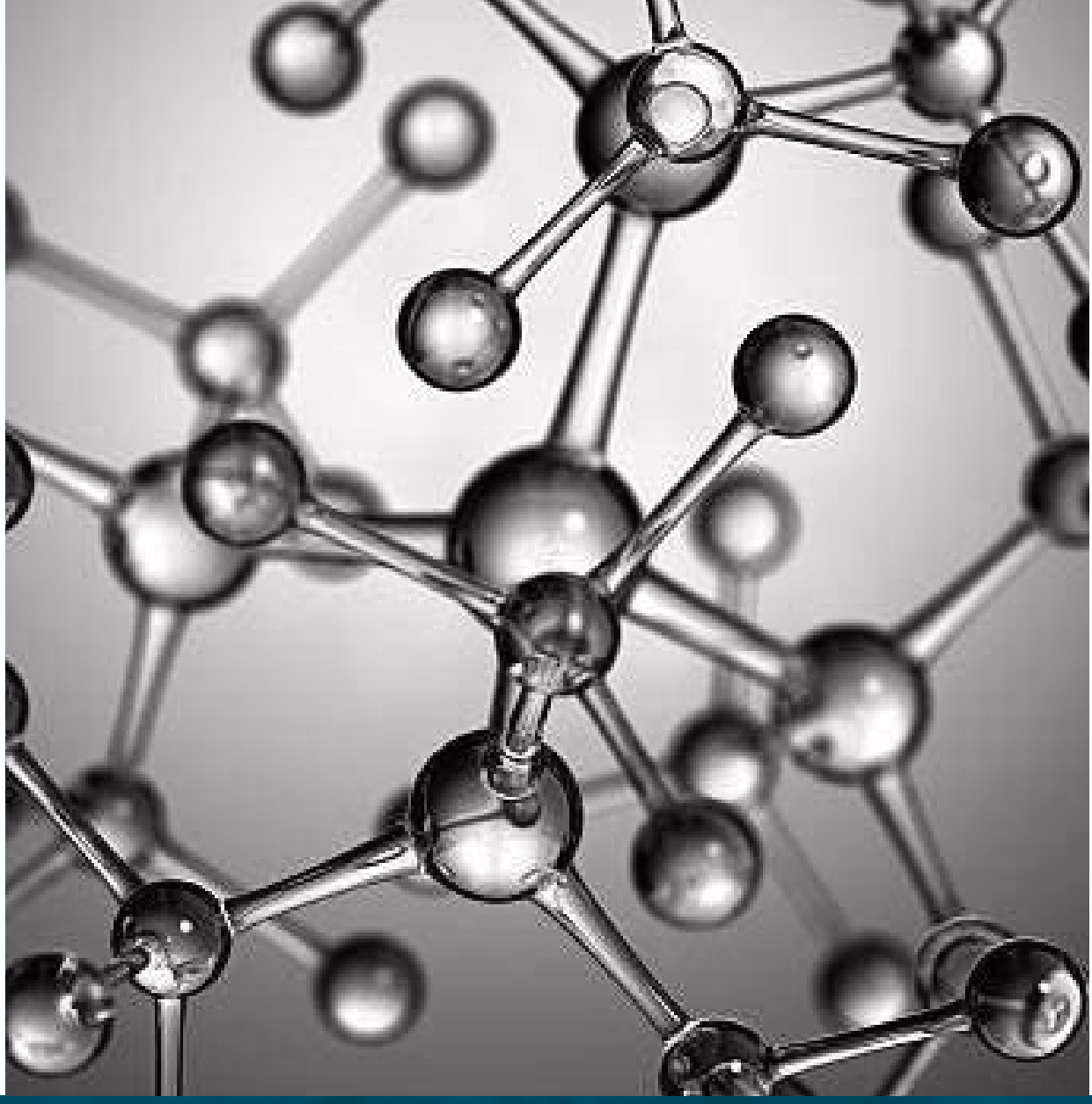
07:30-07:50	Title: Investigation on the Crack Propagation of Rock-Concrete Interface Under Fatigue Loading **Xiaoyu Zhao,** *Chang'an University, China*
07:50-08:10	Title: Medium Viscosity as a Mechanical Cue Regulating Osteogenic Differentiation of Human Mesenchymal Stem Cells **Yin Quan Chen,** *National Yang Ming Chiao Tung University, Taiwan*
08:10-08:30	Title: Quasi-Static and Dynamic Nanoindentation Studies on the Influence of Cooling Window, Grain Size, and Densification on Hardness Anisotropy in AlN Ceramics **Wan Fahmin Faiz Bin Wan Ali,** *Universiti Teknologi Malaysia, Malaysia*
08:30-08:50	Title: Sustainable Use of Composite Materials for Geotechnical Structures **Pranjal Barman,** *Central Institute of Technology Kokrajhar, India*
08:50-09:10	Title: *In Silico* Gene Expression for Simultaneous Cellulose Hydrolysis and Bioplastic Production from Agricultural Waste **Ziningi Rosebud Myeni,** *Durban University of Technology, South Africa*

09:10-09:30	Title: CLARA: Clustered Learning Automata-Based Routing Algorithm for Efficient FANET Communication **Somayeh Danesh,** *Islamic Azad University, Iran*
09:30-09:50	Title: Developing Iron Phosphate Glass from Melt-Quench Simulations Using *Ab-Initio* Molecular Dynamics **Sruti Sangeeta Jena,** *Indira Gandhi Centre for Atomic Research, India*
09:50-10:10	Title: Enhancing Supply Chain Forecasting with Hybrid Stacked Ensembles **Lucia Agnes Beena T,** *Holy Cross College (Autonomous), India*
10:10-10:30	Title: Optimizing Input Parameters Involved in EDM Process of Hardened, Normalized and Annealed 0.2%-C Steel Samples **Lav Maheshwari,** *Manipal University Jaipur, India*
10:30-10:50	Title: The Mechanism of Friction and Wear of Polymer-Polymer Friction Pairs as Revealed by Mass Spectrometry, Plasma-Induced Thermoluminescence and Interface Modeling **Aleksei Pozdnyakov,** *Institute for Problems in Mechanical Engineering of RAS & Ioffe Institute, Russia*
REFRESHMENT BREAK 10:50-11:10	
11:10-11:30	Title: Non-Effervescent Polymeric Floating Tablets of Clarithromycin and Pantoprazole: Preparation and *In-vitro* Evaluation for Improved Gastric Drug Retention **Syed Shafqat Ali Shah,** *Liaquat University of Medical and Health Sciences, Pakistan*
11:30-11:50	Title: Eye Tracking Review: Importance, Tools and Applications **Taisir Hazim Alhilo,** *University of Kerbala, Iraq*
11:50-12:10	Title: *Proteus Mirabilis*—Mediated Green Synthesis of Magnesium Nanoparticles: Optimization and their Antimicrobial Activity **Asma Shahzad,** *Lahore College for Women University, Pakistan*
12:10-12:30	Title: Fashion Artistry Unleashed by Artificial Intelligence (AI) Ingenuity: The Alchemy of Design **Arpita Nayak,** *KIIT School of Liberal Studies, India*
12:30-12:50	Title: Survey on QoS Guaranteed Routing in Cognitive Radio-Adhoc Network **Niranjan Muchandi,** *KLE Technological University, India*

LUNCH BREAK 12:50-13:40	
13:40-14:00	Title: An Investigation on In-Fluid AFM Techniques for Characterization of Soft Samples **Cagri Yilmaz,** *Akdeniz University, Turkey*
14:00-14:20	Title: The Use and Mechanisms of Environmentally Friendly Biofilm Inhibitory or Disruption **Tugba Kilic,** *Gazi University, Turkey*
14:20-14:40	Title: Quantum Size Effect of Bloch Wave Functions of Ultra-High Energy Electrons in a Thin Single-Crystal Film **Shkornyakov Sergey,** *National Research Center "Kurchatov Institute", Russia*
14:40-15:00	Title: Enhanced Oil Recovery Using Nanocomposite-Based Chemical Flooding: A Comparative Study on Light and Heavy Oil **Nahid Sarlak,** *Lorestan University, Iran*
15:00-15:20	Title: Hyaluronans' Molecular Mass Influence on Their Thermo-Oxidative and Thermal Destruction Processes **Li Ekaterina Gavrilovna,** *M.V. Lomonosov Institute of Fine Chemical Technologies, Russia*
15:20-15:40	Title: Academic Optimism, Capital Indicators as Predictors of Cognitive, Affective, and Psychomotor Learning Outcome Among Students in Secondary School, Hierarchical Regression Approach (HRA) **Anthonia Laetitia Anakwue,** *University of Calabar, Nigeria*
15:40-16:00	Title: A Novel Twisting Metamaterial Based on Cells Composed of Two Triangular Lattices **Abderrahim Barhoumi,** *Moulay Ismaıl University, Morocco*
16:00-16:20	Title: A Way of Designing TIA for Quantum Sensing **Teuma Mbezi Michel,** *National Higher Polytechnic School of Douala, Cameroon*
16:20-16:40	Title: Energy Transition in the Maritime Industry: Towards a More Resilient Organization **Samah Chemli Horchani,** *Tunis El-Manar University, Tunisia*

16:40-17:00	Title: Integrating TPACK and TAM Frameworks for Effective Technology Use in Teaching Mathematics: A Study of Rwandan Primary Schools
	Innocente Uwineza, *University of Rwanda College of Education, Rwanda*
17:00-17:20	Title:Influence of Geomaterial Nature on the Buildings Fracturation in the Context of an Active Tectonic Zone: Case of Agadez City (North Niger)
	Baraou Idi Souley, *University of Agadez, Niger*
17:20-17:40	Title: The Influence of the Nature and Strength of Montmorillonite's Acidic Sites on the Flame-Retarding Properties of Polymeric Composites
	Marco Antonio Chaer do Nascimento, *Universidade Federal do Rio de Janeiro, Brazil*
17:40-18:00	Title: Exploring the Frontiers of Photonics: Characterization of Borotellurite Glass for Advanced Optical Applications
	Evangelina Cinhia Cardillo, *Departamento de Química - Universidad Nacional del Sur - CIC Bs. As. - Bahía Blanca, Argentina*
END OF DAY 3	

ADV. MATERIALS SCIENCE 2025



DAY 01

VIRTUAL EVENT

7th EDITION OF

ADVANVCED MATERIALS SCIENCE WORLD CONGRESS

MARCH 24-26, 2025

SPEAKER TALKS

Chemical Design of Magnetic Switchable Molecular Materials

Giordano Poneti[1], Anderson M. V. Guedes[2], Bruno J. Stoeberl[3], William S. Fernandes[2], Thiago M. Cardozo[2], Benjamin R. Salles[4], Marciela Scarpellini[2], Angelo Gallo[5], Lorenzo Sorace[6], Jaísa F. Soares[3] and **Rafael A. A. Cassaro[2]**

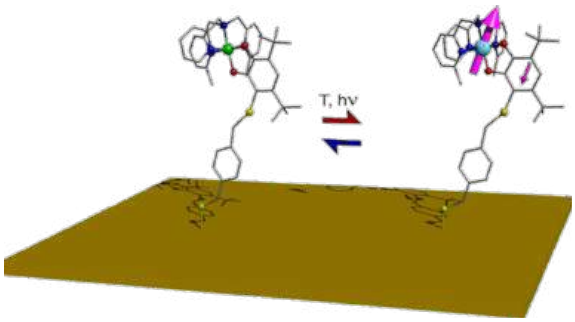
[1]Dipartimento di Scienze Ecologiche e Biologiche, Università degli Studi della Tuscia, Italy
[2]Instituto de Química, Universidade Federal do Rio de Janeiro, Brazil
[3]Instituto de Química, Universidade Federal do Paraná, Brazil
[4]Instituto de Física, Universidade Federal do Rio de Janeiro, Brazil
[5]Dipartimento di Chimica, Università di Torino, Italy
[6]Dipartimento di Chimica "Ugo Schiff", Università di Firenze, Italy

Magnetic Switchable Molecular Materials (MSM) are molecules possessing two different physical states, whose population may be controlled reversibly with an external stimulus. Given the monodisperse sizes and synthetically tailorable properties of MSM, coming from their molecular nature, and the different physical properties of the states, MSM may fuel significant advances in the preparation of new materials for magnetic data processing or storage, or chemical sensing purposes.[1] This contribution aims to present the ongoing work in our laboratory about two different classes of MSM, Valence Tautomeric (VT) and Spin Crossover (SCO) materials.[2]

The systems studied here are coordination compounds including iron(II) or cobalt(II) ions: in the VT class, the switching mechanism encompasses an intramolecular electron transfer between a metal ion and an organic ligand; in the SCO case, it consists in a spin isomerism at the metal center. For both cases, in-house magnetic and spectroscopic techniques, as well as synchrotron-based, X-Ray Absorption spectroscopy, will describe the temperature and light dependent MSM behavior of different systems, allowing to discuss the principles of chemical design of MSM and the chemical tuning of their behavior with electronic and steric effects.

[1] O. Sato, Nature Chem. 2016, 8, 644-656.

[2] M. A. Halcrow (ed.), Spin-Crossover Materials - Properties and Applications, Wiley 2013.



Biography

Dr. Giordano Poneti got his PhD in Chemistry in 2010 at the University of Florence, Italy, under the supervision of Professors Roberta Sessoli and Andrea Dei, from the Laboratory of Molecular Magnetism. Since 2011, he shared his activity with the “Guglielmo Marconi” University in Rome, Italy, where he held a Temporary Research Fellow position. In 2016 he served as an Assistant Professor in the Institute of Chemistry of the Federal University of Rio de Janeiro, Brazil, where he was appointed Young Scientist of the State of Rio de Janeiro in 2019 and Affiliate Member of the Brazilian Academy of Sciences in 2021. From 2022, Giordano is an Assistant Professor at the University of Tuscia, Viterbo, Italy. His research activity concerns the design, synthesis and structural, spectroscopic and magnetic analysis of bistable molecular systems, capable of reversibly changing their chemical-physical properties with an external stimulus, such as light or heat.

Efficient Mapping of the Thalamocortical Monosynaptic Connectivity *in vivo* by Tangential Insertions of High-Density Electrodes in Cortex

Jérémie Sibille, Carolin Gehr and **Jens Kremkow**

Neuroscience Research Center, Charité-Universitätsmedizin Berlin, Germany
Bernstein Center for Computational Neuroscience Berlin, Germany
Institute for Theoretical Biology, Humboldt-Universität zu Berlin, Germany
Einstein Center for Neurosciences Berlin, Germany

The thalamus provides the principal input to cortex and therefore understanding the mechanisms underlying cortical integration of sensory inputs requires to characterize the thalamocortical connectivity in behaving animals. Here we propose tangential insertions of high-density electrodes into mouse cortical layer 4 as a method to capture the activity of thalamocortical axons simultaneously with their synaptically connected cortical neurons. This technique can reliably monitor multiple parallel thalamic synaptic inputs to cortical neurons, providing an efficient approach to map thalamocortical connectivity in both awake and anesthetized mice.

Biography

Jérémie Sibille is a French engineer that specialised in neuroscience during his PhD studying potassic neuroglial interactions and cerebral physiopathology in Paris. He became then a Postdoctoral Researcher at Yale University studying the physiology of new spatial representation in rats in vivo. He then moved to Berlin Germany first at the Freie University studying audition in Fragile X mice and then at Charité University Medicine to become an expert developing new uses of Neuropixels. In particular he develop this new angle of inserting this high density silicon probe tangentially which permits to isolate long-range axons in dizains in the vertebrate visual system. This allowed to refine our understanding of connectivity in the superior colliculus and the visual cortex.

Comparison and Critical Review of Durability Design in Design Codes

Diala Basim Al-Haddad, Gul Ahmed Jokhio and **Abid Abu-Tair**

The British University in Dubai, UAE

Several incidents of early deterioration of structures have highlighted significant negative impacts on buildings and infrastructure performance and safety. These issues often stem from inadequacies in durability design, which may be due to the absence of explicit, standardised guidelines within existing design codes and standards that govern building design, construction, and operational phases. While current design codes provide robust frameworks for assessing structural capacity and serviceability, they frequently fall short of addressing durability comprehensively. This study aims to address this gap by critically evaluating and comparing the durability design provisions outlined in three major international codes: the American, British, and Eurocodes. The analysis reveals that the European and British standards include more precise and comprehensive provisions for durability design compared to the American code. Specifically, the European and British codes offer more detailed guidelines and requirements that address a wider range of durability concerns, potentially resulting in more resilient and long-lasting structures. In contrast, the American code demonstrates considerable scope for development in this area, with less emphasis on durability-specific criteria. In response to these findings, the study proposes a series of enhancements to the durability design provisions within these codes. By providing targeted recommendations and illustrative examples, the study aims to inform and support the revision process for future editions of these codes. The goal is to improve the robustness of durability design requirements, ultimately leading to greater structural longevity and performance, and reducing the incidence of early deterioration in built environments. This work seeks to contribute to the advancement of more resilient structures through enhanced design standards.

Biography

Diala Basim Al-Haddad is a PMP-certified Structural Civil Engineer with extensive experience in structural design for international projects. She earned her Bachelor of Science degree from Jordan University of Science and Technology in Irbid, Jordan, and her Master of Science degree from the British University in Dubai, UAE. Al-Haddad is an active member of the Society of Engineers (UAE) and the Jordan Engineers Association. Her research interests are focused on structural analysis and design, as well as the durability and rehabilitation of reinforced concrete structures. With a strong background in both practical engineering and academic research, she is committed to advancing the field of structural engineering through innovative solutions and rigorous analysis.

Gul Ahmed Jokhio is an Associate Professor in structural engineering at the Faculty of Engineering and IT, British University in Dubai. He received his MSc and BE from NED University of Engineering and Technology, Karachi, Pakistan, in 1999 and 2002, respectively, and his PhD in civil engineering from Imperial College London, London, UK, in 2012. His research interests include structural analysis and design, and sustainable construction materials.

Abid Abu-Tair is a professor of structural engineering at the Faculty of Engineering and IT at the British University in Dubai. He received his BE and PhD in structural engineering from Queen Mary College, London, UK, and his MSc in structural engineering from Imperial College London. His research interests include structural performance sustainability and asset management focusing on the durability of concrete structures.

Development and Performance Analysis of Microwave Planar Sensor for Food Quality Assessment

Kalindi S. Shinde, Shweta N. Shah and **Piyush N. Patel**

Sardar Vallabhbhai National Institute of Technology, India

The food industry has completely changed as a result of microwave sensor technology, which offers quick and non-destructive ways to measure food quality characteristics. In-depth analysis of the design and simulation of a flat microwave sensor created especially for the food industry is provided by the current study. The creation of a reliable and reusable ring resonator sensor for the L (1-2GHz) and S (2-4 GHZ) microwave frequencies is first thoroughly reviewed in the literature. Following that, a simulation of a microwave planar sensor with various geometries and dimensions was carried out with the CST and HFSS Simulation tool, and the final dimensions were determined to have a maximum return loss of -20.177 dB at 2.377 GHz. On a FR4 substrate material with a Cu thickness of 0.4 mm and a substrate height of 1.6 mm, the structure was simulated. By varying the material with their various dielectric permittivities from 1 to 34 for a variety of food samples, these simulations were performed to see shift in the resonant frequency. Following that, an electromagnetic performance analysis is carried out to investigate the dielectric properties of various food samples, offering information about how well the sensor detects electromagnetic signals. Sensitivity and linearity evaluations demonstrate the sensor's accuracy in identifying subtle variations in food characteristics, making it a viable instrument for in-the-moment monitoring and quality assurance. In conclusion, the study's limits and the potential for further research are defined. These aspects are critical in boosting innovation in sensor technology throughout diverse industrial sectors.

Biography

Dr. Kalindi Shinde is Assistant Professor in Department of Electronics and Telecommunication Engineering in Mumbai Educational Trust's, Bhujbal Knowledge City, Institute of Engineering, Nasik, India. She has been awarded her PhD degree from Department of Electronics at Sardar Vallabhbhai National Institute of Technology (SVNIT), Surat. She is having 19 years of working experience in teaching and in the R&D. She has worked on various R&D Projects in the area of Antenna Designing, Microstrip filter Designing, Fiber Optic Link at Giant Meter wave Radio Telescope (GMRT) Observatory, Tata Institute of Fundamental Research (TIFR), India. Currently she has been worked on the projects of Nano antenna, Nano materials and Pervoskite material for the solar application using TCAD and GPVD tools. Now working on the project of Development and performance evaluation of the quality assessment of food materials at the Sensor Research Lab, SVNIT.

Enhancement in Optical and Electrical Characteristics of GaN-Based HEMT by SiNx Nano-Mask

Tu Huynh Pham, Quynh Trang Tran, Thi Bich Tuyen Huynh and **Wu-Ching Chou**

Department of Electrophysics, National Yang Ming Chiao Tung University, Taiwan

The increasing demand for higher power density and operational frequency in advanced electronic applications necessitates the development of devices with superior performance compared to traditional Silicon-based technologies. AlGaN/GaN heterostructure-based high electron mobility transistor (HEMT) grown on Silicon substrate have attracted significant attention for high-speed and high-power electronic applications. However, overcoming the limitations of crystal quality caused by the lattice constant and thermal expansion coefficient mismatch between GaN and Si substrate in order to enhance device performance remains challenging. This work proposes a SiN_x nano mask technique in the buffer layer to achieve better GaN HEMTs device performance. For that purpose, we demonstrated AlGaN/GaN HEMT structures were fabricated on Si (111) substrates using metalorganic chemical vapor deposition (MOCVD), with a SiN nano-mask integrated into the low-temperature GaN buffer layer to enhance device performance by reducing defects and threading dislocations in the crystal structure. This study systematically investigates the effects of SiN_x nano-masks on the optical and electrical properties of the devices, characterized through photoluminescence (PL), Raman spectroscopy, and electrical characterization. While introducing the SiN nano-masks with SiH_4 flow rate of 50 sccm, the intensity of free-exciton emission is enhanced remarkably, associated with a reduction in defect-related yellow emission. However, beyond the aforementioned flow rate, a decline in luminescence properties occurs due to increased Si diffusion into neighboring layers, indicating that the SiN nano-mask can effectively improve film quality by incorporating the SiN nano-masks. Furthermore, electrical device performance characterization demonstrates that incorporating the SiN nano-mask enhances both vertical and lateral breakdown voltage from 1710 V to 1780 V

and 411 V to 448 V, respectively. Thus, optimizing the performance and reliability of AlGaN/GaN HEMT devices.

Biography

Tu Huynh Pham is a Doctoral Student at the Department of Electrophysics, National Yang-Ming Chiao Tung University (NYCU), Taiwan, with a Master's degree from the College of Science, Can Tho University, Vietnam. Her research focuses on characterizing III-V semiconductors for high-electron-mobility transistors (HEMTs), emphasizing crystal structure and optical properties of nanomaterials. She specializes in doping materials such as carbon, iron, and magnesium to develop high-resistivity buffer layers and explores layer-wise structures to enhance crystal quality for high-power and high-frequency electronic applications. She utilizes advanced characterization techniques, including Cathodoluminescence (CL), High-Resolution X-Ray Diffraction (HRXRD), Raman Spectroscopy, Photoluminescence (PL), Atomic Force Microscopy (AFM), and Scanning Electron Microscopy (SEM), to optimize device performance and gain insights into material properties.

Theoretical and Numerical Study of the Decay in a Viscoelastic Bresse System

Mohammad El-Hindi[3], Jamilu Hashim Hassan[1], Salim A. Messaoudi[2] and **Toufic El-Arwadi[3]**

[1]Department of Mathematics and Statistics, King Fahd University of Petroleum and Minerals, Saudi Arabi

[2]Department of Mathematics, University of Sharjah, United Arab Emirates

[3]Department of Mathematics and Computer Science, Beirut Arab University, Lebanon

In this paper, we consider a one-dimensional finite-memory Bresse system with homogeneous Dirichlet-Neumann-Neumann boundary conditions. We prove some general decay results for the energy associated with the system in the case of equal and non-equal speeds of wave propagation under appropriate conditions on the relaxation function. In addition, we show by giving an example that in the case of equal speeds of wave propagation and for certain polynomially decaying relaxation functions, our result gives an optimal decay rate in the sense that the decay rate of the system is exactly the same as that of the relaxation function considered.

Biography

Mohammad El-Hindi started working on hyperbolic systems of PDEs and their numerical analysis. Currently they are dealing with fluid flow in porous media that could be represented by a system of non-linear PDEs. They interested in their existence theory, homogenization, and numerical analysis.

Optical Properties and Band Gap Analysis of Perovskite Thin Films

Arevik Asatryan[1], Gurgen Kolotyan[1], Sona Grigoryan[1], Nane Petrosyan[1,2], Michael J. Schoening[3], Hayk Zakaryan[2] and **Hayk Khachatryan[1]**

[1]A.B. Nalbandyan Institute of Chemical Physics, Armenia
[2]Yerevan State University, Armenia
[3]Institute of Nano- and Biotechnologies, Aachen University of Applied Sciences, Germany

Since their introduction as solar cell materials in 2009, perovskites have garnered significant attention. These materials have achieved power conversion efficiencies exceeding 26%, outperforming conventional silicon-based solar cells and positioning themselves as a promising alternative for next-generation photovoltaic technologies.

To accelerate the discovery and development of novel perovskite materials, we generated a dataset of over 40,000 potential perovskite compounds and applied seven machine learning (ML) algorithms to predict their band gap energies. The selection of the two most effective algorithms was based on mean absolute error (MAE) calculations for training data sets (Chart 1), evaluated through cross-validation process. Using optimized ML models, band gap energies were predicted for the entire generated dataset.

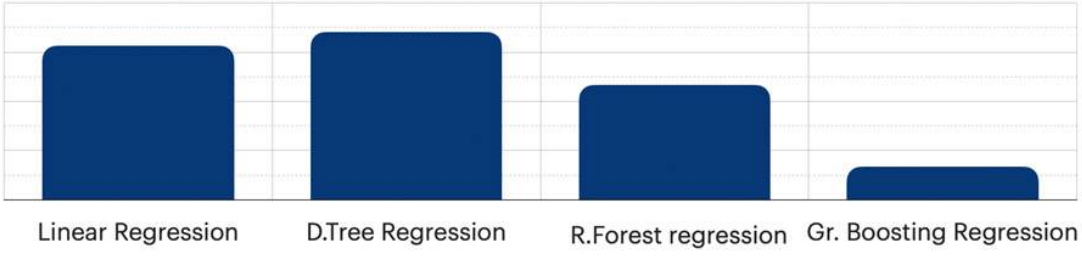


Chart 1. Train MAE for 4 models.

20 composites were selected for further evaluation based on their predicted properties, and their stability was assessed using density functional theory (DFT). Out of these, nine composites demonstrated sufficient stability and underwent detailed band gap energy calculations via DFT (see Table 1). One of the stable candidates was subsequently selected for experimental synthesis. Thin films of this composite were prepared and characterized to compare their properties with theoretical predictions and solution-phase measurements.

Table 1. Selected perovskites and their parameters.

Composite	Calculated tolerance factor	predicted by Gradient Boosting / ev	predicted by Random Forest / ev	predicted by Linear Regression / ev	calculated by DFT above convex hull energy ev/atom
$FAPb(Cl_{0.125}Br_{0.125}I_{0.75})_3$	0.9933	1.61	1.61	1.74	0.249
$FAPb(Cl_{0.125}Br_{0.25}I_{0.625})_3$	0.9959	1.69	1.69	1.83	0.254
$FAPb(Cl_{0.25}Br_{0.125}I_{0.625})_3$	0.9975	1.68	1.68	1.96	0.259
$FAPb(Cl_{0.25}Br_{0.25}I_{0.5})_3$	1.0002	1.82	1.76	2.05	0.264
$FAPb(Cl_{0.325}Br_{0.125}I_{0.3})_3$	1.0019	2.04	1.91	2.18	0.265
$FAPb(Cl_{0.125}Br_{0.375}I_{0.5})_3$	0.9985	1.81	1.79	1.92	0.259
$FAPb(Cl_{0.25}I_{0.75})_3$	0.9949	1.57	1.64	1.87	0.252
$FAPb(Cl_{0.375}I_{0.625})_3$	0.9992	1.64	1.70	2.09	0.265
$FAPb(Br_{0.375}I_{0.625})_3$	0.9942	1.74	1.74	1.70	0.246

The band gap energy predicted by the ML algorithms was validated using both DFT calculations and UV-Vis spectroscopy of the perovskite solution. However, discrepancies were observed between the band gap energies of the thin films and the solution. By leveraging calculations and ellipsometry measurements, it was demonstrated that optimizing the thin film fabrication process could bridge this gap, paving the way for improved consistency.

1. Lamichhane, A. and Ravindra, N.M. Materials, 13(8), 2020.
2. Danielyan T., Asatryan A., Sahakyan A. and Khachatryan H. Journal of Power Sources, 630, 2025.

This work was supported by the Science Committee of MESCS RA [22RL-012].

Biography

Dr. Arevik Asatryan earned her PhD in theoretical biophysics, specializing in DNA stability, melting mechanisms, and ligand interactions within the framework of statistical mechanics. She later contributed to the synthesis of nanoparticles for semiconductor-based sensors and conducted biosensor detection experiments. Currently, Dr. Asatryan leads a research group dedicated to discovering hybrid organic-inorganic halide perovskite materials for solar cell applications. Her work focuses on identifying high-performance, stable materials capable of maintaining efficiency under harsh environmental conditions, advancing the field of renewable energy.

An overview of Design and Development of Biomimetic Bone Scaffolds using Heterogeneous TPMS Lattice Structures

Gangaram Mandaloi[1,2], Anand Prakash Mall[1], Vivek V. Bhandarkar[1] and **Puneet Tandon[1]**

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[2]Department of Mechanical Engineering, Rewa Engineering College, India

Scaffolds play a crucial role in bone tissue engineering by providing structural support and facilitating cell growth. To effectively mimic the heterogeneous and anisotropic nature of bone, Triply Periodic Minimal Surface (TPMS)--based unit cells offer a promising solution. While TPMS structures provide extensive options for structural heterogeneity, achieving material heterogeneity remains a challenge. The adoption of TPMS geometries enhances scaffold design by improving surface area-to-volume ratios, promoting vascularization, and ensuring better pore interconnectivity, all of which are vital for cell proliferation.

This study explores the integration of TPMS-based unit cells (P-Primitive, Gyroid, and Double Diamond) with structural and material heterogeneity using composite materials composed of Poly Lactic Acid (PLA) and Hydroxyapatite (HA). PLA ensures biodegradability, while HA enhances bioactivity and mechanical properties. By varying HA composition within the PLA matrix, material heterogeneity can be achieved to closely replicate bone characteristics.

Additionally, hybridizing TPMS structures enables improved mechanical performance and anisotropy reduction, making them ideal for bone scaffold applications. This research evaluates different TPMS hybrid configurations and proposes the optimal combination for bone scaffold fabrication. The findings contribute to the development of advanced 3D-printed biomimetic scaffolds with enhanced functionality for bone tissue engineering applications.

Graphical Abstract: TPMS solids are classified into network and sheet structures (Figure 1). Segmental bone defects, characterized by gaps between surviving bone segments, can arise from fractures due to trauma or illness (Figure 1).

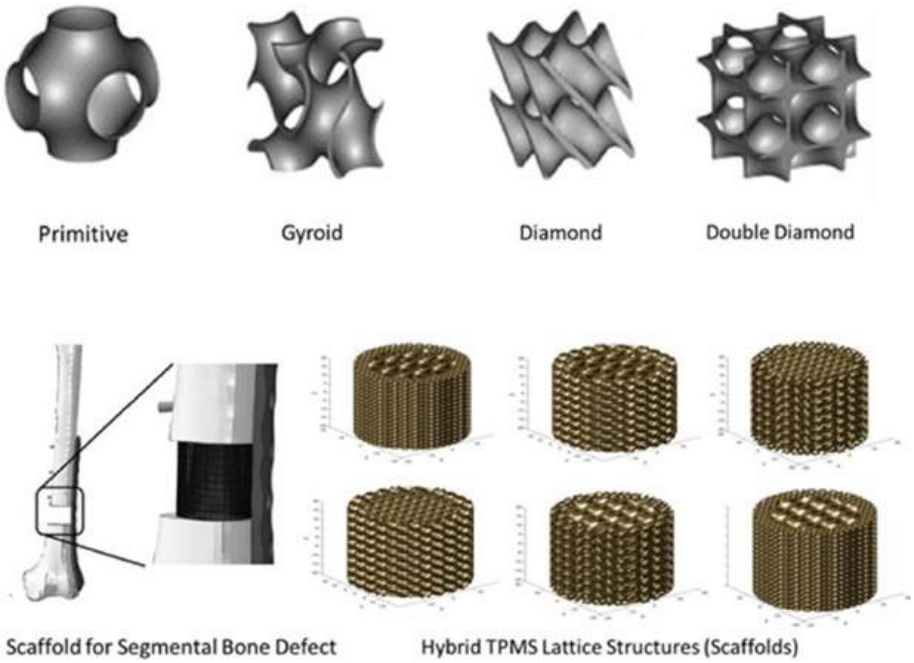

Figure 1 TPMS solids are categorized as network and sheet structures. Segmental bone defects, caused by trauma or illness, feature gaps between surviving bone segments.

TPMS structures, inspired by nature, enable support-free 3D printing, stress reduction, and enhanced cell migration. This study hybridizes P-Primitive, Gyroid, and Double Diamond lattices to mimic bone. PLA/HA composites improve bioactivity and strength. Future research will optimize transition zones, material heterogeneity, and scaffold architectures for bone tissue engineering.

Biography

Dr. Gangaram Mandaloi is a renowned academician, researcher, and administrator in Mechanical Engineering. He currently serves as Associate Professor and Dean (Academic and Administrative) at Rewa Engineering College, Rewa, Madhya Pradesh, a prestigious institution established by the State Government of Madhya Pradesh in 1964.

With over 17 years of teaching experience and three years in industry, Dr. Mandaloi has significantly contributed to advanced manufacturing technologies, non-conventional machining, hybrid deformation machining, wind energy, and biomimetic bone scaffolds. He earned his Ph.D. from the IIITDM Jabalpur, specializing in Hybrid Deformation Machining Processes, and holds an M. Tech. from IIT Roorkee and a B.E. from Government Engineering College, Ujjain.

A life member of ISTE, I2OR, GIER, CMAOI, and AMIEE he has received several prestigious awards, including the International Teacher of the Year Award (2022), Best E-Learning Award (2024), and Best Dean Award (2024). His impactful research is widely published in international journals and conferences, shaping the future of engineering education.

Nanotechnology: An Emerging Field for Enhancing Micronutrient Enrichment In Millets *via* Biofortification Strategies- Present Knowledge and Prospects for the Future

Anbu Malar. M and **J. Sonya**

Stella Maris College (Autonomous) Chennai, India

Pharmaceutical supplementation and dietary fortification are the most common approaches to reducing vitamin deficits. To improve the health and nutritional value of crops, agronomic biofortification necessitates the direct application of nutrients. Producers using micronutrient fertilizers to increase the fortification of crops are essential to the success of biofortification. Overthrow malnutrition using biofortified millets notwithstanding their challenges. Millets stressors have been demonstrated to be reduced by artificial nanoparticles recently. Engineered nanoparticles (ENPs) have had their properties and functions has been reported recently. Several genes that are involved in maintaining an equilibrium of iron and zinc are genetically regulated in millet with nanoparticle formulations, resulting in even greater nutrient-by-default and stress-resilience. Millet, according to the study, is a micronutrient powerhouse because priming controls cereal iron and zinc absorption and enrichment even in the face of nutritional deficiency. This review examines millet, its health advantages, nano fertilizers, and initiatives to improve the crop production.

