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VIRTUAL EVENT

ADVANCED NANOTECHNOLOGY AND NANOMATERIALS

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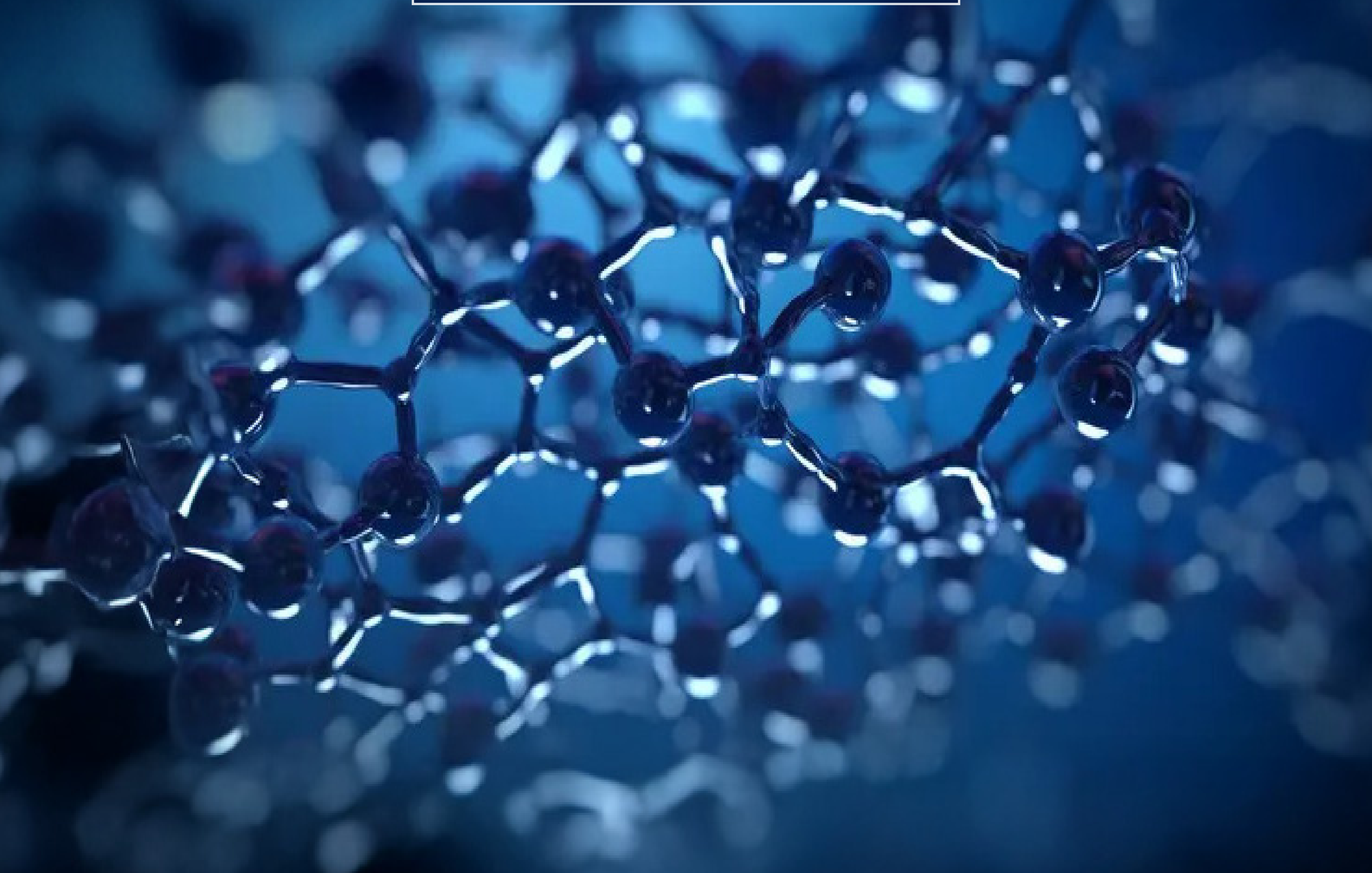
ADVANCES IN SMART MATERIALS, ENERGY MATERIALS AND STRUCTURES

OCTOBER 27-28, 2025



SCIENTIFIC PROGRAM

DAY 01

MONDAY

OCTOBER 27, 2025

GMT - Greenwich Mean Time

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

Sessions: Nanoscience and Technology | Nanomedicine | Nanomaterials | Materials Science and Engineering | Smart Materials | Composite Materials | 3D Printing | Robotics | Nanosensors | Nano Structures | Nanotechnology Applications | Smart Materials Applications | Wearable Healthcare Devices

Distinguished Speaker Talks

07:30-07:50	Title: Corten Steel: Conservation, Corrosion and Concerns **Christian Paglia,** *Institute of Materials and Construction, Switzerland*
07:50-08:10	Title: Mesoscopically Structured Minerals (Mesocrystals) in Geological Processes. A Review **Irina Kircheva Marinova,** *Institute of Mineralogy and Crystallography, Bulgarian Academy of Sciences, Bulgaria*
08:10-08:30	Title: Sulfur-Doped ZnO as Cathode Interlayer for Efficient Inverted Organic Solar Cells **Georgios Manginas,** *General Secretariat for Information Systems and Digital Governance, Greece*
08:30-08:50	Title: Secondary Mandibular Reconstruction with Patient Specific 3D Printed Implant **Harsimran Singh,** *C.K.Birla Hospital, India*
08:50-09:10	Title: Quantum and Nanophotonic Approaches to Advancing Artificial Intelligence **Rohit K. Ramakrishnan,** *Indian Institute of Science, India*
09:10-09:30	Title: Membrane Filtration Technology – Nano Material-Based Waste Water Treatment and Purification **M H Fulekar,** *Parul University, India*
09:30-09:50	Title: Female Computer Teachers Training by the (TAWOCK) Model **Remsh Nasser Alqahtani,** *King Saud University, Saudi Arabia*

09:50-10:10	Title: Design and Application of Novel Nanocomposites for Water Remediation **Chilukoti Srilakshmi,** *GITAM Deemed to be University, India*
10:10-10:30	Title: Additional Increase in Built-in Voltage of Nanowire Solar Cells Based on Strongly Asymmetric *P-N* Heterojunctions **Vitalii L. Borblik,** *V. Lashkaryov Institute of Semiconductor Physics, Ukraine*
10:30-10:50	Title: Environment-Friendly High-Performance $CH_3NH_3SnBr_3$-Based Perovskite Solar Cells: A Numerical Study **Pankaj Arora,** *Birla Institute of Technology & Science, India*
10:50-11:10	Title: Green Synthesis, Characterization of Metallic Nanoparticles and their Multiple Biological Applications **Narasimha Golla,** *Sri Venkateswara University, India*
REFRESHMENT BREAK 11:10-11:30	
11:30-11:50	Title: Nano Implanted Sensor Grids Utilization in the Detection of Micro Cracks in Structural Elements **Aditya Singh,** *Amrita Vishwa Vidyapeetham, India*
11:50-12:10	Title: Green Solvent-Based Synthesis of Sm3+ -Doped Tio_2 Nanostructures for Solar Energy Conversion **Shelan M. Mustafa,** *Erbil Polytechnic University, Iraq*
12:10-12:30	Title: Sunlight-Mediated Degradation of Water Contaminants with a Novel Modified Bismuth Molybdate Perovskite Photocatalyst **Amruth H D Gowda,** *GITAM Deemed to be University, India*
12:30-12:50	Title: Adsorptive Microplastic Removal using Pinus Roxburgii Derived Biochar– a Waste Residue of Himalayan Forests **Misbah Bashir,** *Islamic University of Science & Technology, India*
12:50-13:10	Title: Detection of Pathogen in Water **Faiza Jan Iftikhar,** *National University of Technology (NUTECH), Pakistan*
LUNCH BREAK 13:10-13:40	
13:40-14:00	Title: Modelling of PV Systems Employing MATLAB/SIMULINK **Mourad Talbi,** *Center of Researches and Technologies of Energy of Borj Cedria, Tunisia*

14:00-14:20	Title: The Role of Nanoparticle in Diagnosis and Treatment of Systemic Lupus Erythematosus **Somayeh Marouzi,** *Mashhad University of Medical Sciences, Iran*
14:20-14:40	Title: Enhanced Fluoride Adsorption by Strontium- Modified Dicalcium Phosphate Dihydrate **Tejaswini Mendke,** *GITAM Deemed to be University, India*
14:40-15:00	Title: The Sustainability of Beach-Cast Seaweed Biomass for Biorefinery Processes: Calorific Power Heating Studies with Macroalgae **Fernando Pinto Coelho,** *Institute of Biological and Health Sciences of the Federal University of Alagoas, Brazil*
15:00-15:20	Title: Youth Cultural and Creative Practices in Light of Emerging Artificial Intelligence Usage During COVID-19 **Joanna Black,** *University of Manitoba, Canada*
15:20-15:40	Title: Energy Optimal Speed Profiles for a Differential Drive Mobile Robot with Payload **Mauricio Fernando Jaramillo Morales,** *Universidad Autónoma de Manizales, Colombia*
15:40-16:00	Title: Influence of Load Misalignment on T-Bolts Failure in Wind Turbine Blades **Guillermo Muñoz Hernandez,** *Centro de Tecnología Avanzada, CIATEQ A.C., México*
16:00-16:20	Title: An Exploration of the Discontinuous-Continuous Fusion in Yuunohui'tlapoa for Keyboard **Julio Estrada,** *National Autonomous University of Mexico, UNAM, Mexico*
16:20-16:40	Title: Genostep: Transforming Urban Infrastructure into a Renewable Energy System **Jacob Cox,** *Green Graphene LLC, USA*
16:40-17:00	Title: Navigating Artificial Intelligence in Modern Workplaces **Anne Rosken,** *ANED – HSG – PCU, Germany*

END OF DAY 1

SCIENTIFIC PROGRAM DAY 02

TUESDAY

OCTOBER 28, 2025

GMT - Greenwich Mean Time

08:20-08:30	**Opening Ceremony**	

Sessions: Nanoscience and Technology | Nanomedicine | Nanomaterials | Materials Science and Engineering | Smart Materials | Composite Materials | 3D Printing | Robotics | Nanosensors | Nano Structures | Nanotechnology Applications | Smart Materials Applications | Wearable Healthcare Devices

Distinguished Speaker Talks

08:30-08:50	Title: Top-Down Reverse Engineering of Gold Nanoparticles in a Silica Aerogel Matrix **István Lázár,** *University of Debrecen, Hungary*
08:50-09:10	Title: Luminescent Solar Concentrators Based on Polymer Optical Fibers Doped with Fluorescent Entities **Nekane Guarrotxena,** *Spanish National Research Council (CSIC), Spain*
09:10-09:30	Title: Smart Photoalignment Material: Azodye Nanolayers for Liquid Crystal Devices **Vladimir G. Chigrinov,** *Hong Kong University of Science and Technology, Hong Kong*
09:30-09:50	Title: Mapping the Link Between Environmental Sustainability and Electric Four – Wheelers: A Bibliometric Study **V. Shunmathy,** *Vellore Institute of Technology (VIT), India*
09:50-10:10	Title: Memory Phenomena and Diffusionless Characteristics of Crystallographic Transformations in Shape Memory Alloys **Osman Adiguzel,** *Firat University, Turkey*
10:10-10:30	Title: Atmospheric River Detection- A Survey on Deep Learning and Quantum Neural Networks **Sivachitralakshmi. S,** *SRM Institute of Science and Technology, India*
10:30-10:50	Title: Reducing Bacterial Adhesion on 304 Stainless Steel Surface by Nd-YAG Laser Irradiation **Sahar Sohrabi,** *Iran University of Science and Technology, Iran*

REFRESHMENT BREAK 10:50-11:10	
11:10-11:30	Title: Energy-Efficient Approximate Arithmetic Circuit Design for Power Hungry Applications **Joshi Viraj Vilas Alias,** *Sinhgad Institute of Technology, Pune University, India*
11:30-11:50	Title: Existence of Solutions for a Class of Dirichlet Problems Involving Fractional (p,q)-Laplacian Operators **Hasna Moujani,** *Sultan Moulay Slimane University, Morocco*
11:50-12:10	Title: Incorporating Graphene-Based Nanocomposites Along with Self-Healing Polymers for Civil Infrastructure as Smart Structural Applications **Aditya Singh,** *Amrita Vishwa Vidyapeetham, India*
12:10-12:30	Title: Modeling and Forecasting of Solar Power Plant Energy Production *via* Machine Learning: A Comparative Approach **Lakhdari Lahcen,** *Tahri Mohammed Bechar University, Algeria*
12:30-12:50	Title: Utilizing Non-Convex Optimization for SC-OPF Under N-1 Contingency in a IEEE 9-Bus System **Chaitanya,** *Indian Institute of Management, India*
12:50-13:10	Title: Antimicrobial Activity of Fe_3O_4 and Au@Fe_3O_4 Nanoparticles Against *Salmonella Typhimurium*: *In vitro* Efficacy and in Silico Validation Through Protein–Aptamer Interactions **Chandrajeet Dhara,** *Jaypee Institute of Information Technology, India*
LUNCH BREAK 13:10-13:40	
13:40-14:00	Title: Achieving Cost Efficiency in Cloud Data Centers through Model-Free Q-Learning **Razieh Darshi,** *Iran University of Science and Technology, Iran*
14:00-14:20	Title: Sustainable Agriculture Systems Transformed: The Role of Drones in Enhancing Precision Safety and Efficiency **Syeda Faiza Nasim,** *UIT University, Pakistan*
14:20-14:40	Title: Enhancing Charging Station Power Profiles: A Deep Learning Approach to Predicting Electric Vehicle Charging Demand **Youssef Oukhouya Ali,** *University Sidi Mohamed Ben Abdellah, Morocco*

14:40-15:00	Title: Community Engagement in Slum Upgrading and Maintenance: A Case Study of the Kambi Moto Project in Huruma, Kenya **Susan Kibue,** *Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya*
15:00-15:20	Title: Comparative Evaluation of Pretreatment Methods for Valorising Hemp Hurds as a Lignocellulose Biomass for Bio-Based Products **Ziningi Myeni,** *Durban University of Technology, South Africa*
15:20-15:40	Title: A Novel High-Performance Two-Input NOR Logic Gate Based on OPE Molecular Transistor **Masoumeh Tirgar Fakheri,** *Khatam University, Iran*

END OF DAY 2

NANO INTELLECTS 2025

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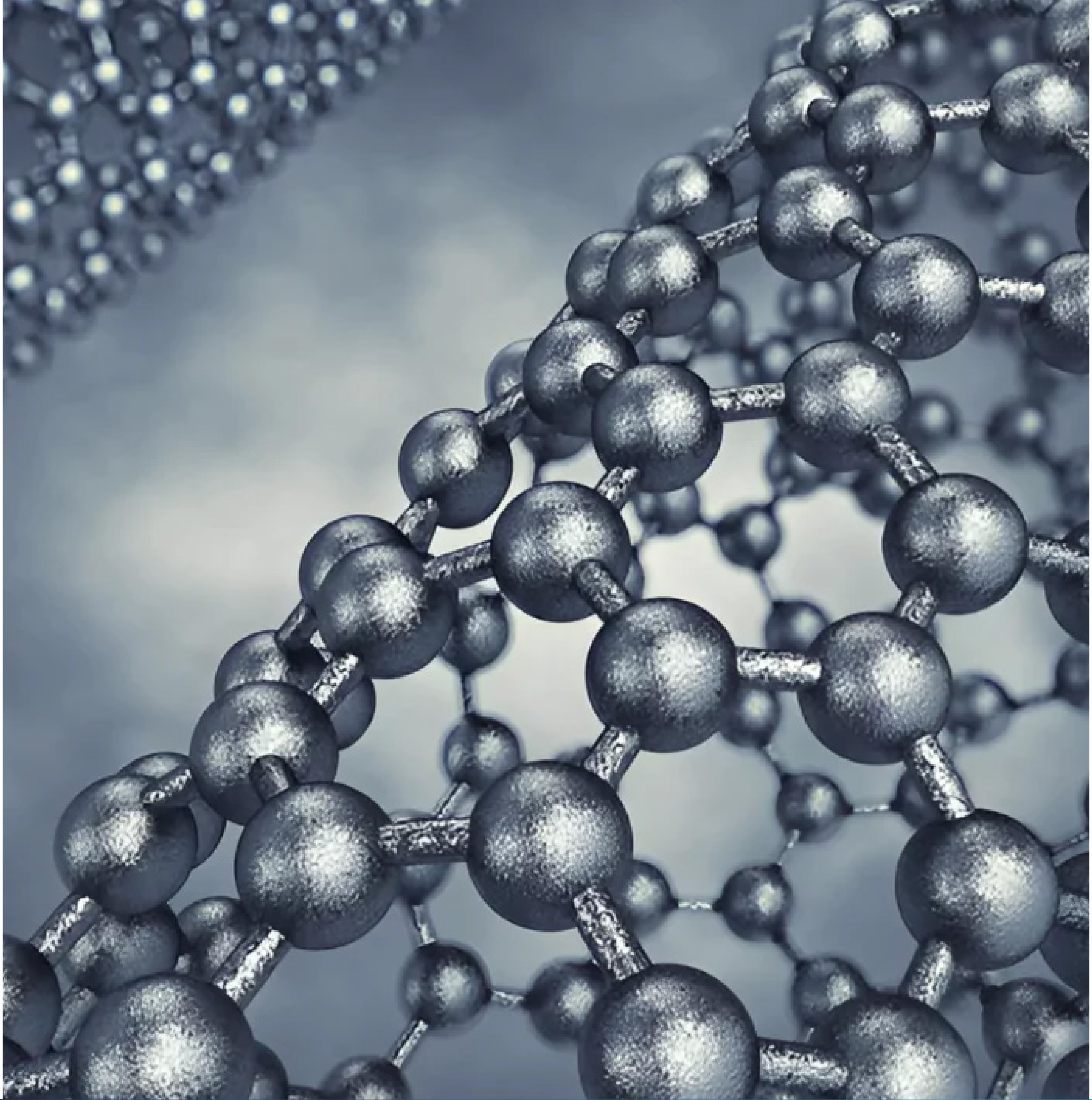