Biography

Dr. Anbu Malar. M is Head and Assistant Professor, Department of Food Processing and Quality Control, Stella Maris College (Autonomous), Chennai, India.

Her research interest is Nanotechnology in food, Fortification and enrichment of micronutrient in foods, Nutrient Bioavailability (In vitro) study, Antioxidant content of foods, Anticancer activity of foods, Bio film for food packaging, new food product development.

She has guided under graduate students in their research work focussing on "Food chemistry and analytical techniques for food".

She has published papers and articles in the area of research interest. She has presented and awarded as best poster/paper in various conferences and seminars. Academic audit member in various colleges.

Her poster was awarded as 'Best Poster' and received "Senior Scientist Award" in 2nd international workshop on micronutrients and child health held at All India Institute of Medical Sciences, New Delhi, Human Nutrition Unit, India.

Currently working with two different sanctioned projects one by MRF for the amount of 9,20,000/- to initiate incubation centre in the department. The other project was sanctioned by TNSCST for 2,40,000/-. Received SEED grant for 05 projects. Organised several programs the world record event on millet day which was organised for the students and faculty of Food Processing and Quality Control, Stella Maris College, Chennai preparing 752 millet recipes with 99 students and 04 faculty.

Phytochemicals Screening, Antimicrobial Activities and Statistical Validation of Bioactive Compounds of *Morella Rubra* Sieb.Et Zucc

Susan Sharma, Janardan Lamichhane, Sajesan Aryal, Srijana Adhikari, Bivek Pokharel, Abhishek Prajapati, Trishna Lamichhane and **Bishnu Maya KC**

Kathmandu University, Nepal

Morella rubra Sieb.et Zucc. belongs to the family Myricaceae, and is taxonomically close to the genus Myrica. It has several traditional, medicinal, and food values. In this study, the phytochemical components and antioxidant and antibacterial activities of M. rubra leaf extract were investigated. Leaves of M. rubra were collected from Nuwakot, Bagmati Province, Nepal, and its phytochemical constituents were determined from methanolic extracts. Total phenolic content (TPC) and total flavonoid content (TFC) of leaves were quantified using a spectrophotometer, antioxidant activity was assessed as scavenging rate of 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical, and the antibacterial activity of the extract was assessed by agar-well diffusion method. Simultaneously, central composite design method was applied for optimizing the extraction protocol. The phytochemical screening in methanol leaf extracts of *M. rubra* revealed the presence of alkaloids, carbohydrates, tannins, glycosides, flavonoids, and phenols as shown in table 1. The TPC and TFC were measured to be 159.95 ± 0.91µgGAE/mL and 54.43 ± 0.67µgQ/ mL respectively. The DPPH radical scavenging activity was 88.13 ± 0.54 as compared to that of ascorbic acid. A remarkable antibacterial activity against pathogenic bacteria (Bacillus subtilis, Enterococcus faecalis, Pseudomonas aeruginosa, and Staphylococcus aureus) was noted at the range of 8.16 ± 0.33 mm to 9.52 ± 0.16 mm at maximum concentration of 100 µg/ mL as shown in table 2. This study confirmed M. rubra as a source of antioxidant-rich food and medicinal product with significant economic importance in healthcare prospects. Further investigation of this species is required to uncover more bioactive compounds and potential pharmacological applications.

Table 1 Qualitative test for *M. rubra* leaf derived phytochemicals

Plant species	Solvent	Phytochemical compounds	Response
Morella rubra	Methanol	Saponins	−
		Terpenoids	−
		Flavonoids	+
		Steroids	−
		Alkaloids	+
		Glycosides	+
		Phenols	+
		Tannins	+
		Carbohydrates	+
		Proteins	+
		Volatile Oils	+

Table1: Qualitative test for *M. rubra* leaf derived phytochemicals

Sample	Microbes	Extract concentration (µg/ml) and ZOI (mm)				
		15 µg/ml	25 µg/ml	50 µg/ml	75 µg/ml	100 µg/ml
M. rubra leaf extract	*Bacillus subtilis*	1.23 ± 0.17^{c}	4.33 ± 0.87^{b}	6.33 ± 0.88^{a}	7.66 ± 0.66^{a}	8.16 ± 0.33^{a}
	Enterococcus faecalis	1.66 ± 0.03^{c}	3.01 ± 0.13^{c}	4.01 ± 0.50^{b}	7.93 ± 0.50^{a}	8.14 ± 0.19^{a}
	Pseudomonas aeruginosa	1.78 ± 0.07^{c}	4.02 ± 0.36^{b}	6.01 ± 0.55^{b}	8.33 ± 0.33^{a}	8.93 ± 0.04^{a}
	Staphylococcus aureus	1.33 ± 0.33^{c}	2.01 ± 0.43^{c}	5.03 ± 0.57^{b}	7.33 ± 0.32^{b}	9.52 ± 0.16^{a}
Ciprofloxacin (antibiotic)	*Bacillus subtilis*	5.0 ± 0.49^{f}	8.19 ± 0.34^{e}	10.09 ± 0.3^{e}	13.0 ± 0.54^{e}	14.0 ± 0.62^{d}
	Enterococcus faecalis	5.56 ± 0.33^{e}	8 ± 0.57^{a}	10.6 ± 0.33^{a}	11.0 ± 0.57^{h}	12.66 ± 0.33^{g}
	Pseudomonas aeruginosa	4.03 ± 0.39^{e}	7.33 ± 0.32^{b}	10.66 ± 0.3^{a}	11.01 ± 0.5^{a}	13.02 ± 0.63^{d}
	Staphylococcus aureus	3.01 ± 0.98^{e}	5.66 ± 0.34^{c}	7.02 ± 0.52^{b}	9.66 ± 0.31^{a}	12.0 ± 0.62^{g}

Table 2: Antimicrobial activity of *M. rubra* extract in methanol

Biography

Susan Sharma holds a bachelor's degree in biotechnology and a master's degree in environmental science. During her academic career, she has the chance to intern at the Molecular and Genetic lab of the National Hospital of Medical Science (NAMS), which was Nepal's first genetic lab. She helped diagnose tuberculosis using the traditional PCR approach, examine chromosomes for genetic anomalies like Down syndrome, and assess the viral load in patients. She worked at Aastha Scientific Lab and Research Center as a quality analyzer and research assistant after receiving her undergraduate degree. While working on the Rural Water Supply and Sanitation Development Project, she evaluated the risk of water samples using both quantitative and qualitative methodologies, taking into consideration factors such as ammonia and nitrate, the presence of heavy metals like lead, iron, and manganese, the amount of arsenic etc. Her undergraduate research focused on molecular identification and model-based optimization approach for Phyto extraction of Myrica rubra was published on International Journal of Plant research. Another research article entitled characterization and assessment of methanogen in biodigester is currently being reviewed.

A Biogenic Approach to Develop Guava Derived Edible Copper and Zinc Oxide Nanocoating to Extend Shelf Life and Efficiency for Food Preservation

Susmita Dey Sadhu[1], Bhasha Sharma[1], Shubhanshu Nigam[2], Anishka Verma[2], Meenakshi Garg[2] and **Avneesh Mittal[2]**

[1]Bhaskaracharya College of Applied Sciences, University of Delhi, India
[2]Netaji Subhash Institute of Technology, India

Nanostructured integrated polymeric coatings have been transpired to preserve vegetables and fruits' quality attributes. Edible nanocoating packaging can significantly prolong the shelf life of fruits by preventing moisture loss and maintaining their freshness. This is because the coating acts as a barrier, preventing water vapor and gases from escaping or entering the fruit, which helps to maintain its firmness, color, and texture. These coatings facilitate barrier properties on the surface of fruits and vegetables and generate a conducive micro-environment by optimizing the concentration and obstructing the ripening process. A bio-nano hybrid based on guava extract intercalated nanoparticles were synthesized using a chemical reduction method for applications in fruit coating. The fabrication of resultant nanocomposites was confirmed by the shifts observed in vibrational frequencies and basal peaks observed by using an X-Ray diffraction pattern. The prepared nanohybrid further elucidates better thermal stability and their hydrotalcite-like structure examined by Field Emission Electron Spectroscopy displayed plate-like structure and homogeneous distribution of nanoparticles into the matrix. The CuO/guava extract nanocomposite has shown 37.79% of weight loss contrary to pristine extract which has 64.92% evaluated using thermogravimetric analysis. The edible nanocoating was developed using the dip-coating method on fresh papaya. To evaluate the efficacy of developed nanocoating, various attributes such as pH, acidity, sensory analysis, weight loss, and water activity coefficient for 18 days were investigated. In addition, the role of dietary sugar with the increase in the shelf life of nanoparticles coating was synchronized. The obtained results revealed that the shelf life of papaya increased with the application of copper nanohybrid coating which

propounds its application in food preservation.

Biography

Dr. Susmita Dey Sadhu is working as an Associate Professor at Bhaskaracharya College of Applied Sciences, University of Delhi since 2005. She has completed her Masters in Chemistry (University of Burdwan, WB) followed Ph.D in Rubber Technology from IIT-Kharagpur in 2005. Her research interest includes fields like Packaging, Blend and composites, Nanocomposites and Adhesive applications. She has nearly 50 publications in reputed international journal, 2 patents, nearly 10 book chapters and 3 books published to her credit. She has completed about 5 projects funded by various agencies.

Developments in Directed Metal-Catalyzed C-H Bond Functionalization

Hamad H. Al Mamari

Department of Chemistry, College of Science, Sultan Qaboos University, Oman

C-H Bond functionalization has emerged as a powerful strategy for transforming inert nonreactive C-H bonds into reactive ones. Due to ubiquitous presence of C-H bonds in natural products and numerous organic molecules, functionalizing such inert bonds would be a vial approach towards accessing functional molecules and materials in an expeditious manner. This strategy will then allow recycling of otherwise wasted hydrocarbons and their reuse in an efficient and environmentally benign manner. Therefore, functionalization of C-H bonds is considered a green approach. Recent research has aimed at developments of new strategies tailored at making C-H bond functionalization more efficient. One of the strategies utilized to solve the regio-selectivity issue to the use of directing groups. The use of mondentate and bidentate directing groups allows delivery of the transition metal catalyst to a proximal C-H bond and accordingly functionalization of such bond. Thus, chelation-assistance allows cleavage of an *ortho* C-H bond with respect to the directing group. Directing groups have allowed a wide range of C-H bond functionalization reactions catalyzed by various second and the more earth abundant, first row-transition metals.

The presentation will report developments in metal-catalyzed C-H bond functionalization reactions assisted by directing groups. This includes research carried out in metal- catalyzed C-H bond functionalization of benzamides containing 8-aminoquinoline as a N,N-bidentate directing group and strategically designed bidentate directing groups, such as the novel triazole-based N,N-directing group the triazolyldimethylmethyl (TAM) group. In addition, the presentation will cover novel design-based removable N,O-bidentate directing group based on cheap and commercially available starting materials such as 4- aminoantipyrine (AAP).

Biography

Hamad Al Mamari obtained his PhD degree (2006) at the University of Oxford under the supervision of Professor David Hodgson. Upon completion of his PhD, he returned to his home institution, Sultan Qaboos University, Oman. In 2012/2013 he spent one-year sabbatical at Georg-August University, Göttingen, Germany where he worked in the field of C-H bond functionalization (Host: Professor Lutz Ackermann). Later, he spent short-term visits at the Department of Chemistry, School of Science, University of Tokyo (Host: Professor Eiichi Nakamura) (2015 & 2017), the Julius-Maximilians-Universität, Würzburg, Germany (Host: Professor Todd Marder) (2016), and University of Ljubljana, Slovenia (Host: Professor Dr. Bogdan Štefane). In the period of 2021/2022, Dr. Al Mamari spent a one-year research visit/visiting scholar at Julius-Maximilians-Universität, Würzburg, Germany (Host: Professor Todd Marder). Dr. Al Mamari currently hold the rank of an associate professor of chemistry at the Department of Chemistry, College of Science, Sultan Qaboos University, Sultanate of Oman. His research interests are themed on organic synthesis with an emphasis on developing methods and reactions in the field of C-H bond functionalization and their applications in natural product synthesis.

EDISnet: Enhanced Detection of Image Splicing Manipulations using Siamese Networks

Khawla Hussein Ali and **Shahad Amjed Hamid**

Department of Computer Science, College of Pure Science, University of Basrah, Iraq

Cutting and pasting images, or image splicing, in digital images presents a major problem in verifying the truthfulness of visual media content. This paper presents a new framework for detecting image splicing manipulations for Siamese networks. Taking advantage of the fact that the network is trained to take two patches of images and identify which one is the spliced part, our method is centered on identifying inconsistencies in the texture, color, and spatial position due to splicing. The Siamese architecture allows discriminative features to be learned well; thus, the detection is also achieved effectively, even in the case of subtle manipulations. The respective experiments show that the proposed model outperforms the traditional approaches to reveal splicing manipulations in various datasets. It offers a relatively better solution for enhancing digital image forensic methodology. After that, a mean shift algorithm is used to determine the same centroids, which are used to search for the exact center localization of duplicated parts in the image. In evaluating the effectiveness, the experimental results cover a range of splicing attacks, including detecting splicing manipulation. The score achieved an accuracy of 98.6% and a precision of 97.5%. This study presents the application of an advanced splicing image forgery detection and localization algorithm that proves its efficiency by performing extensive experiments.

Biography

Dr. Khawla Hussein is an Assistant Professor in the Department of Computer Science at Basrah University, specializing in artificial intelligence, machine learning, and computer vision. With over 20 years of academic experience, Dr. Khawla has authored more than 40 peer-reviewed research articles published in leading journals and conferences, including IEEE, Scopus on Pattern Analysis and Machine Intelligence, CVPR, and NeurIPS.

Her research primarily focuses on deep learning applications in healthcare and autonomous systems, with groundbreaking work on explainable AI and ethical considerations in machine learning. In addition to her academic endeavors, Dr. Khawla serves as an editor for major journals. She holds a Ph.D. in Computer Science from Huazhong University in China.

In her free time, Dr. Khawla enjoys hiking, photography, and exploring the intersection of art and technology.

Stable and Efficient Data Transfer in Disaster Scenarios

Ashwani Kush

Institute of Integrated & Hons Studies, Kurukshetra University (KUK), India

In case of natural disasters, most significant and almost instant impact is the sudden breakdown of communications infrastructure. These Communications systems in case of natural disaster can bring the difference between life and death for those affected. Adhoc networks have been used for this recovery operation owing to their infrastructure setup and working. Disastrous events are one of the most challenging applications of multihop ad hoc networks. Multihop ad hoc communication can be one of the alternative. It can deal with the lack of communications in disaster scenarios. They have evolved since their origin, leading to different ad hoc paradigms such as MANETs, VANETs or WSNs. In addition, it emphasizes the challenges and research directions. Work has been done to generate or boost fading signals to get some communication feedback and if possible to save lives. This work will be significant in tackling natural disasters recovery process for lives.

Biography

- Total teaching experience is 33 years.
- Working as Professor and Head in Department of Computer Science, IIHS, Kurukshetra.
- Worked as DIRECTOR IT- CELL Kurukshetra University Kurukkhstera
- Ph.D. in association with Indian Institute of Technology Kanpur and Kurukshetra University, Kurukshetra, India.
- More than 150 research publications in various International/National Journals and Conferences.
- Chaired session and acted as Resource Person in India, USA and Singapore.
- Member Board of Studies DCSA KUK and Convener syllabus Committee.
- Appreciation letters from Vice Chancellor KUK; IIT Kanpur; Texas State University USA; Principal UCK

- Excelled Computer Science Department of UCK at No. 1 position in North India and No. 3 in India ranked by India Today.
- Teaching and Administration are key responsibilities.
- Guiding M.Phil. and Ph.D. research scholars, 13 Phds awarded.
- Author for various books.
- Papers accepted in Major international conferences like IASTED Canada, World wireless Congress USA, ICIIS Malaysia, IACSIT Singapore, FTC Canada, London etc.
- UGC and DST Grants holder for research projects and travel.
- Member Academic Council and Court KUK

Revitalising Golshan and Sharifiyeh Caravanserais: A Study in Adaptive Reuse and Urban Preservation

Faezeh Hoursan[1] and **Mehranoosh Mofidi**[2]

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[2]Sooreh University, Iran

The inefficient urban textures often turn into hotspots of social anomalies, leading to depressed, insecure, and non-participatory spaces. The issue of preserving historic urban textures and their dynamic evolution is essential for sustainable urban development. This research delves into the potential for adaptive reuse of the Golshan and Sharifiyeh caravanserais in the Hamadan city in Iran. These historically valuable structures previously helped in the facilitation of trade and travel; now, they need regeneration. The research, therefore, aims to harness the tourism and functional capacity of the abandoned Sharifiyeh caravanserai by linking it with the more popular Golshan caravanserai. This link will prevent abandonment and the deterioration of the Sharifiyeh caravanserai through the creation of an in-between space since it revitalizes both sites.

The study emphasizes preserving cultural heritage while at the same time accommodating modern amenities to meet present needs. Therefore, the proposed adaptive reuse method would focus on preserving historical integrity while enabling the building to have a contemporary use. The method then proposes the creation of a transitional zone that transits the historic fabric to modern interventions. The revitalization and reuse of these caravanserais should be able to attract traders, generate hospitable conditions for residents, and increase local income through the tourism generated and the commerce of handicrafts and traditional arts. Effective principles of adaptive reuse are needed to maintain stability in the structure and function of these buildings. The study concludes that a balanced and thoughtful adaptive reuse approach with in-between space can bring transformation in the abandoned space into a lively cultural hub that would contribute both towards economic and cultural development in Hamadan.

Biography

Faezeh Hoursan. she has obtained her Bachelors in Architecture Engineering in Hamedan, Iran, and now she is a MSc student in Urban Regeneration at the Sapienza University of Rome. She has attended various courses after her bachelor's including Climate Change and Adaptation, Energy Efficiency, Sustainability in the Built Environment, Sustainable Construction and Development, Modern Building Design, Green Productivity, Productivity Tools and Techniques. This article has been published in Discover Geoscience Journal in 2024. https://doi.org/10.1007/s44288-024- 00041-1

Powering Rural Entrepreneurship Through Energy Production and Storage

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For rural entrepreneurship to grow sustainably, energy production and storage are essential elements. Lack of access to inexpensive, dependable energy sources can impede innovation, productivity, and economic growth in many rural areas. Therefore, enabling rural communities to participate in entrepreneurial activities requires the integration of advanced storage technologies and local, renewable energy solutions.

Alternatives to conventional power grids, which frequently fall short in reaching isolated rural areas, include renewable energy sources like solar, wind, and biomass. Particularly, solar energy has shown itself to be an effective solution, supplying electricity for a range of applications, such as domestic use, small-scale industry, and agriculture. In areas with the necessary resources, wind and biomass also offer chances for electricity generation. Rural business owners can generate energy locally thanks to the decentralized nature of these energy sources, which lessens reliance on external grids and boosts energy security.

Batteries and thermal storage systems are examples of energy storage technologies that are crucial for controlling renewable energy's erratic output. When energy production is at its highest, these storage systems enable the accumulation of energy that can be utilized when demand is high or generation is low. This is especially crucial for business owners in rural areas who depend on steady electricity to run their operations. Rural businesses can preserve productivity, lower energy expenses, and improve operational efficiency by implementing energy storage solutions.

Additionally, by generating new business opportunities, integrating energy production and storage systems within rural communities can promote economic growth. Energy systems can be installed, maintained, and managed by local business owners, creating jobs

and strengthening local economies. In conclusion, by offering dependable, affordable, and sustainable energy solutions that promote economic growth and empower communities, the combination of advanced storage technologies and renewable energy production holds great promise for boosting rural entrepreneurship.

Biography

Rakesh Suryadevara is a MBA graduate with alma mater from Thunderbird (ASU). He possess rich corporate experience of 12 years in the fields of Operations, Leadership and IT Consultancy with associations ranging from Infosys, KPMG to name a few. He has been teaching and associated with ICFAI for the past 5 years.

Development of a Durable and Stable Optical Fiber Probe using Polyvinyl Alcohol Hydrogel for Enhanced Sensing Applications

Kavita Sharma[1] and **Rajneesh Kumar Verma**[2]

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[2]University of Allahabad, India

This research outlines the creation of a robust and long-lasting metal oxide-coated optical fiber probe, specifically utilizing tin oxide nanoparticles (SnO2 NPs) integrated with polyvinyl alcohol (PVA) hydrogel. The nanoparticles were synthesized and their structures confirmed through X-ray Diffraction (XRD) and High-Resolution Transmission Electron Microscopy (HRTEM) analyses. The uniformity of the deposited layer was scrutinized using Field Emission Scanning Electron Microscopy (FESEM), and the sensor's stability was assessed through repeated usage. Furthermore, the study investigated the impact of PVA on the sensitivity and accuracy of the probe, utilizing UV–Visible spectroscopy and transmission spectra. This research is poised to significantly enhance the field of sensing by improving sensor accuracy, sustainability, and durability, all while maintaining high sensitivity.

Biography

Dr. Kavita Sharma is a dedicated physicist specializing in optical sensors and nanostructures, with a Ph.D. from the Central University of Rajasthan. She has held research positions at prestigious institutions, including IIT Bombay and IIT Delhi, working on innovative projects related to fiber optic sensors and nanomaterial-based detection techniques.

Dr. Kavita Sharma has authored multiple high-impact journal publications and book chapters and has presented her work at renowned international conferences. Her research focuses on bio-optics, plasmonics, nanostructure synthesis, Surface-Enhanced Raman Spectroscopy (SERS) and deep tissue imaging system, contributing to advancements in biomedical diagnostics and environmental sensing.

She is also experienced in scientific mentoring and teaching. With strong analytical skills and hands-on experience in advanced laboratory techniques, Dr. Kavita continues to push the boundaries of optical sensing technologies, aiming to develop cost-effective and efficient diagnostic solutions for healthcare and environmental applications.

Microbial Production of N-Acetyl-D-Glucosamine (Glcnac) for Versatile Applications: Biotechnological Strategies for Green Process Development

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[2]Division of Biochemical Science, CSIR National Chemical Laboratory, India
[3]Department of Biotechnology, Indian Institute of Technology Madras, India
[4]Department of Civil Engineering, Indian Institute of Technology Kharagpur, India
[5]Department of Biotechnology, Indian Institute of Technology Kharagpur, India

N-acetyl-D-glucosamine (GlcNAc) is a commercially important amino sugar for its wide ranges of applications in pharmaceutical, food, cosmetics and biofuel industries. In nature, GlcNAc is polymerized into chitin biopolymer, which is one of the major constituents of fungal cell wall and outer shell of crustaceans. Sea food processing industries generate large volume of chitin as biopolymeric wastes. Because of its high abundance, chitinaceous shell fish wastes have been exploited as one of the major precursor substrates of GlcNAc production, both in chemical and enzymatic means. Nevertheless, the current process of GlcNAc extraction from shell fish wastes generates poor turn over and attracts environmental hazards. Moreover, GlcNAc isolated from shell fish could not be prescribed to certain group of people because of allergic nature of shell components. Therefore, scientists investigate alternative strategy to generate GlcNAc. In this regard, the microbe mediated GlcNAc production could be the best option, as the efficiency of fungus and genetically modified bacteria in the production of GlcNAc has been reviewed recent past. In present review, different microbe based eco-friendly green methods are elaborated either by using chitin as a substrate in bioprocesses or through synthetically redesigned microbe based strategies as novel approach for vegan friendly non shellfish based GlcNAc production. The metabolic engineering approaches are recently investigated to overcome the low yield and high production cost issues, which are major challenges in microbial bio-fermentation processes industries. Besides, global usage and availability of GlcNAc and its derivative in

the treatment of various diseases are also discussed here.

Biography

Sancharini Das working as DBT BioCARe Women Scientist at CSIR National Chemical Laboratory, Pune India and visiting faculty at Savitri Bai Phule Pune University. She completed her Ph. D from Indian Institute of Technology Kharagpur, India on valorization of chitinaceous wastes by Fungal chitinase. Later, she worked as post-doctoral researchers at IIT Kharagpur and CSIR NCL. She also worked as faculty at NIT Sikkim, India and Amity University Uttar Pradesh Noida. Presently, her research is focused on metabolomics studies from biological samples by mass spectrometric techniques for contributing knowledge in the field of medical biotechnology and environmental biotechnology.

Degradation of Energetic Material 2,4,6, Trinitro Toluene using Integrated Approach

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[1]Environmental Microbiology and Bioremediation lab, Department of Environmental Engineering, Delhi Technological University, India

[2]Department of Applied Science and Humanities, Indira Gandhi Delhi Technical University for Women, India

[3]Cranfield University, Centre for Defence Chemistry, Defence Academy of the United Kingdom, UK

TNT red water poses a serious threat to all living organisms due to its toxic, carcinogenic, and mutagenic nature, as well as its resistance to biodegradation. Among the various treatment methods explored, advanced oxidation processes (AOPs) have shown promise as a sustainable solution. This study investigated the integrated use of zero-valent iron (ZVI), Fenton oxidation, and AOP for the degradation of TNT red water. Treatment efficiencies were assessed by measuring chemical oxygen demand (COD), nitrate, and nitrite concentrations using a UV-VIS spectrophotometer. Three chemical treatments were evaluated. Sodium hypochlorite proved effective in decolorizing TNT red water, enabling further processing with AOP. The combined hypochlorite-AOP treatment emerged as the most effective, as it decolorized the water without leaving harmful precipitates that burden the environment. In contrast, Fenton and ZVI treatments required filtration before AOP, leaving precipitates behind. UV-VIS analysis revealed the complete absence of TNT or TNT red water peaks (227 nm and 219 nm), indicating successful degradation. Further assessment showed increased nitrate and nitrite concentrations, signaling the extent of degradation. While Fenton's treatment yielded the highest nitrate levels, hypochlorite-AOP treatment resulted in significantly elevated nitrite levels, indicating superior degradation efficiency. The findings highlight hypochlorite-AOP as the most environmentally friendly and effective chemical approach for treating TNT red water, offering complete degradation without precipitate formation and achieving high ionic concentrations, which are indicative of advanced breakdown of contaminants.

Biography

Garima Upreti is a dedicated research scholar at Delhi Technological University, Delhi, India, with a passion for sustainability and environmental preservation. As a young driven sustainability enthusiast, she focuses her research on energetic waste management, aiming to develop innovative solutions for environmental challenges. Her work explores advanced treatment methods to address contamination in soil and water. Garima's commitment to sustainability reflects her pursuit of groundbreaking techniques that can contribute to cleaner ecosystems and efficient resource management. Her research not only targets reducing waste but also promotes the circular economy by finding value in discarded materials. Through her academic journey, Garima strives to bridge the gap between scientific advancements and real-world environmental issues, aspiring to create a lasting positive impact. She envisions a future where sustainable practices become integral to industrial and societal growth. Her work exemplifies the transformative power of young researchers in shaping a greener tomorrow.

A Review of the Effect of Magnetic Field using Nanofluids and Ultrasonic Amplification Technology on Water Desalination by Solar Stills

K. Samadhi[1], H. R . Goshayeshi[1] and **I.chaer[2]**

[1]Department of Mechanical Engineering, Mashhad Branch, Islamic Azad University, Iran
[2]The School of Built Environment and Architecture, London South Bank University, United Kingdom

Technological advancements such as high-speed microelectronic devices, high-power motors, etc. increase heat load, emphasizing the need for improved cooling. Conventional methods for increasing heat transfer involve rising surface area to allow for more heat exchange. Thus, the size of heat transfer systems increases unfavorably. Therefore, there is an urgent need for a new operating fluid that improves the thermal performance of heat transfer systems. The term “nanofluid” is introduced by describing the dispersion of nano-sized particles (>100 nm) in primary working fluids such as water and ethylene glycol. Compared to the base fluid, nanofluids perform better in terms of convective heat transfer and thermal conductivity. Consequently, numerous studies have been conducted on nanofluids with prospective applications in sensitive areas. The addition of nanoparticles to the base fluid alters its thermophysical properties. In recent years, the rapid development of engineering technologies has contributed significantly to improving heat transfer. (Table1.)

Some of the presented methods include increasing the thermal surface area of the blades, increasing the turbulent flow, vibrating the heating surfaces, or using electric and magnetic fields. Research shows that the thermal performance of heat transfer systems increases with increasing magnetic field strength. The magnetic nanoparticles used produce specific properties compared to other metal nanoparticles in the proximity of the magnetic field. (Fig.1) Depending on the desired application, different chemical syntheses of magnetic nanofluid have been developed for various applications. Solar stills can be an idea solution to compensate for the lack of potable water in warm and arid areas. reviewed researches conducted by others have shown that the use of sonicated water with 3 4 Ferrofluid, which exhibits a strong response to magnetic fields, under magnetic field effect has led to a significant increase in the device efficiency.

Table 1. Particle sizes and magnetic parameters of Fe_3O_4 nanoparticles prepared at different temperatures [113]

Temperature T, °C	Size interval D, nm	Average size D_m, nm	Magnetization M_S, emu/g	Coercivity H_C, Oe
18	60–190	118.7	81.7	112.1
35	40–110	69.9	89.8	114.3
45	20–70	49.3	94.9	96.4
60	10–50	24.6	82.8	126.9
80	10–40	20.1	71.0	80.0

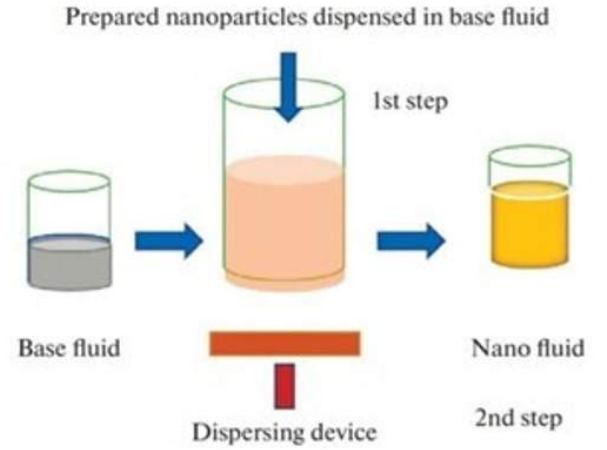

Figure Formation of nanofluids from nanoparticles using the one-step method [97].

Biography

Kimya Samadi. She is a PhD student in Energy transformation at the Islamic Azad University of Mashhad. Her field of interest is renewable energy and the Lattice Boltzmann method. Her articles are listed below:

-Leakage inspection of the stepped solar still using the magnetic particle testing

Method (Renewable energy and smart systems)

-Simulation of Mixing Flow in Wavy Channels using Lattice Boltzmann Method (The fifth international conference of new horizons in electrical, computer and mechanical engineering)

-A Review of the Effect of Magnetic Field Using Nanofluid and Ultrasonic Amplification Technology on Water Desalination by Solar Stills (Applied Solar Energy Journal)

- Computational Fluid Dynamics-Based Analysis of Magnetic Field Effect on Improvement the performance of stepped Solar Still (Experimental Technique Journal)

-Experimental Investigation of the Magnetic Field Effect Using Fe_3O_4Ferrofluid and the Study of the Ultrasonic Phenomenon in Solar Water Desalination Efficiency (Renewable Energy and Smart Systems

Universal Law of Response

Ugur Saglam

Department of Physics, Istanbul University, Turkey

The dielectric response is studied between the low-frequency plateau (LFP) and high-frequency plateau (HFP), and for different transport mechanisms common in amorphous semiconductors and insulators. The response formula arises depending on the shift in frequency range and the type of conductivity/loss mechanisms. However, there is no unified formalism detecting all the response patterns of dielectrics despite many theoretical and semi-empirical modeling studies in the literature. Moreover, there is a diversionary ramification in the dielectric response literature via various methods, models, and theories on dielectric responses that have made progress that is interdependent or independent of each other in an erratic way. Thus, the unification of the literature can clarify the holistic scheme and raise awareness of their historical context.

Universal Law of Response (ULR), a composite formula and a theoretical ansatz, presents a novel contribution to unifying all types of conductivity formulas and determining anomalous transport processes. Thus, all conductivity/conductivity–capacity (C/CC) formulas defined in the low and high-frequency plateaus can be categorized via some predefined parameters regarding the response patterns. The ULR is a formalism that removes all literature irregularities, provides a clear branching hierarchy, and makes the formulas interpretable for all responses. Moreover, the ULR foresees certain gaps in the branching hierarchy, meaning new formulas can be revealed in any theoretical or experimental study that has not yet been detected. This makes every research process on dielectric response more predictable and comprehensive through the known branching hierarchy and behavioral patterns.

Biography

Ugur Saglam is a PhD in the fields of theoretical physics and applied mathematics at Istanbul University. His research interests include modeling studies, theoretical physics, mathematical physics, and applied mathematics. His aim is to write theoretical and philosophical papers on using multidisciplinary, interdisciplinary, and transdisciplinary approaches in various research fields. He is especially concerned with the theoretical sciences which may be derived from a deeper philosophical background. He is collaborate with theoretical and experimental research groups but generally solitarily.

An Efficient Methodology for the Prediction and Improvement of Multi-Laser Shock Peening on Fatigue Life

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[2]Council for Scientific and Industrial Research (CSIR), South Africa

Fatigue failures at stress raiser regions on critical components such as gas turbine engine shafts is becoming an area of great concern. Consequently, techniques to minimize these stresses and improve their fatigue life has become a field of active research. Laser shock peening is an effective and popular method where compressive residual stresses are introduced on the stress raiser regions of such components. Currently, numerical models have been developed for single laser shock pulses. However, reliable numerical models employing multiple laser shocks, as experienced in practice, applied to these stress raiser zones on real components is under-researched and very limited in the literature. A possible reason for this can be attributed to the substantial numerical expense associated with such multi-impact simulations using conventional approaches.

Hence, this work attempts to predict the stress and subsequent fatigue life at the fillet radii zone on a real high-speed gas turbine engine shaft subjected to multiple laser shock pulses by developing a computationally-efficient numerical model to mimic the multi-laser shock process. A modified laser shock peening simulation technique for effective prediction of the residual stress field is developed based on the finite element method. Subsequently, the fatigue life due to laser shock peening is computed.

Interestingly, the results showed considerable promise depicting that the developed numerical model produced similar residual stress profiles at a substantially reduced numerical cost of over 68% when compared to conventional approaches which were quite expensive. Furthermore, the fatigue life predictions revealed an exceptional improvement of 553% due to the laser shock peening operation, which is comparable to similar findings

in the literature. Hence, it may be stated that the developed numerical model using the modified approach can be an effective tool for fatigue life prediction and investigations of multi-laser shock peening operations.

Biography

Dawood Ahmed Desai was born in South Africa where he completed his teaching qualification in Technical Education (cum laude). He was appointed Executive Chair: Automotive Engineering at the Tshwane University of Technology (TUT) whilst working on his doctoral degree. He was subsequently appointed Senior lecturer and thereafter Associate Professor, Deputy Head of Department and Research Chair in the Department of Mechanical and Mechatronics Engineering at TUT. Prof Desai's research interests span the areas of structural dynamics, vibro-acoustics, fluid-structure interaction, materials characterization and heat transfer. He has published in many peer-reviewed scientific journals and conference proceedings and was awarded the "best research paper" at the WCECS conference held at the University of Berkeley, USA. He was recently awarded the Scientist Medal (2023) by the International Association of Advanced Materials', Sweden. Prof Desai has supervised many research students, is registered with many professional bodies including the Aeronautical Society of SA (UK).

On Some Features of Complex Mechanical Systems Analysis

Alexander Trubayev[1], Andrew Larin[1], Oleksandr Tymchenko[2] and **Oleksii Vodka[1]**

[1]National Technical University "Kharkiv Polytechnic Institute", Ukraine
[2]LLC Ukr.Agro-Service, Ukraine

The most important problem in conducting dynamic and strength calculations of machines and mechanisms is the construction of mechanical and mathematical models that adequately reflect the properties of the structure under consideration. The report provides a strategy for modeling complex mechanical systems based on a computational and experimental approach. It involves replacing individual structural elements with simpler ones that are equivalent to the original elements in terms of dynamic and strength properties. This allows for a reduction in the dimensionality of finite element models and an increase in their efficiency. To confirm the reliability of the constructed model, it is necessary to conduct static and dynamic experiments that minimize modeling inaccuracies.

The proposed methodology was implemented in a strength study of the Slavyanka UAS 7 stripper header manufactured by Ukr.Agro-Service LLC (Ukraine, Kharkov). Three rotors of the header (reflecting beater, stripping drum and auger), having a complex design, were modeled as integral and homogeneous cylindrical elements with corresponding bending rigidity and mass. The rigidity characteristics of the rotors were determined through the experimentally obtained values of natural frequencies of bending vibrations. For this purpose, the vibration measuring complex ULTRA-V-I built by the authors on the basis of a microelectromechanical sensor was used. Besides, the employees of Ukr.Agro-Service LLC conducted experiments to determine the static deflections of the structural elements.

Calculation and experimental studies of the strength of the stripping header "Slavyanka UAS 7" allowed not only to lighten its design, but also to formulate recommendations for designing a more productive header with a capture width of nine meters. The new product

has been introduced into production.

Biography

PROFESSIONAL CAREER

- 1975-1981: Study of mechanics in National Technical University " Kharkiv Polytechnic Institute" (NTU “KhPI”), Kharkiv, Ukraine
- 1986-1987: Graduate studies at the NTU “KhPI”, Kharkiv, Ukraine
- 1988: Awarded a PhD degree in Mechanical Engineering (speciality: Dynamics and Strength of Machines)
- Theme of the dissertation thesis: Development of methods for calculating vibrations and lifetime of pipelines under random and deterministic effects

PROFESSIONAL CAREER

- 1981 – 1986:Position: Engineer
- Organisation: Department of Dynamics and Strength of Machines, National Technical University, "Kharkiv Polytechnic Institute", Kharkiv, Ukraine
- 1986 – 1988: 1988: 1989 – 1990: 1993 – 1993: 1995 – Position: Junior researcher | Researcher | Assistant lecturer | Senior lecturer
- Organisation: Department of Dynamics and Strength of Machines, National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine
- 1996 to present Position: Associate Professor
- Organisation: Department of Dynamics and Strength of Machines since October 2022 Department of Mathematical Modeling and Intelligent Computing in Engineering
- National Technical University
- "Kharkiv Polytechnic Institute", Kharkiv, Ukraine

Water-Activated Polymers to Mitigate Growing Global Challenges in the Healthcare and Environmental Sectors

Richard J. Spontak

North Carolina State University, USA

We currently live in a world that is filled with a number of growing challenges that can affect the well-being of the global populace. This study focuses on two of these – pathogenic infections and climate change – and polymer-based solutions to help mitigate them. Both polymer classes possess a common attribute: their unique function activates in the presence of water. In the first challenge, an anionic thermoplastic elastomer (pentablock polymer) without any additives inherently creates a highly acidic surface upon hydration, and the resulting pH drop is sufficient to inactivate a variety of dangerous microbes to at least 99.9999% within an exposure time of 5 minutes or less. Examples of CDC- and WHO-listed microbes include: Gram-positive/negative bacteria such as methicillin-resistant S. aureus (MRSA), E. coli and C. difficile; viruses such as SARS-CoV-2, influenza, and Ebola; and fungi such as *C albicans* and *C. auris*. The efficacy of this polymer is dependent on the contiguity of the pathway through which protons diffuse, and the morphology of this self-organized polymer can be controllably altered via solvent templating or non-thermal annealing. In the second case considered here, pre-existing commercial polymer membranes including polydimethylsiloxane (PDMS) and polytetrafluoro¬ethylene amorphous form (PTFE AF) represent materials possessing high CO_2 permeability but low CO_2 selectivity. Grafting-from polymerizations conducted on the surfaces of both substrates permit the introduction of amine-containing polymer chains. When humidified, these chains serve as CO_2 sponges and concentrate the level of CO_2 in mixtures with either N_2 or CH_4. Although the CO_2 permeability decreases modestly a result, the accompanying CO_2 selectivity increases substantially through this nanoengineered marriage of the solution-diffusion and facilitated-transport mechanisms. These membranes are highly stable and relatively inexpensive, thereby expediting their use to reduce CO_2 emissions from flue gas streams

emanating from power plants operating on fossil fuel.

Biography

Richard Spontak Ph.D., dr. h.c. is presently a Distinguished Professor at North Carolina State University. He received his doctoral degree from UC Berkeley and pursued post-doctoral research at Cambridge University before joining the Procter & Gamble Company in 1990 and then North Carolina State University in 1992. He has published over 300 peer-reviewed journal papers and 40 book chapters and invited works. He has received numerous research awards including the NC State Holladay Medal for Excellence, the NC State R.J. Reynolds Award for Excellence in Teaching, Research and Extension, the ACS-PMSE Tess Award, the SPSJ International Award, the IChemE Underwood Medal and Global Award, the ACS-RUBB Chemistry of Thermoplastic Elastomers Award, and the IOM3 Colwyn Medal and Medal for Excellence. An IOM3, ACS-PMSE, APS and RSC fellow, he is a member of the Norwegian Academy of Technological Sciences.

Creating a Blockchain-Based Audit Trail for Iot Device Interactions and Data Exchanges to Enhance Transparency and Security

Firend Al Rasch

American International Institute, USA

This research explores the interoperability between different blockchain platforms in IoT contexts and focus on the following: development of benchmarks for comparing blockchain-based and traditional audit systems, metrics for measuring transparency, such as data accessibility and verifiability, and security metrics, including resistance to various types of attacks.

Research Problem:

The proliferation of Internet of Things (IoT) devices has led to an exponential increase in data generation and device interactions, raising significant concerns about data integrity, security, and transparency. Traditional centralized systems for logging and auditing these interactions are vulnerable to tampering, single points of failure, and lack the scalability required for IoT networks. There is a pressing need for a robust, decentralized solution that can provide an immutable and transparent audit trail of IoT device interactions and data exchanges while ensuring security and scalability.

Research Questions:

1. How can blockchain technology be effectively implemented to create a tamper-resistant audit trail for IoT device interactions and data exchanges?
2. How can the privacy of sensitive IoT data be maintained within a transparent blockchain-based audit system?
3. What are the performance implications of implementing a blockchain-based audit trail on resource-constrained IoT devices, and how can these be mitigated?
4. How can the proposed blockchain-based audit trail system integrate with existing IoT

protocols and standards to ensure widespread adoption and interoperability?

5. What metrics and methodologies can be used to quantitatively assess the transparency, security, and efficiency gains of the blockchain-based audit trail compared to conventional systems?

These research questions cover various aspects of the problem, from technical implementation details to broader implications for IoT security and privacy. They provide a solid foundation for exploring the potential of blockchain technology in enhancing the transparency and security of IoT networks through robust audit trails.

Biography

Dr. Firend Alan Rasch holds a Ph.D, in applied management and decision science (USA). Dr. Rasch is a global scholar and expert in Southeast Asian region. His experience in California, United States, provides an insight into various industries of California's Silicon Valley. Worked as Sr. Management Consultant with McKinsey & Company, KPMG, and Anderson Consulting advising U.S. Fortune 500 companies. Lectured in numerous countries including the U.K., U.S.A., Korea, Malaysia, Singapore, Qatar, UAE, and Uzbekistan, in the fields of IT and innovation & technology. 25+ years of experiences in international business, combining both East and West. An active researcher and author of several books in the areas of corporate strategy, education and innovation.

Engineering Conducting Polymer Interfaces for Enhanced Organic Photovoltaic Performance

Sugirtha Krishnamurthy

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Conducting polymers have emerged as promising materials for next-generation optoelectronic devices due to their tunable electronic properties and processability. This study explores the design and optimization of polymeric interfaces in organic photovoltaic (OPV) devices, focusing on polyaniline (PANI) as the hole-conducting donor material and 2-phenyl-5-(4-biphenylyl)-1,3,4-oxadiazole (PBD) as the electron-accepting layer. A key challenge in OPV performance lies in achieving high charge carrier mobility while maintaining structural integrity at the donor-acceptor and electrode interfaces.

In this work, PANI was chemically modified using dodecylbenzenesulfonic acid (DBSA) and hydrochloric acid (HCl) to enhance conductivity and optimize its electronic band structure. Conductivity measurements revealed a significant increase in charge transport efficiency, with DBSA-doped PANI exhibiting a reduced band gap of 2.4 eV and improved exciton dissociation characteristics. PEDOT:PSS was utilized as an interfacial layer to facilitate hole transport and minimize contact resistance at the indium tin oxide (ITO) electrode.

Fabricated OPV devices were systematically evaluated for their electrical characteristics, including current-voltage (I-V) response and power conversion efficiency. The DBSA-doped PANI device demonstrated the highest fill factor (0.47), indicating superior charge transport dynamics and reduced recombination losses. These findings underscore the critical role of interface engineering in tailoring electronic properties for efficient energy conversion.

This study contributes to the advancement of electronic materials by providing insights into dopant-mediated conductivity enhancement in polymer-based photovoltaics, paving the way for high-performance, scalable optoelectronic applications.

Biography

Sugirtha Krishnamurthy leads manufacturing design at Apple Inc. and has over a decade of experience spanning academia and the semiconductor industry. She holds a Masters in Chemical Engineering from Cornell University and specializes in engineering semiconductor materials and conductive polymers for FinFETs and consumer electronics applications. With multiple patents and publications, her work spans FinFET processing, organic photovoltaics, and nanomaterials. Sugirtha has contributed to polymer-based photovoltaics at IIT Madras, India and at TU Chemnitz, Germany. She has also led the development of advanced semiconductor processes at distinguished organizations such as GlobalFoundries, Micron Technology, and Apple Inc. She continues to drive advancements in electronic materials, bridging fundamental research with scalable industrial applications.

Analysis of Permanent Deformation in Asphalt Mixtures using Mohr–Coulomb Criteria

Fabiano Pereira Cavalcante[3], Daniel Beserra Costa[1], Osires de Medeiros Melo Neto[2], Milena Cristina Rocha de Souza[2] and **John Kennedy Guedes Rodrigues[2]**

[1]Department of Civil Engineering, Federal University of Maranhão, Brazil
[2]Department of Civil Engineering, Federal University of Campina Grande, Brazil
[3]JBR Engineering, Brazil

This study aimed to investigate the infuence of the internal friction angle on the mechanical properties and resistance to permanent deformation of asphalt mixtures. Permanent deformation, resulting from vehicular loads, can occur due to densifcation, use, and fow of the mixture (Figure 1). Considering that the asphalt mixture behaves as a solid material at service temperatures of 40 °C to 60 °C, the Mohr–Coulomb criterion, commonly used to describe shear characteristics of solid materials, was employed to determine the internal friction angle and cohesive intercept of the mixture. An experimental program was devised to assess the mechanical properties associated with the internal friction angle of asphalt mixtures with asphalt binders of the types Petroleum Asphalt Cement with a penetration grade of 50/70 (PAC 50/70) and Petroleum Asphalt Cement modifed with styrene–butadiene–styrene (SBS) polymer (E-55/75). Laboratory analyses were conducted to determine shear rupture parameters, using the Mohr– Coulomb theory. It was observed that an increase of 5% in coarse particles resulted in an average gain of 1° in the internal friction angle for each studied gradation range, up to the limit of 30–35% of coarse particles for each mixture (Figure. 3). The results indicated that shear rupture parameters, especially the internal friction angle and cohesive intercept, play a crucial role in the resistance to permanent deformation of asphalt mixtures (Table 4). It was concluded that an increase in the internal friction angle contributes to greater resistance to permanent deformation, providing valuable insights for optimizing the composition of asphalt mixtures in terms of mechanical performance.

Figure 1 Plastic deformations of the asphalt mixture on the toll plaza pavement

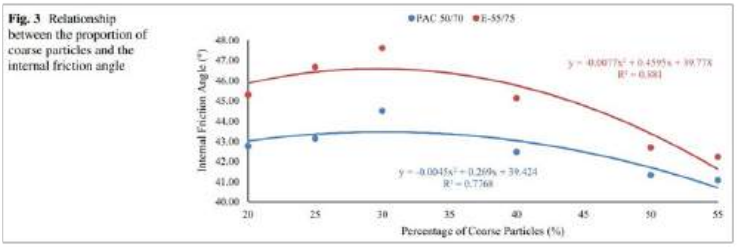

Fig. 3 Relationship between the proportion of coarse particles and the internal friction angle

Table 4 Results of mechanical tests with the asphalt mixtures evaluated

Binder	Mixtures	Compressive strength (MPa)	Tensile strength by diametral compression (MPa)	Moisture-induced damage (%)	Flow number (Cycles)	Resilient modulus (MPa)	Friction angle (°)	Cohesive intercept (MPa)
PAC 50/70	FC	5.54	1.06	68.04	85	5865.7	42.77	1.2122
	FCI	5.59	1.05	69.39	94	5754.7	43.14	1.2113
	FB	6.16	1.08	71.01	126	7219.7	44.5	1.2925
	FBI	5.20	1.01	69.11	73	7309.3	42.48	1.1453
	FBII	4.96	1.01	64.82	44	6136.7	41.33	1.1220
	FF	4.24	0.88	59.92	18	5135.0	41.08	0.9654
E-55/75	FC	7.45	1.26	76.22	309	6129.0	45.29	1.5310
	FCI	7.08	1.12	80.86	354	6000.0	46.67	1.4061
	FB	7.30	1.10	82.04	424	7352.0	47.61	1.4158
	FBI	7.51	1.28	84.39	305	8457.5	45.13	1.5501
	FBII	5.85	1.12	80.07	166	9427.5	42.70	1.2819
	FF	5.01	0.98	76.62	135	6535.5	42.24	1.1095
Difference by mixture type based on asphalt binder type	FC	26%	16%	11%	72%	4%	6%	21%
	FCI	21%	6%	14%	73%	4%	8%	14%
	FB	16%	2%	13%	70%	2%	7%	9%
	FBI	31%	21%	18%	76%	14%	6%	26%
	FBII	15%	10%	19%	73%	35%	3%	12%
	FF	15%	10%	22%	87%	21%	3%	13%

NA not applicable

Biography

Graduated in Civil Engineering from the Federal University of Paraíba (2001), Master's degree in Civil Engineering from the Federal University of Pernambuco (2005) and PhD in Materials Science and Engineering from the Federal University of Campina Grande (2016). He is currently Director of JBR Engenharia Ltda. Supervised and co-supervised course completion, master's and doctorate research. More than 30 articles published in conferences and scientific journals. Consultant and designer in Civil Engineering with an emphasis on Geotechnical Studies, Traffic and Capacity Studies, Hydrological Studies, Earthmoving, Drainage and Paving Projects.

Guided Fantasy: Research for Innovation

Adriano Bernardo Renzi

MobileLIve Research Lab, Canada

Larry Tesler developed first experimentation withGuided Fantasy in 1973, together with Tim Mott, at theParc labs at Xerox. The method was one of many user-centered methods used to test usability at the lab (Moggride 2007,p.48.). While research methods and usability testing such as heuristic evaluation, card sorting, think-aloud protocol, prioritization matrix, cooperative evaluation, etc., help investigate pain points, organize information, pinpoint usability issues, and map users' expectations and mental models, the Guided Fantasy allows researchers create the first drafts of how a new system should be structured based on users' experience, cultural conventions and references. It allows designers and developers to build a new product together with users based on the imagination of how a new system should look like and interact with. This presentation aims to share how the method is adapted to new technology and conducted 50 years later, in both in-person and remote contexts, detailing the process and results for discussion and new learnings. The three projects used for the experiments described here are related to project management, banking systems and telecom service. The results of the experiments connect to all four degrees of innovation: radical, incremental, disruptive and rationalization – Innovation has been commonly used in the industry to represent new products, new services, new processes,new apparatuses,and new ways of thinking, not necessarily following the scientific definition for the characterization of its typology: Innovation is never a one-time phenomenon,but along and cumulative process of a great number of organizational decision-making processes, ranging from the phase of generation of new idea to its implementation phase (Uribe 1988).

Biography

Doctor of Sciences in Design and technology (PhD), experienced in mapping cross-channel experience journeys, structuring iInformation architecture and system thinking in ecosystems. Adriano is a Sr. Researcher for MobileLive research lab, formerly Adjunct professor at Universidade Federal Fluminense, and UX mentor for Google's Accelerate Program, mentoring startups from around the world (Poland, India, Indonesia, Spain, England, Brazil and Mexico). UX consultant for interactive projects in Canada, U.S.A., Italy, and Brazil, he has been writing about the adaptation of research methods to the new hybrid scenario after the pandemic. Scientific Board Member for AHFE, SPGD, Ergodesign & USIHC Journal, and Disciplinarum Scentia Journal. Scientific evaluation on pervasive information architecture for the Technology and philosophy journal.

On the Development of a Constitutive Model for Steel Subjected to Fire

Gustavo Provençano Vilardo and **Theodoro Antoun Netto**

Federal University of Rio de Janeiro, Brazil

The behavior of steel under thermal and mechanical loading including high transient temperatures and strain rates (e.g., fire, creep or explosion) is extremely complex. To study this behavior, we propose a constitutive model accordance with the laws of thermodynamic, the principle of virtual power and experimental results. The thermodynamic framework considers the Clausius-Duhem inequality and maximum dissipation rate principle, as well as the theory of finite deformations, linear isotropic viscoelasticity, nonlinear isotropic and kinematic hardening, local and non-local viscoplasticity, local and non-local anisotropic viscodamage and parameters associated to material behavior dependent on loadings. The components of the thermodynamic conjugate forces are defined from the Helmholtz free energy function and the rate of energy dissipation, which are postulated considering the creep phenomenon, thermal-mechanical transient phenomenon, cyclic phenomenon and plastic wave propagation phenomenon. The balance of microforces is defined based on the principle of virtual power. A novel rule of non-associated thermo-viscoplastic flow of the Perzyna type and a novel rate dependent local and non-local damage evolution law are introduced from constitutive model. The verification of the model was carried out in two benchmark studies composed of fire tests. The predictions of the model have shown in according with the results of the experiments (Table 1 and Figure 1).

Table 1. Failure time (development of plastic hinge) - Benchmark study 1 outcome

	Failure time (min)			
	Test 1	**Test 2**	**Test 3**	**Test 4**
Experiment	114.67	40.82	187.96	98.18
Model_Static	>115	>>45	188.64	98.81
Model_Implicit Dynamic	114.66	>>45	187.21	98.17
Vulcan_EC3 stress strain curves	>>115	>>45	184.9	>100
Toric(b)_EC3 stress strain curves	>>115	-	>190	>100
Toric(b)_EC3 stress strain curves + implicit creep Harmathy	>115	-	>190	>100

Note: the symbol > means close and greater than of the respective time, and the symbol means far away and greater than of the respective time.

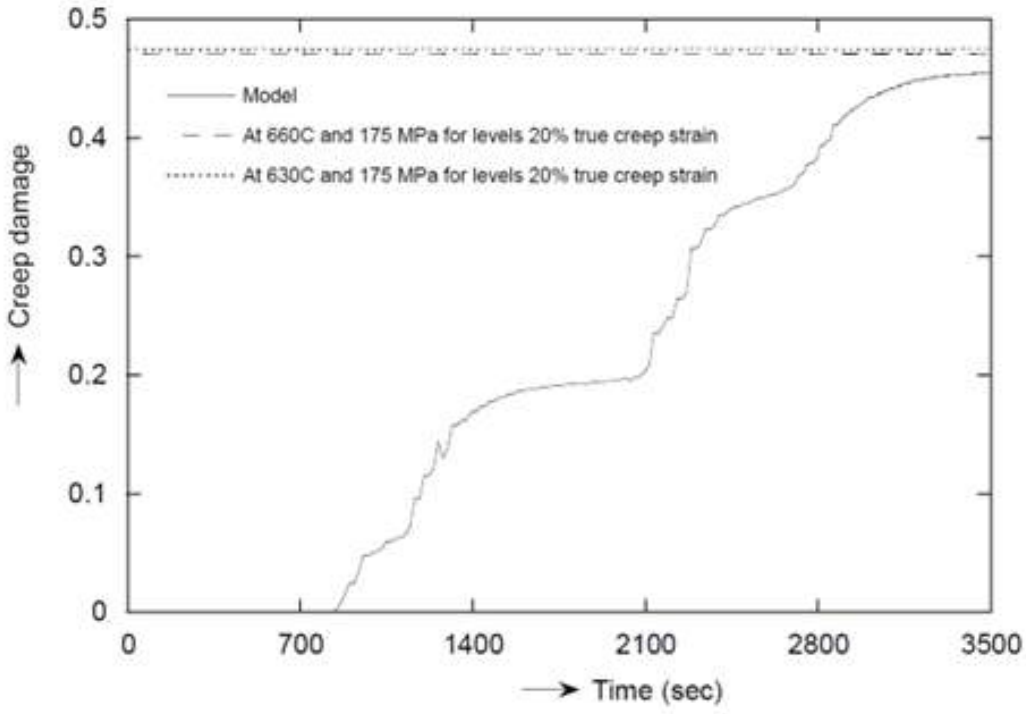

Figure 1 - Maximum creep damage and creep damage results for levels 20% true creep strain - Benchmark study 2 outcome

A sensitivity study was also performed with a view to analysis the influence of the parameters in achieved results. From this study simplified constitutive models are presented.

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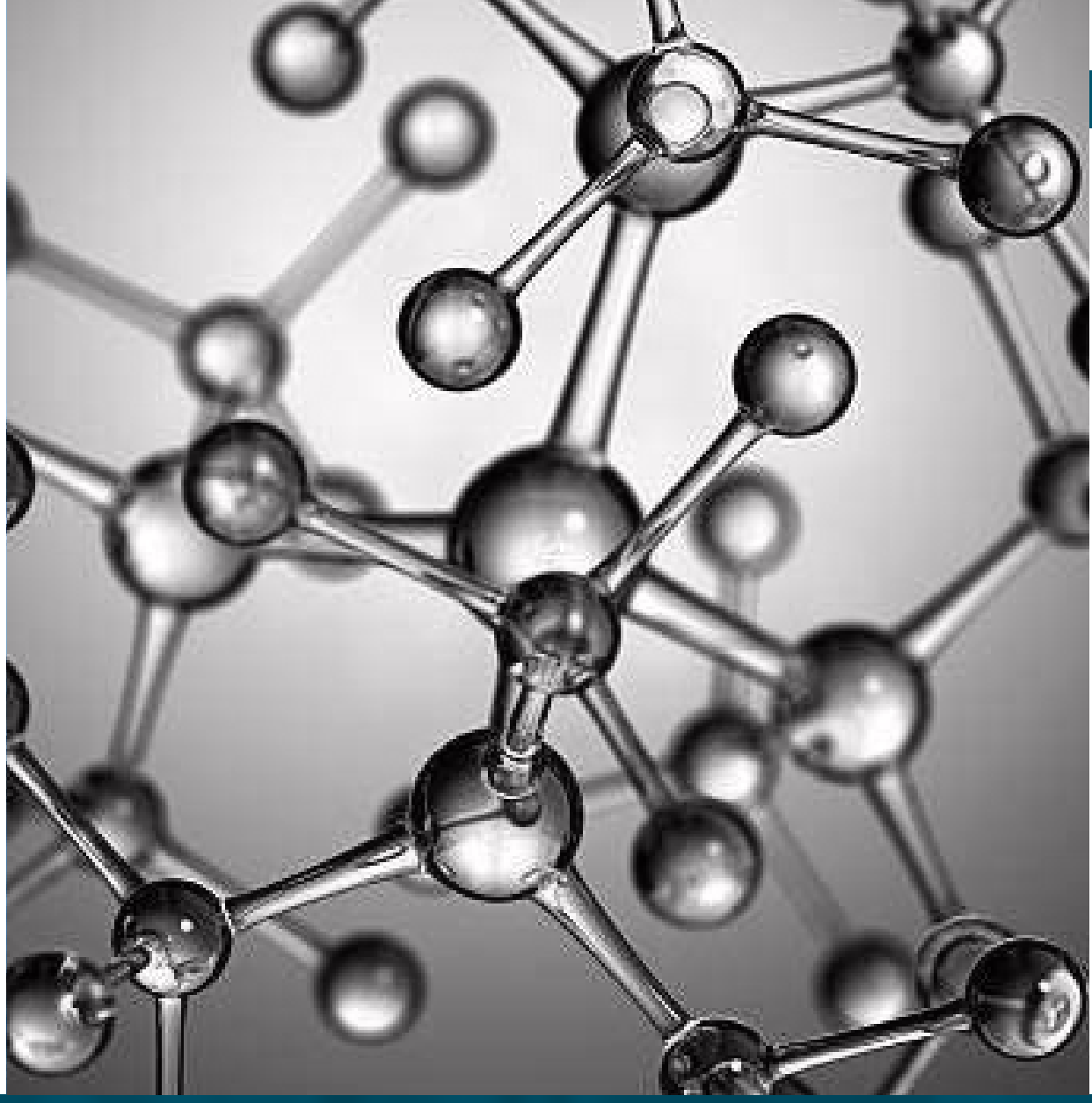
Toric, N, Harapin, A., Boko, I., 2013b. Experimental verification of a newly developed implicit creep model for steel structures exposed to fire. Engineering Structures 57, 116-124.

Wald F., Burgess I., Kwasniewski L., Horová K., Caldová E., 2014. Benchmark studies - Experimental validation of numerical models in fire engineering. COST Action TU0904, Integrated Fire Engineering and Response, fire.fsv.cvut.cz/ifer.

Biography

Gustavo Provençano Vilardo. He was 47 years old. He is from Brazil and live in Rio de Janeiro. He is Bachelor of Science (B.Sc.) and Master of Science (M.Sc.) in Mechanical Engineering at Federal University Fluminense as well as Doctor of Science (D.Sc.) in Ocean Engineering at Federal University of Rio de Janeiro. Nowadays he was working at Subsea7 company as a Structural Engineer. In his doctorate course his research was about the behavior of steel structures subject to high temperatures and strain rate transients. The main objective was to elaborate a constitutive model thermodynamically consistent. Intervals of temperature and strain rate between 300C and 9000C as well as 0 s-1 and 104 s-1 were considered, respectively. Because of this research, a scientific paper was published in the International Journal Mechanics of Materials titled on the development of a constitutive model for steel subjected to fire and explosion. A brief resume was developed aim to presents in this conference.

ADV. MATERIALS SCIENCE 2025



DAY 02

VIRTUAL EVENT

7th EDITION OF

ADVANVCED MATERIALS SCIENCE WORLD CONGRESS

MARCH 24-26, 2025

SPEAKER TALKS

Electrosynthesis of Organic 2D Conducting Polymer Films

Luiza A. Nascimento[1,2], Kilian Fraysse[3], Kevin Krause[4], Cameron Bentley[4], Rosanne Guijt[5], Paul Stoddart[6,7], Simon Moulton[6,7], Saimon M. Silva[1,2] and **George W. Greene[1,2]**

[1]The Biomedical and Environmental Sensor Technology (BEST) Research Centre, La Trobe Institute for Molecular Science (LIMS), La Trobe University, Australia
[2]Department of Biochemistry and Chemistry, School of Agriculture, Biomedicine and Environment, La Trobe University, Australia
[3]Institute for Frontier Materials and ARC Centre of Excellence for Electromaterials Science, Deakin University, Australia
[4]School of Chemistry, Monash University, Australia
[5]Centre for Regional and Rural Futures, Deakin University, Australia
[6]The Aikenhead Centre for Medical Discovery, St Vincent's Hospital Melbourne, Australia
[7]Iverson Health Innovation Research Institute, School of Science, Computing and Engineering Technologies, Swinburne University of Technology, Australia

The development of 2D materials is rapidly advancing, however, when it comes to conductive polymers, they can only be grown like nanosheets or in a colloidal media, and when deposited in an interface its two-dimensionality is lost and its conductive properties are hindered. We designed a novel approach for electropolymerizing conductive polymers that tethers the dopant on the electrode surface, and the electropolymerization reaction is carried through regular cyclic voltammetry (Figure 1). The tethered dopant initiates and limits the propagation of the electropolymerization reaction resulting in a defect-free, nanostructured and transparent 2D conductive polymer film with metallic-like conductivity cause by a novel hyper-doping effect able to cover a cm^2 area with no loss in electrical properties. The electrical and electrochemical properties of the 2D film are unprecedently homogenous, in microns scale, as shown by scanning electrochemical cell microscopy. The capability of growing highly conductive, homogeneous and defect-free 2D polymer films

developed in this work presents a great class of a novel functional biocompatible material for future biosensing interfaces and bioelectronic nanodevices.

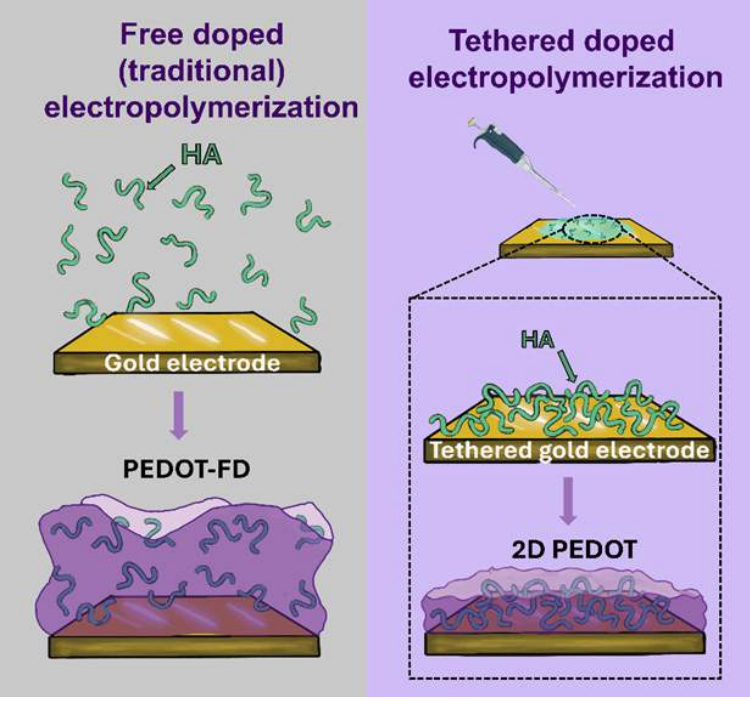


Figure 1: Scheme representing the traditional doping approach for electropolymerization using free HA that grows thick PEDOT, and the tethered HA approach that grows 2D PEDOT.

Biography

Luiza is a Brazilian scientist, graduated in Chemical Engineering and master's in Chemistry, now pursuing her PhD in materials science focusing on electrochemical organic conducting polymers synthesis and biosensing. She works with electrochemical synthesis since 2016 in the beginning of her undergraduate journey, producing photoanodes for water splitting cells, following up with polymer electrochemical synthesis and a COVID-19 electrochemical biosensor in her masters. She now develops 2D conducting polymer films that will be applied in nanoMIPs for biosensing.

The Performance of Handmade Silk Product's from Shkodra Region, Albania

Blerina Kolgjini[2], Julie Kolgjini[1] and **Ilda Kola[2]**

[1]Rochester Institute of Technology/RIT Kosovo, Kosovo
[2]Polytechnic University of Tirana, Albania

The performance of handmade silk products from the Shkodra region of Albania is a unique subject, in particular due to the region's rich tradition in textile craftsmanship, with silk being one of the primary fibers employed historically in traditional Albanian garments and household items. Handmade silk from Shkodra is known for its intricate craftsmanship, cultural significance, and quality. Concerning the performance of these silk fibers, the region's traditions, techniques, and local materials are vital factors. This paper investigates a sample of silk filaments from the Shkodra region. The study looks at the tenacity of such fibers, in addition to other characteristics. The methodology includes analyzing the filaments, in particular in relation to various aspects of density, among other aspects. The findings suggest that the samples considered in the current investigation are similar to theoretical values found in the literature concerning filaments of silk in general. Such results also illustrate the potential for silk cultivation in this part of the world, including concerning environmentally friendly approaches that can enhance the ecosystem. Further, this study also underscores the social as well as economic relevance of silk production for the preservation of cultural heritage in this region of Albania. Continuing to develop such an industry could not only reduce employment of marginalized segments of society, but also foster responsible business practices that highlight sustainability in regard to the natural surroundings. Consequently, continued investments in this sector could be beneficial to both local and national initiatives that center environmental matters for present and future generations to come.

Biography

Dr. Blerina Kolgjini is a textile engineer and an associate professor at the Textile and Fashion Department of the Polytechnic University of Tirana, where she has worked since 2001. As part of the department, Blerina teaches courses related to textile engineering, where she mentors students throughout their projects. Her research involves exploring new materials, including fibers, and developing innovative textile technologies, such as regarding sustainable fabrics and advanced production techniques. Given the global focus on sustainability in textiles, her work involves eco-friendly practices, such as reducing waste, recycling fibers, and using environmentally friendly fibers as well as textiles in dye-related processes.

Dr. Ilda Kola is a textile engineer at Textile and fashion department at Polytechnic University of Tirana for almost 15 years.

Dr. Julie Kolgjini teaches multidisciplinary courses at RIT Kosovo, where she has been working for more than a decade.

First-Principles Insights on Si-Binder Interface for Next-Gen Lithium-Ion Batteries

Rita Maji[1], Michele A. Salvador[2], Alice Ruini[2], Rita Magri[2] and **Elena Degoli[1]**

[1]Dipartimento di Scienze e Metodi dell'Ingegneria, Università di Modena e Reggio Emilia, Italy
[2]Dipartimento di Scienze Fisiche, Informatiche e Matematiche sede ex-Fisica, Università di Modena e Reggio Emilia, Italy

To achieve the growing demand of higher energy densities in commercial lithium-ion batteries (LiBs), it is imperative to improve the next-gen LiB technologies. Silicon emerges as a promising candidate; however, its adoption is hindered for low intrinsic conductivity and volumetric expansion challenges. Addressing these concerns, different strategies has been proposed, where research endeavors have focused on the use of polymeric binders to uphold the structural integrity of the anode by enhancing the mechanical, elastic, electrical, and ionic properties of binders to be used with silicon anodes. Regarding this a crucial aspect in merging structural and chemical insights lies in the investigation of silicon/polymer interfaces. Our study focuses on recently proposed binders for Si anode: polyaniline (PANI), polyaniline functionalized with boronic acid groups ($B(OH)_2$)-PANI), polyvinylidene fluoride (β-PVDF) and a co-polymer binder incorporating poly[vinyl alcohol] (PVA). This presentation aims to deepen and clarify the mechanisms governing the adhesion properties of these polymers on the Si surfaces looking in particular to the role played by the presence of Li inside the anode. Employing first-principles calculations based on density functional theory, we explore the structural and electronic properties, along with the energetics, of PANI, $B(OH)_2$)-PANI), β-PVDF and PVA monomers adsorbed on different Si surfaces (110 and 111) both before and after lithiation. Our findings reveal that the co-absorption of two monomers enhances adsorption energy, consequently improving the adhesion properties of polymers on the different Si facets but the inclusion of an increasing amount of Li can influence both the anchoring mechanism and the reactivity of the binders. For this reason, we will discuss the structural evolution and corresponding electronic properties in relation to Li concentration.