DAY 01

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ADVANCES IN SMART MATERIALS, ENERGY MATERIALS AND STRUCTURES

OCTOBER 27-28, 2025

SPEAKER TALKS

Corten Steel: Conservation, Corrosion and Concerns

Christian Paglia

Institute of Materials and Construction, Switzerland

Weathering steels are used in buildings, infrastructure and decorative-design elements in the construction field. Generally, they exhibit an increased corrosion resistance in the atmosphere, due to the interaction of humidity and oxygen of the atmosphere with the steel. They form a more stable oxide protective layer on the steel surface as compared to conventional low Carbon steels, and the relatively small addition of chemical elements, such as Cu, Cr, Mo and others promotes the long-term stability of the metallic material. Nonetheless, the type of structure and construction details, the chloride-rich solutions, the long wetting time of the surface, which is enhanced by the enrichment of dirt and fine particles and debris in some parts of the Corten elements, may largely reduce the durability. The galvanic coupling, the presence of vegetation, the maintenance, the application of coatings along some building elements, an adequate water drainage and humidity reduction, all affect the stability of the oxide layer of the Corten steel. Cleaning operations, gaps between neighbouring elements, dishomogeneity of the steel chemical composition and inclusions, water leakage, leaching phenomena, water streams, different atmospheric exposure conditions, distance from the river waters or highway in the case of crossing bridges, and a relevant salt spreading during the winter time, are among the critical factors to be considered for Corten steels.

Biography

Christian Paglia Ph. D in Material Science at the Swiss Federal Institute of Technology, in collaboration with Sika AG in Zurich. Post-doctoral Researcher in the Corrosion of Aerospace Aluminum Alloys Friction Stir Welds at the Material Science Department, Ohio State University, Columbus, USA, in collaboration with the Wright Patterson Air Force Research Laboratories. Responsible of a branch office of the Helbling Consulting Engineering Group, Zurich. Head of the Institute of Materials and Constructions at the University of Applied Sciences of Southern Switzerland. Publications on concrete, metals, corrosion and recycling of building materials. Editorial board member of materials and corrosion scientific journals. Member of the CENTC 51 WG 14 Hydraulic binders for road bases. Member of the Swiss standard committee SIA 215 on mineral binders. Rilem technical committee member for the coatings on concrete, carbonation of concrete with SCM, chloride bonding in concrete, concrete fire spalling and performance-based asphalt recycling.

Mesoscopically Structured Minerals (Mesocrystals) in Geological Processes. A Review

Irina Marinova and **Lillia Tsvetanova**

Institute of Mineralogy and Crystallography, Bulgarian Academy of Sciences, Bulgaria

Mesoscopically structured crystalline material (mesocrystal in brief) formation, categorized as non-classical crystallization, has been a focal point of extensive research over the past three decades. The “mesocrystal” term was originally introduced to designate superstructures of nanocrystals with a common crystallographic orientation. Subsequent studies have documented cases where nanoparticles exhibit a degree of orientational mismatch. Unlike the traditional crystallization mechanism, which involves atom- or molecule-mediated growth of a single crystal, mesocrystal formation is explained by particle-mediated growth and assembly processes. Despite these contrasting pathways, both mechanisms are likely governed by similar underlying physical principles.

Mesocrystals hold significant potential for applications in catalysis, sensing, energy storage, and energy conversion, making them a subject of considerable interest among scientists.

Most research on mesocrystals has been carried out in laboratory settings, where these structures are synthesized, resulting in a substantial body of literature. In contrast, the exploration of natural samples is relatively limited, with a focus mainly on biomineralization, diagenetic or supergene processes, or environmental contexts. Studies specifically addressing mesocrystal formation in geological processes such as magmatic and metamorphic processes, hydrothermal mineralizations, sedimentary, diagenetic, and hot-spring processes are even scarcer in comparison. However, research revealing the presence of mesocrystals in geological formations is constantly growing. These circumstances highlight the need for further exploration of mesocrystal formation across diverse geological settings, systems, and processes, as well as for improving the familiarity of researchers working with natural systems and processes.

This report presents a review of mesocrystal formation across various geological processes, including magmatic, pegmatitic, metamorphic, hydrothermal, sedimentary, diagenetic, and supergene environments. Minerals such as magmatic and metamorphic micas; pegmatitic muscovite; sedimentary clay minerals (kaolinite and smectite); hot-spring calcite, aragonite, and opal-A; hydrothermal to sedimentary sepiolite and palygorskite; W-Fe oxides; hydrothermal quartz, and pyrite are examples of natural mesocrystal formation, which are included in the offered review.

The Bulgarian National Science Fund funded this research under contract KP-06-N54/6.

Biography

Irina Marinova has extensive field and research experience in the exploration of base-metal and gold deposits in Bulgaria. By integrating meticulous examination of mineral textures in the field, mines, and hand specimens with a comprehensive understanding of the mineralogical, chemical, and microscopic characteristics of geological objects, she has developed genetic models that serve as valuable tools for mineral exploration. Her most significant findings have been published in leading journals, including *Mineralium Deposita and Geology of Ore Deposits*. In recent years, her research has focused on the mineralogy and geochemistry of the Krumovgrad goldfield in southeastern Bulgaria, as well as on mining and metallurgical waste from metal extraction, with particular emphasis on their recycling and valorization.

Sulfur-Doped ZnO as Cathode Interlayer for Efficient Inverted Organic Solar Cells

Georgios Manginas

General Secretariat for Information Systems and Digital Governance, Greece

Bulk heterojunction (BHJ) organic solar cells (OSCs) represent a promising technology due to their cost-effectiveness, lightweight design and potential for flexible manufacturing. However, achieving a high power conversion efficiency (PCE) and longterm stability necessitates optimizing the interfacial layers. Zinc oxide (ZnO), commonly used as an electron extraction layer (EEL) in inverted OSCs, suffers from surface defects that hinder device performance. Furthermore, the active control of its optoelectronic properties is highly desirable as the interfacial electron transport and extraction, exciton dissociation and non-radiative recombination are crucial for optimum solar cell operation. In this regard, this study investigates the sulfur doping of ZnO as a facile method to effectively increase ZnO conductivity, improve the interfacial electron transfer and, overall, enhance solar cell performance. ZnO films were sulfur-treated under various annealing temperatures, with the optimal condition found at 250 °C. Devices incorporating sulfur-doped ZnO (S-ZnO) exhibited a significant PCE improvement from 2.11% for the device with the pristine ZnO to 3.14% for the OSC based on the S-ZnO annealed at 250 °C, attributed to an enhanced shortcircuit current density (Jsc) and fill factor (FF). Optical and structural analyses revealed that the sulfur treatment led to a small enhancement of the ZnO film crystallite size and an increased n-type transport capability. Additionally, the sulfurization of ZnO enhanced its electron extraction efficiency, exciton dissociation at the ZnO/photoactive layer interface and exciton/charge generation rate without altering the film morphology. These findings highlight the potential of sulfur doping as an easily implemented, straightforward approach to improving the performance of inverted OSCs.

Biography

Georgios Manginas has completed 3 Masters, in Nanotechnology, Materials Science and Renewable Energy from NTUA, University of York and Heriott Watt respectively. Currently, he is currently working in the Ministry of Digital Transformation in Greece, and has presented in 6 different conferences.

Secondary Mandibular Reconstruction with Patient Specific 3D Printed Implant

Harsimran Singh[1], **Neha Sharma**[1], **Anish Goyal**[2] and **Mandeep Singh Malhotra**[3]

[1]Consultant in Department of Surgical Oncology at C.K.Birla Hospital, India
[2]Cheif Dentist-Dental Arch 105P, India
[3]Director in Department of Surgical Oncology at C.K.Birla Hospital, India

Oral cancer is one of the most common cancer in India. Every year 77,000 new cases and 52,000 deaths are reported. 70% of them present in the advanced stages. Surgery in resectable locally advanced oral cancer often includes segmental /hemi mandibulectomy. Primary osseous reconstruction is definitely the preferred option but in majority of circumstances in India due to lack of resources and / or lack of adequate skill or patient having certain comorbidities, the defects are closed with only soft tissue flaps. These patients over the time develop deviation of residual mandible causing malalignment and occlusal disturbances leading to repeated traumatic ulcers which might cause another malignancy. Mandibular reconstruction at a later stage i.e. secondary settings although challenging should be considered in such situations. With advancement in three-dimensional (3D) imaging software and alloplastic technology a complete prosthetic mandibular replacement can also be done. We share our experience around this with the case discussed.

Biography

Dr. Harsimran Singh is a prolific surgical oncologist in Delhi- NCR region with over 15 years of clinical experience. He completed his Fellowship in Head & Neck Onco Surgery from HCG Manavta Cancer Centre, Nashik, Maharashtra University of Health Sciences. Dr Singh has authored many articles for both national and international publications.

Quantum and Nanophotonic Approaches to Advancing Artificial Intelligence

Rohit. K Ramakrishnan

Indian Institute of Science, India
QOSMIC, India

The escalating computational demands of artificial intelligence (AI) drive the development of novel hardware beyond the limits of conventional electronics. This work reviews two convergent, light-based paradigms: nanophotonic and quantum photonic computing. We first examine near-term, efficiency-driven advancements in nanophotonic neuromorphic processors. These brain-inspired architectures, implemented on Photonic Integrated Circuits (PICs) using technologies like Microring Resonators (MRRs) and Vertical-Cavity Surface-Emitting Lasers (VCSELs), perform core AI computations with unprecedented speed and energy efficiency. We then explore the longer-term, paradigm-shifting potential of Quantum Machine Learning (QML) on photonic platforms, detailing how quantum principles are harnessed in algorithms like Quantum Support Vector Machines (QSVMs). Finally, we highlight a powerful symbiotic evolution where AI accelerates hardware discovery. Our analysis, based on recent peer-reviewed literature, synthesises key experimental results.

Nanophotonic accelerators now achieve performance metrics orders of magnitude beyond electronics. For instance, VCSEL-based spiking networks process thousands of images in milliseconds with high classification accuracy. At the same time, MRR-based systems achieve state-of-the-art accuracy on benchmark datasets. In practical applications, time-wavelength multiplexed accelerators demonstrate high accuracy on real-world sensing data, and optical cloud systems achieve energy efficiencies orders of magnitude greater than their electronic counterparts. In the quantum domain, integrated photonic processors have experimentally demonstrated a quantum-enhanced advantage, where quantum kernel methods based on single-photon interference outperform leading classical kernel algorithms on classification tasks. This advantage is achieved on near-term hardware without requiring large-scale entanglement. Concurrently, AI-driven design tools like neural

operators have accelerated photonic device simulation by several orders of magnitude, enabling the rapid creation of novel, high-performance components. In conclusion, the convergence of these photonic approaches, propelled by an AI-hardware co-design feedback loop, is charting a course toward a new era of computation, promising to sustain the progress of AI.

Biography

Dr. Rohit K. Ramakrishnan is a C. V. Raman Postdoctoral Fellow at the Centre for High Energy Physics, Indian Institute of Science (IISc), Bangalore, specialising in Quantum Technology and Artificial Intelligence. His research spans theoretical foundations, algorithm design, simulations, and experimental implementations in quantum photonics. Dr. Ramakrishnan earned his Ph.D. in Quantum Technology from the Department of Electrical Communication Engineering, IISc. He has previously worked on the Quantum Satellite project at the Centre for Quantum Technologies, National University of Singapore, and as a Postgraduate Researcher at the Australian Defence Force Academy. He is a co-author of the book *The Quantum Internet – The Second Quantum Revolution* (published by Cambridge University Press), underscoring his contributions to the global quantum community. His current work integrates quantum computing with advanced machine learning techniques to address high-complexity problems in quantum information science.

Membrane Filtration Technology – Nano Material-Based Waste Water Treatment and Purification

M. H. Fulekar[1] and **Ashita Rai**[2]

[1]Senior Professor and Research Advisor (Environment), PIAS, Parul University, India
[2]Research and Development Cell, Parul University, India

Nano technology is the design, characterization, production and application of structure, devices and system by controlling surface and size at nano scale environmental nanotechnology would offer an innovative techniques and methods to remediate the waste water contaminant and purify the water through membrane filtration viz. microfiltration (0.1 to 10 micrometers), ultrafiltration (0.001 to 0.1 micrometers) and Nano filtration (0.001 to 0.01 micrometers). The membranes are made from material such as thin organic polymer films, metals or ceramics, depending on the application in the present research and development membrane filtration unit has been designed & developed and patented for the application of removal of contaminants and microorganisms based on the pore size and interaction with membrane materials. The pressure- driven membranes are housed in a vessel and the flow is fed from the pump. Membrane filtration technology with nano material provides a compressive solution in a water purification incorporative vertical system through micro, ultra and nano filtration this multistep filtering procedure improves the quality of water and also accomplishes the water quality standards with low cost techniques and methods in comparison to conventional techniques. Membrane filtration technology enables to provide sustainable waste management.

Biography

Sr. Prof. M H Fulekar, recognized among the Top 2% Scientists (Rank- 38,162 globally across all fields) in the World by Stanford University and Elsevier (2020 to 2025), is an internationally renowned environmentalist with over 40+ years of teaching and research experience in environmental science, climate change, environmental bio- and nanotechnology. He has served in key academic leadership roles including Professor & Head (Life Sciences) at the University of Mumbai, Dean and Director (Environment and Sustainable Development) at Central University of Gujarat, and is currently Senior Professor and Research Advisor- Environmental Sciences at Parul University. He has guided 32 PhD and 22 MPhil scholars, authored over 350 peer-reviewed publications, 400+

NCBI accessions, 17 books and more than 55 book chapters, with an impressive h-index of 48, i-10 index of 120 and 9128 citations. He also holds 7 patents to his credit, reflecting his strong commitment to innovation and applied environmental research. He has visited for International Assignments to various countries: Australia, Singapore, Bangkok, Hong Kong, Nepal, Dubai, USA etc.

Area of Research Specialization: Environmental Science: Biotechnology & Nanotechnology, Waste Water Treatment and Purification, Hazardous Waste Management, Climate Change and Sustainable Development, Renewable Energy Production, Environmental Technology Development, Biodiversity Conservation.

Top 2% Scientist- https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/8

Google Scholar- https://scholar.google.com/citations?user=6n7Vrk4AAAAJ&hl=en

Books: https://www.amazon.in/Books-M-H-Fulekar/s?rh=n%3A976389031%2Cp_27%3AM.H%2BFulekar

NCBI: https://www.ncbi.nlm.nih.gov/nuccore/?term=FULEKAR

Dr. Ashita Rai is a distinguished academic working as Assistant Professor- Environmental Sciences and Scientist C Non- Medical (On deputation), at the Research and Development Cell, Parul University. She was awarded her doctoral degree in Environment and Sustainable Development from the Central University of Gujarat, Vadodara, Gujarat. Dr. Rai has made valuable contributions as a young scientist in the field of wastewater treatment, rhizosphere technology, and climate change. She has authored numerous research articles; book chapters, 120+ NCBI accessions and holds two patents in her field. Dr. Rai is also the author of books such as *Pandemic Over Centuries: In a Changing Environment (Springer), Rhizosphere: Green Technology* (Springer) and Econanotechnology for Water Sustainability (CRC Press). Her research primarily focuses on the application of environmental biotechnology and nanotechnology to tackle pressing environmental challenges, especially in the areas of wastewater treatment and purification and Climate Change. As a young scientist, Dr. Rai's innovative research highlights her dedication to advancing environmental solutions, reflecting her commitment to fostering a greener and more sustainable future.

Area of Research Specialization: Waste Water Treatment and Purification, Rhizosphere Technology, Econanotechnology, Environmental Health and Climate Change.

Female Computer Teachers Training by the (TAWOCK) Model

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

[1]Curriculum and Instruction, Department of Curriculum and Instruction, College of Education, King Saud University, Saudi Arabia
[2]Curriculum and Computer Education, Department of Curriculum and Instruction, 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 ($\alpha \leq 0.05$) 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 ($\alpha \leq 0.05$) 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.

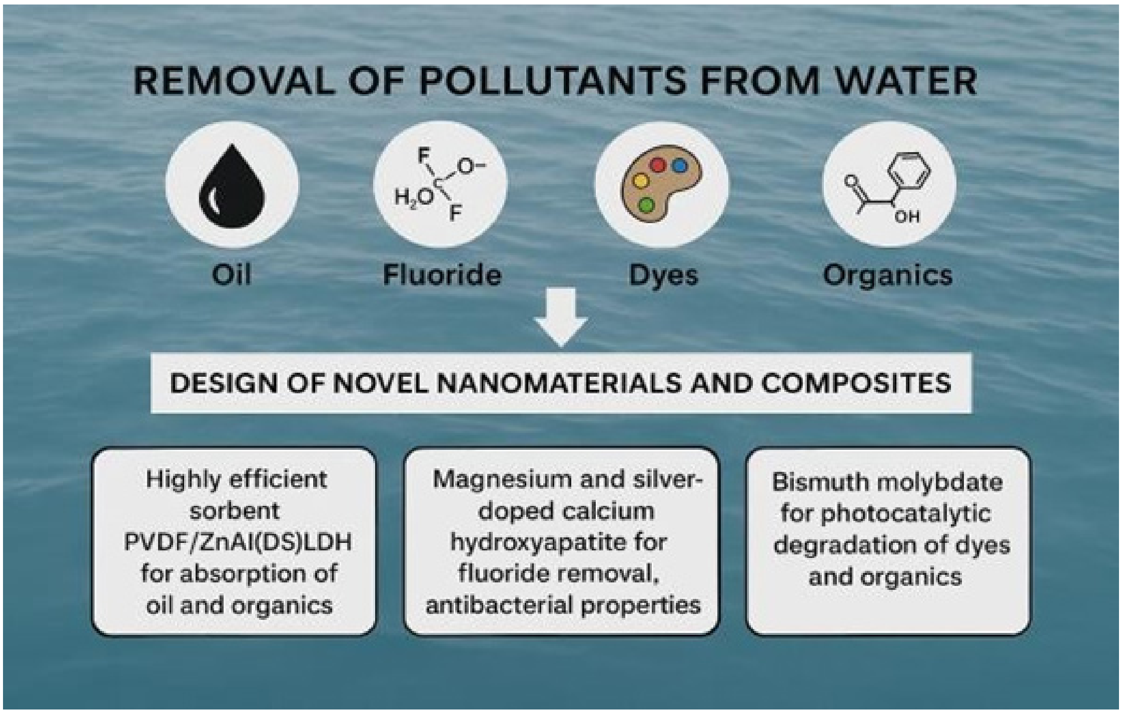
Design and Application of Novel Nanocomposites for Water Remediation

Chilukoti Srilakshmi

Advanced Materials Synthesis Research Lab, GITAM School of Science, GITAM Deemed to be University, India

Water pollution caused by organic compounds, heavy metals, dyes, oil spills, and fluoride contamination poses a significant threat to the environment and public health. Among these pollutants, fluoride contamination is of particular concern due to its dual nature—while fluoride is essential for human health in trace amounts, excessive intake can lead to severe health issues such as dental and skeletal fluorosis. According to the World Health Organization (WHO), the permissible limit of fluoride in drinking water is 1.5 mg/L. However, in many regions across the globe, fluoride levels in groundwater far exceed this limit, necessitating the development of efficient and sustainable fluoride removal technologies.

Nanomaterials and their composites have emerged as promising candidates for water remediation due to their high surface area, tunable physicochemical properties, and enhanced reactivity. In this talk, I will discuss the design and development of novel nanomaterials and their composites aimed at removing various pollutants from water, including oils, fluoride ions, dyes, and organic contaminants. A highly efficient sorbent, PVDF/ZnAl(DS) LDH, will be presented for the absorption of oil and organics from water. Furthermore, I will highlight the synthesis and characterization of magnesium and silver-doped calcium hydroxyapatite-based adsorbents, which exhibit remarkable fluoride ion removal capabilities along with antibacterial properties. The presentation will also cover the fabrication of perovskite-based nanomaterials, such as bismuth molybdate, for the photocatalytic degradation of dyes and organics from water. The results demonstrate that these innovative materials offer sustainable and cost- effective solutions for water purification, addressing both environmental and health concerns.



Biography

Chilukoti Srilakshmi is a Professor at the Gandhi Institute of Science and Technology, Bengaluru, Karnataka India. She earned her Ph.D. from the Indian Institute of Chemical Technology (IICT) in 2005 and completed her postdoctoral research at Eindhoven University of Technology (TU/e), Netherlands. She has held esteemed positions as a Senior Research Scientist at the Institute of Chemical and Engineering Sciences, Singapore, and as an INSPIRE Faculty at the Indian Institute of Science (IISc), Karnataka, Bengaluru, India.

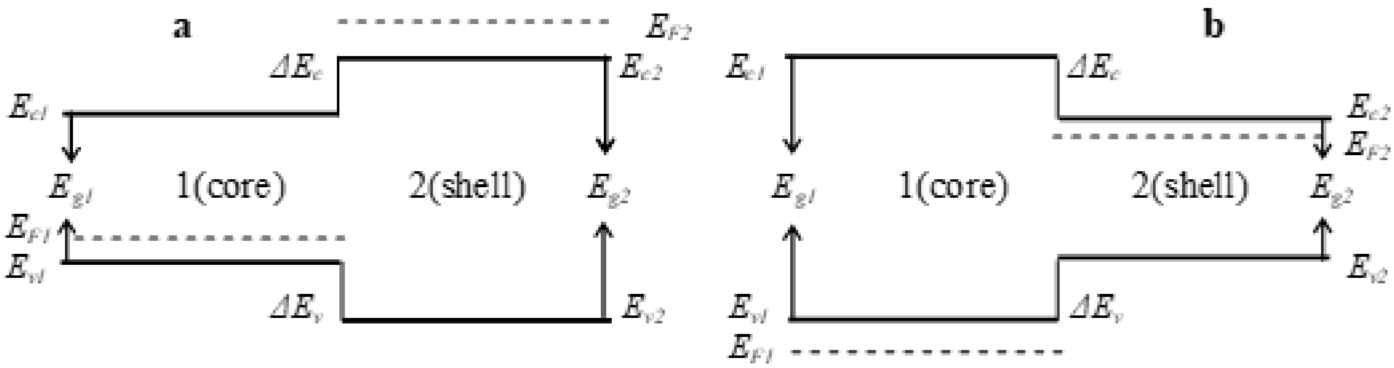
Prof. Srilakshmi has published over 50 journal papers in reputed international journals and holds five patents. She has presented her work at 40 conferences worldwide. Her pioneering research focuses on designing nanocomposites for water remediation, including oil spill cleanup and the removal of fluoride ions, dyes, and organic pollutants. Her expertise also encompasses heterogeneous catalysis, In Situ Spectroscopy and Chemometrics. She has been honoured with the prestigious INSPIRE Faculty Award and the Bharat Gaurav Puraskar from the Government of India and the KTK Foundation, acknowledging her impactful work in materials science and engineering.

Additional Increase in Built-In Voltage of Nanowire Solar Cells Based on Strongly Asymmetric *P-N* Heterojunctions

Borblik V. L

V. Lashkaryov Institute of Semiconductor Physics, Ukraine

Recently, semiconductor core-shell nanowires are used broadly for constructing numerous nano-devices – radiation detectors, solar cells, light emitting and laser diodes, tunnel diodes, bipolar transistors etc. Often the main building block in these devices is *p-n* heterojunction of type 1 (see the figure with two possible configurations).



Here E_{C1} and E_{C2} are bottoms of the conductivity bands, E_{v1} and E_{v2} are tops of the valence bands, ΔE_c and ΔE_v are the energy bands discontinuities, E_{g1} and E_{g2} are the energy gaps, E_{F1} and E_{F2} are the Fermi levels.

If doping level of the narrow-gap material is higher than that of the wide-gap material, then small amount of free carriers, transferred from wide-gap layer into narrow-gap layer, recombine there with some part of majority carriers; the rest of majority carriers diffuse into the wide-gap layer. Under these conditions solution of the Poisson equation is found in the depletion approximation.

But if doping level of the wide-gap material is higher than that of the narrow-gap material, the latter acquires excess amount of free (in given case - *minority*) carriers which gives contribution to the space charge density comparable with (and even more than) contribution of ionized impurities. Solution of the Poisson equation in this case shows additional increase in both width of the space charge region and value of built-in potential. This effect is in logical correspondence with known effect of decrease in both these parameters at taking into account free *majority* carriers.

This effect depends on *p-n* junction radius. In configuration a), both above mentioned parameters increase under decreasing in the radius but decrease in configuration b). This is one of manifestations of non-reciprocity inherent to the core-shell nanowires.

Biography

Dr. Vitalii L. Borblik was born in township Kolodische, former USSR (now Belarus'), in 1941. He graduated from Kiev State University in 1968 (Quantum Electronics specialty). He received his PhD on physics and mathematics from the Institute of Semiconductors in Kyiv (National Academy of Sciences of Ukraine) in 1979.

From 1979 to 1990, he was a Scientific Researcher with the Department of Theoretical Physics, from 1990 to 2020, he worked as a Senior Scientific Researcher at first with the Laboratory of Semiconductor Physical Sensors, and later with the Temperature Sensors Group in the Department of Electrical and Galvanomagnetic Properties of Semiconductors at V. Lashkaryov Institute of Semiconductor Physics in Kiev. From 2020, he is Senior Scientific Researcher in the Department of Kinetic Phenomena and Polaritonics in the same Institute.

His researches included electron transport in semiconductor heterostructures, dynamical concentration lattices in bipolar semiconductor plasma, injection and exclusion phenomena in semiconductor devices and also physics of diode temperature sensors. In a recent time, scientific interests of V. L. Borblik are electronic and optic properties of nanoscale objects. He is author of over 90 publications (theoretical for the most part). 2 review articles and 5 Chapters are among them. One of his review articles is part of collection **"Best of Soviet semiconductor physics and technology, 1987-1988"**. He is expert of journals "Review of Scientific Instruments" and "International Journal of Thermophysics".

V. L. Borblik was one of recipients of the Bronze Medal of the 12^{th} European Conference on Solid-State Transducers and the 9th UK Conference on Sensors and their Applications in 1998, and of the Bronze Medal of the 13th European Conference on Solid-State Transducers in 1999.

Environment-Friendly High-Performance $CH_3NH_3SnBr_3$-Based Perovskite Solar Cells: A Numerical Study

P. Arora and **V. Singh, S. Jain**

Department of Electrical & Electronics Engineering, Birla Institute of Technology & Science, India

Traditional perovskite solar cells (PSCs) using lead (Pb) halide perovskites have many benefits, including fast-growing efficiencies, low production costs, tunable band gaps, low rates of charge recombination, and broad optical absorption. Nevertheless, the widespread use, particularly for utility-scale deployments, is constrained by severe issues related to lead toxicity and long-term stability. This provides background for our work to numerically model Pb-free PSCs made of methylammonium tin bromide ($CH_3NH_3SnBr_3$) as the absorber layer, looking to achieve an efficient, stable, and environment-friendly PSC, by looking at the effects of performance parameters and operational conditions in a systematic study. Through the SCAPS-1D and Comsol Multiphysics (3D) based simulations, the study assessed aspects such as absorber layer thickness, doping concentration, bulk and interface defect density, working temperature, series resistance, and shunt resistance. We also examined several combinations of hole transport layers (HTLs) and electron transport layers (ETLs) with $CH_3NH_3SnBr_3$ as the absorber layer. Out of the structural configurations evaluated, the device structure ITO/ZnO/$CH_3NH_3SnBr_3$/CuI/Au was found to be the best with a current density of 31.12 mA/cm^2, an open-circuit voltage of 1.13 V, a fill factor of 88.86%, and a power conversion efficiency of 31.34%. This improved design resulted in a more favourable built-in electric field and carrier transport pathways for separating and collecting photogenerated electron-hole pairs. Comparison to studies already published indicates a considerable difference in performance of $CH_3NH_3SnBr_3$-based PSCs with the paired HTL/ETL. These observations suggest that $CH_3NH_3SnBr_3$ represents a viable absorber material and provides a substantial avenue towards stable, high-efficiency, environment-friendly perovskite photovoltaics.

Biography

Dr. P. Arora (Senior Member, IEEE) received his M.S. and Ph.D. dual degree in Electrical Engineering from IIT Madras, Chennai, India, in 2016. From 2016 to 2018, he was a Post- Doctoral Researcher at the Faculty of Science, The Hebrew University, Jerusalem, Israel, where he was involved in studying the light-matter interaction at the nanoscale in photonic devices. He is an assistant professor at the Department of Electrical and Electronics Engineering, Birla Institute of Technology and Science at Pilani, India. His current research interests include plasmonics, silicon photonics, optical sensors, solar cells, 2D nanomaterials, microfluidics, and imaging microscopy.

Green Synthesis, Characterization of Metallic Nanoparticles, and their Multiple Biological Applications

Narasimha Golla

Sri Venkateswara University, India

Nanotechnology is a novel interdisciplinary science serving as a nexus between the basic sciences. Metallic nanoparticles, Silver, Copper, Titanium, and Zirconium have been found to have applications in various biological applications, including antifungal, anti-inflammatory, antibacterial, antiviral, and bio-catalytic Properties, as well as anticancer agents and medicines. materials for electrical batteries, optical receptors, catalysis in chemical reactions, biolabeling agents, sensors, bioactive materials, and antimicrobial agents in the biomedical fields. including medical, agricultural, and environmental sectors, as bioactive and biocatalytic agents. Due to their enhanced responsiveness to environmentally friendly technology for quantifiable synthesis, several developed nations have seen significant growth in the biosynthesis of these metallic nanoparticles. The biological method, however, is the approach to preparation that is most in demand since it is quicker, safer, less expensive, and more environmentally friendly than other methods. Recent reports indicate that microbes like fungi and bacteria are more susceptible to metallic nanoparticles. In our laboratory, metallic silver, copper, zirconium, and titanium nanoparticles are synthesized through an eco-friendly biological approach with the cell-free filtrate of microbial and plant sources The synthesized metallic nanoparticles were characterized by UV-visible spectroscopy, FTIR, SEM, and DLS analysis for further examine the morphological properties, including size, shape, and stability. The metallic NPs showed good antibacterial, antifungal, antioxidant, and antiviral properties. Based on their multiple applications, MNPS could be used as potent bioactive agents for modern medical and Agricultural sectors.

Biography

Dr. Narasimha Golla is working as Professor and Dean (R&D) at Sri Venkateswara University, India. His research area, Nanotechnology and Applied Microbiology aspects of Bioactive compounds, metallic nanoparticles, characterization, and their applications as potential antimicrobial, anticancer, antiviral, and biocatalytic agents in modern science and technology. Dr. Narasimha has published more than 160 research papers in reputed National and International journals. He attended National and International conferences, and seminars, presented documents, and served as an expert member of scientific programs. He handled major research projects sponsored by the Department of Biotechnology, the University Grants Commission, and the Board of Nuclear Sciences, India, He published books and book chapters in internationally reputed journals. He served as editor, editorial, and advisory board member for National and International peer-reviewed journals. Prof. Narasimha is a member of the American Society (AMN), the Indian Science Congress (ISCA), the Asian Council of Science Editors (ACSE), and the Andhra Pradesh Academy of Science. (APAS) Member and President of the Microbiology Society of India (AP -MBSI). He received National and International Reorganizations and awards like Highly Cited Researcher, (Elsevier, Netherlands) BRAVe Faculty, (Athens, Greece), Young Faculty (MG. University. India) Research Excellence Award (Indo-American summit) IconsSWM-CE Excellence Award (IconSWM-CE-2022) Senior Scientist Award (ABAP-2023), name indexed in A.D, World Scientific Index-2024, Dr. Narasimha looks forward to developing his eminence in modern science and technology.

Nano Implanted Sensor Grids Utilization in the Detection of Micro Cracks in Structural Elements

Aditya Singh

Amrita Vishwa Vidyapeetham, India

India is having a number of infrastructure projects in the past years for development of the country, but at the same time to maintain the development of the country, it is important to make sure that the infrastructure has structural integrity. This structural integrity is essential for making sure that the built infrastructure has long life as well as safe, particularly important in the case of critical infrastructure, which includes high risk load bearing elements like bridges, etc. However, micro level irregularities might go undetected through traditional methods of inspection, which might lead to major structural failures as time passes. This study focuses on nano implanted sensor grids which can be incorporated into structural components of given infrastructures to allow real-time detection of micro cracks as well as monitoring the health of the said infrastructures. They are especially useful in responding to deformations at the micro level due to stress in the structures, which then sends the needed data to an interpretation system powered by Artificial Intelligence to detect irregularities. The study will consider the recent published papers to find out the gaps in the current literature in the case of nano implanted sensor grids for the above case. Further, data from various sources will be presented to perform graphical analysis to support the study and understand the market along with the future scope of nano implanted sensor grids. More focus will be given on the application of nano implanted sensors grids in the infrastructural projects in the country India, in this study.