Biography

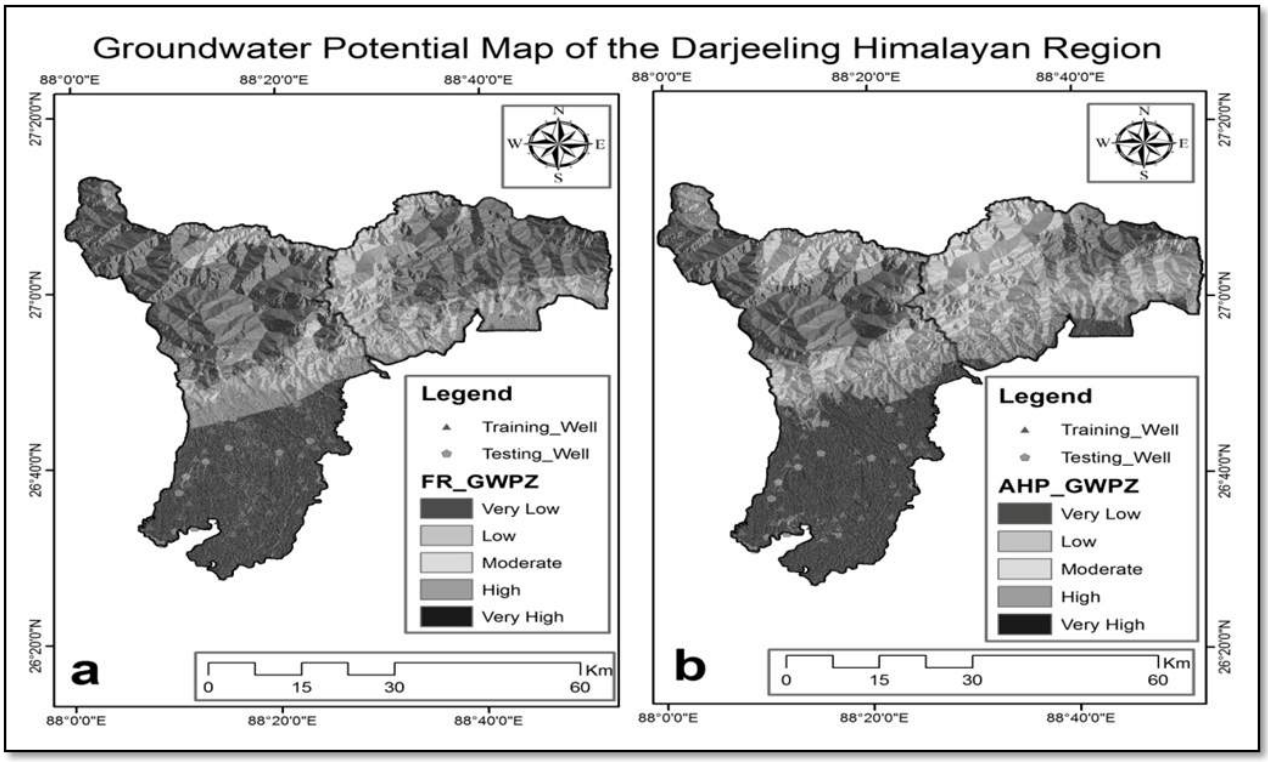
Rita Maji received PhD in physics from National Institute of Science Education and Research, India. Now she is working as a researcher in University of Modena and Reggio Emilia, Italy. Her recent research activity includes analysis of extended defects in poly-crystalline materials, optical properties of solids, multi-scale modelling with insights from atomistic simulations, materials modelling for functionality of next-gen Li-ion battery (European BAT4EVER project). She is now involved in collaborative project with Applied Materials, Italy. With a strong background in materials science and applied research, Dr. Maji is working now on materials-device co-optimization, leveraging cutting-edge technologies to advance semiconductor and materials innovations, that contributes to bridging materials science and device engineering for next-generation solutions.

An Assessment and Mapping of Groundwater Potential Zones in Darjeeling Himalayan Region using Frequency Ratio and Analytical Hierarchy Process

Kabirul Islam

Department of Geography, School Education Department, Karajgram High School, India

Groundwater crisis is spreading across the India at an alarming rate and its poses serious threat for the existence of living world. But the nature of scarcity is uneven and spread on some unexpected locations such as Darjeeling Himalayan region where rainfall is adequate. Darjeeling Himalaya, one the most attractive tourist destination in India, facing water crisis due to adverse topographical characteristics, climatic issues and over exploitation along with rapid urbanization, booming tourism industry, excessive deforestation and climate change are making the situation progressively worsening. Consequently, a huge imbalance is generated between the requirements and availability of water, which promotes black-marketing of water, has flourished in entire region. For this reason the assessment of groundwater potential zone and its distribution in Darjeeling Himalayan region become very important. In this regard, to prepare a groundwater potential map of the study area, eight thematic maps are prepared with the help of geospatial technique and integrated them with Frequency ratio and Analytical Hierarchy methods. The final map is reclassified into five potential zones i.e. very low, low, moderate, high and very high classes respectively. The results of this analysis, shows that the success rate and prediction rate of FR model are 87% and 83% respectively. On other hand success and prediction rate for AHP methods are 84% and 79% which indicates the performance of the FR method slightly better than AHP method. The overall result may be helpful to the planners for the better management or sustainable uses of the groundwater resources.



Groundwater Potential Class	Frequency Ratio method (FR)		Analytical Hierarchy process (AHP)	
	Area (km²)	Percentage (%)	Area (km²)	Percentage (%)
Very Low	1337.47	42.97	762.64	24.5
Low	580.83	18.66	690.05	22.17
Moderate	249.97	8.03	404.84	13.00
High	252.45	8.11	377.38	12.13
Very High	691.52	22.22	877.33	28.19

Coverage areas (km² and Percentage) of different groundwater potential zones

Biography

Kabirul Islam serves as an Assistant Teacher of Geography at Karajgram High School, under the School Education Department of West Bengal, India. With 13 years of continuous experience in education, Mr. Islam has dedicated his career to fostering geographical knowledge and environmental awareness among students.

Beyond his teaching duties, Kabirul Islam is actively involved in research focused on environmental concerns. His publications have contributed to the understanding of local and regional environmental issues, emphasizing the importance of sustainable practices. His work bridges the gap between academic knowledge and practical application, inspiring students to become environmentally conscious citizens.

Mr. Islam's commitment to education and environmental research and his dual role as an educator and researcher exemplifies the importance of integrating current environmental studies into the school curriculum, preparing students for the challenges of a changing world.

Additive Manufacturing of Mo-Sic Multimaterial Component

Marina Aghayan

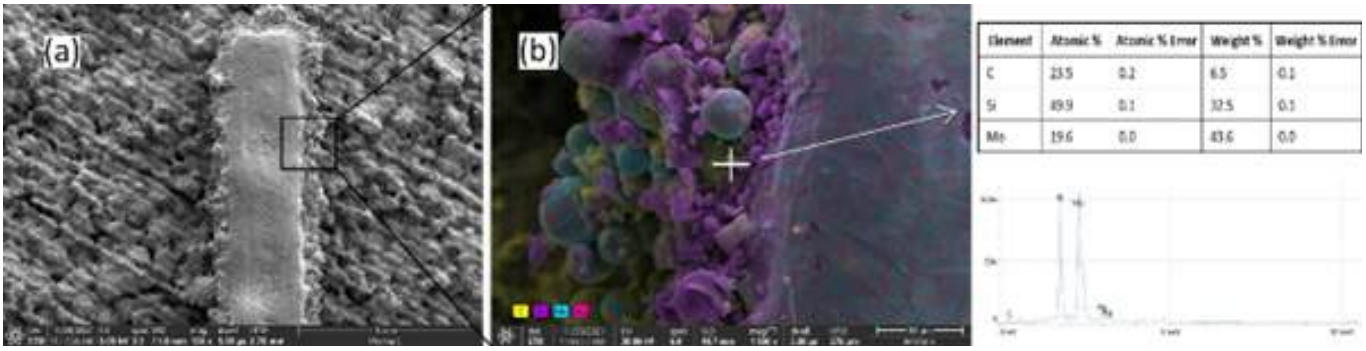
A.B. Nalbandyan Institute of Chemical Physics, Armenia

Additive manufacturing (AM) technologies enable the fabrication of components with more design freedom. The geometric and compositional complexity can provide higher functionality, and multimaterial parts have the potential to achieve higher performance. However, the majority of multimaterial printing techniques are still in their early stages and full of challenges. For example, multimaterial powder-bed AM is significantly slower and may result in issues when the metal powders are later mixed. Many materials need to be post-treated individually, and some might not be compatible with one another in terms of shrinkage, melting or sintering temperatures, and interaction.

In this research, we propose a method of fabricating metal—ceramic multimaterial prototype for electronic packages using powder-bed additive manufacturing technology, particularly selective laser melting (SLM). Silicon carbide-based composite was prepared (Table 1), and SLM-ed as an electrical resistive layer. Then the powder was eliminated from the chamber to escape from cross-contamination and molybdenum powder was placed. Molybdenum tracks with diameter of 400μm and length of 15mm were SLM-ed on SiC layer. The SLM parameters for silicon carbide and molybdenum are concluded in Table 1.

Initial powder	Laser Current (mA)	Exposure time (μs)	Hacth Distance (μm)	Point Distance (μm)	Layer thickness (μm)
74%SiC-15%Si-5%Y2O3-10%BN	2800	40	60	20	25
Molybdenum	4000	80	50	20	25

The findings showed that the SiC-based samples have a rather homogeneous microstructure (Figure 1a). The surface is rough, though. It is easy to see the tracks that were formed during SLM. The surface of the Mo layer is smoother (Figure 1b). Nevertheless, because SiC and Mo have different thermal expansion coefficients, cracks may occur. There is a layer of spherical mass that forms on the tracks. According to the EDS study, the spheres are made of MoSi2, which was created during the Mo-Si interaction.



Element	Atomic %	Atomic % Error	Weight %	Weight % Error
C	23.5	0.2	6.5	0.1
Si	49.9	0.1	32.5	0.1
Mo	19.6	0.0	43.6	0.0

Biography

Marina Aghayan is the head of laboratory of Additive Manufacturing at the A.B. Nalbandyan Institute of Chemical Physics. Her focus lies on additive manufacturing of ceramics, metals, and their composites using selective laser melting and stereolithography/DLP technologies. Mrs. Aghayan is interested in applied research and industrial projects. She has managed and successfully completed more than 20 industrial projects for biomedical and aerospace industries.

Marina Aghayan is patinate to learn and bring research outcomes to industry. She is inventor of 5 patents. She is author of over 40 research papers.

Marina is a co-founder and CEO of two successful deep tech startups with strong R&D focus.

Cell Death Induction in 2D and 3D Prostate Cancer Models Through Green Nanoparticles Synthesized from *Stephania Glabra*

Reena V. Saini[1] and **Prachi Vaid**[2]

[1]Department of Bio-sciences and Technology, MMEC, Maharishi Markandeshwar (Deemed to be University), India

[2]School of Biotechnology, Shoolini University of Biotechnology and Management Sciences, India

Green synthesized nanoparticles offers an innovative approach for improving cancer treatment moreover these nanoparticles are eco-friendly, cost-effective and biocompatible agents. In a pursuit for novel effective treatment for prostate cancer, the methanolic extract of Stephania glabra tubers (Sg-ME) was utilized to fabricate silver nanoparticles (Sg-AgNP), copper oxide nanoparticles (Sg-CuONP) and silver-copper bimetallic nanoparticles (Sg-BNP). The synthesis of these nanoparticles was confirmed by UV-Vis spectroscopy, FTIR, DLS, XRD, TEM and FESEM-EDS mapping, depicting spherical nanoparticles with an average diameter of 30.72, 32.19 and 25.59 nm for Sg-AgNP, Sg-CuONP and Sg-BNP, respectively. Interestingly, Sg-AgNP, Sg-CuONP and Sg-BNP exhibited significant cytotoxicity towards prostate (PC3) cancer cells with IC50 values of 78.65 ± 0.11, 83 ± 0.06 and 60.45 ± 0.03 µg/ml, respectively while no toxicity was found against human blood lymphocytes. These green nanoparticles induced apoptosis in PC3 cells by enhancing reactive oxygen species generation, mitochondrial depolarization and by activating caspase-3 and PARP-1. Furthermore, we evaluated anticancer potential effect of these nanoparticles on 3D prostate tumor model. The shrinkage of tumor spheroids was observed after 4 days treatment with, Sg-AgNP (~7 fold), Sg-CuONP (~ 2 fold) and Sg-BNP (~ 9 fold). The multicellular resistance index depicted that prostate cancer cells in 3D model were less susceptible to the nanoparticles as compared to the cells in 2D model system. Sg-BNP showed highest anticancer potential both on 2D and 3D prostate cancer models as compared to Sg-AgNP, Sg-CuONP and Sg-ME. In conclusion, these green synthesized nanoparticles showed cytotoxic effect on prostate cancer cells and can act as promising cancer therapeutic agents.

Biography

Prof. Saini is a cancer biologist, and her research expertise are Animal Biotechnology, Immunotherapy and nanotechnology. She is working as a Professor in Department of Bio-sciences and Technology Maharishi Markandeshwar (Deemed to be University), Mullana. She completed her graduation and post-graduation form University of Delhi and Postdoctoral fellow at National Cancer Institute, National Institutes of Health, USA. Currently, Her lab is working on synthesis of nano-scale formulations for cancer immunotherapy and activation of apoptotic pathways in cancer cells. Received grant (25 lakhs) from DBT under the scheme of Pilot Project Grant for Young Investigators in Cancer Biology. Recently, she has received a grant of 65 Lakhs from Department of Science and Technology for developing a Biosensor for Hypovitaminosis. She has published more than 80 articles and book chapter in reputed Journals and Books. She has filed more than 70 patents, among them, 18 patents have been granted.

The (TAWOCK) Model and their Effect on Training of Female Computer Teachers

Remsh Nasser Alqahtani[1] and **Ahmad Zaid Almassaad**[2]

[1]P.H.D in Curriculum and Instruction, Curriculum and Instruction Department, College of Education, King Saud University, Saudi Arabia

[2]Professor of Curriculum and Computer Education, Curriculum and Instruction Department, College of Education, King Saud University, Saudi Arabia

The aim of research is to design the training program based on the TAWOCK model for and reveal their effect on teaching self-efficacy among computer teachers. It used the quasi-experimental approach, with a pre-test and post-test design with a control group. An electronic training program based on the TAWOCK model was designed, and prepared (teaching self-efficacy scale). The research sample included (42) female teachers in the experimental group, and (39) female teachers in the control group. The research reached: There was a statistically significant difference at the level (α≤0.05) between the mean scores of computer teachers in the experimental and control groups in the post application; In favor of the experimental group, the value of the ETA square for the total scale of teaching self-efficacy was (0.613); Which indicates the size of significant impact on the self-teaching effectiveness of female computer teachers. There was also a statistically significant difference at the level (α≤0.05) between the mean scores of computer teachers in the experimental group in the pre and post applications; In favor of the post application, the value of Cohen's coefficient for the total scale of teaching self-efficacy was (1.26). This study proposed conceptualization based on the TAWOCK model was presented for training computer science teachers in specialized topics in the field of computing and reviewed by several specialists. This study recommended using this proposed conceptualization for designing and delivering e-training for computer science teachers.

Biography

PhD in Curriculum and Instruction from King Saud University, Supervisor in support unit at Office of Vice Governor for Planning & Business Development, Technical and Vocational Training Corporation, Riyadh, Saudi Arabia. More than 10 years of training experience.

Characterization of Polyhydroxyalkanoate Films and its Application

Shina Gautam[1], Alok Gautam[2] and **Rekha Kanzariya[3]**

[1]Department of Chemical Engineering, Harcourt Butler Technical University, India
[2]Department of Chemical Engineering, UPL University of Sustainable Technology, India
[3]Department of Chemical Engineering, Government Engineering College, India

Plastic is considered to be one of the unending problems of pollution in all over the world. There is no place on earth where it is not reached. To overcome this condition polyhydroxyalkanoate (PHA) can be an alternative which is a biodegradable polymer and can be degraded by itself in soil. It may pose a positive impact on environment depending on the replacement volume of the petrochemical based polymer. In the present work PHA had been extracted from a waste stream of a process industry. PHA extracted was further analyzed for its properties such as functional groups, molecules present as well as its thermal and mechanical stability. PHA was found to be thermally stable than the standard PHA formed from glucose as well as its mechanical strength was also at par with standard HDPE and LDPE. Molecular weight of the polymer was $2.8x10^5$ Da. Further, biodegradability of the PHA films was observed for its degradation in soil. It was observed that as the composition of PHA was increased it can extend its degradation upto 8 weeks. However, if the application of this composition is considered in the packaging films which are of single use, it is quite acceptable for the PHA degradation. PHA films were also tested for the antimicrobial behavior if exposed to the environment and common pathogens to humans were found to be non-permeable to the films. The application of the PHA films were found for food packaging containing different substance like alkaline, acidic or hydrated food.

Biography

Dr. Shina Gautam is working as an Associate Professor in Chemical Engineering department at HBTU since October 2023. She has a vast research experience in biopolymers and its applications from waste streams, pyrolysis of different solid wastes from process industries, e waste and other organic wastes. Her focus of work is to provide solutions to different chemical industries and she has executed more than 2.5 crore consultancy

projects where different pilot plants from waste to products, process safety problems and other process problems have been solved. She is holding four patents which are transferred to industries and implemented. Currently she is guiding several masters and PhD candidates and three PhDs are awarded under her where recently one of her thesis guided is awarded as best PhD thesis by Gujarat Technological University in 2024. Apart from it she has received best Chemical Engineer award by IIChE in 2011, Guru Tech Award by Education Minister in Gujarat in 2019 are a few in the list.

Damage Accumulation and Estimated Nonfailure Operating Time of Ideal Elastoplastic Structures

Yu. S. Neustadt

Academy of Architecture and Building, Samara State Technical University, Russia

When elastoplastic structures are operated for a long time, they inevitably develop inelastic deformations leading to a decrease in ultimate load that a building can resist. The question is how to estimate failure-free operating time of the structure if the operating strength and the future load history are known. The theory of ideal elastoplasticity with a fixed yield surface cannot be applied to solve this problem. Currently, two approaches are used. The first one involves models where a solid is defined by stresses and microstresses linked to deformations via constitutive equations. The second approach (isochronous plasticity) introduces the stress–deformation equation in a more complex integro-differential form than the elastic medium does. Although numerous problems have been studied via these models, a common mathematical theory has not been developed owing to the resulting nonlinear equations. The presented study offers a solution to the problem in a generalized framework based on variational principles and the assumption of defect accumulation. The concept of the damage accumulation tensor is introduced within the Schleicher–Nadai model depending on plastic deformation. This tensor is assumed to be determined by mechanical testing of the structural material. An experimental design is offered to find the damage accumulation tensor. If the bearing safety factor against plastic failure exceeds unity at a certain time, then generalized solutions to the reviewed problem exist and are proved until the moment of plastic failure. The nonfailure operating time is defined by calculation of the generalized solutions.

Biography

Yuriy Neustadt has been a Professor of Industrial and Civil Engineering at Samara State Technical University since 1993. He graduated from Kuibyshevsky (Samara) Institute of Civil Engineering in 1960 and defended his PhD thesis in Mechanics of Solids at Saint Petersburg State University in 1970 (advisor — V. V. Novozhilov). He has published more than 120 papers in Mechanics of Solids and Building Design and Structures.

His current research interests include mechanics of deployable thin-walled systems, general problems of the theory of elastoplasticity, mechanics of shape memory materials, problems of shell stability and mechanics of creep theory.

Femtosecond Laser Ablation of Decagonal and Icosahedral Quasicrystals: Synthesis and Structural Analysis of Nanoparticles

Bibek Kumar Singh and **Ajay Tripathi**

Department of Physics, School of Physical Sciences, Sikkim University, India

Femtosecond laser ablation of Al-Co-Ni and Al-Co-Cu-Ni decagonal quasicrystals (DQCs) in deionized water (DI) was conducted to investigate the structural properties of the generated nanoparticles (NPs). Structural analysis revealed the retention of phases from the target materials in the NPs. For $Al_{70}Co_{20}Ni_{10}$, Al_3Ni_2 phase formation was identified through SAED patterns and HRTEM micrographs. In contrast, $Al_{70}Co_{15}Cu_{10}Ni_5$ did not show Al-Ni phase formation, this is attributed to the presence of Cu, which inhibited the mixing of Ni with Al. Further, HRTEM micrographs revealed the presence of Al_2O_3 at the edges of the NPs in both samples. The presence of Al_2O_3, at the edges is attributed to its low enthalpy of melting, due to which it stays in its melted form for the longest and gets pushed toward the edges as crystallization of the NPs progresses. HRTEM micrographs also revealed the presence of CuO along with Al_2O_3 at the edges.

In parallel, AlCuFe icosahedral quasicrystal (IQC) targets, prepared via vacuum induction melting and spray forming, were subjected to femtosecond laser pulses in DI water. The target prepared via vacuum induction melting showed presence of IQC phases along with the presence of $Al_{13}Fe_4$ and β-Al(Fe,Cu) phases, whereas the other target prepared via spray forming showed only the IQC phases. HRTEM and SAED analysis of the synthesized NPs revealed the presence of IQC phases in both preparation methods. NPs from induction-melted IQC targets exhibited Al13Fe4 and β-Al(Fe,Cu) phases alongside the IQC phase, similar to their bulk counterparts, whereas spray-formed IQC targets exhibited only IQC phases. Consistent detection of CuO and amorphous Al_2O_3 was observed in both samples. The ablated surfaces displayed laser-induced periodic surface structures (LIPSS) and evidence of liquid vortices during ablation, indicated by the presence of macropores. The results obtained highlight the significance of target preparation method and the importance of

the synergy between the elements during the nucleation of the NPs.

Biography

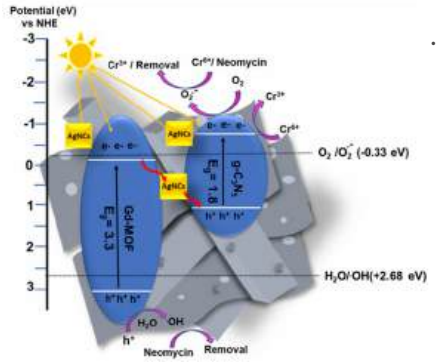
Bibek Kumar Singh is a Research Scholar in the Department of Physics at Sikkim University, India. His research focuses on the synthesis and characterization of advanced alloy nanoparticles, with a particular emphasis on high-entropy alloy (HEA) nanoparticles and quasicrystal nanoparticles. Utilizing the pulsed laser ablation in liquid (PLAL) technique, by employing nanosecond and femtosecond pulsed lasers he has successfully synthesized HEA nanoparticles incorporating seven elements and explored the formation of AlCoNi, AlCoCuNi, and AlCuFe quasicrystal nanoparticles. His work aims to contribute to the development of novel nanomaterials for diverse applications.

Facile Fabrication of a Z-Scheme G-C3N5/Gd-MOF/ Silver Nanocube Composite as a New Generation Visible Light Active Photocatalyst for Abatement of Persistent Toxic Pollutants

Varsha UshaVipinachandran and **Susanta Kumar Bhunia**

Department of Chemistry, School of Advanced Sciences, Vellore Institute of Technology, India

Some of the persistent hazardous contaminants that readily dissolve in water with a recognizable hue are hexavalent chromium and neomycin antibiotics. Herein, a Z-scheme g-C_3N_5/Gd-MOF/silver nanocube (CNGdAg) ternary composite was successfully designed by the combination of graphitic carbon nitride (g-C_3N_5), gadolinium-based molecular organic framework (Gd-MOF), and silver nanocubes (AgNCs). Under visible light irradiation, CNGdAg outperforms individual components and binary composites in the photoreduction of hexavalent chromium (Cr^{6+}) and the removal of neomycin. The maximum photocatalytic efficiency of Cr6+ (98%) in 150 minutes and complete neomycin removal in 25 minutes were accomplished by the CNGdAg-40% composite. A hydrothermal approach was chosen to prepare this visible light active composite. The formation of photogenerated electrons and superoxide radicals plays a major contributing factor in the efficient degradation in a short period without using any external components. The combined effect of the individual components in the composite led to the remarkable degradation via the Z-scheme pathway. This work exemplifies that the CNGdAg-40% photocatalyst can be used for the removal of heavy metal ions and organic contaminants from aquatic environments.



The work has been published in Environmental Science Nano with impact factor 7.3.

Biography

Varsha UshaVipinachandran an avid researcher pursuing a PhD at the Vellore Institute of Technology under the guidance of Dr. Susanta Kumar Bhunia. She has been working on nanomaterial synthesis and its application for over four years. Expertise in the synthesis and fabrication of nanomaterials like plasmonic materials with various nanostructures, carbon dots, metal-organic frameworks, graphitic carbon nitride, Mxene, treated carbon nanotubes, polycarbosilane-based composites, and reduced graphene oxides for chemical and photocatalytic studies and sensing of toxic chemicals and storage applications. During her master's degree, she worked on rocket coating material based on polycarbo silane and carbon nanotubes for ISRO (Indian Space Research Organization). Currently, ten articles have been published (including reviews) and two more are in the process of being communicated.

Effect of Nano Fillers on Areca Fiber Reinforced with Hybrid Composites for Aerospace Application

Sanjay Kumar S M

Department of Mechanical Engineering, SJB Institute of Technology, India

Nowadays, practically all automotive, aerospace, marine, agricultural, and dentistry applications use composite materials such as polymer, metal, and ceramic matrix types, with polymer matrix types being the most commonly used. Almost of FRP is made of single fibers; however, to increase strength, one or more materials are combined with filler material. In this experiment, only natural fibers such as areca and basalt are employed, together with clay filler material, and an additional filler material, alumina powder (Al_2O_3), for the same areca and basalt combination epoxy resin matrix. We examine the mechanical and tribological characteristics of both combinations to determine which is best suited for use in aerospace applications. The qualities of composite materials are enhanced by the combination of areca fiber, which is biodegradable and hence free from environmental contaminants, basalt fiber, which has excellent tensile strength properties, and clay filler material, which is entirely natural and available without damaging the environment.

Biography

Dr. Sanjay Kumar S M is currently working as Associate Professor in the Department of Mechanical Engineering, SJB Institute of technology, Bengaluru. He is graduated from PES College of Engineering, Mandya and obtained Master's degree (Machine Design) from SJC Institute of Technology, Chickballapura and received Ph.D In Mechanical Engineering from Jawaharlal Nehru Technological University, Anantapuram. He has an academic experience of about 23 years and 2 years of industrial experience.

He has presented/published about 30 research papers in the National/ International conference, published 22 journals papers with good impact factor/Scopus indexed journals, 2 textbooks and 1 book chapter publication in Springer. Out of eight patents, four patents are granted and four patents are published. He has got funding from KSCST, VTU and other funding agencies. His areas of research include Machine Design. Materials technology, Polymer composites, Production technology.Editorial Board member of International journals in Materials today proceedings, Springer and WoS Journals.

In-situ Bioremediation of 1,3,5-Trinitroperhydro-1,3,5-Triazine Contaminated Sediments using Endemic Microbial Formulation

Avantika Shukla[1], Garima Upreti[2] and **Ranu Gadi[1]**

[1]Department of Applied Science and Humanities, Indira Gandhi Delhi Technical University for Women, India

[2]Environmental Microbiology and Bioremediation lab, Department of Environmental Engineering, Delhi Technological University, India

Sediment contamination by 1,3,5-trinitroperhydro-1,3,5-triazine (RDX), a commonly used explosive component, poses major environmental and ecological problems due to its toxicity and durability. The goal of this research is to create and test an in-situ bioremediation technique that employs an endemic microbial formulation to effectively degrade RDX in polluted sediments.

The experiment entailed extracting and characterising indigenous microbial strains from RDX-contaminated areas, with a focus on their enzymatic pathways capable of breaking down RDX into environmentally benign byproducts. Laboratory-scale experiments were carried out to optimize important parameters such as pH, temperature, and nutrition availability for increased microbial activity. Field studies were then conducted to determine the feasibility and efficacy of the suggested bioremediation approach in real-world situations.

The results demonstrated that the microbial consortium reduced RDX levels by more than 90% in six weeks, exhibiting considerable degrading efficiency while preserving the site's ecological integrity. Analytical techniques such as Ultra high-performance liquid chromatography (UHPLC) and UV-Vis spectrophotometry were employed to track degradation routes and ensure the creation of non-toxic end products.

The results highlight the feasibility of using endemic microbial formulations for in-situ bioremediation of explosive-contaminated sediments. This green technology strategy provides a cost-effective, long-term, and environmentally benign solution for reducing

the environmental impact of RDX contamination, making it a good option for large-scale application.

Biography

Avantika Shukla is a dedicated researcher and PhD scholar in the Department of Applied Sciences and Humanities (ASH) at Indira Gandhi Delhi Technical University for Women (IGDTUW), Delhi, India. With a strong academic foundation and a keen interest in sustainability, her research focuses on developing innovative solutions for environmental remediation.

Avantika's current work revolves around harnessing the potential of native microbial communities to address contamination in a sustainable and eco-friendly manner. Her expertise spans bioremediation techniques, environmental pollution control, and sustainable material development, reflecting her passion for creating impactful solutions to pressing environmental challenges.

Avantika is actively involved in presenting her findings at national and international platforms. Her participation at the Advanced Material Science World Congress under the theme "Green Technologies" underscores her commitment to advancing sustainable practices in material science and environmental protection.

In addition to her academic pursuits, Avantika is a lifelong learner who aspires to leverage her research for practical applications, fostering collaborations that bridge the gap between scientific innovation and societal benefit.

Applications of Machine Learning and Deep Learning in Pavement Crack Detection and Characterisation: A Comparative Approach

Harris Khan and **Mustafa Alas**

Faculty of Civil and Environmental Engineering, Near East University, Turkey

Cracking in asphalt pavement structures is one of the major forms of deterioration that not only jeopardises the traffic safety but also compromises the durability and serviceability of the roads. Traditional crack evaluation techniques involve manual human field surveys, which has major flaws such as, requirement of intensive labour force and time, poor repeatability and reproducibility of the data and data collection method and subjectivity of the rating measured by the individual surveyor. Accurate detection and characterisation of the extent of cracking is crucial for the maintenance and longevity of pavement infrastructure. Recently, machine learning (ML) and Deep Learning (DL) methods have arisen as an instrumental tool for crack detection and characterisation. The current study provides a comprehensive analysis of the ML and DL applications in crack identification and characterisation to enable a data-driven pavement management system. A number of machine learning techniques such as; Support Vector Machines (SVM), Artificial Neural Networks (ANN), Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN) and deep learning (DL) techniques were analysed for their suitability in identification of pavement cracks and their extent. The article delves into crack identification and characterisation by focusing on object detection, classification and segmentation methods. Furthermore, the current study discusses the performance evaluation metrics and provides case studies by highlighting the successful application of ML and DL techniques for crack identification and characterisation.

Biography

Harris Khan is a dedicated researcher and professional in the field of civil engineering, specializing in infrastructure maintenance and innovative solutions. With a strong background in construction management and advanced analytics, Harris has contributed to developing data-driven strategies for optimizing pavement performance and durability. He holds a master's degree in construction management and has presented research on various international platforms. Harris's expertise in machine learning and deep learning applications positions him as a thought leader in modern infrastructure solutions.

The Synthesis, Crystal Structure, Hirshfeld Surface Analysis, Luminescence, Aggregation Behaviors, (I–V) Characteristics, and Antibacterial Assay of Cd(II) And Zn(II) Complexes Containing 2-Mercaptopyridine

Arijit Das

Department of Chemistry, Bir Bikram Memorial College, India

Two transition metal complexes of Cd (complex-1) and Zn (complex-2) have been created by reacting 2-mercaptopyridine (2-mcp) in a 1:4 molar ratio with either $Cd(NO_3)_2.4H_2O$ or $Zn(NO_3)_2.6H_2O$. These compounds have been well described using single crystal X-ray analysis, NMR spectroscopy, UV-Vis, and IR. The luminescent characteristics of compound 2 were also examined. Complex 2's emission is attributed to the intra-ligand transitions π···π*. Both complexes' structural architecture was characterized by monomeric tetra-coordinated M-centers that were expertly coordinated by four 2-mcp ligands. Both nitrate groups were used in these configurations to neutralize the complex charge. Hirshfeld surfaces research revealed that complexes 1 and 2 had maximum interactions of 25.6% and 26.6% for H···H and 25.0% and 25.1% for O···H contacts, respectively. Both the Zn(II) and Cd(II) complexes' I-V curves have been measured in the voltage range of 0 V to +1 V. It's interesting to note that both complexes exhibited Ohmic behavior. This demonstrates that both complexes are conducting. In contrast to the Zn(II) complex, which has a microampere order of current, the Cd(II) complex has a few milliamperes, which is over a thousand times bigger. FESEM investigations provide compelling visual evidence of two complexes' aggregation behavior. The ligand and complexes underwent antimicrobial research to evaluate its potential. Under laboratory conditions, the antibacterial activity of 2-mcp complexes 1 and 2 was evaluated in terms of the "Zone of Inhibition" (ZOI) against human pathogenic Gram-negative E. Coli, Shigella Boydii, and Gram-positive Staphylococcus aureus bacteria. While compound 2 demonstrated a modest effect against both Gram-positive and Gram-negative bacteria, complex 1 demonstrated the strongest antibacterial activity, especially against Gram-negative bacteria. For this research work, financial support from the SERB, DST, GoI, New Delhi is greatly appreciated (SERB's Sanction order No. EEQ/ 2021/000257 dated 25/02/2022).