Biography

Er. Aditya Singh is an Independent Researcher, Editorial Review Board Member in 6 American International Journals (IJSSMET, IJSDS, IJPAEI, IJESGT, IJDSST, IJRLEDM), Reviewer in 8 American, 4 Singaporean & 1 Indonesian International Journals (IJUPSC, IJCVIP, IRMJ, JTA, IJAIBM, IJCEWM, JITR, IJSSSP, JDSIS, AAES, JCCE, SWT, & IJEECS), Research Mentor at Academy Innova World (MSME registered), Kalipur, India & Ex-Alumni Mentor (LPU) at present. He had completed his regular B. Tech degree in Civil Engineering from Lovely Professional

University, India, in 2020. He is currently affiliated with Amrita Vishwa Vidyapeetham, India. He has 28 publications under his name, in which he is a single author in 19 of them, whereas in 6 of them he is the main author. Most of his publications are Indexed in Scopus. Also, Paper Presentations performed 24 times in 21 National/ International Conferences in the world. He has also delivered Guest Lecture in Faculty Development Program as a Keynote Speaker. He has also worked as a Reviewer/Editorial Review Board Member, for 144 times in the evaluation of manuscripts so far in international conferences, international books and international journals. He had also won 2 International Awards((Thailand) & (Cambodia)) as a Reviewer in 2023. He has worked in 50 positions so far in his professional career, including Journals, Conferences, Research Books of International stature.

Green Solvent-Based Synthesis of Sm^{3+} -Doped Tio_2 Nanostructures for Solar Energy Conversion

Shelan M. Mustafa

Department of Automation Industrial Technology Engineering, Erbil Technology College, Erbil Polytechnic University, Iraq

Development of efficient and sustainable energy materials is critical in addressing the growing global demand for renewable energy technologies. In this study, samarium (Sm^{3+})-doped titanium dioxide (TiO_2) nanoparticles (NPs) and nanosheets (NSs) were synthesized through a green chemistry approach utilizing Oxalis Corniculata leaf extract as a natural reducing and stabilizing agent. A facile screen-printing method followed by controlled thermal annealing was employed to fabricate the hybrid nanostructured films. Structural analyses by X-ray diffraction (XRD) confirmed the predominance of the anatase TiO_2 phase; minor Sm^{3+} ion impurity peaks were observed at elevated dopant concentrations, indicating partial phase separation. Morphological investigations *via* field emission scanning electron microscopy (FE-SEM) revealed a significant enhancement in particle dispersion and surface texturing upon Sm^{3+} doping, along with an increase in average particle size. Photoluminescence (PL) spectra exhibited strong visible light emission features corresponding to ${}^4G_5/_2 \rightarrow {}^6H$ transitions of Sm^{3+} ions, confirming efficient dopant incorporation and suggesting potential for extended solar absorption. The chromaticity coordinates (x = 0.3105, y = 0.2507) aligned close to the white-light region, indicating broad visible emission and high color purity. The photovoltaic performance of dye-sensitized solar cells (DSSCs) based on the synthesized nanostructures was evaluated under AM 1.5 G simulated sunlight. Sm^{3+}-doped TiO_2 NSs-based devices demonstrated the highest short-circuit current density (Jsc = 20.30 mA/cm²) and energy conversion efficiency (EFF = 9.11 %), significantly outperforming the undoped TiO_2 (EFF = 5.38 %). The enhanced performance is attributed to synergistic effects of rare-earth doping and 3-dimensional nanosheet morphology, facilitating improved charge separation and transport.

Biography

Dr. Shelan M. Mustafa is a distinguished physicist and nanotechnology expert from Erbil, Iraq. She earned her B.S. in General Physics (2001) and M.S. in Nanotechnology (2010) from Salahaddin University, followed by her Ph.D. from Soran University's Scientific Research Centre.

Beginning her career at Erbil Technology College in 2011, Dr. Mustafa rapidly advanced through leadership roles, serving as Vice Head of Road Department (2012) and Head of Electricity Department (2014-2020). During her tenure, she transformed the department into Automation Industrial Technology Engineering, offering both diploma and bachelor's programs. Since July 2024, she serves as Director of Scientific and Higher Education at Erbil Polytechnic University.

Her research focuses on nanotechnology, renewable energy, and solar cell technology, with expertise in green synthesis methods, nanomaterials, and semiconductor nanostructures. She specializes in nanoscale material properties, surface structure analysis, and X-ray diffraction techniques, making significant contributions to nanotechnology and renewable energy solutions.

Sunlight-Mediated Degradation of Water Contaminants with a Novel Modified Bismuth Molybdate Perovskite Photocatalyst

Amruth H D Gowda and **Chilukoti Srilakshmi**

Advanced Materials Synthesis Research Lab, GITAM School of Science, GITAM Deemed to be University, India

In the present study, manganese-modified bismuth molybdate was developed and characterized as a photocatalyst for the sunlight-mediated degradation of diverse water pollutants. Structural, optical, and surface properties were investigated using XRD, UV-Vis spectroscopy, FTIR, SEM, BET surface area analysis, and photoluminescence spectroscopy, revealing a band gap in the range of 2.5-1.1eV. Photocatalytic degradation studies demonstrated the effective removal of various dyes, chloro-organic compounds, and pharmaceuticals. The catalyst exhibited higher activity without H2O2 compared to its performance with it. Application to real dye-containing wastewater resulted in 100% pollutant removal, with degradation kinetics following a second-order model. This work establishes the catalyst's potential for efficient and practical wastewater remediation in industrial settings.

Biography

Amruth H D Gowda earned his post-graduate degree from Mysore University in 2021. He commenced his Ph.D. studies at GITAM University in 2023, under the supervision of Prof. Ch Srilakshmi, focusing on the synthesis and development of layered perovskite nanomaterials for the photocatalytic degradation of dyes, pharmaceuticals, and organic pollutants.

Adsorptive Microplastic Removal using Pinus Roxburgii Derived Biochar– a Waste Residue of Himalayan Forests

Misbah Bashir[1], **Khalid Muzamil Gani**[2] and **Manzoor Ahmad Ahanger**[3]

[1]Islamic University of Science & Technology, India
[2,3]National Institute of Technology Kashmir, India

The industrial revolution has led to widespread plastic production, resulting in microplastics becoming a significant environmental concern. These tiny plastic particles persist in water bodies and pose potential risks to ecosystems and human health. This study investigates the use of biochar for microplastic removal from aqueous solutions. Two types of biochars—sludge-based biochar and lignocellulosic-based biochar, specifically pine bark biochar (PBC)—were analyzed, with a focus on resource recovery from Himalayan forest byproducts. Preliminary characterization revealed that PBC had a higher carbon content (87.8%) compared to sludge-based biochar (59.8%), making it a better candidate for adsorption studies.

Further experiments examined the adsorption performance of both PBC and modified pine bark biochar (MBC) for removing polyvinyl chloride (PVC) microplastics. The highest adsorption capacity (131.5 mg/g) was observed at a pH of 10, a PVC concentration of 200 mg/L, and a 6-hour contact time. Adsorption occurred through ion exchange and physical interactions, including Van der Waals, London dispersion, and electrostatic forces. Thermodynamic analysis confirmed that the adsorption process was exothermic and spontaneous within a temperature range of 10–40°C. Isotherm and kinetic studies demonstrated a good fit with the Temkin model and pseudo-second-order (PSO) kinetics ($R^2 > 0.9$).

Notably, MBC exhibited superior performance compared to PBC, achieving an optimal adsorption capacity of 156.08 mg/g and a removal efficiency of 78%, surpassing that of unmodified PBC. These findings highlight the potential of biochar, particularly MBC, as an effective adsorbent for microplastic removal. This research provides valuable insights into biochar-based remediation strategies, offering a sustainable approach to mitigating microplastic pollution in aquatic environments.

Biography

Dr. Misbah Bashir is an accomplished academic with a Ph.D. in Civil and Environmental Engineering from the Indian Institute of Technology (IIT) Mandi. She also holds degrees in B. Tech (Honours) and M. Tech in Civil Engineering from Lovely Professional University. Dr. Bashir has extensive experience in environmental research, specializing in biochar technology, wastewater treatment, and waste management.

Her career includes roles as an Assistant Professor at Lovely Professional University and a Postdoctoral Fellow at NIT Srinagar. Currently, she is an Assistant Professor at the Islamic University of Science and Technology. Dr. Bashir has authored multiple peer-reviewed journal articles, with recent work focusing on microplastic removal and biochar production techniques.

In addition to her academic contributions, she serves as a reviewer for several international journals and was a member of the Indian Science Congress Association and The Institution of Engineering & Technology. Her research continues to make significant strides in environmental sustainability and innovative waste management solutions.

Detection of pathogen in water

Faiza Jan Iftikhar

NUTECH School of Applied Sciences and Humanities, National University of Technology (NUTECH), Pakistan

The electrochemical nano-biosensors are at the forefront of technology that combine the power of the precision of nanotechnology with the sensitivity of biosensing to create solutions for a more sustainable future. These nano-sized devices result in higher sensitivity and selectivity when it comes to detecting different chemical and biological substances due to their interfaces and hence a lot of effort is directed towards building such interfaces that can result in robust and fast biosensing. The work at hand is specifically focused on sustainable health and wellbeing. Water is vital for human welfare and a sustainable ecological balance. Consequently, its contamination widely impacts the health of population worldwide. Among several factors affecting water pollution, pathogenic viruses, toxins, and bacteria can cause illness. Such pathogens can be characterized by their high virulence, stability, and widespread accessibility via drinkable water. Furthermore, water-borne diseases mostly associated with gastrointestinal diseases, are a challenge prevalent not only in developing countries but also developed countries which need serious deliberations and research to find robust and economical solutions. This calls for a serious galvanizing of the system to address such challenges with robust and economical ways to prevent a failing health system which requires fast identification of contaminants/pathogens in different media of the environment. So, we propose to immobilize the electrode surface with nanomaterials (functionalized MOFs) for detection purposes of *E.coli* with ultra-low limit of detection and establish it as a label free detection method.

Biography

Dr. Faiza Jan Iftikhar is currently working as an Associate professor at National University of Technology (NUTECH) since 2018. She earned her Ph.D. in Dec. 2009 in the field of Electrochemistry under the supervision of distinguished Prof. Guenter Grampp from the Institute of Physical and Theoretical Chemistry, Graz University of Technology, Austria with a foreign scholarship from HEC, Pakistan. Later she worked as a postdoctoral fellow in the research group of Prof. PGL Baker at the University of Western Cape, South Africa on electrochemical and biosensors harnessing sensor technology as a tool to employ conductive polymers immobilized with nano-sized particles for sensing of environmental toxins and enjoyed the different flavors of electrochemistry. She won an NRPU project of Rs. 8.7 million to that effect. Her research interests include batteries, biosensors, nanosensors, drug analysis and electrolysers.

Modelling of PV Systems Employing MATLAB/SIMULINK

Mourad Talbi, Nawel Mensia and **Abdelmajid Zairi**
Center of Researches and Technologies of Energy of Borj Cedria, Tunisia

The main aim of this paper, consists in modelling and simulations under Matlab/Simulink, of two new Photovoltaic (PV) systems. In the first one, is applied a Perturb and Observe (P & O) controller and in the second one, is applied an Incremental Conductance (IC) command. The performance of these controllers is tested under Standard Conditions (STC: the temperature is ***T=25 °C*** and the insolation is ***G=1000 Watt/m²***) also in case where the climatic conditions are variables over time. These climatic conditions are manifested in the time varying of the temperature and Insolation. The performance testing of these two PV systems is performed through simulations and the obtained results are in terms of P-V characteristics and the temporal variations of the power produced by the used Photovoltaic Generator (PVG). These results are obtained in case of STC and in case where the temperature and insolation are varying over time. These results show the performance of these two controllers (P& O and IC). In fact, in the PV systems proposed in this work, the two used commands (P & O and IC), permit to track efficiently the Maximum Power Point (MPP) since we have oscillations near the maximum of power in the different temporal variations curves of the power produced of the PVG. Hence, the used PVG produced at each time a power near the maximum power and this thanks to the employed MPPT controller (P & O or IC). By producing each time, the maximum power by the used PVG, this implies that the proposed PV systems are operating in the maximum of yield.

Biography

At present, Mourad Talbi is an Associate Professor in Signal at the Center of Resear-ches and Technologies of Energy of Borj Cedria (CRTEn), Tunis, Tunisia. He is a member of “Laboratory Laboratoire de Maîtrise de l'Energie Eolienne et de Valorisation Energétique des Déchets”. In 2004, he has obtained his Master degree in automatics and signal processing at National Engineering School of Tunis. In 2010, he has obtained his Ph.D. thesis in Electronics at Faculty of Sciences of Tunis. In 2015, he has obtained his HDR in Electronics at Faculty of Sciences of Tunis.

The Role of Nanoparticle in Diagnosis and Treatment of Systemic Lupus Erythematosus

Somayeh Marouzi[1], **Amin Seddigh**[2], **Zahra Salmasi**[3,4], **Fatemeh Kalalinia**[5] and **Maryam Hashemi**[1,3]

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[2]School of Pharmacy, Mashhad University of Medical Sciences, Iran
[3]Nanotechnology Research Center, Pharmaceutical Technology Institute, Mashhad University of Medical Sciences, Iran
[4]Department of Pharmaceutical Nanotechnology, School of Pharmacy, Mashhad University of Medical Sciences, Iran
[5]Biotechnology Research Center, Pharmaceutical Technology Institute, Mashhad University of Medical Sciences, Iran

Recognizing and managing chronic inflammation is crucial for preventing disorders such as SLE, arthritis, Alzheimer's, and heart disease. Systemic lupus erythematosus (SLE) is a chronic autoimmune disorder characterized by inflammation from autoantibodies targeting nuclear antigens, affecting multiple body systems. Existing treatments are limited by inadequate bioavailability, low specificity, and notable side effects. Advancements in solubility, stability, bioavailability, controlled release, and targeted delivery using nanoparticle (NP)-based drug delivery systems signify a major advancement in managing chronic inflammation like SLE. Recent research indicates that nanoparticles with varying structures provide two primary mechanisms of action (novel approaches) for treating SLE, potentially minimizing side effects and enhancing the effectiveness of therapeutic agents. The objective of this presentation is to evaluate the present state of the potential advantages and difficulties associated with employing nanoparticles in the diagnosis and treatment of SLE.

Biography

Somayeh Marouzi graduated from the Department of Biophysics at the Tehran Azad University, Science and Research Branch. She currently working as a postdoctoral researcher at the Department of Pharmaceutical Biotechnology, Faculty of Pharmacy, Mashhad University of Medical Sciences, Iran.

Due to her interest, she is eager to engage in research activities in the field of new technologies in the creation of nanomedicines to improve the effectiveness in the treatment and diagnosis of autoimmune diseases and cancer.

In addition, she has 10 international articles in the fields of nanoemulsions from natural extracts, studying the biodistribution of carbon quantum dots, and molecular modeling studies for the affinity of the amino acids tryptophan, tyrosine, and phenylalanine in the halotransferrin (HTF) protein.

And she continue to work in the hope of creating effective drugs with minimal side effects in combination and codelivery treatments.

Enhanced Fluoride Adsorption by Strontium-Modified Dicalcium Phosphate Dihydrate

Tejaswini Mendke and **Chilukoti Srilakshmi**

Advanced Materials Synthesis Research Lab, GITAM School of Science GITAM Deemed to be University, India

The present research focused on the synthesis and characterization of strontium-doped dicalcium phosphate dihydrate (Sr-DCPD) as an adsorbent for fluoride removal from aqueous solutions. The adsorbents were synthesized using a co-precipitation method and subsequently analyzed by XRD, FTIR, BET, TEM, SEM, and EDX. The XRD patterns confirmed a monoclinic crystal structure with the /1 2/a 1 space group, while SEM images showed plate-like morphology. EDX analysis verified the uniform distribution of elements. The adsorption process was best described by the Freundlich isotherm model, indicating heterogeneous adsorption, and followed pseudo-second-order kinetics. The Sr(0.05)DCPD adsorbent demonstrated exceptional fluoride removal capacity, reaching a maximum of 1428 mg/g, highlighting its potential for effective water purification.

Biography

Tejaswini Mendke is a Ph.D. research scholar at GITAM (Deemed to be University), Bengaluru, she is working under Prof. Ch. Srilakshmi on developing cost-effective nano-adsorbents for fluoride removal from water. She earned her BSc in Biotechnology (2018) and MSc in Nanotechnology (2020) from Punyashlok Ahilyadevi Holkar Solapur University, and has been applying her knowledge to nanomaterials for water remediation and healthcare since 2021. Her work has resulted in 2 Indian patents and 4 research publications.

The Sustainability of Beach-Cast Seaweed Biomass for Biorefinery Processes: Calorific Power Heating Studies with Macroalgae

Fernando Pinto Coelho[1,2], Rômulo Simões Cesar Menezes[2], Cesar Augusto Moraes de Abreu[2], Everardo Valadares de Sá Barreto Sampaio[2], Elvis Joacir de França[2] and **Elica Amara Cecília Guedes- Coelho[1]**

[1]Centre for Energy Production in the Semi-Arid Region of Alagoas - National Council for Scientific Research - CNPq. (NUPRES/AL), Federal University of Alagoas, Campus of Engineering and Agricultural Sciences, Institute of Biological and Health Sciences of the Federal University of Alagoas, Brazil
[2]Graduate Program in Energy and Nuclear Technologies at the Federal University of Pernambuco (UFPE/PROTEN). National Nuclear Energy Commission, Brazil

Alternative renewable energy technologies offer the opportunity to move towards more sustainable systems in which natural resources are conserved through their own perennial cycles. Macroalgae as a marine substrate for the biomass energy sector is a natural resource of inexhaustible abundance in the oceans, growing three to four times longer than terrestrial plants. The aim of this work was to assess the sustainability of macroalgal biomass for biorefinery processes. Two studies were therefore carried out. In the first, the natural deposition of macroalgae was evaluated in 28 collections carried out in seven beaches on the Maceió coast over a period of 2 years. Samples were taken using the zigzag method and covered a deposition area of 135,000 m². The results obtained of 5.08 tons/ha for dry biomass by daily collection means that it is the only type of biomass that can be collected daily, with an efficiency 35 times greater than sugarcane biomass production. The second study evaluated the calorific value of the biomass and, as a result, the low calorific value of 8.82 MJ/kg in 13 species analysed was similar to the main biomass used in Brazil, sugarcane bagasse, evaluated at 8,91 MJ/kg. Aggregated macroalgae biomass in condensed pellets as energetic composites, obtained a value of 20.19 MJ/Kg, 11.46% more than the average of terrestrial biomass pellets with an average of 17.61 MJ/Kg. Based on the results obtained, it is observed that macroalgae biomass has potential for biorefinery.

Biography

Dr. Fernando Pinto Coelho is a Professor of Environmental Research in the Surveying Engineering Course at the Federal University of Alagoas (2024). Full member of the Alagoas State Management Research Group for the National Low Carbon Agriculture Project - ABC+. (2023). Researcher in Phytoplankton Field Environmental Impacts of V and VI Scientific Expedition of San Francisco River by Federal University of Alagoas (2023 - 2022). Technical Director of Caatinga Biome Social Carbon Credits Association (2022), Director of Research, Development and Innovation at Proalga Brazil Institute of Science, Technology and Innovation (2022). Representative Federal University of Alagoas in Sertão São Francisco Hydrographic Region Basin Committee (2022). Expert in Environmental Analysis by the Department of Internal Affairs Court of Justice of the State of Alagoas (2019). PHD in Energy and Nuclear Technologies from the Federal University of Pernambuco - UFPE (2018), specialization in Renewable Energy and research line - Environment and Biomass Energy. Prof. Advisor of the Federal Pedagogical Residency Program (2018). Ad hoc advisor to the Ministry of Education and Culture - MEC (2014). Leader of the National Scientific Research Group of the Council - CNPq. (Nucleus for Production Energy in the Semi-Arid Region of Alagoas - NUPRES - AL) - (2013). Professor of Hydrography with specialization in Climatology and Environmental Impact Assessment, Federal University of Alagoas - Campus do Sertão - UFAL (2011). Master in Water Resources and Sanitation - Federal University of Alagoas - UFAL (2008). Master in Business Administration (MBA) - Getúlio Vargas Foundation - FGV (2002). Degree in Geography - Federal University of Alagoas (1999).

Youth Cultural and Creative Practices in Light of Emerging Artificial Intelligence Usage During COVID-19

Joanna Black

Faculty of Education, University of Manitoba, Canada

The presentation is about the book chapter concerning artificial intelligence (AI) and students' visual online social media, published in the recent book entitled, " Navigating the Online Networks of Young Creators: An Investigation of Digital Visual Learning Networks' by Springer Publications (2025). The research was conducted from 2020-2023 during the height of COVID-19, in which we examined art students working within networked environments. Our data collection began before generative artificial intelligence (GAI) mainstream exposure (November 2022), in which we present findings about young secondary school and university art students' cultural creative practices, specifically analyzing their awareness and use of AI in their offline and online learning. Discussed will be ways in which educators might design AI-integrated learning experiences and implement teaching strategies in online arts education that respond to the challenges identified from the research findings.

Biography

Joanna Black is a professor of Art Education in the Faculty of Education at the University of Manitoba, Winnipeg, Canada. Her research interests are on subjects of artificial intelligence (AI), digital arts pedagogy, and social media usage in art education. For over thirty years she has worked as an art educator, art director, museum educator, curator, art consultant, and a k-12 teacher in formal and informal settings in Canada and the United States. Recently, she co-edited a book, along with Juan Carlos Castro entitled, *Navigating the Online Networks of Young Creators; An Investigation of Digital Visual* Learning published by Springer. Dr. Black has received awards from the Centre for Human Rights Research at the University of Manitoba, and the Provincial Affiliate Art Educator Award from the Canadian Society for Education through Art, and the Art Education Technology Outstanding Research (AET) Award from the National Art Education Association (NAEA).

Energy Optimal Speed Profiles for a Differential Drive Mobile Robot with Payload

Mauricio F. Jaramillo-Morales[1], **Sedat Dogru**[2] and **Lino Marquez**[2]

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Mobile robots are being increasingly used in various environments, including households, hospitals, agriculture, and industry. In these settings, robots often need to cover long distances, sometimes carrying heavy payloads, which results in high energy consumption. To address this, the paper presents a set of novel optimal speed profiles for two-wheel differential drive robots. These profiles are derived using Hamiltonian formalism, leading to closed-form speed profiles for both straight and rotational motions. The derivation utilizes a power model that explicitly accounts for robot and motor dynamics, as well as external payloads.

The energy consumption of a commercial two-wheel differential drive robot was experimentally evaluated using various trapezoidal and proposed optimal speed profiles (fig1). The results demonstrated significant energy savings with the new profiles. Notably, the savings were positively correlated with the payload—i.e., the heavier the robot or the load it carries, the greater the benefit from optimization. This feature makes the optimization method easily adaptable to logistics solutions in warehouses with mobile robots.

Relative energy savings were observed to be more significant along shorter path segments. This is because, as the path length increases, the relative contributions of the start and end segments (where accelerations occur) to the total energy consumption decrease. Nevertheless, the savings remained substantial for path segments up to at least 8 meters. For rotational trajectories, energy savings were also considerable, particularly when compared with the default trapezoidal speed profile.

The proposed optimal speed profiles, which incorporate all relevant motor and robot parameters, facilitate easy adaptation to different differential drive platforms with minimal effort. Additionally, the paper presents an analysis of how trajectory times and maximum speeds vary with changing payloads.

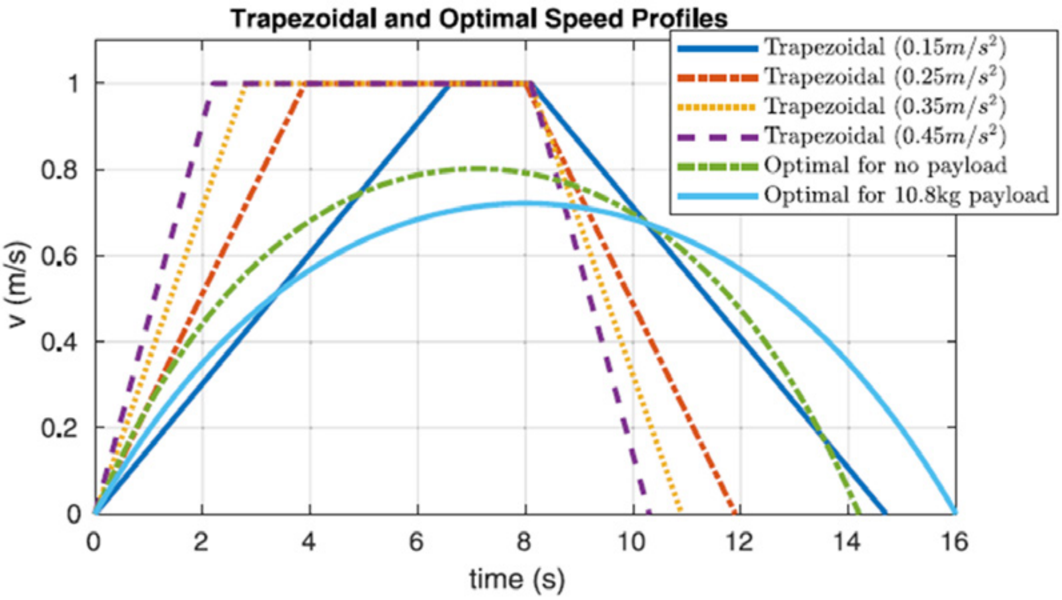

fig1. Different speed profiles used in the tests for the 8m long trajectory.

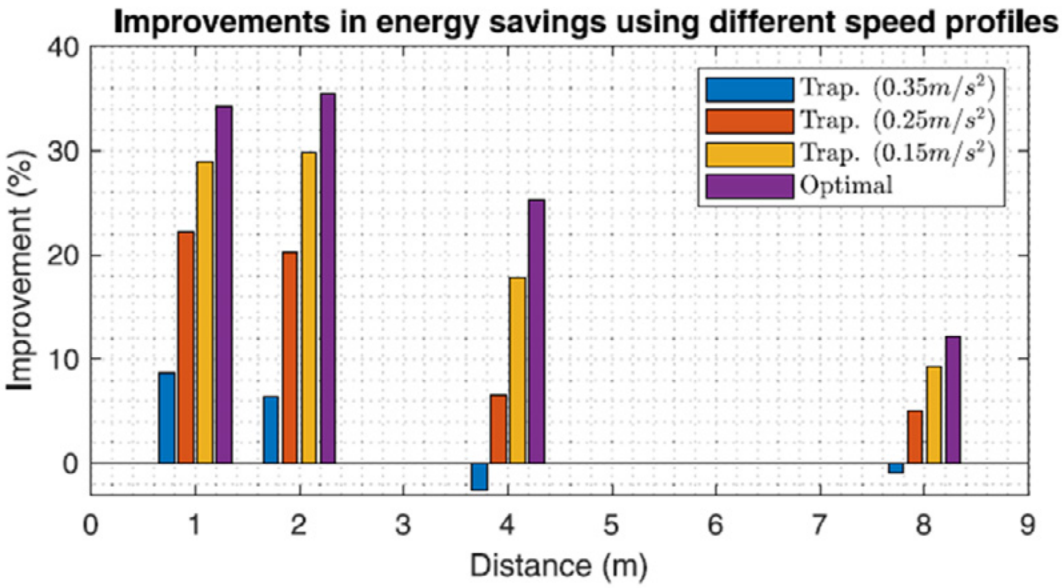

fig2. Energy savings (in %) along different paths compared with the default speed profile with 10.8 kg payload.

Biography

Dr. Mauricio Fernando Jaramillo Morales is a robotics researcher focused on mobile robots, energy estimation, and optimization. He holds a degree in Electronic Engineering, a Master's in Industrial Automation, and a PhD in Engineering with an emphasis on Automation, all from the National University of Colombia. His doctoral thesis received distinction. In 2018, he completed a research internship at the University of Coimbra, Portugal, where he validated mathematical optimization models in mobile robotics. The results were presented at major European robotics conferences and published in scientific robotic and optimization journals. He also participated in an international educational project co-funded by the European Union, during which he served as a lecturer at the University of Warmia and Mazury in Olsztyn, Poland, in the Faculty of Mathematics and Computer Science. There, he taught the courses "Introduction to Python" and "Introduction to R."

Influence of Load Misalignment on T-Bolts Failure in Wind Turbine Blades

Guillermo Muñoz-Hernandez, Giovanni Vidal-Flores, Filiberto Ramon-Cipriano, Jose Guadalupe Rico-Espino and **Felipe Garcia-Ramirez**

Centro de Tecnología Avanzada, CIATEQ A.C., México

The T-bolt connection for wind blades has become a popular solution, but it has also exhibited premature failures in wind turbines. The experimental data of the blade static test showed the ideal assembly conditions of the T-bolt do not exist, there is a load misalignment. So, an additional variable must be taken into consideration in design calculations. This paper presents both ultimate stress and fatigue analysis to determine the influence of load misalignment on the stress state of T-bolts, which have been identified as components prone to suffer fatigue damage. These failures have a high impact on the operation of wind turbine blades. The results showed that the bending of T-bolts directly impacts the safety factors in both the ultimate stress and fatigue analyses, therefore, making it a critical cause of failure. Additionally, the inclination of the T-bolt α was proposed to define permissible values in the design or prevent failure.

Biography

Education:

Doctoral Degree in Science and Technology from the Interinstitutional Postgraduate Program in Science and Technology (PICYT) of the National Council for Science and Technology (CONACYT), currently the Secretariat of Science, Humanities, Technology, and Innovation (SECIHTI). Master's degree in mechanical engineering from the University of Guanajuato, Mexico. Agricultural Mechanical Engineering from the Autonomous University of Chapingo. Mexico.

Work Experience:

I am currently working at the Center for Advanced Technology (CIATEQ A.C.) as a Senior Project Engineer in the energy group of mechanical system division. Technical manager in more than 25 projects over 31 years, in the design and implementation of machines for different sectors, under agreement or contract. 37 scientific and technological publications in journals, conferences, and media outlets. 12 patent applications and 3 intellectual property grants. Graduate professor for CIATEQ's postgraduate program in the subjects of Finite Element, Design of Experiments, and Research and Development Methodology (R&D).

Membership and Certification:

Member of the National System of Researchers, Level I, of SECIHTI. In May 2025, he obtained the G18014904 certification in Innovation from the Spanish Agency for Standardization and Certification (AENOR).

An Exploration of the Discontinuous-Continuous Fusion in Yuunohui'tlapoa for Keyboard

Julio Estrada

Institute for Research in Aesthetics, National Autonomous University of Mexico, UNAM, Mexico

This work arises from compositional and theoretical research on music scales through *d1-theory*, and on the continuum; it resorts to a terminology useful for composers, interpreters, or musicologists without mathematical training, as the author himself. The musical topic of the continuum emerged in the 20th century, introducing ideas like rhythm as frequency, micro intervals, timbre, noise, glissandi, and spatialization. A unified study to comprehend the musical continuum as a global field needs to focus on a blend of components of rhythm (pulse, attack, micro durations) and sound (pitch, dynamics, color). This idea is understood as a *macro timbre*. When these components in a continuous macro timbre are intended to be asynchronous, the audible result is an amalgam of disruptions, interferences or crossings that are perceived as an elastic musical matter. By combining sequential pitch with continuous transitions of chords density, harmonic content, dynamics, and speed of pulse, such as *yuunohui'tlapoa* for a keyboard, asynchrony produces a discontinuous-continuous macro timbre. The synthesis of this last is perceived as internal collisions of rhythm, melody, and harmony within a *melo-harmonic* texture or as a macro-timbre texture. The substantial differences between discontinuity and continuity in terms of calculation, memory, perception, or imagination, prompted the need for a distinct compositional approach to allow the notation of its constant spatial-temporal evolution, this being fulfilled by chronographic recording of rhythm and sound.

Biography

Julio Estrada is a Member of the Institute for Research in Aesthetics, coauthor with Jorge Gil of Music and finite Groups Theory. *3 Boolean Variables* (1984), author of *El sonido en Rulfo* (1998, 2006), and *Canto roto: Silvestre Revueltas* (2012, 2023), head of the research project Musical and Mathematical Continuum Theory (eua'oolin & MúSIIC systems). He substituted Xenakis as Director of the Centre d'Études de Mathématique et Automatique Musicale, Paris (2000-2001). He is National Scholars System Emeritus, member of the Mexican Academy of Science and the International Musicological Society. At UNAM he is Coordinator of the Seminar for the Research in Artistic Creation, and at the Faculty of Music, he is Director of the Laboratory for Musical Creation, and the Seminar of Theory and Philosophy of Music Creation. Visiting professor at Stanford, La Jolla UCSD, Darmstädter Ferienkurse, Rostock's MusikWissenschaft Institut, Bergen's Griegakademiet Institutt for Musikk, Sorbonne's Alfonso Reyes Chair, Ircam, and Beijing Central Conservatory.

Genostep: Transforming Urban Infrastructure into a Renewable Energy System

Jacob Cox

Green Graphene LLC, USA

Urban environments consume vast amounts of energy yet remain largely passive surfaces with little contribution to generation or storage. This presentation introduces Genostep, a graphene-enhanced, magnetically levitated triboelectric kinetic energy harvesting flooring system, designed to transform everyday human activity into a renewable power source. By integrating Genostep with concrete battery technology, urban infrastructure can evolve into an active energy network capable of producing, storing, and delivering electricity at the point of use.

Genostep operates by converting mechanical motion—footsteps, rolling loads, or vibrations— into electrical energy through triboelectric interactions, with graphene enhancing conductivity and durability while magnetic levitation minimizes friction and wear. Concrete batteries, an emerging class of energy storage materials, embed electrochemical capacity directly into structural concrete, enabling dual-function pavements and foundations that both support and store energy. The coupling of these two innovations creates a self-powered infrastructure system, where energy harvested on-site is immediately stored within the built environment itself.