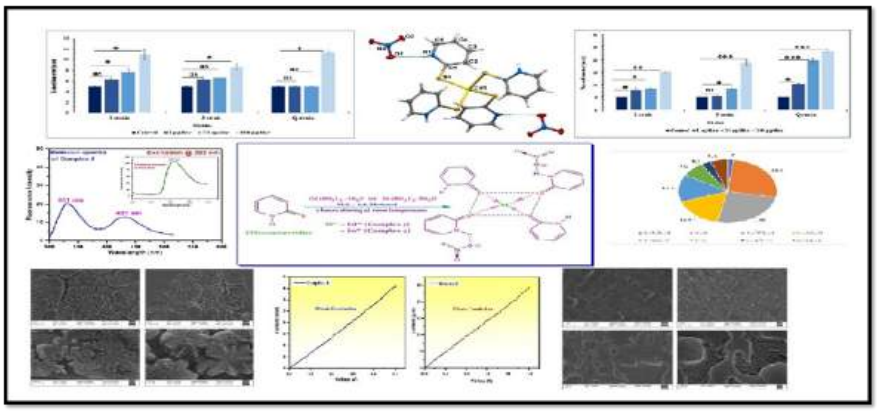


Fig.1. Synthesis, Crystal structure, FESEM studies, (I–V) characteristics, HS analysis, Luminescence and Antibacterial study of Cd(II) and Zn(II) complexes of 2-Mercaptopyridine

Biography

Dr. Arijit Das is basically a Chemical Educationist and specifically Inorganic Chemist. Dr. Das holding the post of Associate Professor and HOD, Department of Chemistry, Bir Bikram Memorial College, Tripura, India. Dr. Das received his Ph.D. from Tripura Central University, in 2008. Dr. Das achieved 05 copyrights from Govt. of India for his innovative research work in the field of chemical education. Dr. Das proposed 26 time economic teaching methodologies in the field of chemical education (2011-2023), recognized & indexed by the American Chemical Society, US in March 2023. Dr. Das's innovative book, entitled 'Innovative Mnemonics in Chemical Education: A Handbook for Classroom Lectures', published by the Cambridge Scholars, Lady Stephenson Library, UK dated Sept 2019. Dr. Das is a nominated member of the Chemical Education Division of the American Chemical Society since 2013. Dr. Das is an author of Stanford University; University of California, Davis; Wikieducator; ERIC, Govt. of US.

Testing Artificial Intelligence to Minimize Costs in the Fashion Industry: An Approach Towards Sustainable Advertising

Nadia Atshan[1], Ali Said Jaboob[2] and **Marwa Ibrahim Zaid[3]**

[1]Business Administration Department, Technical College of Management, Middle Technical University, Iraq

[2]Dhofar University, Oman

[3]Department of Management and Marketing of Oil and Gas, College of Industrial Management for Oil and Gas, Basrah University for Oil and Gas, Iraq

This study aims to look into how artificial intelligence can be used to reduce costs in the Middle Eastern fashion industry. Interviews were conducted with managers from women's clothing companies, and a questionnaire (100) was distributed to their employees. The descriptive approach was used to analyze the data. Some important conclusions were reached about the future of artificial intelligence in this industry.

Biography

Nadia Atshan is currently a PhD student at the Business and Management Department, Universiti Tenaga Nasional (UNITEN). And Member of faculty at Middle Technical University, Iraq. Her areas of interest are management information, marketing, marketing, and branding. customer behavior, and decision-making. The author has published in journals such as Global Business and Organizational Excellence, Springer, Wiley, International Journal of Organizational Analysis, and Journal of Family Business.

Contradictions in the Generally Accepted Mechanism of Thermal Runaway in Lithium-Ion Batteries

N. E. Galushkin, N. N. Yazvinskaya and **D. N. Galushkin**

Don State Technical University, Laboratory of Electrochemical and Hydrogen Energy, Russia

The possibility of thermal runaway in lithium-ion batteries is a serious obstacle to the safe operation of these batteries. However, until our recent paper, no thermal runaway mechanism capable of quantitatively explaining this dangerous phenomenon had been established. The purpose of this study is to analyze experimental results that contradict the generally accepted mechanism of thermal runaway in lithium-ion batteries and to provide another explanation for these phenomena. Firstly, it is believed that the drop in open-circuit voltage of the battery during thermal runaway is associated with internal short circuits of the electrodes. However, the work experimentally proved that during thermal runaway, the battery resistance increases sharply, which excludes the occurrence of internal short circuits of the battery electrodes. Secondly, the paper shows (when using heat-resistant separators) that the drop in open-circuit voltage of the battery during thermal runaway occurs at temperatures significantly below the separator destruction temperature. Therefore, in this case, the occurrence of internal short circuits of the electrodes at the beginning of thermal runaway is impossible. The paper experimentally proved that the drop in open-circuit voltage of the battery during the thermal runaway is due to the lithiation of the cathode active material.

Biography

Prof. Dr. Nikolay Galushkin is a professor at Don State Technical University, Russia. He heads a research laboratory "Electrochemical and hydrogen energy". He received Dr. in Engineering from the South-Russian State Polytechnical University in 1998.

His research interests include:

Firstly, the study of the processes of thermal runaway in alkaline, acid and lithium-ion batteries. For the first time, he experimentally established a thermal runaway mechanism in lithium-ion batteries capable of quantitatively explaining all experimental results related to this dangerous phenomenon.

Secondly, the research and development of hydrogen storage systems. The metal hydrides he obtained (with a capacity of 20.1 wt% and 400 kg m-3) are far exceeding the criteria for hydrogen storage systems established by the US DOE.

Third, the modeling of processes in electrochemical batteries to develop battery models suitable for practical use in electric vehicles.

Water Desalination using Atmospheric Pressure Plasma Combined with Thermal Treatment

Ayman A. Saber, F. M. El-Hossary and **Mohammed H. Fawey**

Sohag University, Egypt

Herein, a novel method is presented for enhancing the thermal desalination process of saline water and seawater using atmospheric pressure plasma (APP). The effect of APP treatment combined with thermal heating (APP-TH) on the energy consumption, conductivity, and pH of seawater and saline water is investigated. Utilizing scanning electron microscopy and X-ray diffractometry, the evolution of the morphology, structure, and chemical composition of precipitated crystals is characterized. The APP-TH method reduces the energy consumption for desalination by 40.5% for saline water and by 52.82% for seawater when compared to the TH-only method. The pH value remains approximately unchanged, decreasing slightly for the saline water from 7.1 for untreated saline water to 7.05 after APP-TH treatment. However, after APP-TH treatment, the pH value of the seawater increased slightly, from 7 to 7.8. The total dissolved salts decreased after APP-TH treatment, lowering the conductivity of the saline water from 65,000 µS/cm to 160 µS/cm and the conductivity of the seawater from 58,200 µS/cm to 243 µS/cm. Moreover, the size of precipitated crystals from saline water is 31.47 nm after APP-TH treatment, compared to 55.59 nm after TH-only treatment. They also dropped from 41 nm to 39.5 nm for seawater. Compared with traditional approaches, this research proposes an optimistic solution to address global potable water scarcity issues.

Biography

Ayman Ahmed Saber Mohamed dedicated Plasma Physics Researcher and University Teaching Assistant at Sohag University, Egypt. With a strong background in experimental physics, his research focuses on plasma applications for water desalination and material surface modification. Since 2020, he has played a key role in plasma coating systems and atmospheric plasma devices, contributing to innovative advancements in the field.

He has published research in peer-reviewed journals and presented findings at international conferences. Her project on water desalination using atmospheric pressure plasma, funded by Egypt's Science, Technology & Innovation Funding Authority (STDF), highlights my expertise in applied plasma research.

Holding a B.Sc. in Physics and advanced coursework in Plasma Physics, he passionate about scientific research, teaching, and interdisciplinary collaboration. He actively engages in academic discourse, quality assurance, and student mentorship while mastering scientific data analysis and research methodologies.

Synthesis, Characterization and Application of Metal Nanoparticles from Plant Based Terpenoids - a Review

Manisha Agrawal, Sarvari Bano and **Rupa Upadhyay**

[1]Krishna Vikash Group of Institution, India
[2]Chhattisgarh Swami Vivekanad Technical University, India
[3]Kalinga University, India

Terpenoids contains 5 carbons isoprene units and occupies a broad category of chemical compounds. Terpenoids found in plants, plant extracted essential oils and bacteria and fungi. Varieties of terpenes have medical applications as the treatment of bacterial infections, wound healing, and malarial infection.

Literature shows that terpenoids extracted organically by the different parts of vegetables and plants. Extraction process of photochemical terpenoids is performed through biosynthesis or green pathways methods.

Extracted terpenoids used for the synthesis of metal nanoparticles organically. Size, shapes, diameter, surface area and other features of the nano-particles are investigated through XRD, FTIR, SEM, TEM, and UV Visible instrumental techniques. Antimicrobial and antibacterial activities along with medicinal applications are listed and compared.

S.no	Plant name	Parts of the plant used	Nano-particles	References
1	Turmeric	Leaves	Silver , Ag	Singh, D.et al. [41]
2	Turmeric	Tubers	copper , Cu	Ayarambabu, N., et al. [42]
3	Ginger and Garlic	Bulbs of ginger and rhizomes of garlic	Metal (silver Ag, Zinc Zn, Copper Cu and Iron Fe)	El-Refai, A. A. et al. [43]
4	Green tea	Leaf	Zinc oxide, ZnO	Senthilkumar, S. R. et al. [44]

5	Soya bean	Textured soya	Copper, Cu	DeAlba-Montero, I.et al. [45]
6	Tomato	Whole	Silver, Ag	Maiti, S. et al. [46]
7	Grapes	Seed	Silver, Ag	Xu, H. et al. [47]
8	Honey	Liquid	Silver and Gold	Sreelakshmi, C. H. et al. [48]
	Cauliflower and cabbage	Whole	Silver , Ag	Tamileswari, R., et al. [49]
10	Broccoli	Whole	Gold , Au	Piruthiviraj, P. et al. [50]

Biography

Dr. Manisha Agrawal, Professor Chemistry and Dean Research & Development is affiliated with Krishna's Vikash Institute of Technology Raipur with 21 years of academic and research experiences. She did masters from School of Studies, Pt. Ravishankar Shukla University Raipur and awarded PhD in the year 1999 from Pt. Ravishankar Shukla University, Raipur in Organic Chemistry. Dr. Manisha has Credited 12 Indian Patents and Copyrights as applicant and investors. She has written 17 Books and book chapters, out of them 3 books are recommended by UGC. Received Funds of 15 Research Projects Funds from various government Funding agencies as Principal Investigator. She has published 40 research papers in Scopus and SCI Indexed Journals. Organized 11 International and National Conferences as Convener and Guided 4 Students as PhD Supervisor.

The Role of Probiotics in Skin Care: Advances, Challenges and Future Needs

Fatemeh Safaei[1], Faezeh Shirkhan[2], Mohammad Zandi[3], and **Saeed Mirdamadi[1]**

[1]Iranian Research Organization for Science and Technology, Iran
[2]Tehran Medical Sciences, Islamic Azad University, Iran
[3]Iranian Research Organization for Science and Technology, Iran

The skin, as the largest organ in the human body, plays a crucial role in protecting us from external threats. As skin disorders become more common in society, it is increasingly important to strengthen, and care for this vital organ. Recent research indicates probiotics can effectively enhance skin health and reduce skin disorders. This study examines the gaps in current research and addresses future needs in the field of probiotics in skincare. Studies reveals the impact of oral (fermented foods and supplements) and topical probiotics on skin health and their mechanisms of action. The findings demonstrate that fermented foods with probiotics, particularly dairy products, positively impact skin health. While the results of probiotic supplements and live strains in treating skin conditions are promising, it's crucial to conduct a research to identify potential side effects. Probiotics appear to have a positive impact on skin health and mental well-being through the gut-skin and gut-skin-brain axis. Therefore, it is important to identify safe probiotics and conduct further studies to determine optimal doses and establish proper regulatory guidelines.

Biography

Fatemeh Safaei PhD Candidate

Iranian Research Organization for Science and Technology (IROST) Field of Biotechnology

She earned her Bachelor's degree in Microbiology from Azad University, North Tehran Branch (2011-2015), followed by a Master's degree in Biotechnology from Azad University, Tehran Medical Branch (2015-2018). Since 2021, She has been a PhD candidate in Biotechnology at the Iranian Research Organization for Science

and Technology (IROST).

She has practical experience from an internship where she worked on improving the culture media for industrial probiotic bacteria to boost biomass production. Currently, her research is focused on investigating the anticancer and anti-aging effects of lactic acid bacteria and probiotics on skin health. She is passionate about this field and she is eager to contribute to advancements in skin health and microbiome research.

Performance Evaluation of 2D and 3D Beam and Channel Tracking using Adaptive Filtering Techniques

Ruaa Shallal Abbas Anooz[1,2], Jafar Pourrostam[1] and **Mohanad Al-Ibadi[2]**

[1]Faculty of Electrical and Computer Engineering, University of Tabriz, Iran
[2]Technical Engineering College, Al-Furat Al-Awsat Technical University, Iraq

This work studies the effect of array dimensions on the tracking performance of a single line-of-sight (LoS) path channel in a millimeter-wave (mmWave) multiple-input multiple-output (MIMO) communications system utilizing adaptive filters. We evaluate the performance of the least mean squares (LMS) filter and compare it with a reference extended Kalman filter (EKF) in full-dimensional (FD) MIMO channels. Two-dimensional (2D) arrays are deployed to control the elevation and azimuth planes in different tracking scenarios. This paper assumes pedestrian communication between a person in a hall and a station. The state vector in our model comprises the angular channel parameters (the angles of arrival and departure) and the channel path gain. We use the mean squared error (MSE) to evaluate our results. The tracking results of the FD channel parameters are also compared to those of the 2D channel parameters to emphasize the role of the 2D array deployments compared to one-dimensional (1D) arrays to track in an mmWave communications system. We demonstrate that using 2D arrays, a minor MSE performance is observed compared to the 1D arrays, besides more robustness against large state variance values. In addition, our results confirm that the array configuration is more important than the array size in beam tracking at the mmWave band. Moreover, a robustness analysis has been conducted to evaluate the performance of LMS and EKF under perfect and imperfect initial conditions. The EKF is more robust than LMS under unfavorable initial conditions.

Biography

Ruaa Shallal Abbas Anooz received her Bachelor of Communication Technical Engineering from Engineering Technical College-Najaf, Iraq, in 2006 and her MTech. in Communication System Engineering in the Department of Electronics and Communication Engineering at SHIATS, Allahabad, India, in 2014. She is currently a Ph.D. student at Tabriz University. She is a faculty member of the Engineering Technical College of Najaf at Al-Furat Al-Awsat Technical University, Iraq. Her areas of interest include digital signal processing, beam and channel estimation, wireless communications, Image processing, and antenna design. She can be contacted at email: coj.rua@atu.edu.iq.

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Assessment of the Micro-Tensile Bond Strength of a Novel Bioactive Dental Restorative Material (Surefil One)

Reham Alzhrani[2], Abdulrahman A. Alghamdi[1], Samaher Athmah[2] and **Hanan Filemban[1]**

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[2]Faculty of Dentistry, King Abdulaziz University, Saudi Arabia

Objectives: The aim of this study is to assess the micro-tensile bond strength and the mode of failure of a bioactive hybrid self-adhesive composite (Surefil one) under various dentin conditions.

Methods: Thirty-two extracted human molar teeth were used to test the micro-tensile bond strength of Surefil one under different dentine conditions (no treatment, 37% phosphoric acid etching, and universal adhesive) in comparison with a resin-modified glass ionomer (RIVA). All restorations were light cure-bonded onto flat dentine and then sectioned into beams. Then, fractured specimens were observed under a light microscope to evaluate the mode of failure.

Results: The Surefil one no-treatment group (NTG) exhibited the highest micro-tensile bond strength. Furthermore, there was no statistically significant difference observed between the Surefil one adhesive group (EAG) and the Surefil one acid etch group (EG). However, compared to other groups, the resin-modified glass ionomer (RIVA) produced the lowest results, which are statistically significant.

Conclusion: Surefil one offers superior bond strength values when compared to resin-modified glass ionomers. Furthermore, Surefil one requires no dentin condition and has more straightforward clinical steps.

Biography

Reham Alzhrani is a passionate and dedicated general dentist who graduated with honors from King Abdulaziz University in Jeddah, Saudi Arabia. She gained valuable clinical experience during her one-year tenure at Andalusia Dental Center, where she refined her skills in comprehensive dental care.

With a strong commitment to professional growth, Reham is now focused on advancing her expertise in pediatric dentistry—a field she is deeply passionate about. She aspires to specialize in providing high-quality, patient-centered care for children, combining clinical excellence with a compassionate approach.

2D-Biopad: Supple Graphene Bio-Platform for Point-of-Care Early Detection and Monitoring of Alzheimer's Disease

Apostolos C. Tsolakis[1], Marianna Rossetti[2], Ruslán Alvarez-Diduk[2], Arben Merkoçi[2,3], Vincent Bouchiat[4], Aristeidis Bakandritsos[5], Anastasia A. Pantazaki[6], Makis Angelakeris[6], Sandeep Kumar[7], Jean-Jacques Toulmé[7], Mervi Issakainen[8], Anna Mäki-Petäjä-Leinonen[8], Alina Solomon[8], Anthoula Tsolaki9, Magda Tsolaki[9], Angeliki Koukoura[10], Kyriaki Antonopoulou[10], Eirini Papadaki[10], Gitte Juel Holst[10], Vicky Valla[10], Efstathios Vassiliadis[10], Lutz Froelich[11], Cristian Bosch Serrano[12], Polat Goktas[12], Julia Palma[12], Ricardo Simón-Carbajo[12] and **Kostas Giagtzoglou[1]**

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Currently, reliable diagnostic methods for Alzheimer's Disease (AD), the most prevalent form of dementia, are either expensive, invasive or time consuming. Blood-based biomarkers have introduced a significant step towards addressing these issues; however, without introducing a cost-effective and simple testing protocol for each biomarker.

2D-BioPAD aims to introduce a fast, cost-effective, less invasive, reliable, and digitally enabled Point-of-Care (PoC) In-Vitro Diagnostic (IVD) system for supporting early diagnosis and progression monitoring of AD. The envisioned graphene-based PoC IVD system leverages the unique properties of 2D materials to deliver (i) a versatile surface chemistry that combines nano and DNA technologies towards improved biocompatibility, stability, high sensitivity and specificity for enhanced (bio-)sensing; (ii) real-time and simultaneous reliable identification and quantification of up to 5 AD protein blood-based biomarkers; (iii) a user-friendly digital interface with key metrics and insights regarding the measured results; and (iv) Artificial Intelligence to improve the overall system development.

The 2D-BioPAD system is designed and implemented following an ethical-by-design approach, exploring the potential of both electrochemical and GFET technologies (Fig. 1), empowered by unique aptamers for targeting identified biomarkers, graphene derivatives to achieve high functionalization degree of graphene's surface and magnetic nanoparticles to support with sample purification, minimalization of non-specific signals, and flow regulation during various stages of the bioassays.

The 2D-BioPAD system's impact will be demonstrated and validated in 3 clinical centres in Europe under real-world conditions.

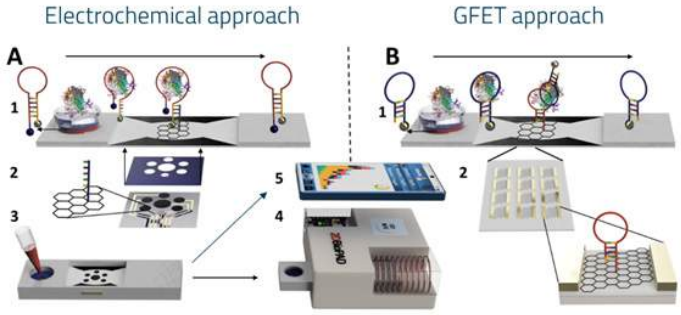


Fig. 1. 2D-BioPAD PoC IVD system overview.

This work is part of the 2D-BioPAD project that has received funding from the European Union's Horizon Europe Research and Innovation Programme under grant agreement No 101120706.

Biography

Apostolos Tsolakis holds a Master and a PhD in Electrical and Computer Engineering. His professional experience encompasses years of experience with a highly diverse scientific and commercial background. Currently, he is affiliated with Q-PLAN INTERNATIONAL as a Project Manager. He coordinates and works alongside a multidisciplinary team of dedicated researchers and consultants towards meeting industrial and societal challenges under European Framework Programmes for Research and Innovation (R&I), all while also serving as Project Manager in strategic R&I projects. Apostolos has many years of experience in ICT-oriented R&I projects across diverse sectors (i.e., Energy, Health, Construction, Space, and more), acting either as the Technical Manager, Project Manager, or Research Associate, with a good truck of scientific results. During my current working experience, I have been involved in more than 15 research projects funded by the EC and the Greek secretariat of Research and Technology.

Lipid-Based Nanoparticles as a Promising Treatment for the Skin Cancer

Parisa Golestani

Department of Health Sciences, Università del Piemonte Orientale, Italy

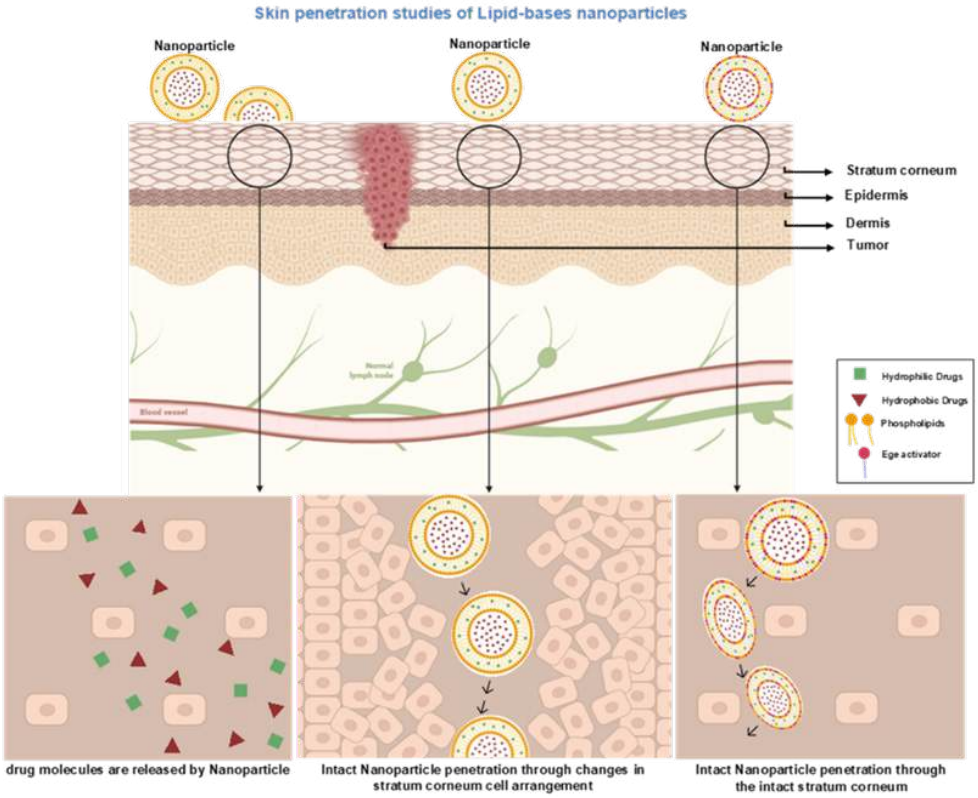
Skin cancer is one of the most prevalent types of cancer globally, with basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma being the most common forms. Conventional treatments, such as chemotherapy and radiotherapy, often suffer from limitations including systemic toxicity, drug resistance, and suboptimal delivery to the tumor site. Lipid-based nanoparticles (LBNPs) have emerged as a novel drug delivery system, offering the potential for targeted, localized treatment while minimizing adverse effects on healthy tissues.

This review discusses the application of various LBNPs, such as nanoliposomes, ethosomes, and transferosomes, for the treatment of skin cancer. LBNPs possess unique properties that allow them to penetrate the skin's outer barrier, the stratum corneum, and deliver drugs directly to cancer cells. These nanoparticles offer controlled release and enhanced bioavailability of both hydrophilic and hydrophobic drugs, improving therapeutic outcomes.

The review highlights the advantages of using LBNPs for localized skin cancer treatment, including reduced systemic toxicity and improved patient compliance. Additionally, it explores the potential of these nanoparticles to serve as both therapeutic agents and drug carriers, providing a non-invasive alternative to traditional methods.

LBNPs represent a promising advancement in nanomedicine, offering new avenues for cancer therapy. This review underscores the potential of these systems to revolutionize the treatment of skin cancer and calls for further research into optimized nanoparticle formulations for clinical applications.

Graphical abstract:



Biography

Parisa Golestani holds a bachelor's degree in Molecular and Cellular Biology and a master's degree in Biochemistry from Iran. After completing her studies in Iran, she immigrated to Italy, where she currently pursuing a degree in Medical Biotechnology at Università del Piemonte Orientale. Her academic journey has provided me with a robust foundation in molecular biology, biochemistry, and biotechnology.

Her research primarily focuses on advanced drug delivery systems, particularly lipid-based nanoparticles, with a special emphasis on improving therapeutic outcomes for cancer treatments. In addition to her work on lipid-based nanoparticles, she has authored two other research articles: one on "The antioxidant and selective apoptotic activities of modified auraptene-loaded graphene quantum dot nanoparticles (M-AGQD-NP)," and another on "The anticancer impact of folate-linked ZnO-decorated bovine serum albumin/silibinin nanoparticles on human pancreatic, breast, lung, and colon cancers."

Through her research, she to contribute to the development of innovative biomedical solutions that address critical challenges in cancer therapy, particularly in the realm of targeted drug delivery and personalized medicine.

Tailings in Abandoned Mining Sites: Impact, Treatment and Recycling for Sustainable Development

Chiraz Abdelmalak Babbou and **Fredj Chaabani**

Laboratory of Mineral Resources and Environment/ Department of Geology, Faculty of Sciences of Tunis, University of Tunis El Manar, Tunisia

The contamination of soil, plants, water and air by heavy metals (Pb, Zn) from former mining activities is a major issue nowadays. Therefore valorization of mining waste as construction materials is a management alternative for sustainable development.

The current work is integrated within this framework, which aims to apply mineral processing to waste from two different abandoned mining sites (North-East and North-West of Tunisia).The first purpose is to compare the results of reducing chemical content in the treated products. The second objective is to integrate and recycle products (reduced in heavy metals) into the industrial circuit.

To achieve these goals, hundreds of tailing samples were taken from two different abandoned mining sites. For each site, these waste samples were mixed, homogenized, and quartered to obtain representative samples (±500g). These tailings are characterized by mineralogical, petrographic and chemical analyses. This step is followed by mechanical preparation (grinding and screening). The froth flotation process is applied. The results showed that the initial Pb and Zn contents were very high, but after treatment, the contents were minimized in the final product. This was in favor of decision support towards the recycling track in the industrial field. The next step is managing tailing, which consists in carrying out geotechnical tests on the suitable mineral-processed samples and fabricate bricks as building materials. These small-scale bricks are of a good quality.

All these results are in favor of subsequent large-scale translation. In this way, Pb and Zn contents in waste minerals can be minimized and valorized. Therefore, an abandoned mining site can be rehabilitated.

Biography

Chiraz Abdelmalak Babbou was born in Sfax (Tunisia), at 12th March 1978. she received her bachelor degree in Natural Sciences,2000 at the faculty of Sciences of Tunis (FST), her master degree in Environmental Applied Geology on 2004 and a Ph.D. 2012 on Environmental characterization of the Fedj Lahdoum mining site (NW Tunisia), decontamination of mining waste by flotation, from the University of Tunis El Manar. her skills: 2008-2012: Contractual assistant at ISEP-BG Soukra. 2012-2024 : Assistant professor at FST. She is a teacher-researcher with a background in Geology an d She is mineralurgist. She is interested in waste management and environmental science She spent all of my time in testing flotation process to other abandoned mine sites, and She developed new processes adapted to each site, presented on a national and international scale. The aim is to reduce heavy metal levels in the environment and to valorize tailings by recycling them in the industrial sector.

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March 24-26, 2025

Lesion Classification by Model-Based Feature Extraction: A Differential Affine Invariant Model of Soft Tissue Elasticity in CT Images

Weiguo Cao[1], Marc J. Pomeroy[2], Zhengrong Liang[1,2], Yongfeng Gao[1], Yongyi Shi[1], Jiaxing Tan[3], Fangfang Han[4], Jing Wang[5], Jianhua Ma[4], Hongbin Lu[6], Almas F. Abbasi[1], and **Perry J. Pickhardt[7]**

[1]Department of Radiology, Stony Brook University, USA
[2]Departments of Radiology and Biomedical Engineering, Stony Brook University, USA
[3]Department of Computer Science, City University of New York at CSI, USA
[4]School of Biomedical Engineering, Southern Medical University, China
[5]Department of Radiation Oncology, University of Texas Southwestern Medical Centre,USA
[6]Department of Biomedical Engineering, The Fourth Medical University, Xi'an, China
[7]Department of Radiology, School of Medicine, University of Wisconsin, USA

The elasticity of soft tissues has been widely considered as a characteristic property for differentiation of healthy and lesions and, therefore, motivated the development of several elasticity imaging modalities, for example, Ultrasound Elastography, Magnetic Resonance Elastography, and Optical Coherence Elastography to directly measure the tissue elasticity. This paper proposes an alternative approach of modeling the elasticity for prior knowledge-based extraction of tissue elastic characteristic features for machine learning (ML) lesion classification using Computed Tomography (CT) imaging modality. The model describes a dynamic non-rigid (or elastic) soft tissue deformation in differential manifold to mimic the tissues' elasticity under wave fluctuation in vivo. Based on the model, a local deformation invariant is formulated using the 1st and 2nd order derivatives of the lesion volumetric CT image and used to generate elastic feature map of the lesion volume. From the feature map, tissue elastic features are extracted and fed to ML to perform lesion classification. Two pathologically proven image datasets of colon polyps and lung nodules were used to test the modeling strategy. The outcomes reached the score of area under the curve of receiver operating characteristics of 94.2% for the polyps and 87.4% for the nodules, resulting in an average gain of 5% to 20% over several existing state-of-the-art image feature-based

lesion classification methods. The gain demonstrates the importance of extracting tissue characteristic features for lesion classification, instead of extracting image features, which can include various image artifacts and may vary for different protocols in image acquisition and different imaging modalities.

Biography

Dr. Weiguo Cao received his Ph.D. from the Chinese Academy of Sciences and is currently a Research Associate at Stony Brook University. With a strong research background, Dr. Li specializes in medical image analysis, computer vision, pattern analysis, and machine learning.

Comprehensive Evaluation of Rapid-Set Concrete Mixes for Pavement Repair

Daniel D. Akerele and **Federico Aguayo**

Department of Construction Management, University of Washington, USA

The demand for rapid-set concrete in pavement repair, especially in high-traffic areas where minimizing road closures is critical, is increasing. Effective repairs require materials that gain strength quickly and demonstrate long-term durability under traffic and environmental stresses. This study aims to identify and optimize rapid-set concrete mixes, focusing on durability and workability under varying conditions. We present a comprehensive evaluation of various mixes, including CSA-based and traditional cement-based formulations, assessing their suitability for pavement repair where rapid strength gain and dimensional stability are essential. The primary objective is to identify optimal concrete mixes based on performance metrics such as early and long-term compressive strength, tensile and flexural strengths, shrinkage, and fresh properties (workability, temperature, air content). CSA-based mixes demonstrated exceptional early strength, surpassing 2500 psi within 4 hours and exceeding 4000 psi within 1 day, along with satisfactory flexural and tensile strength. These findings highlight the rapid-setting capability of CSA mixes, making them ideal for applications requiring minimal downtime. Traditional cements, while meeting long-term strength requirements, do not achieve sufficient early strength for rapid-set applications. Shrinkage tests showed that CSA-based mixes, especially with polymer modifications, exhibit controlled shrinkage, reducing cracking risks and enhancing durability. CSA mixes also showed favorable fresh properties, facilitating efficient placement. These results support the use of CSA-based mixes for high-traffic repairs due to their rapid strength gain and dimensional stability. Traditional cement mixes may be suitable for applications without immediate load-bearing requirements but require shrinkage mitigation. This study provides valuable insights into selecting concrete mixes that balance strength, stability, and ease of application, contributing to efficient and durable pavement repair solutions.

Biography

Daniel D. Akerele is a PhD student at the University of Washington's Department of Construction Management. He has a master's degree in civil engineering from University of Ibadan, Nigeria with strong field practice experience across multiple roles in the civil/construction industry. He is currently working as a research assistant at the Center for Education and Research in Construction (CERC) under the mentorship of Dr. Fred Aguayo on sustainable rapid set concrete for infrastructural applications and exploring alternative cements for similar applications.

Quantum Chemical Studies of Carbon-Based Graphene-Like Nanostructures: From Benzene to Coronene

Alberto Soares Vanny[1] and **Arlan da Silva Gonçalves**[2]

[1]Department of Chemistry, Federal University of Espírito Santo, Brazil
[2]Department of Chemistry, Federal Institute of Education, Science and Technology of Espírito Santo,Brazil

This study investigates 14 distinct carbon-based nanostructures (CBN), ranging from benzene as the primary lattice to more complex ones like coronene (figure 1), using quantum chemical calculations. The aim was to elucidate the relationships between molecular orbital (MO) energies, energy band gaps, electron occupation numbers (eON), the cohesion energy (C_E) and the estimated electronic conduction in these materials, with a focus on identifying structures that closely mimic graphene for theoretical computation approaches. The models were designed at Ghemical software optimized at Tripos5.2 force field and properly protonated on the peripheral carbons. The research involved optimizing molecular geometries using the PM7 semiempirical method at MOPAC2016 to minimize the gradient energy before applying the DFT calculations at the functional B3LYP and 6-31G* basis set, implemented in the ORCA 5.0.4 software. The electronic properties of the molecules, including eON, MO energies, and Raman spectra were obtained with the same method, evaluating their potential as graphene-like structures, making possible the spectrum extraction without the interference of H atoms, approaching the analyses to graphene-like topologies. The analysis revealed that the structural topology of CBNs significantly influences the electronic exchange between orbitals. Specifically, the study found that coronene exhibits properties closest to graphene, supported by its electronic characteristics, the structure stability and its theoretical Raman spectrum, which showed characteristic vibrational modes (D, G, D', and G' bands) consistent with experimental data for graphene nanoflakes. This confirms the suitability of coronene as a model for graphene in theoretical studies, providing a valuable reference for in silico analyses of graphene nanostructures.

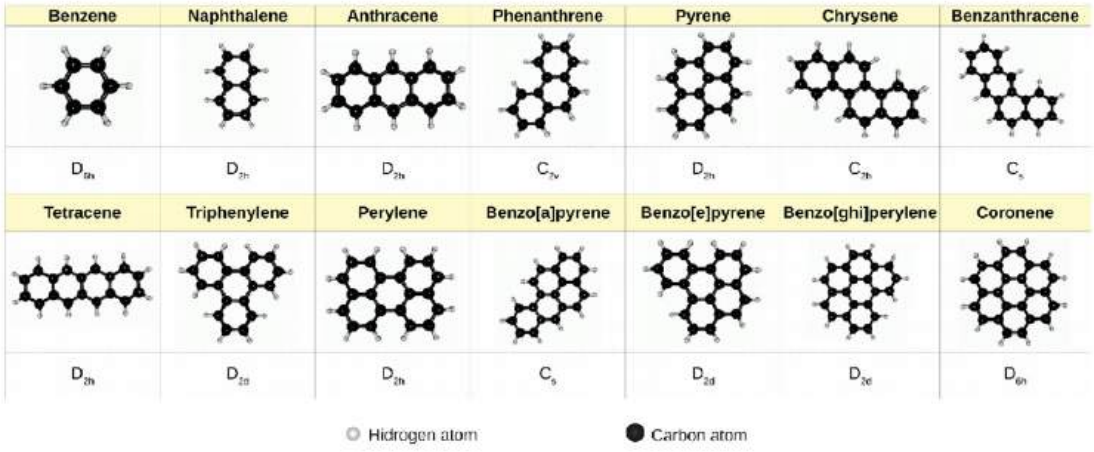


Figure 1 - Models of the analysed structures and the symmetry operations of each one.