The talk will examine key performance parameters of Genostep prototypes, including energy output per unit area, material resilience, and integration potential with reinforced concrete.

It will be presented to demonstrate how a single city block, transit hub, or sports arena could offset significant electrical loads by deploying Genostep-concrete battery systems. Beyond technical feasibility, the presentation will explore scalability, cost competitiveness, and the environmental benefits of decentralizing power generation within urban landscapes.

By merging energy harvesting with structural storage, Genostep represents a paradigm shift: transforming sidewalks, plazas, and buildings into renewable energy assets. This integration not only advances sustainable design but also supports the global transition toward resilient, low-carbon smart cities.

Biography

Jacob Cox, MRSC, PhD, is the CEO of Green Graphene LLC and the innovator behind Genostep, a graphene-enhanced, magnetically levitated triboelectric kinetic energy harvesting flooring system. He has almost 20 years of experience in chemistry research and development, with expertise spanning inorganic chemistry, electrochemistry, nanomaterials, and CO_2 reduction and utilization. Jacob has served as a Contractor for the U.S. Department of Defense, a vendor for NASA, and collaborated with the United Nations on deploying sustainable technologies in developing regions. He is a published contributor to Education in Chemistry, Chemistry World, and ACS Chemical & Engineering News, and holds multiple patents in sustainable energy technologies. Jacob is also an elected committee member of the Royal Society of Chemistry Energy Sector, where he contributes to advancing global discussions on energy innovation and sustainability.

Navigating Artificial Intelligence in Modern Workplaces

Anne Rosken

ANED – HSG – PCU, Germany

Artificial intelligence (AI) is gaining a lot of attention due to the rapid dynamics in terms of the development of various tools. In order to overcome the effects, a certain degree of care is required because the new solutions have advantages and disadvantages and the interaction between humans and artificial intelligence in the workplace is not sufficiently clarified. This can result in serious wrong decisions that can have a significant impact on work and employers, especially for those with poor digital skills or people with a health problem. Management is more important than ever. For example, it can decide to what extent AI should be used, which tasks should be taken over by AI tools, and which skills people need to acquire. This research explores fundamental questions of AI in the world of work. Expert interviews according to Meuser/Nagel (2009) are used to answer the main research question: How should AI navigate the modern workplace? Theoretical sampling is used to select the experts and is based on the principles of grounded theory according to Glaser/Strauß (2005). With this strategy, data is collected throughout the process until theoretical saturation is reached. The results presented here come from an ongoing research project and place current results and findings at the center of the lecture.

Biography

Professor of business administration with a focus on: Artificial Intelligence & Work – Health & Work – Leadership – Human Resources Management – Dis-(Ability) Management. Expert in the Academic Network of European Disability Experts (ANED). She also works at the University of St. Gallen and at the Pacific Coast University, Vancouver/Canada. Previously, she was a professor at the University of Hamburg and director and professor at the Carinthia University of Applied Sciences. Anne Rosken is one of the leading experts for Artificial Intelligence & Work as well as Health & Work. She is also a senior consultant, coach and author. She also has many years of leadership and management experience in national and international organizations and projects. www.prof-dr-anne-rosken.co LinkedIn Anne Rosken.

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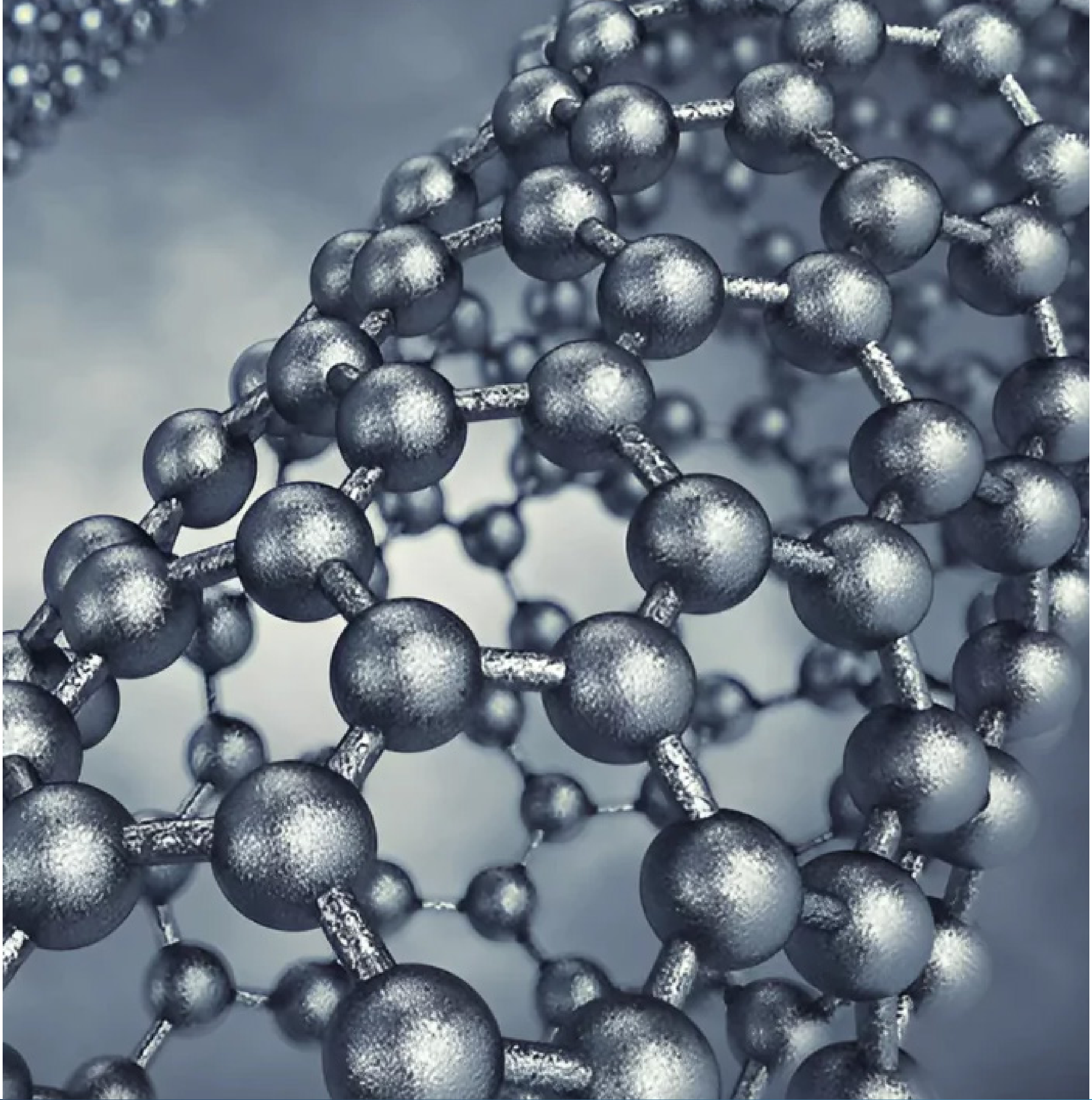

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Top-Down Reverse Engineering of Gold Nanoparticles in a Silica Aerogel Matrix

I. Lázár[1,4], H. J. Csupász-Szabó[1], L. Daróczi[2], B. Döncző[3] and **M. Szarka[3]**

[1]Department of Inorganic and Analytical Chemistry, University of Debrecen, Hungary
[2]Department of Solid State Physics, University of Debrecen, Hungary
[3]Laboratory for Heritage Science, Hungary
[4]Nuclear Astropysics Group, Hungary

Gold nanoparticles are excellent catalists in many chemical reactions, including the catalytic transformation/removal of the environmentally dangerous and persistent chemical 4-nitrophenol (4-NP). In homogeneous solutions, the reduction of 4-NP with sodium hydroborate proceeds smoothly providing the biodegradable chemical 4-aminophenol (4-AP). However, from such a system, the catalyst cannot be recovered and recycled. In addition, releasing metallic nanoparticles into the environment is a source of nanoparticle pollution. Silica aerogels are excellent catalyst supports, chemically neutral and does not affect the catalytic reaction. In this study, the research focused on the immobilization of gold nanoparticles in a silica matrix providing a SiO_2–AuNP aerogel composites, which were synhtesized by the sol-gel process and supercritical CO_2 drying. In the gelation porcess, however, a significant aggregation of the AuNPs occurred without the polymeric stabilizer polyvinyl pyrrolidone (PVP), that preserved the red Au nanoparticles during the gelation process. The aerogel composites synthesized without PVP contained large AuNP aggregates, resulting in a shift of the plasmon resonance color from red to blue or blue-grey. Such composites showed diminished or almost no catalytic activity and proved to be virtually useless for the purpose.

After an observation of the thermal transformation of surface gold nanolayers into gold nanoparticles, the research focused on the development of a thermal thermal top-down reverese engineering/redispersion process, that regenerates catalytically active AuNPs in the solid phase. The aerogels were characterized using SEM, TEM, 3D optical microscopy, UV-Vis and ATR-IR spectroscopy, and N_2 porosimetry, with properties analyzed as a func-

tion of annealing temperature. Their catalytic activity was evaluated through the reduction of 4-nitrophenol with sodium borohydride. The thermal redistribution of large gold clusters into individual Au-nanoparticles provides a new and promising approach for creating catalytically active nanogold-containing aerogel catalysts.

Biography

István Lázár received his M.Sc. in Chemistry in 1984 and his Ph.D. in biologically active boron analogs of amino acids in 1988, both at Lajos Kossuth University (Debrecen, Hungary). He spent two periods as a postdoctoral research associate at The University of Texas at Dallas, USA (1989-91 and 1994). He received a C.Sc degree in the synthesis of new MRI contrast agents in 1994 (Hungarian Academy of Science, Budapest). His research interest shifted to materials science, and he initiated and established the aerogel research facility at the University of Debrecen in 2006. He retired from the Department of Inorganic and Analytical Chemistry in 2025, and continues his research at the Nuclear Research Institute Atomki (Debrecen, Hungary). He was awarded the Hungarian Order of Merit, Knight's Cross in 2020. His actual research involves the synthesis and study of catalytically or photocatalytically active aerogels, and nuclear particle detection with aerogel materials.

Luminescent Solar Concentrators Based on Polymer Optical Fibers Doped with Fluorescent Entities

N. Guarrotxena

Institute of Polymer Science and Technolog (ICTP), Spanish National Research Council (CSIC), Spain

The increase in energy demand and the need to reduce carbon emissions during energy production require technological improvements in the renewable energy field. Photovoltaic technology arises as a promising and rapidly evolved renewable energy; wherein luminescent solar concentrators (LSCs) based on doped polymer optical fibers (POFs) are spectral conversion devices in which the luminophores and lightguides enables the collection, re-emission and transport of solar photons, directing them toward the end of solar cells for light-to-electricity conversion. In this presentation, I will provide an overview of different physico-chemical methodologies of device production at the micro- and nanoscale level, wherein multicomponent systems based on polymer and nanoparticle/dye synergy will play a pivotal role in an effective design of the required properties at their macro level performance. Their potential application as luminescent solar concentrators (LSCs) based on cylindrical polymer optical fibers (POFs) will be stated.

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Biography

N. Guarrotxena is a Research Scientist at the Institute of Polymer Science and Technology (ICTP) of the Spanish National Research Council (CSIC), Spain, an and External Expertise Consultant on I+D+i Management and Policy for National and International Agencies. She was vice director of ICTP-CSIC (2001-2005) and visiting professor at UCSB-USA and UCI-USA (2008-2011 and 2019). Her research focuses on the synthesis and assembly of hybrid nanomaterials, smart nanomaterials and nanogels, nanoplasmonics, and their nano-biotechnology and green energy applications. She has published many papers in reputed journals and has been serving as an editorial board member of repute.

Smart Photoalignment Material: Azodye Nanolayers for Liquid Crystal Devices

Vladimir G. Chigrinov

Hong Kong University of Science and Technology, Hong Kong
Nanjing Jingcui Optical Technology Co., China
Department of Fundamental Physics and Nanotechnology, State University of Education, Russia

Photoalignment and photopatterning has been proposed and studied for a long time [1]. Light is responsible for the delivery of energy as well as phase and polarization information to materials systems. It was shown that photoalignment liquid crystals by azodye nanolayers could provide high quality alignment of molecules in a liquid crystal (LC) cell. Over the past years, a lot of improvements and variations of the photoalignment and photopatterning technology has been made for photonics applications. In particular, the application of this technology to active optical elements in optical signal processing and communications is currently a hot topic in photonics research [2]. Sensors of external electric field, pressure and water and air velocity based on liquid crystal photonics devices can be very helpful for the indicators of the climate change.

We will demonstrate a physical model of photoalignment and photopatterning based on rotational diffusion in solid azodye nanolayers. We will also highlight the new applications of photoalignment and photopatterning in display and photonics such as: (i) fast high resolution LC display devices, such as field sequential color ferroelectric LCD; (ii) LC sensors; (iii) LC lenses; (iv) LC E-paper devices, including electrically and optically rewritable LC E-paper; (v) photo induced semiconductor quantum rods alignment for new LC display applications; (vi)100% polarizers based on photoalignment; (vii) LC smart windows based on photopatterned diffraction structures; (vii) LC antenna elements with a voltage controllable frequency.

Biography

Professor Vladimir G. Chigrinov is Professor of Hong Kong University of Science and Technology since 1999. He is an Expert in Flat Panel Technology in Russia, recognized by the World Technology Evaluation Centre, 1994, and SID Fellow since 2008. He is an author of 6 books, 31 reviews and book chapters, about 317 journal papers, more than 668 Conference presentations, and 121 patents and patent applications including 36 US patents in the field of liquid crystals since 1974. He got Excellent Research Award of HKUST School of Engineering in 2012. He obtained Gold Medal and The Best Award in the Invention & Innovation Awards 2014 held at the Malaysia Technology Expo (MTE) 2014, which was hosted in Kuala Lumpur, Malaysia, on 20-22 Feb 2014. He is a Member of EU Academy of Sciences (EUAS) since July 2017. He got A Slottow Owaki Prize of SID in 2018 http://www.ee.ust.hk/ece.php/enews/detail/660. He is 2019 Distinguished Fellow of IETI (International Engineering and Technology Institute). http://www.ieti.net/news/detail.aspx?id=184 http://www.ieti.net/memberships/Fellows.aspx

Since 2018 he works as Professor in the School of Physics and Optoelectronics Engineering in Foshan University, Foshan, China. 2020-2024 Vice President of Fellow of Institute of Data Science and Artificial Intelligence (IDSAI) Since 2021 distinguished Fellow of Institute of Data Science and Artificial Intelligence.

Mapping the Link Between Environmental Sustainability and Electric Four – Wheelers: A Bibliometric Study

V. Shunmathy and **V. Selvam**

Department of Commerce, School of Social Sciences and Languages (SSL), Vellore Institute of Technology (VIT), India

The objective of this study is to explore and analyze the research landscape connecting electric four-wheelers with environmental sustainability using a comprehensive bibliometric approach. In recent years, electric four-wheelers have emerged as critical components in the global effort to reduce greenhouse gas emissions, improve energy efficiency, and transition toward cleaner, more sustainable transportation systems. This study seeks to assess how academic research has evolved in this area over the past decade, particularly between 2014 and 2024.

To achieve this, a total of 542 research articles were retrieved from the Scopus database, forming the basis of the bibliometric analysis. The study employs specialized tools such as the Bibliometrix R programming package and VOSviewer software to analyze publication trends, keyword co-occurrence, author collaboration networks, institutional and country-level contributions, and influential journals. This methodological framework enables a systematic mapping of the intellectual structure and dynamics of the field.

The objective is to map the intellectual structure of research on the environmental sustainability of electric four-wheelers and identify research trends and emerging areas of research within the nexus of environmental sustainability and electric vehicle adoption and to assess the impact and influence of research by identifying highly cited publications, influential authors, and key research institutions. For instance, the analysis highlights that Tomaszewska A et al. (2019) is the most cited work, while Tsinghua University leads in affiliation-based output. China and Poland have emerged as leading contributors, and journals like Energies are prominent in disseminating research.

By uncovering these patterns, the study aims to contribute to the growing body of knowledge that supports sustainable innovation in the electric vehicle sector. Furthermore, the insights generated can guide researchers, policymakers, and industry stakeholders in identifying gaps, opportunities, and collaborative directions for future work. Ultimately, the study emphasizes the strategic importance of electric four-wheelers in achieving long-term environmental sustainability goals.

Biography

Shunmathy is a Commerce Research Scholar at Vellore Institute of Technology (VIT), Vellore, Tamil Nadu, India. She holds M.Com., M.Phil., and B.Ed. degrees from reputed institutions, reflecting a strong academic background in commerce and education. Her research primarily focuses on marketing, with a growing interest in the role of electric four-wheelers in promoting environmental sustainability. Shunmathy has published research in peer-reviewed journals and actively participates in sustainability conferences and workshops. An internationally recognized champion in Abacus, she showcases her exceptional analytical and cognitive abilities. In addition to her academic work, she is an accomplished artist with a passion for drawing, often using her creativity to enrich her research presentations. Shunmathy aims to bridge the gap between marketing strategies and sustainable practices, contributing to both academia and real-world solutions for a greener future.