Biography

Master's degree in Chemistry with specialization in computational chemistry. Experience in research focused on nanomaterials and 3 years of high-school teaching. Expertise in molecular modeling, molecular dynamics, electronic property calculations, DFT, semi- empirical and ab initio calculations using MOPAC, ORCA and GROMACS software.

Evolutionary Algorithms Approach for Search Based on Semantic Document Similarity

Chandrashekar Muniyappa and **Eunjin Kin**

School of EECS, College of Engineering and Mines, Computer Science, University of North Dakota, USA

Efficient techniques for storing, indexing, searching, and retrieving data are crucial for finding the right set of documents for a given problem. With the increasing volume of data in the Big Data era, the necessity for advanced methods to tackle this issue has become more important than ever. Various techniques exist for retrieving documents that match users' queries, utilizing similarity measurement methods such as cosine similarity, Jaccard similarity, and Euclidean distance, among others. While these techniques are effective at finding accurate answers to specific queries, they may not always yield the desired number of top answers (N). When the available accurate answers are fewer than the requested N documents, it can lead to the inclusion of noisy records alongside the accurate answers to meet the N requirement. To address this challenge, I have applied evolutionary algorithms, such as the Genetic Algorithm (GA) and Differential Evolution Algorithm (DE), to strike the right balance between accuracy and relevance, thereby reducing noise and refining the search results.

Genetic Algorithms (GA) and Differential Evolution (DE) algorithms both inherit traits from their parent solutions to generate quality offspring through mutation and crossover processes. The key difference between these algorithms lies in their execution order: in GA, the crossover operator is applied first, followed by the mutation operator, whereas in DE, this order is reversed.

We applied these algorithms to the Stanford Question Answering Dataset (SQuAD) to match user queries and retrieve the top 15 relevant records. Text embeddings for both the SQuAD dataset and user queries were generated using a sentence transformer, and Manhattan distance was utilized as a fitness function to measure the similarity between user requests and the dataset to find corresponding records.

We compared the results of using Manhattan distance alone against those obtained using the GA and DE algorithms to fetch the top 15 records. The results from the Manhattan distance method provided accurate answers at the top of the list but included many irrelevant answers at the bottom. In contrast, the results from the GA algorithm showed accurate answers at the top and a larger number of relevant responses at the bottom. However, while DE returned many relevant answers, it also missed a few accurate answers. In conclusion, our findings indicate that the GA algorithm most effectively addresses the problem for the given dataset.

Biography

Chandrashekar Muniyappa received a Master's in Data Science from the University of Wisconsin Green Bay and is currently pursuing a Ph.D. in Neural Network Learning algorithms at the University of North Dakota. He has more than 19 years of experience across AI, ML, data engineering, and software engineering and has worked at Samsung, Yahoo, AOL, and Mphasis in the past; he is currently working as a principal ML engineer at Upgrade, Inc. He has published multiple patents and research papers in prestigious IEEE, Springer, and ACM publications. Anomaly detection, graph ML, searching, ranking, learning with a small amount of data, and continuous learning (CL) are his research areas.

SBB-Chi2-A2: Stacking of Bagging-Boosting with the Blend Chi-Square for Effective Prediction of Aortic Aneurysm using Biomarker Profiling

Saurabh Aggarwal

San Jose State University, USA

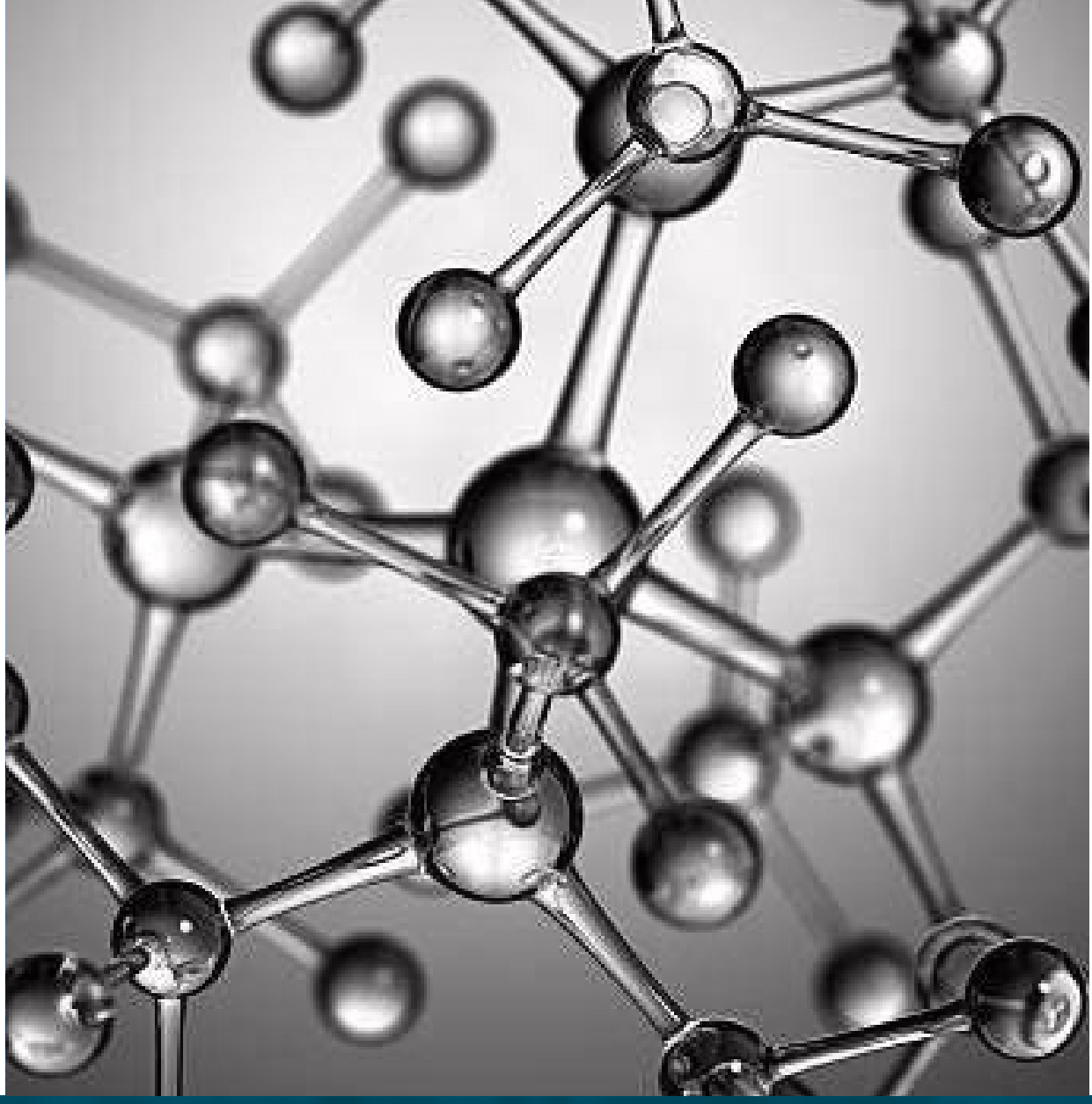
Aortic Aneurysm (A^2) remains a leading cause of morbidity and mortality worldwide, necessitating innovative approaches for accurate prediction and early intervention. This study proposes a novel ensemble learning framework that integrates bagging and boosting techniques through stacking, combined with Chi-square feature selection, to enhance the prediction of A^2 condition using biomarker profiling. The stacking method leverages the strengths of individual models, including Decision Trees (DT), Random Forests (RF), and AdaBoost, GBoost, and XGBoost, to create a robust meta-model. The experimental evaluations are then conducted on Aorta Vessel Tree (AVT) dataset taken from a public repository. Chi-square (Chi^2) feature selection is utilized to identify the most significant biomarkers, reducing dimensionality and ensuring that only the most relevant features contribute to the model. This preprocessing step enhances the model's interpretability and performance by focusing on the critical factors associated with Aortic Aneurysm. The proposed framework is evaluated using key performance metrics, demonstrating superior predictive performance compared to conventional individual-model approaches.

Biography

Saurabh Aggarwal is a Senior Manager & Principal Data Scientist at a major software company based in Silicon Valley, with over 15 years of expertise in data science, machine learning, and AI.

A seasoned keynote speaker and cloud solutions architect, he leads teams that deliver impactful insights and AI-driven solutions for developer ecosystems. Saurabh is a Fulbright scholar, with multiple research publications, and holds a master's degree with distinction from San Jose State University. His work bridges cutting-edge research and practical application, driving innovation in platform services.

ADV. MATERIALS SCIENCE 2025



DAY 03

VIRTUAL EVENT

7th EDITION OF

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MARCH 24-26, 2025

SPEAKER TALKS

Investigation on the Crack Propagation of Rock-Concrete Interface under Fatigue Loading

Xiaoyu Zhao[1] and **Wei Dong**[2]

[1]School of Civil Engineering, Chang'an University, P. R. China
[2]State Key Laboratory of Coastal and Offshore Engineering, Dalian University of Technology, P. R. China

Quasi-static monotonic and fatigue crack propagation tests were initially conducted on composite rock-concrete beams. Subsequently, a fatigue cohesive damage evolution law considering the effects of the upper fatigue load level, load ratio and interfacial elastic mismatch parameter was derived in the framework of the dimensional analysis and self-similarity theory. Then, a fatigue cohesive constitutive model for the interface was developed through integrating the fatigue cohesive damage evolution law into the cohesive constitutive model of the interface under monotonic loading. After that, a deformation-based fatigue crack propagation criterion was proposed according to the relationship of the crack-mouth-opening displacement versus crack propagation length under monotonic and fatigue loading. This was followed by the simulation of fatigue crack propagation for composite rock-concrete beam. The good agreement between the experimental and numerical results suggested that the combination of the fatigue cohesive constitutive model and the deformation-based fatigue crack propagation criterion can successfully simulate the fatigue crack propagation of rock-concrete beam. The developed fatigue cohesive constitutive model effectively characterized the stiffness degradation in the fatigue fracture process zone.

Biography

Dr. Zhao Xiaoyu, born in July 1994, is a lecture at Chang'an University of P. B. China. Her research primarily focuses on the theoretical and numerical analysis of fatigue damage and fracture behavior in interface materials within civil engineering. She has authored eight papers published in prominent academic journals in the field, including Rock Mechanics and *Rock Engineering, Engineering Structures, Journal of Materials in Civil Engineering (ASCE), Engineering Fracture Mechanics, and Theoretical and Applied Fracture Mechanics.*

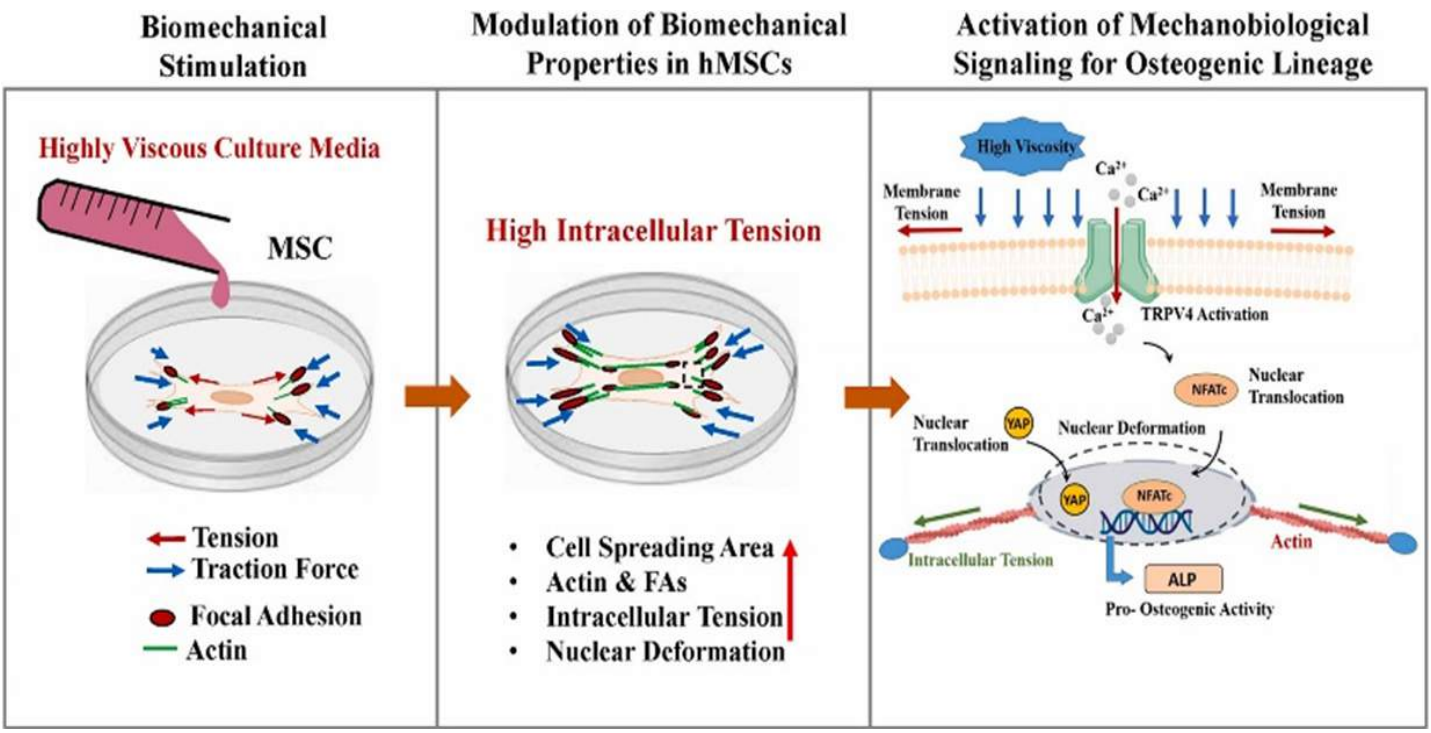
Medium Viscosity as a Mechanical Cue Regulating Osteogenic Differentiation of Human Mesenchymal Stem Cells

Yin-Quan Chen[1], Ming-Chung Wu[2], Ming-Tzo Wei[3], Jean-Cheng Kuo[2], Helen Wenshin Yu[2] and **Arthur Chiou[4]**

[1]Center, National Yang Ming Chiao Tung University,Taiwan
[2]Institute of Biochemistry and Molecular Biology, National Yang Ming Chiao Tung University,Taiwan
[3]Department of Chemical and Biological Engineering, Princeton University, USA
[4]Institute of Biophotonics, National Yang Ming Chiao Tung University, Taiwan

Biomechanical cues play a pivotal role in governing gene expression and directing stem cell differentiation. Recently, medium viscosity has emerged as a critical mechanical stimulus influencing cellular mechanical properties and physiological functions. However, its role in modulating the mechanical properties of human mesenchymal stem cells (hMSCs) to promote osteogenic differentiation remains unclear. In this study, we investigate whether changes in medium viscosity can effectively trigger osteogenesis in hMSCs.

Our results demonstrate that hMSCs cultured in high-viscosity conditions exhibit larger cell spreading areas and increased intracellular tension, correlating with enhanced formation of actin stress fibers and focal adhesion maturation. These mechanical changes are linked to the activation of TRPV4 (transient receptor potential vanilloid sub-type 4) channels, which mediate calcium influx. This calcium signaling promotes nuclear localization of NFATc1, while elevated intracellular tension induces nuclear deformation, enhancing YAP (YES-associated protein) nuclear translocation. The combined activation of NFATc1 and YAP significantly upregulates alkaline phosphatase (ALP), marking pre-osteogenic activity.



Biography

A Research Scientist at the Cancer and Immunology Research Center, National Yang Ming Chiao Tung University, with expertise in biophotonics and cellular mechanics. The research focuses on developing and applying biophotonics platforms to explore the interaction between cell mechanical properties—such as cellular traction force, cytoplasm and nuclear stiffness, and cell motility—and the physical microenvironment. This work advances the understanding of how mechanical cues influence cell behavior in both physiological and pathological contexts.

Quasi-Static and Dynamic Nanoindentation Studies on the Influence of Cooling Window, Grain Size, and Densification on Hardness Anisotropy in AlN Ceramics

Wan Fahmin Faiz Wan Ali[3], Nur Liyana Nabihah Yusof[1] and **Ohmura, Takahito[2]**

[1]Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Malaysia
[2]National Institute for Materials Science, Japan
[3]Computational Structural Materials Science, Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Malaysia

This study investigates the effects of cooling window and grain growth on the mechanical properties of aluminum nitride (AlN) ceramics. The cooling window during the fabrication process plays a crucial role in determining the microstructural characteristics of AlN, particularly grain size and distribution. A controlled cooling rate can promote uniform grain growth, which is essential for optimizing the material's mechanical performance. Larger grain sizes, resulting from prolonged cooling periods, can enhance the hardness and elastic modulus of AlN ceramics; however, this may also lead to increased brittleness, making the material more susceptible to fracture under stress. Conversely, finer grains typically improve toughness and resistance to crack propagation, contributing to better overall mechanical performance. Experimental results indicate that an optimal cooling window can achieve a balance between desirable mechanical properties and structural integrity. The relationship between grain growth and mechanical performance is critical, as it influences the dislocation behavior and elastic recovery of the material. These findings provide valuable insights for tailoring the properties of AlN ceramics for various applications, particularly in high-performance environments where mechanical reliability is paramount. Understanding the interplay between cooling conditions and grain growth will aid in the development of advanced AlN ceramics with enhanced performance characteristics.

Biography

Ir Ts Dr Wan Fahmin Faiz Wan Ali (C. Eng MIMMM, ACPE) is a Senior Lecturer at the Faculty of Mechanical Engineering with PhD in Advanced Materials from Universiti Sains Malaysia (USM). His research area focused on solid-state kinetics and reaction mechanisms, delving into the intricate processes that govern material transformations at the atomic level. With a deep understanding of advanced materials and their properties, he has been actively involved in the design and synthesis of innovative alloys/ceramics with tailored properties for various applications. His expertise lies in optimizing the structural, mechanical, and chemical characteristics of alloys/ceramics to meet specific performance requirements. He is also actively involved in structural health monitoring for asset integrity management.

Sustainable Use of Composite Materials for Geotechnical Structures

Pranjal Barman

Central Institute of Technology Kokrajhar, India

The rapid growth in industrialization and urbanization leads to the generation of large quantity of fly ash and scrap tyres all over the world. Fly ash and scrap tyre, which are considered as waste materials, creates great deal of environment related problem for disposal in many parts of the world. Moreover, conventional building materials are fast depleting with the increase in construction activities in the country. It necessitates the use of substitute materials for the natural construction materials which are non-renewable. The effective and sustainable way to address all these issues can be the utilization of fly ash and scrap tyre in the geotechnical structures.

Due to some unique inherent properties of fly ash and scrap tyre derived fibers can extensively be used in the field of geotechnical engineering. The previous investigation indicate that these two waste materials can effectively be used in the modification of soil properties e.g., compaction, compressibility, strength, deformability, and hydraulic conductivity. But a very few literatures are available to understand the effect of fly ash and scrap tyre derived material with or without cementing agent on soil properties. Therefore, the present research work is aimed at developing an understanding of the geotechnical behavior of composites containing soil as base material mixed with fly ash and scrap tyre derived fiber in different proportions or in combination with cement by means of some test series. Geotechnical tests were carried out on the as-compacted specimen of composites focusing on compaction, stress-strain-strength and permeability behavior of composites. From tests, encouraging results have been found in terms of strength gain, lower unit weight and decreased permeability. The composites developed in these studies have been found to have some potential for use in the geotechnical structures.

Biography

Dr. Pranjal Barman hailed from Assam, India obtained his Bachelors and Master's degree in Civil Engineering from Assam Engineering College, Guwahati, Assam, India. Then he completed his PhD in the Department of Civil Engineering at Indian Institute of Technology (IIT) Guwahati, India. His area of specialization is Geotechnical and Engineering. His research involves primarily the development of soil composites/mixes for potential use of waste materials in geotechnical engineering applications. Different ground improvement techniques such as soil reinforcement and soil stabilization with additives with or without cementitious material are adopted in these studies. His work has been published in many reputed conferences and journals.

Presently he is working as an Assistant Professor in the Department of Civil Engineering in Central Institute of Technology Kokrajhar, Assam, India. Apart from various academic activities, he has been associated with funded projects and supervising PhD scholars in various research areas.

In Silico Gene Expression for Simultaneous Cellulose Hydrolysis and Bioplastic Production from Agricultural Waste

Ziningi Rosebud Myeni[1], N. Ntombela[2], T.E. Motaung[3], F.Dziike[4] and **N.Deenadayalu[5]**

[1,4,5]Durban University of Technology, South Africa
[2]Technology Innovation Agency, South Africa
[3]Sefako Makgatho Health Science University, South Africa

The global shift towards sustainable bioprocessing technologies has sparked significant interest in valorising agricultural waste,for renewable bioplastic production. In this study, we focus on the in silico gene expression for silmutaneous cellulose hydrolysis into fermentable sugars and polyhydroxybutyrate (PHB) (bioplastic) production from agricultural waste biomass. After investigating various pretreatment methods, an optimal pretreatment method was employed to maximize cellulose availability from the hemp hurds biomass. This was followed by the identification of key PHB -producing genes from Cupriavidus necator H16 and cloned into Trichoderma reesei, a cellulolytic fungus and Clostridium thermocellum, an anaerobic bacteria. The gene engineering was confirmed using agarose gel and confirm the molecular base pairs of protein fragments align with the..... The research aims to optimise gene expression, enzyme activity, and fermentation conditions to enhance cellulose degradation and PHB production. This study presents a promising approach to valorising agricultural waste into valuable bioproducts, contributing to both waste beneficiation and sustainable production of biodegradable plastics. Future work will focus on scaling up this process, optimizing reaction conditions, and evaluating the economic and environmental impacts of this integrated bioprocess.

Biography

A PhD Chemistry Candidate at the Durban University of Technology (DUT). My doctoral research focuses on beneficiating agricultural waste into valuable bioproducts, particularly bioplastics, reflecting my dedication to advancing sustainability and innovation in Green Chemistry. Currently affiliated with Technology Innovation Agency (Department of Science Technology and Innovation – South Africa) specializing in application of Analytical Chemistry techniques for downstream processing. Passionate about bridging science and industry, I aim to contribute to cutting-edge solutions that drive environmental and economic impact.

CLARA: Clustered Learning Automata-Based Routing Algorithm for Efficient FANET Communication

Somayeh Danesh and **Javad Akbari Torkestani**

Department of Computer Engineering, Arak Branch, Islamic Azad University, Arak, Iran

With the increasing deployment of FANETs, efficient routing algorithms play a crucial role in ensuring reliable and optimal communication among UAVs. This paper presents a novel Clustered Learning Automata-based Routing Algorithm (called CLARA) for FANETs. The proposed algorithm is designed to enhance the performance of routing by leveraging the capabilities of learning automata. The CLARA consists of five key phases. In the first phase, actions, states, and a Q-Table are initialized to facilitate the learning process. Subsequently, in the second phase, drones within the FANET are clustered based on their geographic location and connection characteristics. This clustering enables efficient management of UAVs and improves network performance. In the third phase, the algorithm selects the next hop for data packet transmission, considering factors such as connectivity and reliability. This selection process ensures robust and efficient data delivery within the network. The fourth phase focuses on Q-Table updating and energy management, which optimizes resource allocation and prolongs network lifetime. Finally, in the fifth phase, the cluster head is selected based on its remaining energy, ensuring effective leadership within each cluster. This dynamic selection process enables the efficient distribution of responsibilities and enhances network stability. Simulation results demonstrate the superiority of the CLARA approach compared to existing methods, including OLSR, AODV, and Q-FANET. CLARA algorithm shows its superiority in the criteria of control overhead, routing overhead, computational overhead of energy consumption, network lifetime, PDR, and end-to-end delay.

Biography

Somayeh Danesh received his B.Sc. and M.Sc degree in computer engineering in iran in 2006 and 2013 , respectively . She is also Ph.D. candidate under Javad Akbari Torkestani in the Department of Computer Engineering, Islamic Azad University, Arak Branch, Arak Iran. Her research interest is in Routing Algorithms,Wireless Sensor Networks, Flying AD HOC Network and Clustering in Network.

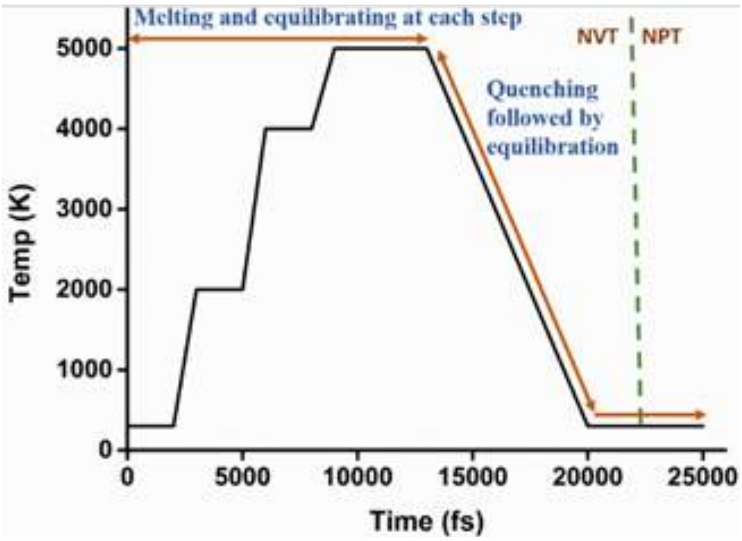
Developing Iron Phosphate Glass from Melt-Quench Simulations using *Ab-Initio* Molecular Dynamics

Sruti Sangeeta Jena[1], Sharat Chandra[1], Shakti Singh[2] and **Gurpreet Kaur[1]**

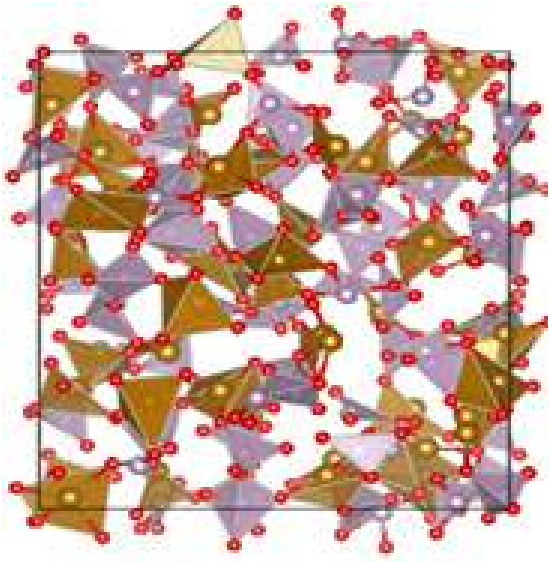
[1]Materials Science Group, a CI of Homi Bhabha National Institute (Mumbai), Indira Gandhi Centre for Atomic Research, India

[2]Laser Biomedical Applications Division, Raja Ramanna Centre for Advanced Technology, a CI of Homi Bhabha National Institute (Mumbai), India

Iron Phosphate glass (IPG) has recently gained interest for immobilizing high level nuclear waste due to its excellent chemical durability. In the current study, we have developed atomistic models of IPG by performing ab-initio molecular dynamics (AIMD) simulations on crystalline $Fe_3(P_2O_7)_2$ following the melt-quench procedure. The system was heated to a very high temperature and then quenched to room temperature, followed by equilibration at each and every step. The final vitreous model was obtained by further relaxing the system using the NPT ensemble to minimise the set-in stress and interatomic forces. Fig. 1(a) shows the temperature profile of the whole procedure, and the final glassy model is shown in Fig. 1(b). The resulting structure was then characterized at different length scales. For the short range, properties like radial distribution function (RDF), coordination number, and bond angle distributions were studied. Similarly, in the intermediate range, an analysis of ring size distribution and neutron structure factor was carried out. Since the AIMD approach gives a very accurate estimation of the electronic structure, property like the electronic density of states (DOS) was studied. Band gap was calculated from the DOS plot, and a few defect peaks were observed in the band gap region of the plot. Those defect states mainly arose due to the dangling bonds of the Fe atoms present in the glassy structure. Apart from this, elastic and vibrational properties were also studied, and the results were compared with the theoretical and experimental results available.



(a)



(b)

Fig. 1(a) Temperature profile of the melt-quench procedure, (b) Final configuration of the Iron Phosphate glass

Biography

Ms. Sruti Sangeeta Jena is a Senior Research Fellow at Indira Gandhi Centre for Atomic Research in Kalpakkam, India. Her doctoral research work focuses on developing atomistic models of glasses using the ab-initio molecular dynamics (AIMD) simulations and characterizing them at different length scales. In addition, it involves the determination of the electronic, optical, vibrational, and mechanical properties of the obtained models using density functional theory (DFT) calculations. Her recent work is based on developing and characterizing Iron Phosphate glasses. She has gained significant experience in molecular dynamics and electronic structure calculations. She has developed a strong foundation in computational materials science and a keen interest in leveraging machine learning techniques to enhance AIMD simulations.

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Enhancing Supply Chain Forecasting with Hybrid Stacked Ensembles

Lucia Agnes Beena T[2], Vinolyn Vijaykumar[1], Mercy P[3] and **Leena H M[4]**

[1]Alpha Arts and Science College, India
[2,3,4]Holy Cross College (Autonomous), India

To maintain a competitive edge and boost profits in this ever evolving and aggressive Supply Chain Management (SCM) market, demand forecasting is important for optimizing operations, lowering costs, and assuring customer satisfaction. Machine Learning (ML) algorithms have turned out to be very good tools in enhancing the accuracy of forecasts since they enable businesses to work with large amount of information, identify the patterns, and make the predicted demand more reliable. But, when only one ML model is implemented, it often does not lead to satisfactory results owing to the nature and diversity of the supply chain data. In these situations, practitioners often turn to Ensemble learning techniques, especially, hybrid stacked ensembles as they can enhance the predictions without using many models' individual powers by utilizing their combined approaches as synergetic effect. In this research, the impact of the hybrid stacked ensemble techniques on the forecasting accuracy of the supply chain is addressed. Stacking technique is applied to combine Long Short-Term Memory ((LSTM) Neural Network, Autoregressive Integrated Moving Average (ARIMA), Random Forest, XGBoost and Linear Regression forecast models together with Ridge Regression as a meta model to make the final forecast decision. The performance of the hybrid ensemble approach is assessed through the application of Mean Squared Error (MSE) and demonstrates improved ability to predict demand changes and replenish stock that fortifies a more resilient supply chain and efficient inventory management. The research indicates that competitive advantage in channels of supply management can be realized by employing ensemble approaches that are superior to ordinary forecasting methods. Future studies will focus on adding comprehensive feature engineering to the dataset, utilizing hyperparameter tuning approaches such as Grid

Search or Random Search, and combining models like Seasonal Autoregressive Integrated Moving Average (SARIMA) and Gated Recurrent Units (GRU) for improving time-series and sequential forecasting for businesses seeking ways to enhance operations and forecasting accuracy.

Biography

Dr. T. Lucia Agnes Beena is working as an Assistant Professor in the Department of Computer Science, Holy Cross College (Autonomous), Tiruchirappalli, Tamil Nadu, India. She has 21 years of teaching experience and 8 years of research experience. She has published number of research articles in Scopus indexed Journals. She has authored one book and edited one book. She has published more than 12 chapters with CRC, Wiley and IET publishers. Her areas of interest are Cloud Computing, Psychology of Computer Programming and Machine Learning.

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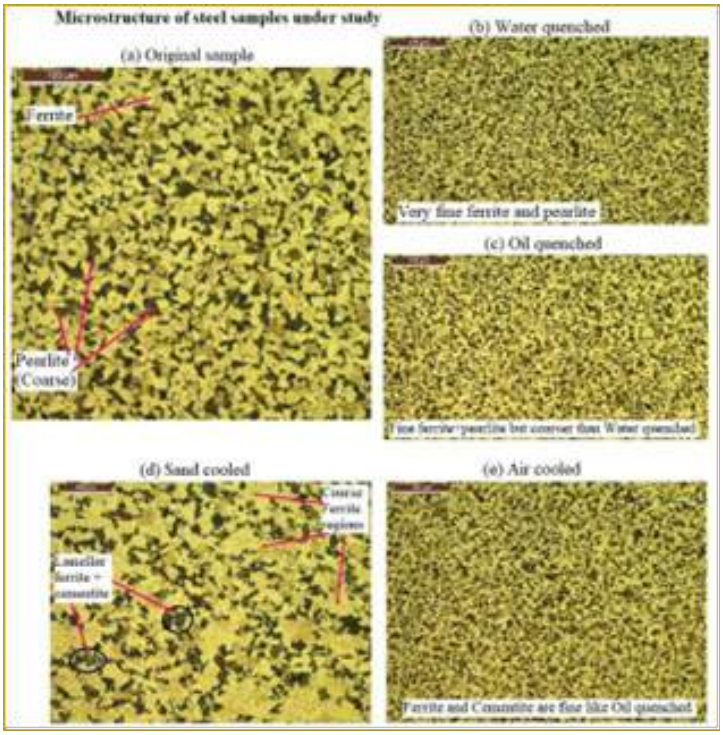
Optimizing Input Parameters Involved in EDM Process of Hardened, Normalized and Annealed 0.2%-C Steel Samples

Lav Maheshwari, Saurabh Dewangan, Gopal Sukhwal, Sidharth Naidu, Harsh Surana and **Avaneesh Rajesh Kulkarni**

Department of Mechanical Engineering, Manipal University Jaipur, India

The present work deals with the optimization of input parameters involved in 'electric discharge machining (EDM)' of AISI 1020 steel with 0.2% carbon content. A total of five such samples, each consisting of a unique physical characteristic, were selected in the work. The first sample was in the original or "as received" state, while the next two were hardened by quenching them into water and oil respectively. The normalizing heat treatment was followed for the fourth sample whereas the fifth was annealed. The hardness of the samples got significantly varied after heat treatment. Current, pulse-on-time, and pulse-off-time were the three distinct input characteristics taken into consideration as variables. The output parameters were determined by the surface finish of the cut and weight loss after machining. EDM tool of brass was chosen for investigation. Eight different sets of machining parameters were chosen to cut slots on every sample for the five plates. The ANOVA method was used to analyze the impact of inputs on the response and the experimental data were formulated using the Taguchi method. The purpose of this study is to find the effect of varying hardness, developed due to heat treatment, on the machining performance of the EDM. It was found that water and oil-quenched specimens, harder than other samples, could be machined at a relatively lower current. The difference noted in EDM parameters proves that the heat treatment process has successfully improved the material's properties.