Memory Phenomena and Diffusionless Characteristics of Crystallographic Transformations in Shape Memory Alloys

Osman Adiguzel

Department of Physics, Firat University, Turkey

Shape memory alloys take place in a class of advanced smart materials by giving stimulus response to changes in the external conditions. These alloys are adaptive structural materials and exhibit dual memory characteristics, shape memory effect and superelasticity, with the recoverability of two shapes at different conditions. Shape Memory Effect is initiated with thermomechanical treatments on cooling and deformation and performed thermally on heating and cooling, with which shape of the material cycles between original and deformed shapes in reversible way. Therefore, this behavior can be called thermal memory or thermoelasticity. This phenomenon is governed by the thermomechanical and thermoresponsive transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformations occur on cooling with cooperative movement of atoms in <110 > -type directions on a {110} - type plane of austenite matrix, along with lattice twinning and ordered parent phase structures turn into the twinned martensite structures. The twinned structures turn into detwinned martensite structures by means of stress induced martensitic transformations with deformation. Superelasticity is performed by mechanically stressing and releasing in elasticity limit at a constant temperature in the parent phase region, and material recovers the original shape upon releasing, by exhibiting elastic material behavior. Superelasticity is also result of stress induced martensitic transformation, and the ordered parent phase structures turn into the detwinned martensite structures with stressing. However, lattice twinning and detwinning reactions play important role in martensitic transformations. Also, these reactions are driven by inhomogeneous lattice invariant shears. These alloys are functional materials with these properties and used in many fields from biomedical application to the building industry. Copper based alloys exhibit this property in metastable beta-phase region. Lattice twinning and lattice

invariant shear are not uniform in these alloys and cause the formation of complex layered structures.

In the present contribution, x-ray and electron diffraction studies were carried out on copper based CuAlMn and CuZnAl alloys. X-ray diffraction profiles and electron diffraction patterns exhibit super lattice reflections. Critical transformation temperatures of these alloys are over room temperature. The specimens were aged at room temperature and, taken a series of x-ray diagram during aging. X-ray diffractograms taken in a long-time interval show that diffraction angles and intensities of diffraction peaks change with the aging duration at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 230 online conferences in the same way in pandemic period of 2020-2024. He supervised 5 PhD- theses and 3 M. Sc- theses. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

Atmospheric River Detection- A Survey on Deep Learning and Quantum Neural Networks

Sivachitralakshmi, Chitra P and **Bharathi S**

Department of Computer Science and Engineering (E Tech), SRM Institute of Science and Technology, India

Atmospheric rivers (ARs) represent narrow corridors that facilitate the predominant poleward transportation of water vapor in the mid latitudes. These corridors exhibit notable features such as elevated water vapor levels and robust lower-level winds, playing a role in the expansive warm conveyor belt associated with extratropical cyclones. The meridional movement of water vapor within ARs holds significant importance for water reserves, yet their interaction with mountainous regions can lead to severe flooding events. Quantum neural networks are an emerging field combining quantum computing with artificial neural networks. The idea is that the computational advantage of quantum computing could potentially improve the performance of neural networks including those used for the complex task of atmospheric river detection.

Biography

Sivachitralakshmi. S is a researcher doing her research in SRM Institute of Science and Technology, Chennai, India on “Atmospheric River Detection Using Quantum Neural Networks.

She is a Highly motivated Quantum Computing Researcher with expertise in quantum algorithms and Quantum Machine Learning.

She published a few papers on Atmospheric river detection and on VANET technologies.

She also working on Quantum Image Processing algorithms in Quantum Computer Vision during her research period.

She have received the Quantum Excellence batch in IBM Summer school 2024

She presenting her research work on “Quantum Keypoint extraction and Matching on Autonomous Vehicles” in BMW Summer school,2025.

Reducing Bacterial Adhesion on 304 Stainless Steel Surface by Nd-YAG Laser Irradiation

Sahar Sohrabi

Iran University of Science and Technology, Iran

Increasing the antibiotic-resistant bacteria and bacterial adhesion and grow on the surface of medical devices, leads to several problems such as increasing the cost of patient treatment and even increasing the death rate following bacterial infections discussions. Nowadays, antibacterial surfaces fabrication is in interest of scientists. There are many parameters influencing bacterial attachment to a surface including surface topography, morphology and wettability. Controllable micro/nano scale structures can be induced on a surface following laser irradiation of the sample. These structures can change the wettability, morphology and topography and as a result, bacterial adhesion rate of the surface. On the other hand, surface nanotexturing is considered as a new efficient strategy for antibacterial surfaces fabrication.

Stainless steel is a widely used in many medical applications such as implants, bone fixation, needles and syringes, sensor probes and so on. Therefore, antibacterial stainless steel fabrication is essential. In this presentation, effect of an Nd-YAG laser irradiation (as a cost-effective laser) on the morphology, wettability, roughness and bacterial adhesion rate on the surface of a 304 stainless steel is investigated. The results show that following laser irradiation, nanostructures formed on the surface. These structures change the surface to superhydrophilic one and reduce the bacterial adhesion rate. Therefore, a simple, cost-effective approach for antibacterial stainless steel fabrication using nanosecond laser irradiation, without using chemical agents is presented.

Biography

Sahar Sohrabi was born in Iran. She received the B.S (2015), M.S (2017) and PhD (2024) degree in atomic and molecular physics from Iran University of Science and Technology.

Her current research interests include laser-material interaction, laser induced surface phenomena and lasers in medicine and biology.

Energy-Efficient Approximate Arithmetic Circuit Design for Power Hungry Applications

Joshi Viraj Vilas Alias
Sinhgad Institute of Technology, Pune University, India

The impetus for approximate computing is propelled by two pivotal factors: a fundamental transformation in the nature of computing workloads and the imperative for novel sources of efficiency. Other than that, as the scaling of silicon devices has approached its saturation point, the enhancement of circuit efficiency through approximate computing emerges as the most viable solution. A burgeoning array of applications is meticulously crafted to accommodate "noisy" real-world inputs, employing statistical or probabilistic methodologies. These computational approaches endeavor to yield results that most closely align with established standards, diverging from traditional paradigms that necessitate precise answers. Such computations furnish results of acceptable quality, prioritizing efficacy over perfection.

An approximation is typically introduced either during construction, at the logical level, or within the hardware description of arbitrary circuits. When approximation is introduced at software level, better energy or power efficient system is realized.

AC encompasses a diverse array of applications, ranging from data processing and filtering to neural networks, as well as extensive big data applications and sophisticated image processing.

The first is the algorithmic level, where the fundamental algorithm remains unaltered, either by modifying the inputs or adjusting the hyperparameters favored in machine learning, a process known as meta-learning. The second approach pertains to the application level, wherein the algorithms themselves are transformed to achieve a desired degree of approximation. Loop perforation serves as a pertinent example, wherein the management of loop iterations is dictated by the user. The third approach operates at the architectural level, where approximation is realized through modifications in the instruction set, ensuring error resilience is bounded for each instruction. The final approach is concerned with the circuit level, specifically related to hardware circuits. Consequently, a substantial body of work exists regarding adders and multipliers, categorized into deterministic and non-deterministic types.

Biography

Miss. Joshi possesses a cumulative 22 years of experience in both industry and academia. She earned her master's degree in VLSI Design and a Ph.D. in Microelectronics from the EEE Department at BITS Pilani K.K. Birla, Goa Campus. Currently, she is affiliated with the Sinhgad Institute of Technology, Lonavala, under Pune University.

BITS Pilani, K.K. Birla, Goa Campus, EEE Department, and SIT, Lonavala's Department of E&TC are nationally renowned for their pioneering research and innovative pedagogical approaches.

She has authored four publications in Scopus-indexed journals and ten in international journals, in addition to contributing to twenty plus publications presented at international and national conferences. Furthermore, she holds four copyrights and has filed two patents.

Miss. Joshi is a partner in a consultancy firm named Aakrutii Technology, located in Pune, India. She has organized and conducted over twenty plus project-based learning hands-on programs for Pune University's students.

Additionally, she was a participant in the European Commission (EU) Fellowship for researchers, serving as a full-time research scholar at the University of Tor Vergata, Rome, Italy, for six months (August 2010 to February 2011). Beyond her academic pursuits, she is a certified trainer of astrology at Pune University. Her hobbies include singing, acting, and cooking.

Existence of Solutions for a Class of Dirichlet Problems Involving Fractional (p,q)-Laplacian Operators

Hasna Moujani[1], **Ali El Mfadel**[2], **Abderrazak Kassidi**[3] and **M'hamed Elomari**[4]

[1,3,4] Laboratory LMACS, Faculty of Sciences and Techniques, Sultan Moulay Slimane University, Morocco

[2]Superior School of Technology, Sultan Moulay Slimane University, Morocco

This manuscript focuses on establishing the existence of weak solutions for a nonlocal elliptic problem governed by a fractional double-phase operator, under Dirichlet boundary conditions. The existence results are obtained by combining the Galerkin approximation, Lebesgue and Sobolev spaces, the Young measures approach, and the assumption of growth conditions on a given datum g. Our results expand upon and broaden several recent studies in this area of literature.

Biography

Hasna Moujani is a PhD student at the aboratory of Applied Mathematics and Scientific Computing, Faculty of Sciences and Techniques, Sultan Moulay Slimane University in Beni Mellal, Morocco. She holds a Master's degree in *Science and Technology Mathematical Engineering and Applications* and a Bachelor's degree in the same field, both from the same institution. Her research focuses on the analysis of elliptic and parabolic problems, with a particular interest in fractional operators and double-phase operators across various functional spaces. In addition to her academic research, Hasna is also a mathematics teacher at the middle school level, combining practical teaching experience with theoretical investigations. She is committed to contributing to the advancement of mathematical analysis and its applications in complex systems.

Incorporating Graphene-Based Nanocomposites along with Self- Healing Polymers for Civil Infrastructure as Smart Structural Applications

Aditya Singh
Amrita Vishwa Vidyapeetham, India

In the case of smart infrastructure systems, the combination of graphene-based nanocomposites with self-healing polymers particularly in the case of aging civil structures which often experience environmental conditions that are harsh in nature along with dynamic loads, could gain transformative opportunity. When taking steel and concrete structures into consideration, conventional maintenance strategies are not only time consuming, but also costly and reactive in nature. This study will discuss a novel composite system which is multi-functional in nature, and this system integrates graphene nanosheets which are implanted on self-healing polymer matrices, with the target to sense freely the occurred micro cracks as well as start healing them at the molecular level without the assistance of external interference. Then, the creation of graphene improved polymer networks with natural healing abilities which could be activated through moisture or heat which are counted as environmental stimuli. In self-healing system, graphene offers excellent thermal stability, electrical conductivity, in addition to mechanical strength, which considerably enhances durability as well as responsiveness. Then, developing implanted sensor systems which use graphene's conductive nature, permits monitoring of damage start as well as repair cycles in real-time. The study will also discuss where it could be applied in the real world, like high-rise structures, bridges, pavements, tunnels, and so on, where not only sustainability but long-term performance are essential. The gaps in the current literature will be covered and graphical analysis will be performed to understand the future of this composite system. This study not only offers intelligent material solutions but also sustainable ones to decrease the lifecycle costs, improve the resilience of structures, as well as sides with international goals for smart infrastructure and green construction. It will further converge civil engineering, with smart materials and nanotechnology, which can be considered as a considerable advancement for the future.

Biography

Er. Aditya Singh is an Independent Researcher, Editorial Review Board Member in 6 American International Journals (IJSSMET, IJSDS, IJPAEI, IJESGT, IJDSST, IJRLEDM), Reviewer in 8 American, 4 Singaporean & 1 Indonesian International Journals (IJUPSC, IJCVIP, IRMJ, JTA, IJAIBM, IJCEWM, JITR, IJSSSP, JDSIS, AAES, JCCE, SWT, & IJEECS) these 19 International Journals include some Scopus & WoS indexed ones, Mentor (Research) at Academy Innova World, Kalipur, India & Ex-Alumni Mentor (LPU) at present. He had completed his regular B. Tech degree in Civil Engineering from Lovely Professional University, India, in 2020. He is currently affiliated with Amrita Vishwa Vidyapeetham, Coimbatore, India. He has 30 publications under his name, in which he is a single author in 21 of them, whereas in 6 of them he is the main author. Most of his publications are Indexed in Scopus. He had also worked as a Reviewer/Editorial Review Board Member for 150 times in the evaluation of manuscripts so far in Conferences, Research Books and Journals of International stature. His global presence as a professional could also be seen with 25 Paper Presentations in 22 Conferences in 9 countries (Thailand, Sri Lanka, Egypt, India, Cambodia, Bangladesh, Turkey, United Kingdom, & Germany); as well as his position as Program Committee Member, and Scientific Committee Member in International Conferences, and Reviewer in total 8 International Conferences (including countries Thailand, Cambodia, USA, India, and UK), and Keynote Speaker in Faculty Development Programme, and so on. He had also won 2 International Awards((Thailand) & (Cambodia)) as a Reviewer in 2023. He had worked on 52 positions so far in his professional career, including positions in Journals, Conferences, Research Books of International stature.

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Modeling and Forecasting of Solar Power Plant Energy Production *via* Machine Learning: A Comparative Approach

Lakhdari Lahcen

Laboratory of Control Analysis and Optimization of the Electro-Energetic Systems (CAOSEE), Tahri Mohammed Bechar University, Algeria

This study focuses on the prediction of solar power plant energy production through a comparative evaluation of various machine learning algorithms. The primary goal is to determine which models deliver the most accurate and consistent forecasts by analyzing their performance on a real-world dataset. The dataset integrates several meteorological and environmental parameters, including distance to solar noon, temperature, wind direction and speed, sky cover, visibility, humidity, average wind speed over a given period, average atmospheric pressure, and recorded solar energy output.

To assess the predictive capabilities of each algorithm, both regression and classification approaches were explored. Regression models were evaluated using performance indicators such as Mean Squared Error (MSE) and the coefficient of determination (R^2), while classification-based predictions were assessed with metrics including accuracy, precision, recall, and F1 score. This dual analysis offers a richer understanding of each model's ability to generalize and adapt to the variability of solar energy production.

In addition to the numerical results, the study presents visual comparisons through bar charts, enabling a straightforward interpretation of the performance differences among the models. This graphical analysis helps highlight the strengths and weaknesses of each algorithm, providing valuable insights for future applications in renewable energy forecasting.

Ultimately, this research contributes to the optimization of solar energy systems by identifying robust and efficient predictive models, thereby supporting better integration of solar power into energy management strategies.

Biography

Lakhdari Lahcen is a university research teacher at Tahri Mohamed University of Béchar (Algeria) and a member of the Laboratory for Analysis and Optimization of Control of Electro- Energetic Systems (CAOSEE). He specializes in industrial automation and computer engineering, with a research focus on artificial intelligence applied to industrial systems. His areas of interest include the application of machine learning techniques in energy production forecasting, predictive maintenance, and intelligent automation. He actively contributes to research and teaching projects aimed at integrating AI approaches into complex systems and promoting their use in the context of energy transition and Industry 4.0.

Utilizing Non-Convex Optimization for SC-OPF Under N-1 Contingency in a IEEE 9-Bus System

Chaitanya[1] and **Bhavika Sood**[2]

[1]Indian Institute of Management, India
[2]The State University of New York, USA

The intention of the paper was to imitate a practical power system N-1 contingency scenario, wherein one component of the network gets excluded from the system due to an unprecedented situation. A modified IEEE 9 Bus system was modelled in the MATLAB environment, with 3 generators in total. Each generator has a different cost fuel characteristic, hence, establishing an aggregate cost-fuel characteristic of the network as a non convex function. When one of the generators experiences a fault, it gets out of the network, which leads to the model operating on just 2 servers. Exclusion of 1 generator from the system creates a situation of N-1 contingency. Also, it becomes essential to ensure that the system operates within healthy electrical limits, like power angle, per unit voltage, etc. Therefore, the operating cost of the system is optimized taking into consideration the constraints of electrical limits as mentioned above. For executing the optimization process, certain specific MATLAB functions are used to find the optimum point of operation. Results are presented graphically, and the cost of operation in a contingency scenario is higher than the normal cost of operation, which justifies the trade off between cost and reliability of the power system network in unexpected circumstances. This practical simulation supports the relevance of SC-OPF in managing system resilience. The study reinforces that even under constrained conditions, stable and secure system operation can be maintained through robust optimization techniques.

Biography

Chaitanya is currently pursuing Masters in Business Administration from Indian Institute of Management, Lucknow. He has 11 months of experience working in KPMG, wherein he carried out software license compliance checks as per the substance of the project. He has pursued his Bachelor of Engineering in Electrical and Electronics Engineering from Panjab University, Chandigarh, in 2024. His primary interest area for research is regulatory mechanisms for negative emissions.