Microstructural images of all the samples; (a) for original sample; (b) For water quenched sample; (c) For oil quenched sample; (d) For sand cooled sample; (e) For air cooled sample

Original			Normalized Values		Deviation Sequence		Gray Relational Coefficient		GRG	Rank
S No	SR	ML	SR	ML	SR	ML	SR	ML		
1	3.415	0.060	0.750	0.000	0.250	1.000	0.667	0.333	0.500	8
2	2.618	0.135	1.000	0.250	0.000	0.750	1.000	0.400	0.700	1
3	3.016	0.098	0.875	0.127	0.125	0.873	0.800	0.364	0.582	3
4	3.813	0.173	0.625	0.377	0.375	0.623	0.571	0.445	0.508	6
5	4.212	0.200	0.500	0.467	0.500	0.533	0.500	0.484	0.492	9
6	4.610	0.240	0.375	0.600	0.625	0.400	0.444	0.556	0.500	7
7	5.007	0.280	0.250	0.733	0.750	0.267	0.400	0.652	0.526	5
8	5.408	0.320	0.125	0.867	0.875	0.133	0.364	0.789	0.576	4
9	5.805	0.360	0.000	1.000	1.000	0.000	0.333	1.000	0.667	2

Grey Relational Analysis for water quenched sample

Biography

Lav Maheshwari is an Associate Professor in the Department of Mechanical Engineering at Manipal University Jaipur, India. With a robust academic background in Materials and Metallurgical Engineering Prof. Maheshwari has been instrumental in teaching and developing curricula for a variety of courses, including Basic Mechanical

Engineering, Engineering Graphics, AutoCAD, Creativity and Innovation, Thermodynamics, and MATLAB for Engineers. His teaching methodology emphasizes practical applications and hands-on learning, fostering a dynamic and interactive educational environment.

Prof. Maheshwari's research interests encompass a wide range of topics within materials science and mechanical engineering. He focuses on electric discharge machining (EDM), fracture mechanics, alloy design, and the optimization of steel machining in EDM processes. His recent publication, "Optimization of Input Parameters Used for Machining Heat-Treated 0.2%-C Steel Under the EDM Method," co-authored with several colleagues, reflects his commitment to advancing knowledge in the field through collaborative research efforts.

With over a decade of academic and research experience, Prof. Maheshwari is dedicated to exploring innovative solutions to contemporary engineering challenges. His expertise and enthusiasm for EDM and materials optimization position him as a valuable contributor to the advancement of materials science and engineering.

The Mechanism of Friction and Wear of Polymer-Polymer Friction Pairs as Revealed by Mass Spectrometry, Plasma-Induced Thermoluminescence and Interface Modeling

Pozdnyakov A.O.[1,2], Myasnikova L.P.[1], Li Syanchun[3] and **Sedakova E.B.[2]**

[1]Ioffe Institute, Polytechnicheskaya str. 24, Russia
[2]Institute for Problems in Mechanical Engineering of RAS, Russia
[3]Chengdu Aeronautic Polytechnic, China

We discuss the dynamic friction force transitions in polymer-polymer friction pairs and the related wear behavior of the sliding counterparts from the standpoint of in-situ mass-spectrometric analysis of the tribodecomposition products in these pairs and ex-situ plasma-induced thermoluminiscence analysis of the polymer surface after friction. The results are visualized by molecular dynamics simulations. Hereto related thermal analysis of the friction process in vacuum and atmosphere is also discussed. Examples include industrially important polytetrafluoroethylene, polyoxymethylene and polyetheretherketone [1-3]. The results suggest the molecular level model of the friction force growth in symmetric polyoxymethylene-polyoxymethylene pair, absent in asymmetric friction pairs, above glass transition temperature of polyoxymethylene to be a scission of macromolecules. The mechanism of the process in relation to thermal analysis at the friction interface is discussed.

1. Pozdnyakov, A.O., Syanshun, L. &Sedakova, E.B. Molecular Mechanisms of Polyoxymethylene Wear. J. Frict. Wear 45, 24–31 (2024). DOI:10.3103/S1068366624700041

2. Pozdnyakov, A.O. Formation of Decomposition Products of Macromolecules Upon Friction of Polymer Against Polymer. Tech. Phys. Lett. 49 (Suppl 2), S108–S111 (2023). DOI:10.1134/S1063785023900509

3. A.O. Pozdnyakov, V.L. Preobrajenskii, L.P. Myasnikova, O.Yu. Solov'eva, K.A. Danilova, , Yu.M. Boiko,Technical Physics Letters, 2023, Vol. 49, No. 12, pp. 59-62

DOI: 10.61011/TPL.2023.12.57587.151A

Biography

Pozdnyakov Aleksei. Born 11.03.1966. Graduated from Polytechnic Institute, Saint Petersburg. Work place 1989-present: Ioffe Institute and Institute for problems in Mechanical Engineering, Saint-Petersburg. Humboldt Foundation stipendium holder. PhD and Docent. Research interests: experimental physics, friction, polymers, crystals, vacuum experimental conditions.

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Non-Effervescent Polymeric Floating Tablets of Clarithromycin and Pantoprazole: Preparation and *In-Vitro* Evaluation for Improved Gastric Drug Retention

Syed Shafqat Ali Shah[2], Fahad Ashraf[1] and **Kifayat Ullah Shah[1]**

[1]Particle Design and Drug Delivery Laboratory, Faculty of Pharmacy, Gomal University, Pakistan
[2]College of Pharmacy, Liaquat University of Medical and Health Sciences, Pakistan

Purpose: The study intended to develop and investigate controlled release non-effervescent floating polymeric tablets of Clarithromycin and Pantoprazole to enhance their bioavailability by prolonging the gastrointestinal transit time of drugs, a system for Helicobacter pylori elimination.

Methods: The gastro-retentive tablets were prepared via direct compression method using different concentrations and combinations of hydroxypropyl methylcellulose (HPMC) K4M, Carbopol and guar gum as hydrophilic polymers and Avicel 102 as a filler. The pre-compression solid mixture was characterized for angle of repose and compressibility index, applying Hausner's ratio to predict the flowability, as well as fourier transform infrared spectroscopy for drug-excipient interaction evaluation. The prepared tablets were investigated for dimension, hardness and friability, weight variation and content uniformity, swelling index, density, buoyancy and in-vitro drug release.

Results: All the formulations exhibited desired floating and flow attributes. Solid-state characterization revealed no chemical interaction between excipients and the drugs. With reference to in-vitro study results, all formulations, except F7, have displayed slow drug release and reduced burst effect (F6). The lowest lag buoyancy of 5 min was achieved in F2. This study develops a non-effervescent floating system for dual drug delivery to enhance gastric residence time, thereby optimizing local therapeutic effects. This innovative approach aims to reduce dosing frequency and associated side effects, improving patient compliance and treatment efficacy for gastric ulcer. This innovative approach can provide effective ulcer healing with shortened treatment time, reduced side effects and improved patient compliance.

Biography

Dr. Shafqat Ali Shah, Lecturer at the College of Pharmacy, LUMHS Jamshoro. He has earned his PhD in (Pharmacognosy) from Ziauddin University, Karachi, a leading institution in Pakistan.

His Research interests centre is on the identification and characteristics of marine products which are pharmacological active to work on the recent innovation in the field of medicine, aiming to improve patience compliance and treatment efficacy.

He is privileged to contribute to Adv. Material Sciences.

Eye Tracking Review: Importance, Tools and Applications

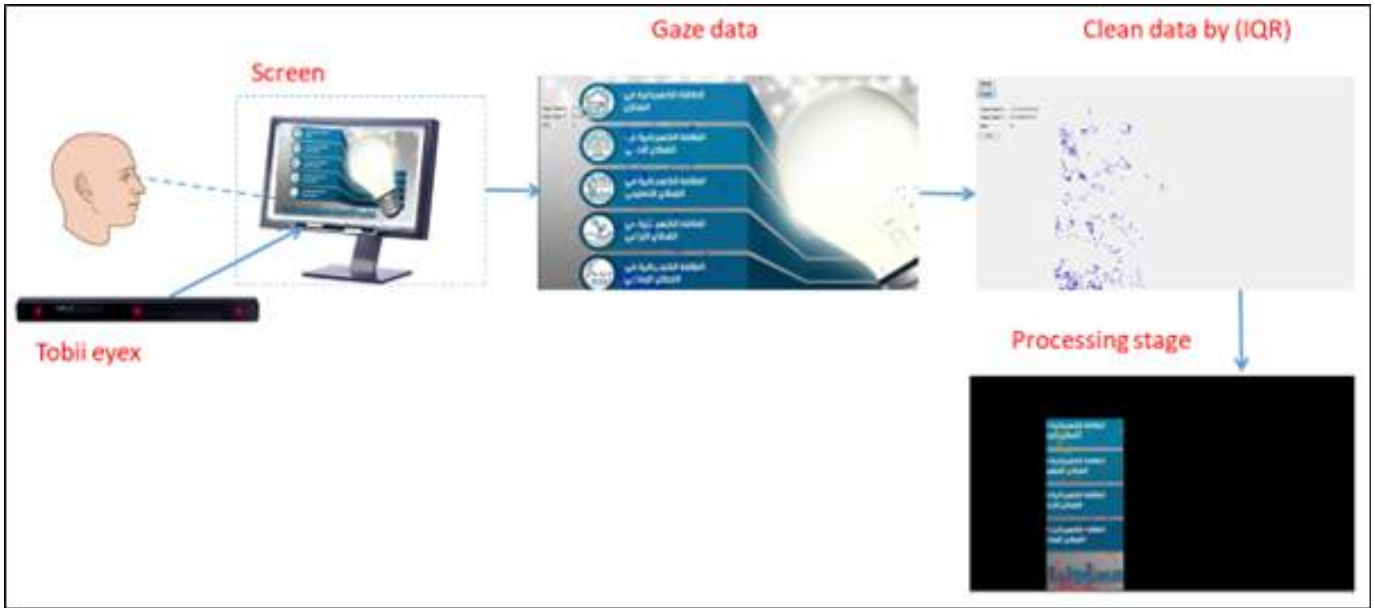
Taisir Alhilo and Akeel Al-Sakaa

College of Computer Science and Information Technology, University of Kerbala, Iraq

Eye tracking technology has evolved as a powerful and flexible tool, providing critical insights into human visual activity and cognitive processes in a range of disciplines. This article looks at the importance of eye tracking and the hardware components used in eye tracking systems. The benefits and applications of types of eye trackers, such as remote and head-mounted, are discussed. Considerations like as spatial resolution, sample rate, and accuracy assist researchers in selecting the best equipment for their study objectives.

The study discusses software essential for evaluating and interpreting data from eye movements. Then deepen on major eye movements and metrics utilized in eye tracking studies, such as fixation length, saccades, and pupil dilation. These measures offer useful insights on visual attention and cognitive processes, allowing researchers to better understand how people respond to visual stimuli.

Finally, eye tracking applications in psychology, marketing, human-computer interface, and medical research are highlighted. Eye tracking demonstrates its adaptability and importance in understanding human behavior in real-world scenarios, from analyzing consumer behavior to improving user interfaces.



Biography

Taisir Alhilo has over 10 years of experience in the field of computer science. She holds a master's degree in Computer Science from the University of Kerbala, where I specialized in data analysis and eye-tracking technologies. Throughout her career, she has published several research papers, including "Handling Noisy Data in Eye-Tracking Research: Methods and Best Practices" (DOI: 10.1109/BATS59463.2023.10303090), which addresses how to manage noisy data in eye-tracking studies, and "Eye Tracking Review: Importance, Tools, and Applications" (https://link.springer.com/chapter/10.1007/978-3-031-56728-5_32), which reviews the significance and applications of eye-tracking tools. She is dedicated to advancing this field through innovative research and practical solutions.

Proteus Mirabilis—Mediated Green Synthesis of Magnesium Nanoparticles: Optimization and their Antimicrobial Activity

A. Shahzad, M. Iqtedar, S. Arooj, A. Kaleem, R. Abdullah and **M. Aftab**

Department of Biotechnology, Lahore College for Women University, Pakistan

The present study was carried out to produce magnesium nanoparticles (MgNPs) through biological method by using microbes which is not only sustainable but economical too. After careful screening, *Proteus mirabilis* BTCB21 (MN956898) was selected for the synthesis of magnesium nanoparticles. Various parameters like temperature, pH and substrate concentration were adjusted to optimize magnesium nanoparticles and investigate their effect on reaction time and size of nanoparticles. Characterization of magnesium nanoparticles was completed by UV-Vis spectrophotometer which exhibited peak at 350 nm, Fourier-transform infrared (FTIR) exposed presence of various groups like N-H, C-C, C-Cl, C-Br, C-F and O-H. Scanning Electron Microscopy (SEM) displayed irregular nanoparticles with average size of 463.06 nm. The results revealed optimization conditions for magnesium nanoparticles to be at 37°C temperature, pH 7 and 1 g of substrate concentration was selected for optimization. Antibacterial activity was also carried out; highly resistant pathogenic bacteria *Staphylococcus aureus* BTCB02 and *Salmonella typhi* BTCB06 were selected for antibacterial activity. The zones of inhibition ranged between 11 to 27 mm respectively. Magnesium nanoparticles prepared through biological method has great potential for applications in different fields especially biomedical; to treat antibiotic resistant illnesses.

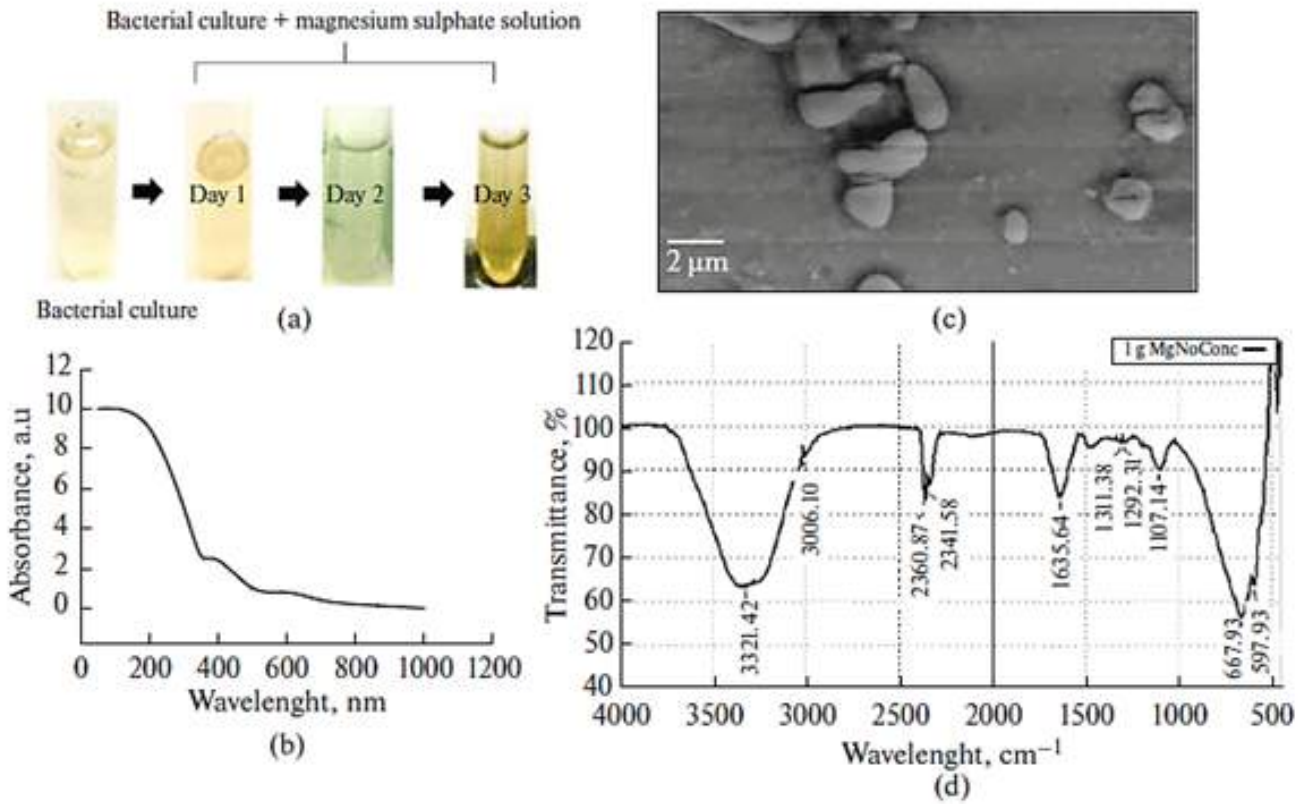


Figure 1. Characterization of magnesium nanoparticles (a) colour change observed during the formation of Mg nanoparticles for a period of 3 days, (b) UV-Visible spectroscopy indicating the formation of MgNPs at 350 nm, (c) SEM analysis showing irregular MgNPs, (d) Fourier-transform infrared (FTIR) showing presence of various functional groups.

Biography

Asma Shahzad has completed her Ph.D. from Lahore College for Women University, Pakistan in Biotechnology that was based upon myco-synthesis of silver nanoparticles, optimization, characterization and their antimicrobial and cytotoxic activity. Along with that she also has 6 month's research experience at a renowned university of United Kingdom i.e. University of Bristol with research topic 'Engineering nanoparticle distributions for brain cancer treatment.' Hence her research revolves around various metal nanoparticles and their applications. As a research associate, she has also introduced green nanotechnology in her lab and have also worked on different projects involving plants, fungus, bacteria with other types of nanoparticles (gold, zinc, magnesium, silver, iron etc.) and their synthesis. Moreover, she also interested in cancer studies and cytotoxicity of nanoparticles and want to develop better and safer ways to regulate nanoparticle distributions for cancer treatments.

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Fashion Artistry Unleashed by Artificial Intelligence (AI) Ingenuity: The Alchemy of Design

Arpita Nayak[1] and **Ipseeta Satpathy**[2]

[1]KIIT School of Liberal Studies, India
[2]KIIT School of Management, India

The broad use of Artificial Intelligence (AI) in the fashion industry has increased dramatically in recent years. This novel form of technology has not only disturbed old practices, but it has also opened up a universe of previously unimaginable possibilities. The highly personalized and precise fashion recommendations are one of the most visible developments brought about by AI in the fashion business. Customers no longer have to sift through hundreds of apparel selections to get the perfect fit. To propose apparel that is a good fit for their personality, AI algorithms analyze user preferences, past purchases, and even social media activities. This not only improves the purchasing experience but also raises conversion rates for online marketplaces. AI isn't simply about optimizing logistics and improving consumer experiences. It is also a fashion industry creative powerhouse. Designers may use generative design algorithms to help them create distinctive and original apparel designs. Designers may obtain several design versions in a matter of minutes by feeding the AI with certain parameters and design components, saving time and extending creative horizons. In the fashion industry, sustainability is a major problem. By analyzing their environmental effect and durability, AI can aid in the choosing of environmentally friendly materials. This ensures that fashion companies make informed material purchase decisions, resulting in a more sustainable and environmentally conscientious business. According to McKinsey, generative AI has the potential to greatly boost profitability in the garment, fashion, and luxury industries over the next three to five years, with an anticipated rise of up to $275 billion. The disruptive impact of generative AI rests in its capacity to co-design and accelerate content generation processes, opening up new creative paths. The technique excels in processing many types of "unstructured" data, such as raw text, photos, and video, allowing

for the creation numerous media formats. Generative AI broadens the gamut of creative possibilities, from fully-written scripts to detailed 3D designs and lifelike virtual models for video commercials. The chapter on his paper focuses on deftly exploring the intersection between ancient fashion craftsmanship and current artificial technology. The article investigates how AI might be used as a revolutionary agent to reinvent the creative terrain of fashion design. This article would add the book's important contributions, detailing how digital innovation intersects with art and fashion and highlighting contemporary advances in design.

Biography

Dr. Arpita Nayak is currently serving as an Assistant Professor, offering courses in management. She completed her Ph.D. in management from the KIIT School of Management. Her MBA and strong interest in Human Resource Management (HRM) led her to pursue further studies in HRM. Her passion for talent management inspired her doctoral research on “A Comparative Study on Talent Management in Private and Public Manufacturing Industries in Odisha.” Dr. Nayak has presented research papers at both national and international conferences and has published articles in SCOPUS-listed journals. Over the years, she has taught a variety of subjects, including Human Resource Management, Principles of Management, Business Studies Management, Tribal Entrepreneurship, and Organizational Behaviour. In addition to her academic career, she also has several years of corporate work experience.

Survey on Qos Guaranteed Routing in Cognitive Radio -Adhoc Network

Niranjan Muchandi[1], Rajashri Khanai[1] and **Mandakini Muchandi[2]**

[1]Department of Computer Science Engineering, KLE Technological University, India
[2]Department of Mathematics,Govindarama Seksaria Science College, India

Cognitive radio adhoc networks have quality of service (QoS) challenges due to multiple factors of improper spectrum utilization, multipath fading and hidden node issues. Routing can be made effective by proper management of primary user spectrum and allocation of channels. This involves accurate detection of primary user, prediction of channels free time etc. When routing is based on these spectrum availability prediction, the QoS of routing in terms of packet delivery ratio, overall latency, throughput etc can be improved. This work explores the exiting works on improving the QoS of routing in cognitive radio networks. Existing works are reviewed in three perspectives of routing, spectrum sensing and spectrum sensing attacks. . The aim of this work is to identify the challenges in achieving higher QoS in Cognitive radio adhoc networks and present prospective solution architecture to address those challenges.

Biography

Dr. Niranjan Muchandi is an Assistant Professor in the Department of Computer Science Engineering at KLE Technological University, Belagavi Campus. He holds a B.E. in Telecommunication Engineering (2008), an M.Tech in VLSI Design and Embedded Systems (2010), and completed his Ph.D. in Cognitive Radio Wireless Sensor Networks in December 2023.

With over 8 years of research experience, Dr. Muchandi specializes in Wireless Sensor Networks, Cognitive Radio Spectrum Sensing, Routing, and Security. His work focuses on advancing the efficiency and reliability of communication systems, particularly in dynamic and resource-constrained environments. Throughout his career, Dr. Muchandi has contributed to various projects aimed at improving the performance and security of wireless networks.

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An Investigation on In-Fluid AFM Techniques for Characterization of Soft Samples

Cagri. Yilmaz

Vocational School of Technical Sciences, Akdeniz University, Türkiye

Viscoelastic properties of soft materials are extensively explored using single- and multi-frequency Atomic Force Microscopy (AFM) methods in liquids. Performing In-fluid AFM operations enables to acquire higher observable sensitivity to properties of soft samples. Amplitude, phase shift, and frequency shift sensitivity to varying properties of soft materials can be gathered considering the effect of viscous loads in different AFM operation modes. Significant improvements in the extraction of functional heterogeneity of the biological materials can be achieved by conducting multi-parametric AFM experiments. Obtaining ultra high-resolution images of uncoated DNA, DNA molecules can easily interact with the tip of the micro-cantilever in liquid mediums. Imaging DNA in liquids is much more desirable owing to the lower imaging forces in viscous mediums. Highly sensitive analysis can also be conducted for characterization of biomolecules and cells at the sub-nanometer scale. Ultrastable AFMs providing subpiconewton force precision lead to enhancements in AFM imaging techniques for new biological applications. In addition to that, pairwise friction coefficients of polystyrene particles can be measured in Newtonian liquids. Based on AFM measurements, the friction properties of the particles can be related to macroscopic rheological behaviors. An in-fluid AFM technique can also be regarded as an active micro-rheology method in the investigation of the structures and dynamics of soft samples. The micro-rheological methods bring significant improvements, especially in the characterization of polymers and biological samples. Simultaneous imaging can also be conducted to extract properties of the polymer-blend films in high-speed AFM. Therefore, fluidic AFM techniques can be robustly utilized to characterize soft materials with high selectivity and sensitivity for different technological applications.

Biography

Cagri Yilmaz received his undergraduate degree in mechanical engineering from Middle East Technical University (METU) in 2007. He went on to complete his master's degree in mechanical engineering at Duisburg-Essen University in Germany in 2010. He worked as an intern in the manufacturing department at ThyssenKrupp MillServices & Systems in Duisburg. In 2010, he successfully completed his master's thesis at Trützchler Spinning firm in Mönchengladbach, Germany, as part of the T-Data project. Subsequently, he worked as a research assistant in the Distributed Artificial Intelligence Laboratory (Dai-Labor) at the Technical University of Berlin from 2011 to 2014, focusing on robot systems and smart grids. He completed his doctoral studies in the field of acoustics and vibration at Akdeniz University's mechanical engineering department in May 2022. Currently, he is engaged in theoretical studies on the sensitivities of micro-cantilevers to external forces under multi-frequency operations.

The use and Mechanisms of Environmentally Friendly Biofilm Inhibitory or Disruption

Tugba Kilic

Gazi University, Vocational School of Health Services, Department of Medical Services and Techniques, Program of Medical Laboratory Techniques, Türkiye

Biofilm structure is the layer formed by beneficial and/or pathogenic monospecies and multispecies microbial cells adhering to a biotic (tissues) or abiotic (medical or food devices) surface through extracellular matrix components. The matrix comprises exopolysaccharides, proteins, lipids, extracellular DNA and RNA, and other molecules. Biofilm structure is associated with medical and industrial processes. Medically important pathogenic bacterial species can form biofilms by colonizing clinical surfaces and medical devices. Biofilm cells may be more resistant to antibiotics, biocides, nutrient deficiencies, and attacks on the immune system than planktonic cells due to the thick layer they form. About 99% of bacteria are biofilm producers. Biofilms cause contamination of food-related surfaces or about 65-80% of microbial infections. The thick biofilm matrix can block the passage of antibiotics. The aim is to prevent bacterial biofilms before they form or to disperse the cells within the formed biofilm structure and return them to planktonic cell form. Biofilm formation is a complex process involving bacterial signaling systems. Moreover, the complex structure of the biofilm may result from phenotype-adaptive and genetic-related mechanisms. Studies are on inhibiting these signals, such as quorum sensing (bacterial communities), or preventing biofilm formation with other antibiofilm agents, such as antimicrobial peptides, essential oil, ozone, and green synthesized nanoparticles. In conclusion, microbial infections and food contamination associated with biofilm formation continue to be a global concern. Therefore, since biofilm formation mechanisms and matrix component properties vary from species to species, species-specific new environmentally friendly therapeutic agents and approaches must be discovered for biofilm control. Primarily, comparative analysis of transcriptomic data may identify novel dysregulated genes related to biofilm formation.

Furthermore, dual and triple combination combinations of antibiofilm agents of different origins can be used, such as essential oil-antibiotics, antimicrobial peptide-antibiotics, quercetin-allicin, ultrasound-biosurfactants, silver nanoparticles-antibiotics for a synergistic effect.

Biography

I graduated in Biology, with a Master's Degree in Biotechnology. I had PhD in Molecular Biology at Ankara University in 2016. I work as an Assistant Professor in the Department of Medical Services and Techniques, Medical Laboratory Techniques Program, Vocational School of Health Services, Gazi University. My Ph.D. thesis topic is "Analysis of biofilm structures on various surfaces of thermophilic bacilli forming high amounts of biofilms and prevention of biocorrosion by removal of biofilms". My research is on bacterial biofilm formation and biofilm control. I recently reviewed biofilm control strategies for the World Journal of Microbiology and Biotechnology Journal.

Research interest:

Microbiology, Biotechnology, Molecular Biology, Bacterial biofilm formation, Biofilm removal.

Quantum Size Effect of Bloch Wave Functions of Ultra-High Energy Electrons in a Thin Single-Crystal Film

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A.V. Shubnikov Institute of Crystallography of the Kurchatov Complex "Crystallography and Photonics", National Research Center "Kurchatov Institute", Russia

According to previously obtained formulas, the reflection coefficient of electrons incident normally on a thin single-crystal film was calculated. It was shown that even at ultra-high particle energies (about 1 MeV), the quantum size effect is noticeably manifested. This fact was not known before. It was believed that the effect is observable only for low-energy electrons and it was actually observed in tunnel experiments where this requirement is met.

In a single-crystal film, Bloch waves are formed, the length of which varies from the period of the one-dimensional lattice to the film thickness. This significantly weakens the requirements for the object of study and makes it fundamentally possible to observe the effect.

It should also be noted that earlier, when constructing the theory of diffraction of medium and high-energy electrons from single-crystal films, reflection from the second boundary of the film was not taken into account (it was considered that it was small and was neglected). Taking it into account leads to the emergence of a quantum size effect when electrons are scattered on the film.

The last two factors, which the author first drew attention to, had not previously been taken into account either in theoretical models of the effect or in its experimental study.

In addition, narrow peaks of the order of unity are revealed on the curves of the dependence of the electron reflection coefficient on energy. Their appearance is explained by Bragg reflection. Formulas are derived that determine their magnitude and position on the reflection curves. This phenomenon was also previously unknown.

Biography

In 1974, he graduated from the Physics Department of the Lomonosov Moscow State University in the Department of Solid State Physics. In the same year, he joined the A.V. Shubnikov Institute of Crystallography in the electronography laboratory, where I have been working to this day.

Research interests include electron diffraction, thin single-crystal films, and the theory of various manifestations of the quantum size effect in thin single-crystal films. He has published about 40 papers in scientific journals.

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Enhanced Oil Recovery using Nanocomposite-Based Chemical Flooding: A Comparative Study on Light and Heavy Oil

Nahid Sarlak[1,2] , Ashkan Maleki[3], Behnam Sedaee[4], Alireza Bahramian[4], Sajjad Gharechelou[5], Arash Mehdizad[4], Mohammad reza Rasaei[4] and **Aliakbar Dehghan[6]**

[1]Department of Analytical Chemistry, Faculty of Chemistry, Lorestan University, Iran
[2]Research institute of petroleum industry, Iran
[3]Science and Research Branch, Islamic Azad University, Iran
[4]Institute of Petroleum Engineering, School of Chemical Engineering, University of Tehran, Iran
[5]School of Geology, College of Science, University of Tehran, Iran
[6]Iranian Offshore Oil Company, Iran

Objectives & Scope

This study aims to investigate the efficiency of six different injection solutions in enhancing oil recovery for both light and heavy crude oil under varying brine salinities. The primary objective is to determine the key recovery mechanisms associated with nanocomposite-polymer solutions and their interactions with oil and formation water.

Methodology

Experiments were conducted using a homogeneous glass micromodel to evaluate the impact of different injection solutions. The base solution consisted of synthetic seawater (SSW) with 40,000 ppm NaCl. Five additional solutions were formulated by incorporating 1000 ppm of various additives, including silica-based polyacrylamide (NCSP), alumina-based polyacrylamide (NCAP), a combined silica-alumina nanocomposite (NCSAP), surfactant (CTAB), and polyacrylamide (PAM).

Results and discussions

The findings reveal that nanocomposites play a crucial role in improving oil displacement efficiency through IFT reduction, wettability alteration, and mobility control. The NCSAP

solution exhibited the highest light oil recoveries of 95.83% and 70.33% at salinities of 250,000 ppm and 180,000 ppm, respectively. Similarly, CTAB demonstrated significant recovery rates of 84.35% and 91% under the same conditions. For heavy oil recovery, mobility control was the dominant factor, with PAM achieving comparable recovery levels to CTAB and other nanocomposites, reaching approximately 17%. A general sketch of this study is presented in Figure 1.

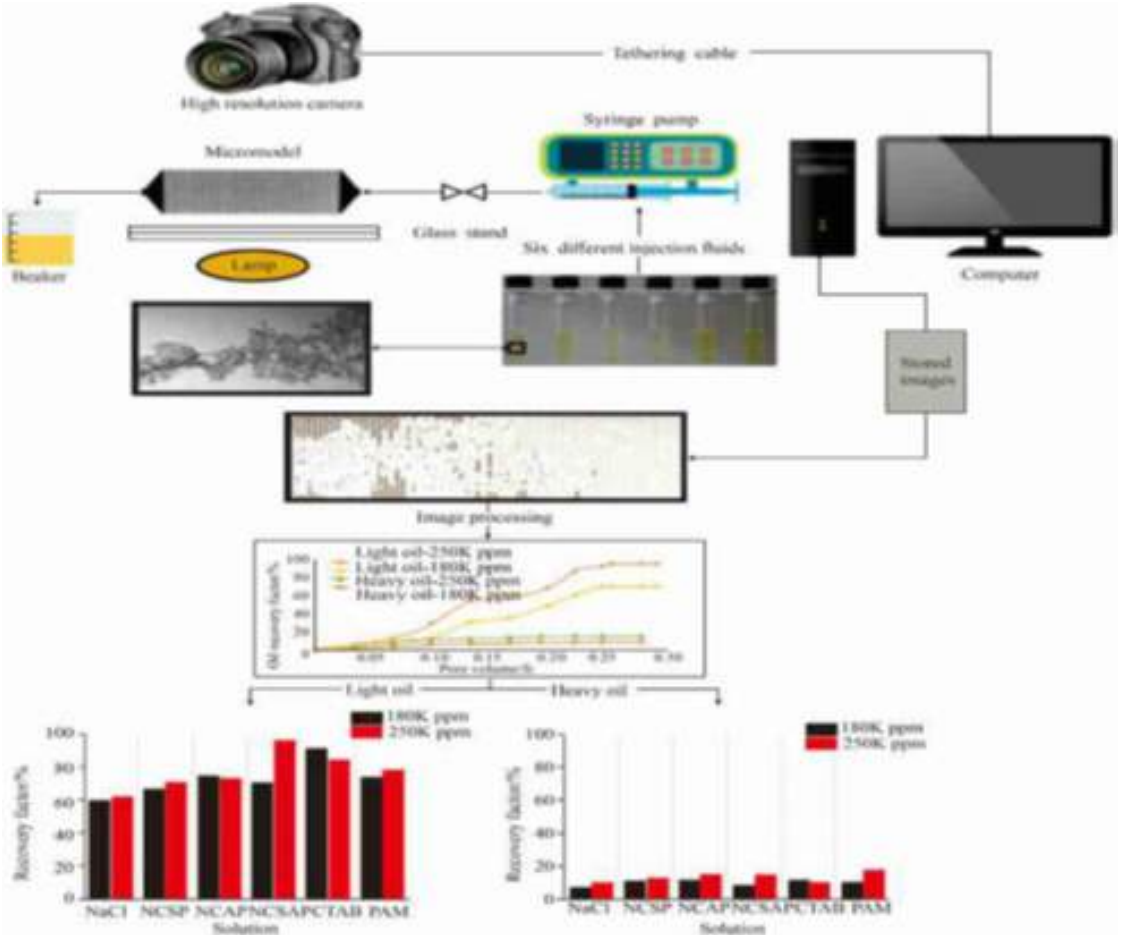

Figure 1. General sketch of this study from experimental setup and methodology to results.

Conclusion

This study underscores the importance of nanocomposite-assisted EOR in optimizing oil recovery efficiency. The dominant recovery mechanism for light oil was IFT reduction, primarily induced by CTAB. However, integrating polymer-based nanocomposites such as NCSAP further enhanced recovery by introducing mobility control. In heavy oil scenarios, mobility control was found to be more influential than IFT reduction. These insights contribute to a deeper understanding of advanced EOR techniques and provide a foundation for future field-scale applications.

Biography

Nahid Sarlak, Ph.D.

Associate professor

Department of Chemistry, Lorestan University, Khorram Abad, IRAN

Nanotechnology center of Research Institute of Petroleum Industry

EDUCATION:

- PhD (2006) Bu-Ali Sina University, Hamedan, Iran Department: Chemistry
- M.A. Sc. (1995) Tarbiat Modares University, Tehran, Iran Department: Chemistry
- B.A.Sc. (1985) Lorestan University, Khoram Abad, Iran
- My Bachelor's degree obtained at two part. At first, I was accepted at Department of Electrical Engineering (1979), Isfahan University of Technology, Iran and then transferred to the Department of Chemistry, Lorestan University, Khorram Abad, Iran (1983 – 1985).

Working and Educational Experience:

1. I have been working as a faculty member in teaching and research in the Department of Chemistry of Lorestan University since 1990.
2. Visiting scholar (2012-2013) at EFRC group at University of North Carolina (UNC) at Chapel Hill in USA
3. I am working as a Project Manager in the department of nanotechnology of Research Institute of Petroleum Industry since 2016.

Hyaluronans' Molecular Mass Influence on their Thermo-Oxidative and Thermal Destruction Processes

Li E.G., Lagutina E.A. and **Zhavoronok E.S.**

RTU MIREA, M.V. Lomonosov Institute of Fine Chemical Technologies, Russia

Using thermal analysis methods, thermogravimetry (TG) and differential scanning calorimetry (DSC), systematic studies of thermal and thermo-oxidative destruction of hyaluronans in a wide range of molecular masses (from 11.2 to 1800 kDa) were carried out. TG and DSC thermograms demonstrated the only effect attributed to hyaluronan macromolecules destruction in the temperature range >200°C. It was noted that thermal destruction predominates under inert gas conditions (viz., in nitrogen), while thermal-oxidative processes were detected under air conditions. With increasing MM, an increase in thermal stability was observed presumably due to more complex conformations of macromolecules. Thermal destruction of hyaluronans, estimated by DSC thermograms, occurs in two stages. The first stage is generally associated with the destruction of side substituents of macromolecules, and the second one with the destruction of the main polymer chain of hyaluronan. The quantitative characterization of the specimen at the second stage allowed a method for rapid assessment of the hyaluronan molecular weight to be suggested based on DSC data viz., the shape and area of exothermic peaks.

This work was performed using the equipment of the Shared Use Center of RTU MIREA, which is supported by the Ministry of Science and Higher Education of the Russian Federation under Agreement dated September 1, 2021, No. 075–15–2021–689.

Biography

Li Ekaterina is currently a PhD student at MIREA – Russian Technological University, Department of Biotechnology and Industrial Pharmacy. She is a senior researcher in one of the largest pharmaceutical companies in Russia JSC "GENERIUM", Department of Pharmaceutical Development. She has published 5 papers in high-ranking journals. The papers "Effect of the Molecular Mass of Hyaluronan on Its Thermophysical Properties and on Dynamic Viscosity of Its Aqueous Solutions" and “Features of The Thermal Degradation of Sodium Hyaluronates with Different Molecular Weights” have been published as peer-reviewed evaluation of the research results for the dissertation dubbed "Cross-linked Hyaluronans for Use in Cosmetology".

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Academic Optimism, Capital Indicators as Predictors of Cognitive, Affective, and Psychomotor Learning Outcome Among Students in Secondary School, Hierarchical Regression Approach (HRA)

Anakwue Anthonia Laetitia[2] and **Usani Joseph Ofem**[1]

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[2]Institute of Education, University of Calabar, Calabar-Nigeria

Background: Studies that were carried out previously on learning outcomes focused mainly on the student's cognitive domain while identifying factors that predicted it. More so, most of the learner's assessments in school are largely dependent on the score obtained from specific subjects by the learner, and efforts to address other domains of instruction such as affective and psychomotor domains have been minimal or absent in regard to the variables selected for the study. This study therefore sought to address that gap by finding out the relative and composite contribution of academic optimism and capital indicators to the learning outcomes (of students. Methods: The study adopted a correlational design with a multistage sampling technique to select a total of 534 senior secondary class II students. Two research instruments, the Academic Optimism and Capital Indicators Scale (AOCIS) and the Learning Outcomes Scale (LOS), were used for data collection. Exploratory and confirmatory factors analysis were used to assess the dimensionality of the items and factor structure of the scales. The psychometric properties obtained for scale were adequate for the instrument to be adjudged valid and reliable. The collected data were analyzed using the hierarchical regression approach (HRA).

Table 1 Exploratory factor analysis of academic optimism and capital indicators.

Factors	Items	Means	SD	EFA	CFA
Academic emphasis	AE2-The school targets are clearly worked for by staff of the school.	2.362	0.623	0.613	0.689
	AE3-In my school, teachers are monitored to keep to their time schedule	2.164	0.385	0.443	0.488

	AE4-In my school, every staff is ensuring that students are committed to the studies.	2.19	0.393	0.401	0.441
	AE5-In my school, the focus is on achieving academic excellence	2.254	0.476	0.644	0.513
Collective efficacy	CEE5-Teachers do not give up on the believe that students will do well.	3.028	0.571	0.621	0.675
	CEE6-In my school, the teachers are confident that the students will perform very well.	3.13	0.443	0.711	0.781
	CEE7-In my school, there is this generally believe that instructions from all angles is possible for the teachers.	3.065	0.555	0.701	0.762
	CEE8-Teachers believe that inadequacies found in the learners will be addressed.	2.904	0.695	0.762	0.754
Faculty trust	FCT1- Students are often relied on to perform very well.	2.551	0.695	0.632	0.656
	FCT2-Parents can be trusted to meet their children's school responsibilities.	2.529	0.699	0.813	0.861
	FCT3-Teachers can often count on the parents for support in the school	2.463	0.715	0.807	0.858
	FCT4- Parents are sure that schools are doing the right thing for their children.	2.506	0.761	0.81	0.821
Social capital	SC1- Sometimes, I go and look after my friends.	2.439	0.672	0.712	0.758
	SC2– I do not like to lose a friend.	2.383	0.645	0.763	0.831
	SC3– I keep my relationships very well.	2.345	0.619	0.6	0.605
Family Economic capital	EC2-I have never been driven home for non-payment of school fee. EC3- I have all the school materials that I am supposed to get.	2.32	0.486	0.465	0.47
		2.329	0.485	0.655	0.698
	EC4-Sometimes I go to school hungry.	2.358	0.487	0.83	0.834
	EC5-My parents sometimes do not even provide food for me to eat before going to school	2.342	0.482	0.649	0.67
Cultural capital	CC1–I do not behave the way I like in my place.	2.444	0.567	0.689	0.7
	CC2-Sometimes, our values make me control myself in the public.	2.48	0.602	0.644	0.658
	CC3– I keep to the values I have been taught by my parents'.	2.431	0.556	0.72	0.736
	CC4–I hold strong to my community rules and regulations wherever I go.	2.377	0.536	0.7	0.703

Instrument attributes	Kaiser-Meyer-Olkin (KMO) = 0.880 Bartlett's Test of Sphericity at df = 253, (7654.76, p < .05 Corr. Det. Matrix = 0.000 Reliability coefficients Academic emphasis (α = 0.781) Collective emphasis (α = 0.842) Faculty trust (α = 0.817) Social capital (α = 0.820) Economic capital (α = 0.899) Cultural capital (α = 0.852)				

Discussion of result

The findings of the study have significant implications for decision-making, suggesting that by recognizing various influential factors such as 'academic emphasis, collective efficacy, faculty trust, social capital, economic capital, and cultural capital', targeted interventions can be implemented to enhance student success across cognitive, affective, and psychomotor learning domains. For instance, educators might focus on creating a supportive social environment that fosters trust in the educational system, promotes inclusivity, and eliminates barriers that restrict access to resources and opportunities.

Theoretically, the study sheds light on complex factors that interact within educational systems and can be utilized to develop and articulate theories regarding student performance. By incorporating frameworks like social and capital theory, a deeper understanding of the elements that contribute to student success can be explored. Furthermore, the study serves to validate and refine existing theoretical models, thereby improving their applicability in educational research and practice.

Implications and recommendations

The implication of the findings is that the management of the school has a role to play in ensuring that the school environment and activities are programmed towards improving learning outcomes of the learners. The students should be made to engage in serious academics, and staff and other members of the school community should be confident in what they inculcate in the learners to maximize their academic output. The findings stand as an input to policy makers who have not seen the need to view the school output from the three areas of the learner's development to ensure that programmes and policies that are developed focus on improving not just the cognitive ability of the learner but the affective and psychomotor areas as well. Lastly, curriculum planners should place the learner's learning outcome in a pivot and ensure that all objectives, philosophy, and inputs are built towards the learner's development in these three areas of instruction. From the findings, it was recommend that schools should maintain workable social relationships that foster collaborations in order to develop manipulative skills relevant in the world of technology. The school community should ensure that activities that will maximize students' potential

are emphasized to help improve their earning outcomes. The school should ensure that activities that are carried out win the trust of parents and other members of the school community to gain their support.

Biography

Dr. Anakwue A. Laetitia is a Lecturer in the Institute of Education, University of Calabar. She holds a Ph.D degree in Educational Psychology from University of Calabar, M.Ed degree (Counseling Psychology) University of Ibadan, B.Ed degree (Special Education and Language Arts) University of Ibadan, HND (Social Pedagogy) Specialized academy for social pedagogy, Passau, Germany. She equally holds a professional certificate in conflict resolution management and peace advocacy in the Institute of Universal Harmony in collaboration with University of Calabar. She is a volunteer member of Human Dignity Concern and Advocacy, in University of Calabar, Cross River State.

Her major research interests are in Human development/learning, Guidance and counseling, Special Education, Women studies, Child and Adolescent development. She has published journal articles and book chapters to her credit. She has attended some workshops and conferences in the specialized areas of Psychology, Childhood Education, Special Education, Research, Guidance and counseling, all of which have helped to enrich her academic perspectives and focus. Apart from being a lecturer in the University of Calabar, she has equally taught at Nursery, Primary and Secondary Schools in Germany and also in Nigeria; Oyo State, Delta State, Imo State and Cross River State. She also has administrative experiences, first as a Headmistress in Nursery/Primary Schools and Principal of Secondary school in Cross River State.

A Novel Twisting Metamaterial Based on Cells Composed of Two Triangular Lattices

Abderrahim Barhoumi[1], Mohamed Atify[2] and **Abdelhai Rahmani[1]**

[1]Advanced Materials and Applications Laboratory (LEM2A) Moulay Ismaıl University, Morocco
[2]Department of new technologies (DTN), Polydisciplinary Faculty, Sultan Moulay Slimane University, Morocco

The study of mechanical metamaterials has recently expanded with the introduction of compression-torsion metamaterials, which convert axial loads into torsional motion. Chirality in elastic mechanical metamaterials has revealed the existence of this additional rotational degree of freedom as part of a global compression-induced torsional behavior. In this presentation, we propose a new three-dimensional (3D) chiral-torsion metamaterial whose cells are composed of two triangular lattices. Using the finite element method within the framework of linear elasticity theory, we investigate the factors influencing the torsion angle and effective Young's modulus of the unit cell. Our numerical results demonstrate that the unit cell can achieve a maximum torsion angle of 23.45 degrees at 1% compressive strain, underscoring the potential of the metamaterial for high-performance applications in elastic mode conversion, microelectronics, actuators, sensors and energy harvesting.

Biography

Abderrahim BARHOUMI is an associate professor and doctoral researcher at the Advanced Materials and Applications Laboratory (LEM2A) at Moulay Ismail University (Morocco). His doctoral research focuses on mechanical metamaterials. More specifically, he is studying the compression-torsion coupling of chiral mechanical metamaterials. Dr. Barhoumi is an associate professor of mechanical engineering and holds a specialized master's degree in mechanical engineering (ENSAM, Mohamed 5 University, Rabat, Morocco). He has been teaching industrial science in preparatory classes for engineering schools (CPGE) since 2003.

A Way of Designing TIA for Quantum Sensing

Michel Teuma Mbezi, Eke Samuel, Idelette Hermine Som and **Ruben Martin Mouangue**

National Higher Polytechnic School of Douala, Cameroon

An avalanche photodiode (APD) is a highly sensitive type of photodiode, which can be used to detect incoming photons and also entangled photons. At its output, we generally have a transimpedance amplifier (TIA) which aim to convert the electrical current produce by APD to a voltage for a better signal processing. It becomes evident that the behave of the TIA is crucial for quantum signal processing. The aim of this work is to design a new TIA to improve Quantum sensing devices. To achieve our purpose, a negative electrical resistance was introduced into conventional TIA. SPICE software and Kirchhoff's laws were used to design and analyze the circuit. The obtained results show that the new TIA has a better amplitude gain response and lower equivalent noise than conventional TIAs. High bandwidth and flat amplitude response in the pass band characterize our TIA. That characteristic is one of the two criteria for a photodetector to be considered as a quantum device.

The designed Q-TIA is represented by figure 1 where the positive feedback electrical resistance is replaced by the negative feedback electrical resistance. Figure 2 shows gain behavior of Q-TIA and C- TIA. C-TIA exhibits gain peaking while Q-TIA does not.

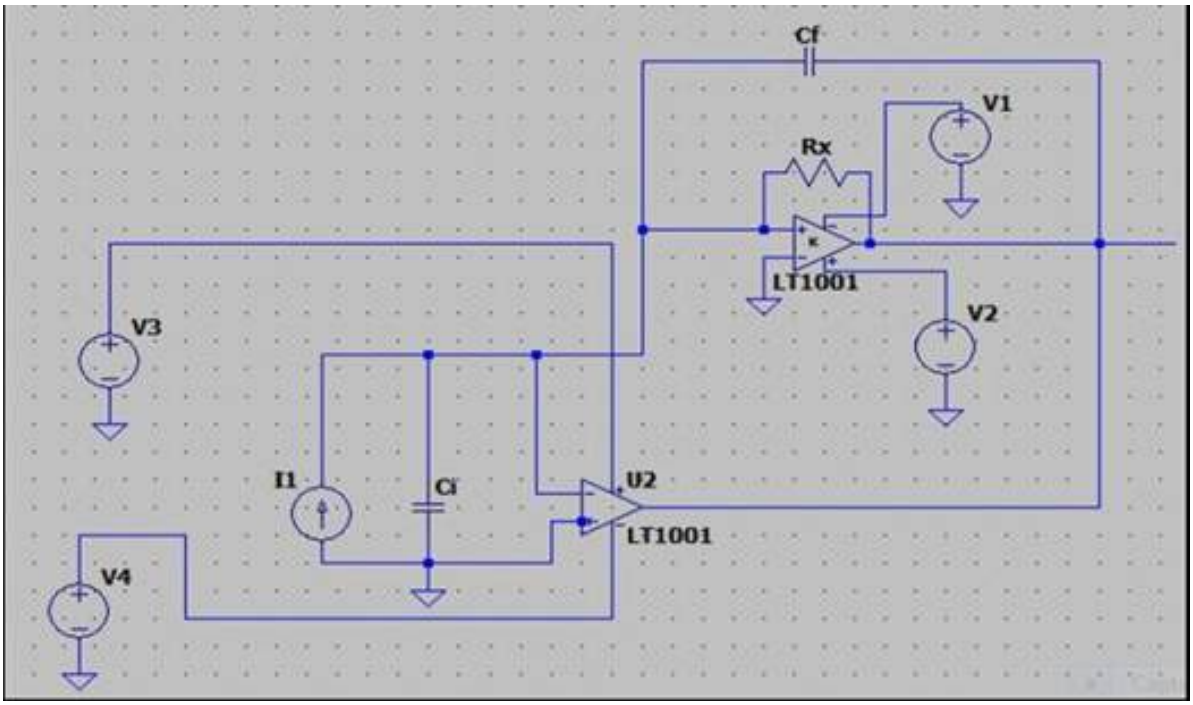

Figure 1. Quantum transimpedance amplifier (Q-TIA). The positive feedback electrical resistance is replaced by the negative feedback electrical resistance

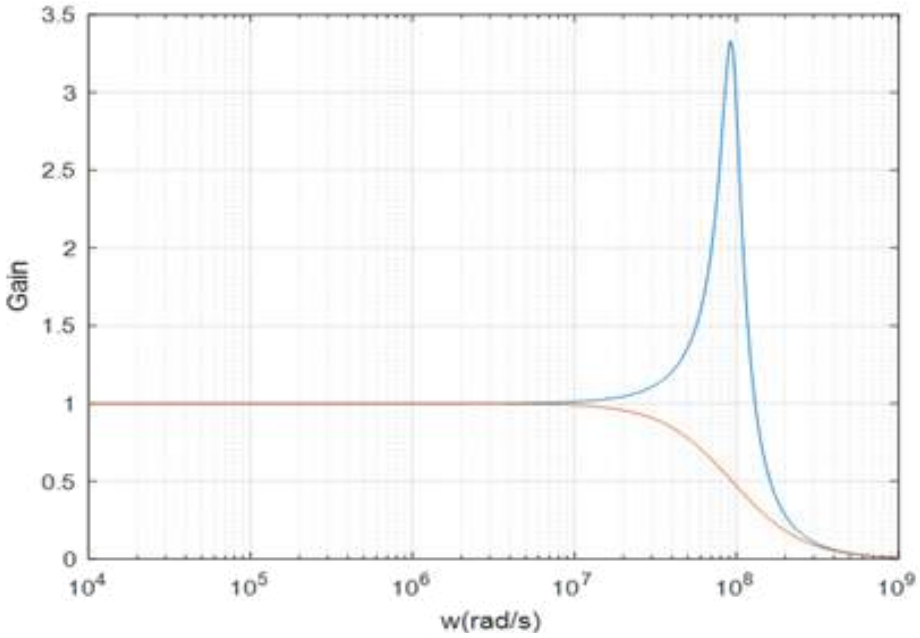

FIGURE 2. Comparison between the C-TIA and Q-TIA gain for Rf = 5kΩ; Rn = - 5kΩ. Blue line is for C-TIA and red line for Q-TIA. For having used positive and negative electrical resistance, C-TIA exhibits high gain peaking while Q-TIA does not.

The aim of this work was to design a Q-TIA which could be incorporated into quantum photo-detectors. Q-TIA is much better than C-TIA and I-TIA because of its characteristics and low cost.

Biography

TEUMA MBEZI Michel was graduated with: a PhD in Telecommunications and Information Systems from the National Higher Polytechnic School of Douala, a PhD in Biophysics from the University of Yaoundé I, a Master Engineering in Telecommunications from the National Advanced School of Posts, Telecommunications and I.C.T.; and a Secondary School Teacher Diploma from Higher Teachers Training College of Yaoundé 1. He is currently teaching Physics courses at the Ngoa-Ekele High School, and Telecommunications courses at the Higher Institute of Technology and Commerce (ISTC). His research interests include Classical and Quantum Free Space Optical Communication (FSO); Quantum communication and devices, Quantitative Photo-acoustic; Electrical Bio impedance; Acoustic Energy Harvesting and Generative AI.

Energy Transition in the Maritime Industry: Towards a More Resilient Organization

Samah Chemli Horchani

Tunis El-Manar University, Faculty of Economics and Management Sciences of Tunis FSEGT, Laboratory of Innovation Strategy Entrepreneurship Finance and Economics LISEFE, Campus Universitaire Farhat Hached, Tunisia

The maritime industry is a significant contributor to global greenhouse gas emissions. Consequently, the sector is under increasing pressure to reduce its carbon footprint and contribute to global efforts to combat climate change. One of the key strategies to achieve this is to shift to cleaner and more sustainable energy sources, the so-called energy transition. This work examines how the energy transition enhances organizational resilience, requiring anticipation, preparation, absorption, response, and adaptation to unexpected disruptions, shocks, and challenges. The work provides the general framework for a study highlighting the importance of renewable energy to reduce greenhouse gas emissions and improve operational efficiency. A bibliometric analysis examines the volume, scope, and impact of scientific publications on energy transition and organizational resilience. The results highlight the growing importance of the studied concepts in the contemporary landscape. This study provides a framework to help organizations prepare for the future and develop a culture that fosters sustainable resilience.

Biography

Dr. Samah Chemli Horchani has a PhD in Management Sciences and is associate professor at the Faculty of Economics and Management Sciences of Tunis FSEGT, University of Tunis El Manar, Tunisia. She is an academic researcher and a member of the Innovation Strategy Entrepreneurship Finance and Economy laboratory (LISEFE), Management Department, Faculty of Economics and Management of Tunis (Tunis El-Manar University), Tunisia. She has contributed to research in topics related to sustainable entrepreneurship and innovation management, such as entrepreneurial orientation, leadership, ambidextrous innovation, open innovation, intellectual capital, agility, and resilience. She is a professional academic trainer in entrepreneurship innovation and agile management.

Integrating TPACK and TAM Frameworks for Effective Technology use in Teaching Mathematics: A Study of Rwandan Primary Schools

Innocente Uwineza and **Alphonse worwabayeho**

University of Rwanda College of Education, Rwanda

This paper explores the integration of the Technological Pedagogical Content Knowledge (TPACK) and Technology Acceptance Model (TAM) frameworks to understand and enhance mathematics teaching using Interactive Mathematics Software in Rwandan primary schools. We investigate teachers' perceptions of the software, its impact on learning outcomes, and how the combined framework supports technology integration. TPACK focuses on the use of technology in instruction, but does not address teachers' initial willingness to adopt new technologies. Conversely, TAM focuses on adoption but not necessarily on how effectively the technology is applied once it is accepted. This study therefore contributes to the existing literature in bridging the gap by examining both adoption (via TAM) and effective use (via TPACK), providing a fuller understanding of the entire process of technology integration—from teachers' acceptance of the software to their capacity to incorporate it meaningfully into their instructional strategies. By aligning the technological competence of educators with their attitudes toward the software's usability and perceived effectiveness, the study demonstrates that combining TPACK and TAM frameworks enhances both teaching strategies and technology acceptance.

Biography

Dr. Innocente Uwineza is a lecturer of Education (Mathematics Education) at the University of Rwanda, College of Education (UR-CE), Rwanda. She is a Ph.D. holder in Education, specializing on the integration of technology in Mathematics Education from the UR-CE. She holds research experience in the mathematics education field and gender studies. She evaluated research, wrote several publications, and co-authored a book chapter. Dr. Innocente is a member of the Rwandan Association for Women in Science and Engineering (RAWISE), which promotes women's engagement in STEM activities and research.

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Influence of Geomaterial Nature on the Buildings Fracturation in The Context of an Active Tectonic Zone: Case of Agadez City (North Niger)

Baraou Idi Souley[1], Dia Hantchi Karimou[2] and **Abdoulwahid Sani[1]**

[1]University of Agadez, Niger
[2]Dan Dicko Dankoulodo University of Maradi, Niger

The studied zone corresponds to the interface between Air basement and its Tim Mersoi basin formations which deposit in unconformity on the basement formations. Along this N-S major unconformity, Agadez city is built on the faulted and fractured sandstones substratum [1] and located on a tectonically active zone corresponding to a regional N-S Arlit In-Azaoua fault system (Figure 1). In addition to the substratum seismicity, the nature of geomaterials influences significantly on the building fracturation which constitute a geotechnical risks. In Agadez city, geomaterials used for buildings are the clay, coarse sand and gravels, all formed from granitic alteration. Thus, two types of buildings (clay buildings and concreted cement) can be observed and all affected by fracturation events. To determine how nature of geomaterials influences this fracturation, a methodological approach integrating i) the review literature, ii) field investigation consisting of priorly the identification of the most affected sectors and measurement of fracture planes and iii) their statistical analysis was carried out. These results reveal that in 220 measured fractures planes, 135 affected the buildings made from cement, and 85 affected the buildings made with clay materials (Table 1), respectively 61.36% against 38.64%. Indeed, the buildings made from cement and sandstone material are more easily fractured than buildings made with clay materials. This is due to the rheological difference between clay material which is plastic and ductile material and concreted sandstone which is brittle materials. These observations are similar to the results obtained in the Franklinian Basin [2] where, considering the rheology of the materials, the sandstone strata was qualified as a “brittle level” and the clay strata as a “ductile level”. Based on the obtained results, buildings in clay ma¬terials is higher recommended than in cement and concrete. Indeed, clay materials are plastic and less exposed to the fracturation.

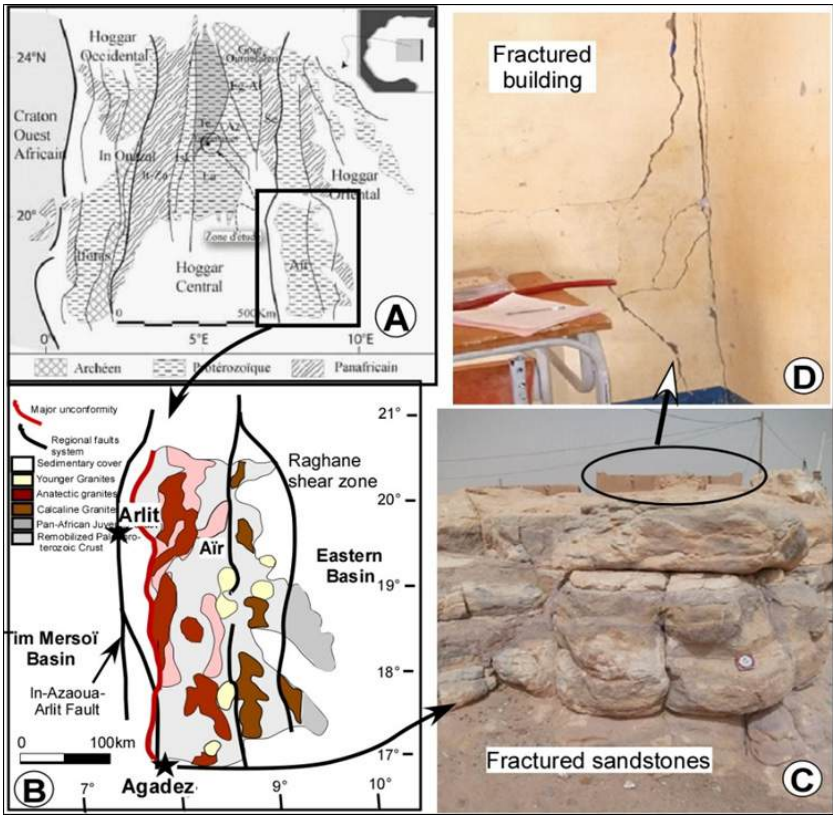

Figure 1: Location of Agadez city within the geological and structural maps showing the regional tectonic context of Air basement and it Tim Mersoi Basin. (A): Toureg Shield [3]; (B): Air Massif [4]; (C): Fractured sandstones of Agadez and (D): Fractured building.

Table 1: Statistic of measured fractures by nature of geomaterials

Nature of buildings	From cement and sansdstone	From Clay materials	Total
Number of measured fractures	135	85	220
Percentages (%)	61.36%	38.64%	100%

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[4]PRDSM, 2005. Geophysic interpretation map of Aïr Mountains. Ministry of Mines and Industrial devel¬opment, Niger. pp. 55.

Biography

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The Influence of the Nature and Strength of Montmorillonite's Acidic Sites on the Flame-Retarding Properties of Polymeric Composites

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To investigate the influence of the acidity of montmorillonites (Mt) on the flame- retarding properties of intumescent composites, a raw montmorillonite (Mt) was submitted to acidic activation during different periods of time, producing Mt samples with acidic sites of different strengths and natures (Brønsted and Lewis), which were then incorporated into intumescent polymeric composites. The raw and acidic-activated Mt samples were characterized by XRF, XRD, nitrogen adsorption analysis and particle size distribution. Their acidity was quantified by TPD-NH3 and FTIR with pyridine adsorption (FTIR-Pyr). The clays were added an intumescent system composed by ammonium polyphosphate (APP) and pentaerythritol (PER) as the intumescent formulation, in a polypropylene (PP) matrix. The neat polymeric samples and the composites were submitted to thermogravimetric analysis coupled to FTIR, limiting oxygen index (LOI) and UL-94 vertical test, in order to determine their thermal stability and flame-retardant properties. The burnt residues were submitted to FTIR spectroscopy, XRD and scanning electronic microscopy (SEM). The mechanical properties of the composites were determined by tensile tests.

The LOI results suggest a competition between the nature and the strength of the acidic sites, as a better performance was achieved for the systems with an excess of Brønsted sites relative to the Lewis ones, preferably for moderate-strength sites to the strong ones, as the latter seems to be detrimental to the flame-retarding properties. It is possible that the Brønsted sites takes part in the esterification reaction between APP and PER, contributing to a more efficient ester conversion and subsequent cyclization process to produce the polyaromatic structures that will give rise to the char. In addition, the absence of those

sites could be responsible for a lower efficiency in the esterification reactions, impairing the flame- retarding properties. The tensile tests shows that the addition of the clay minerals did not affect the mechanical properties of the intumescent composites.

Biography

Professor Emeritus of Physical Chemistry at the Chemistry Institute, Federal University of Rio de Janeiro (UFRJ); Member of the Brazilian National Academy of Sciences; Member of the International Core Academy of Sciences and Humanities; Commander of the National Order of the Scientific Merit, granted by the President of Brazil. Member of the editorial board of Progress in Theoretical Chemistry and Physis (Springer); Member of the Scientific Board of the World Association of Theoretical and Computational Chemists (WATOC); Member of the Scientific Committee of the National Institute for Science, Technology and Innovation in Functional Complex Materials (INOMAT/CNPq-Brazil). Director of the Research Program in Hydrocarbon Functionalization. Areas of Research: Atomic and Molecular Structure and Spectroscopy, Heterogeneous Catalysis, Flame Retardant Materials, Materials for CO2 Capture, Nanostructured Materials, Development of New Computational Methods, Nature of the Chemical Bond.

Exploring the Frontiers of Photonics: Characterization of Borotellurite Glass for Advanced Optical Applications

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Borotellurite glasses with composition $(0.4Li_2O{\cdot}0.4MgO)0.2TMO(1.4B_2O_3{\cdot}0.6TeO_2)$, where TMO = MoO_3, WO_3, or Bi_2O_3, were successfully synthesized using the melt quenching technique. X-ray diffraction (XRD) confirmed the amorphous nature of the prepared samples.

Fourier transform infrared (FTIR) spectroscopy revealed the presence of structural units, including BO_3/BO_4 and TeO_3/TeO_4 units. UV–vis spectroscopy was employed to investigate the optical properties, demonstrating modifications in the optical band gap, Urbach's energy, refractive index, and permittivity values due to the incorporation of different transition metal oxides.

The Tauc and DASF methods confirmed direct inter-band electronic transitions in the studied glasses. Notably, the LMBT: Bi glass exhibited high density, refractive index, and polarizability, making it a suitable candidate for activation with Dy3+ ions.

These results highlight the potential of borotellurite glasses for photonic applications, particularly in the development of novel optical materials. The systematic investigation of the structural and optical properties provides valuable insights into the effects of transition metal oxides on the glassy matrix.

The incorporation of MoO_3, WO_3, or Bi_2O_3 resulted in distinct changes in the optical properties, indicating the influence of ionic radius on the glassy matrix. Overall, this study

demonstrates the promise of borotellurite glasses for advanced photonic applications.

Biography

Dr. Evangelina Cinthia Cardillo is a researcher and educator specializing in the development of ionic conductors and glassy materials for technological applications. She holds a PhD in Chemistry from the Universidad Nacional del Sur (UNS), Argentina, and is an Assistant Researcher at the Comisión de Investigaciones Científicas (CIC) of Buenos Aires, a position she has held since 2016.

Dr. Cardillo's research focuses on the synthesis and characterization of advanced glassy materials, particularly vanadium-tellurite, molybdenum-based glasses and borotellurite glasses, with applications in energy storage and conversion technologies. Her work has been published extensively in peer-reviewed journals, and she has contributed to several book chapters on solid electrolytes and ion-conducting materials.

In addition to her research, Dr. Cardillo has taught numerous courses in chemistry at UNS and has been recognized for her academic contributions with Category IV and V rankings in the "Incentive Program for Teachers." Her work continues to contribute to advancements in sustainable energy systems and materials science.

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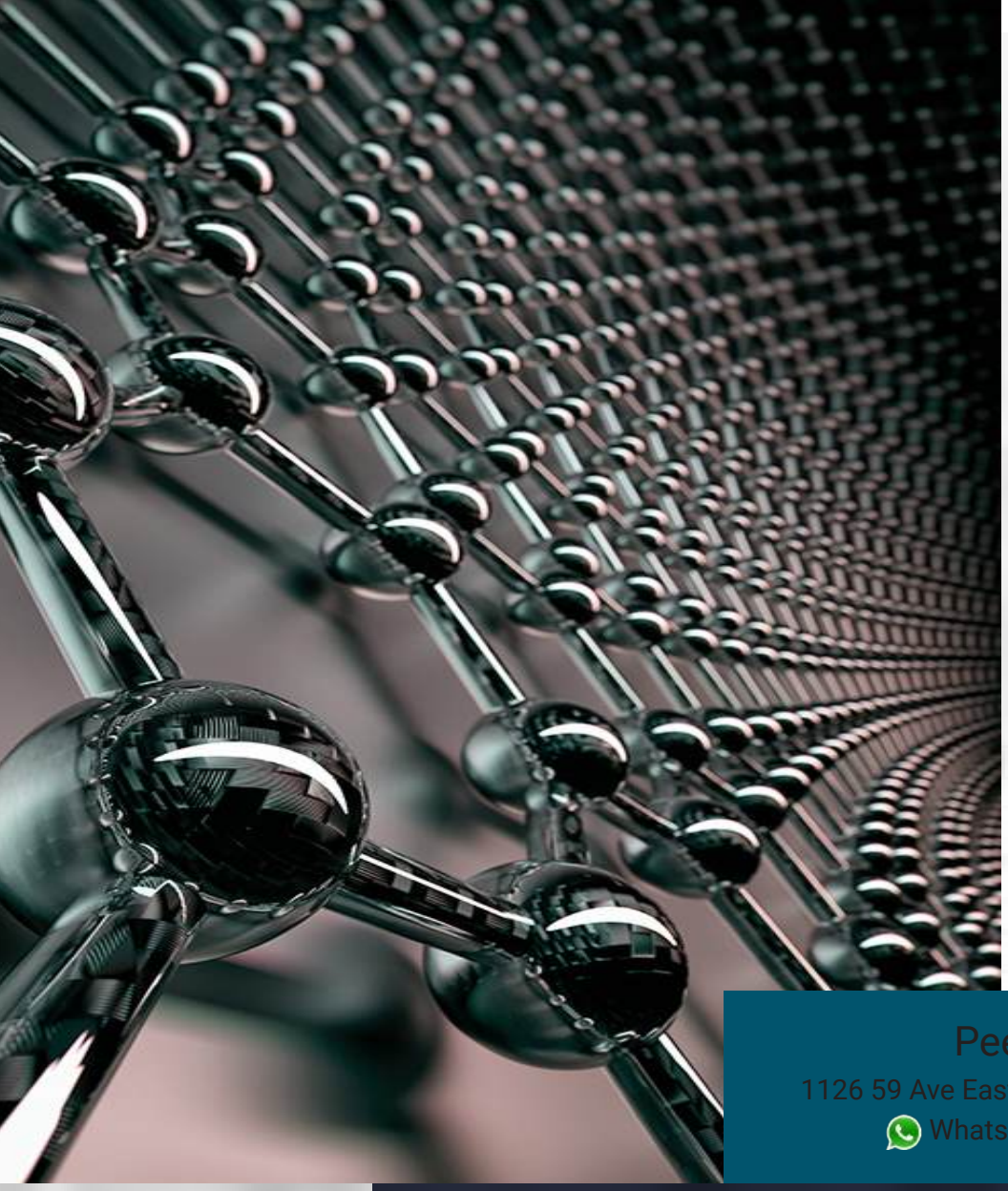

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