Bhavika Sood is currently pursuing a Master of Science in Engineering Science at The State University of New York, Buffalo, New York, USA. She pursued her Bachelor of Engineering in Electrical and Electronics Engineering from Panjab University, Chandigarh, in 2024. Her research interests lie in the fields of engineering and technology, with a focus on innovative applications and sustainable solutions. With a strong academic foundation and a passion for engineering, Bhavika aims to contribute to advancements in her field through her research and professional endeavors.

Antimicrobial Activity of Fe_3O_4 and Au@Fe_3O_4 Nanoparticles Against *Salmonella Typhimurium*: *In vitro* Efficacy and in Silico Validation Through Protein–Aptamer Interactions

Chandrajeet Dhara[1] and **Chikesh Mishra**[2]

[1]Department of Biotechnology, Jaypee Institute of Information Technology, India
[2]KIIT School of Biotechnology, India

The global crisis of antimicrobial resistance (AMR) underscores the urgent need to develop novel antimicrobial strategies. Metal and metal oxide nanoparticles have gained attention for their unique physicochemical properties, such as high surface area, reactivity, and tunable functionalization, which contribute to their antimicrobial potential. Iron oxide nanoparticles (Fe3O4) have garnered significant attention due to their ROS generation, biocompatibility, magnetic properties, and potential antibacterial effects. However, their intrinsic antibacterial activity is often limited due to factors such as nanoparticle aggregation and insufficient surface reactivity. Various strategies have been explored to enhance their antimicrobial potential, including surface modification. Coating Fe_3O_4 nanoparticles with noble metals such as gold (Au) has been shown to significantly enhance their antimicrobial properties by improving stability and bio-interaction. The protein aptamer gets docked with the SopE surface protein of S. *typhimurium*, which shows the efficacy of binding the DNA aptamer on the nanoparticles. The combination of magnetic properties from Fe_3O_4 and the antimicrobial efficacy of Au offers a promising platform for developing multifunctional materials. *Salmonella typhimurium* is a major foodborne pathogen responsible for significant morbidity and mortality worldwide. The development of effective strategies to combat these infections is crucial for public health. The purpose of this study is to manufacture and analyze Fe_3O_4 and Au@Fe_3O_4 nanoparticles, as well as to assess their antibacterial activity against *Salmonella* spp.

The findings support the potential of Au@Fe_3O_4 nanostructures as effective agents against antibiotic-resistant pathogens.

Biography

Chandrajeet Dhara is an emerging Indian biotechnologist, research scholar, and author known for his work in cancer genetics, nanotechnology, and medical immunology. He completed his schooling at St. Thomas' School, Dwarka, pursued a B.Tech in Biotechnology at Apeejay Stya University, and was selected to conduct his final dissertation at the ICMR-NICPR (National Institute of Cancer Prevention and Research) in Bioinformatics. And, currently pursuing his M.Tech in Biotechnology from JIIT, Noida. Dhara is a member of several international scientific societies, including the American Association for Cancer Research, and regularly publishes research articles in reputed Scopus-indexed journals. He has served as a peer reviewer for journals such as Cureus from Springer Nature Group and is involved in scientific outreach and mentoring.

Achieving Cost Efficiency in Cloud Data Centers through Model-Free Q-Learning

Razieh Darshi[1], Parisa Mohammadi[1], Ali Akbar Nasiri[2], Arman Shirzad[3] and **Razieh Abdollahipour[4]**

[1]Iran University of Science and Technology, Iran
[2]University of Tabriz, Iran
[3]University of Science and Culture, Iran
[4]Leibniz Institute for Agricultural Eng. & Bioeconomy (ATB), Germany

Cloud computing data centers play a critical role in storing, processing, and accessing vast amounts of digital information. They are essential infrastructures that support modern businesses, scientific research, communication networks, and various online services relying on reliable and efficient data management. However, their substantial energy consumption poses challenges in terms of operational costs and environmental sustainability. As a result, this paper investigates the utilization of distributed energy resources such as photovoltaics and wind turbines to reduce reliance on fossil fuels and achieve sustainability goals. Due to the intermittent and stochastic nature of these energy resources, traditional model-based methods are insufficient. Therefore, we propose a novel model-free Q-learning approach to address the challenges and ensure reliable and consistent power supply within data center operations. In the proposed structure, producers and consumers are modeled as autonomous agents within a multi-agent framework, making decisions to maximize their rewards. This paper addresses the hour-ahead energy scheduling problem using this approach, aiming to effectively manage the data center's load demand and optimize distributed energy resources. By formulating the problem as a Markov Decision Process (MDP) and employing Q-learning, our study demonstrates increased energy producer profits and reduced data center costs. Finally, the proposed method is validated through simulation using real-world power datasets.

Biography

Razieh Darshi received the B.S. and M.S. degrees from the Electrical and Computer Engineering School, Shiraz University, Iran, in 2012 and 2015, respectively, and the Ph.D. degree in electrical engineering-control from Iran University of Science and Technology, Iran, in 2024. Her main research interests include artificial intelligence, reinforcement learning, and energy management systems.

Sustainable Agriculture Systems Transformed: The Role of Drones in Enhancing Precision, Safety and Efficiency

Syeda Faiza Nasim[1], **Umm-e-Kulsoom**[2] and **Syeda Alishba Fatima**[3]

[1]UIT University, Pakistan
[2]IQRA University, Pakistan
[3]NED University of Engineering & Technology, Pakistan

Our paper provides a comprehensive overview of the revolutionary role drones have in agriculture, making a significant contribution to the scientific discourse. The study highlights how data-driven decision-making, accuracy, and efficiency from drones can solve significant agricultural problems and enhance farming operations. Important farming chores are covered in detail, including soil quality assessment, pest management, livestock monitoring, and precision planting. The review focuses on how vehicle-to-vehicle communication (V2V) and Unmanned Aerial Vehicle (UAV) detection technologies can improve safety and operational efficacy in agricultural drone applications. A thorough analysis of different detection methods, including passive radio frequency (RF), radar, computer vision, acoustic, and computer vision, emphasizes the significance of adaptable and comprehensive detection systems. The study highlights the revolutionary potential of drone-to-drone and vehicle-to-vehicle (V2V) communication while illuminating several Unmanned Aerial Vehicle (UAV) applications in agriculture. The systematic study concludes by suggesting future research priorities to assure a promising era of efficiency and safety in sustainable agricultural drone technology. These objectives centre on enhancing security measures, streamlining communication protocols, and lowering dependency on the Global Navigation Satellite System (GNSS).

Table 1: provides insights of numerous applications and limitations of various UAV architectures for a variety of purposes.

Tested UAV	Objective	UAV Architecture	UAV Type	Crop	Limitation
DJI Matrice 100 UAV (RGB-Sensor)	Monitoring vegetation state	Single UAV	Rotary-Wing	Winter wheat	• Cannot used to spray. (Due to lightweight) • Cannot detect pesticide. • Cannot detect Water temperature. (Because of not using Multispectral Sensor) • Cannot detect crop damage assessment. (Because of not using Thermal Sensor)
Mikrokopter Hexa-II (Multispectral Sensor)	Monitoring vegetation state	Single UAV	Rotary-Wing	Vineyard	• Cannot use to spray. (Due to lightweight) • Cannot detect Water source. • Cannot detect Livestock. • Cannot detect Water temperature. (Because of not using Thermal Sensor)
Mikrokopter Okto XL	Evaluating water stress	Single UAV	Rotary-Wing	Vineyard	• Cannot use to spray. (Due to lightweight) • Cannot detect crop damage. (Because of not using Thermal Sensor)
Skywalker X	Optimizing the image acquisition system of UAV	Single UAV	Fixed-Wing	• Potato • Grapes • Asparagus • Sugar cane	• Cannot use to spray. (Due to lightweight)
Merak UAVs	Optimizing spraying process proposing an innovative path planning algorithm	Multiple UAVs	Rotary-Wing	Any crop	• Cannot detect pesticide. • Cannot detect Water temperature. (Because of not using Multispectral Sensor) • Cannot detect crop damage assessment. • Cannot detect Livestock. (Because of not using Thermal Sensor)

Biography

Syeda Faiza Nasim is a PhD scholar in Computer Science at NED University of Engineering & Technology. Her academic foundation includes a bachelor's in software engineering and a master's in computer science. Currently, she is a lecturer at UIT University and served at various academic institutions. With a deep passion for teaching, she aims to inspire and engage students in meaningful learning. Alongside teaching, she actively pursues research, with more than 13 publications in recognized journals and conference proceedings. Her primary research interests lie in artificial intelligence and machine learning, with a particular emphasis on their applications in agricultural sustainability and environmental technologies. She has presented her work at over seven international conferences, contributing insights into computational methods and data integrity. She remains committed to using technology for sustainable innovation and aim to make valuable contributions to both academia and the broader tech industry. For more details, visit: https://www.linkedin.com/in/syeda-faiza-nasim-b8875b136

Enhancing Charging Station Power Profiles: A Deep Learning Approach to Predicting Electric Vehicle Charging Demand

Youssef OUKHOUYA ALI[1], **Jamila EL HAINI**[2], **Mohamed ERRACHIDI**[3] and **Omar KABOURI**[4]

[1,2]Department of Engineering, Systems and Applications Laboratory, National School of Applied Sciences, University Sidi Mohamed Ben Abdellah, Morocco
[3]Modeling and Mathematical Structures Laboratory, Faculty of Science and Technology, University Sidi Mohamed Ben Abdellah, Morocco
[4]Laboratory of Intelligent Systems, Geo-resources and Renewable Energies, Faculty of Science and Technology, University Sidi Mohamed Ben Abdellah, Morocco

The transportation sector is a primary driver of rising fuel consumption and greenhouse gas (GHG) emissions. Electric vehicles (EVs) are considered a promising solution to these environmental issues. However, due to variances in charging demands, widespread EV adoption may pose problems to the distribution network's reliability. Numerous methods are employed to forecast EV charging demand to overcome these difficulties. This study evaluates the performance of four well-known deep learning models—artificial neural networks (ANN), recurrent neural networks (RNNs), long short-term memory (LSTM), and gated recurrent units (GRUs)—in forecasting the charging demand for EV customers once a charging session begins. Additionally, the paper proposes a two-layer charging station energy management system aimed at smoothing the power profile of a charging station with high power demands by integrating solar energy from photovoltaic (PV) panels. According to the findings, the GRU regression method demonstrates a slight advantage over the remaining three models in predicting power charging requirements. Notably, the GRU regression model exhibits the lowest Mean Absolute Error (MAE) of 2.6391. These results hold the potential to aid Moroccan authorities in enhancing the dependability of the grid utility in the near term and providing guidance for the strategic expansion of charging infrastructure in the long term.

Biography

Youssef OUKHOUYA ALI is a Ph.D. student and is a member of the Engineering, Systems, and Applications Laboratory (LISA) at the National School of Applied Sciences in Fez, Morocco. He holds a Master's degree in Energy Engineering from the Faculty of Sciences and Technology at the University Abdelmalek Essaadi in Tangier, Morocco. His research focuses on renewable energy, particularly photovoltaic and wind systems, electric vehicles, and energy management systems.

Youssef is particularly interested in the optimization of energy management in electric vehicle charging stations, exploring various charging station designs and strategies to enhance efficiency and sustainability.

Dr. EL HAINI Jamila, Research Professor of Mechanical Energetic Engineering, National School of Applied Sciences, University Sidi Mohamed Ben Abdellah, Fez

Dr. EL HAINI Jamila is a Research Professor specializing in predictive maintenance, mechanical impact analysis, and the development of electric and hydrogen vehicles. Dr. El haini earned their Ph.D. in Mechanical Energetic Engineering in 2016 and has since been at the forefront of innovation in sustainable transportation, advanced mechanical systems and energy efficiency.

Dr. El haini's research focuses on designing robust predictive maintenance algorithms to enhance the reliability and efficiency of industrial systems and next-generation vehicles, and maximizing energy efficiency and reliability in electric and hydrogen-powered transport. Their work bridges fundamental research with real-world applications, making a strong impact in the fields of automotive engineering, renewable energy, and sustainable technologies.

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Community Engagement in Slum Upgrading and Maintenance: A Case Study of the Kambi Moto Project in Huruma, Kenya

Susan N. Kibue, Josephine W. Muchogu, Brenda M. Bhoyyo, Josephine Wairimu, Sarah Mwende Musau, Carolyne Wanza and **Kathy Kibowen**

Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya

Due to socio-economic challenges, many individuals flock to urban areas across Kenya seeking employment opportunities and a better lifestyle, with a large number of them end up as slum dwellers. Currently, over 60% of Nairobi's population resides in informal settlements. This paper recounts the success story of a determined community initiative in upgrading of their own informal settlement. The residents of Kambi Moto lived in appalling conditions in dwellings made of flimsy residual materials, prone to frequent fires and destruction, especially during the heavy rain seasons. Lack of basic infrastructure and sanitation exposed them to health challenges.

The community effectively rallied and mobilised its members (community leaders, women, youth leaders) through focus group discussions (FGDs) to understand the challenges faced and mitigation measures that would result in improved living conditions. Through strong community ties, they effectively mobilised resources for construction through daily savings from informal businesses. Strong advocacy enabled them to engage key stakeholders such as local authorities, institutions of higher learning, and Slum Dwellers International (SDI) to leverage the support they needed to realize their dream of having decent houses. Through engagement with SDI (India), they adopted a modular construction system that enabled them to build homes for 84 households.

Subsequent Post Occupancy Evaluation (POE) and Perception studies established that most of the residents were very satisfied with their upgraded homes. Through benchmarking and the acquisition of new construction skills, community members have supported other communities and individuals in constructing their homes. This entrepreneurship has given them job opportunities and an improved quality of life. Involvement of the community by local authorities is key in the provision of affordable housing and other infrastructure projects.

Biography

Dr. Kibue has worked for over 30 years, as a Senior Lecturer at the Department of Architecture in the School of Architecture and Building Sciences at the Jomo Kenyatta University of Agriculture and Technology, where she has taught undergraduate and postgraduate courses.

She has been a Validation Panellist at the Commonwealth Association of Architects (CAA), and a member of the International Union of Architects., She has taken part in the validation of Architecture courses in various schools of Architecture in Africa, Asia and the Caribbean Islands. She has also been an external examiner at Makerere University in Uganda, Ardhi University in Tanzania, and at the Polytechnic of Namibia.

With co-researchers a Post Occupancy Evaluation study on both formal and informal low- cost housing initiatives in Nairobi was done. This includes documentation and supporting informal communities in their initiatives of improving their housing, through engaging university faculty and students in the design process.

Comparative Evaluation of Pretreatment Methods for Valorising Hemp Hurds as a Lignocellulose Biomass for Bio-Based Products

Ziningi Myeni[1], **Gumede Sani**[2], **Farai Dziike**[3] and **Nirmala Deenadayalu**[4]

[1,3,4]Durban University of Technology, South Africa
[2]Technology Innovation Agency, South Africa

Hemp hurds, a waste product from hemp processing, represent lignocellulose biomass (LB) as raw material for valuable bio-based material production. However, the complex structure of LB, comprising mainly of cellulose, hemicellulose and lignin, restricts its application. This necessitates a need for pretreatment, to disrupt the rigid and complex structure of LB and facilitate downstream processing for biomaterial production. This study investigates the structural and compositional changes in LB subjected to four different pretreatment methods: (1) acid pretreatment with 2% sulphuric acid, (2) organic solvent pretreatment using 60% ethanol, (3) a combined oxidative-alkaline pretreatment using hydrogen peroxide and ammonia, and (4) ultrasound-assisted alkaline pretreatment with sodium hydroxide at 60% amplitude. The effectiveness of each method was evaluated through X-ray diffraction (XRD) analysis, sugar yield quantification, thermogravimetry (TGA), scanning microscopy (SEM) and morphological assessment.

Among the pretreatment methods, sulphuric acid treatment consistently showed best results across all analytical criteria. XRD study indicated an enhancement in crystallinity, whereas sugar yield assessments validated optimal saccharification efficiency. SEM pictures demonstrated an altered structure, facilitating enzyme accessibility, while TGA data verified enhanced thermal stability and compositional purity. The results combined demonstrate that sulphuric acid pretreatment is the most efficacious method for converting hemp hurds biomass for subsequent applications.

This comparative study highlights the crucial role of pretreatment in converting hemp hurds from agricultural waste into useful feedstock for biobased products applications. The insights revealed, facilitate the development of tailored, sustainable processing pathways for the production of bio-based products within a circular bioeconomy model.

Biography

Ziningi Myeni is a research scientist specialising in Analytical Chemistry at the Technology Innovation Agency, operating under South Africa's Department of Science, Technology and Innovation. Her current research focus lies in the development of sustainable technologies that contribute to the circular bioeconomy, with emphasis on green methods for agricultural waste beneficiation.

Ziningi plays an active role in technology transfer, skills development, and community-focused initiatives that bridge scientific innovation with rural development. She is passionate about applying scientific research to create real-world solutions, especially in reducing agricultural waste and promoting environmentally responsible practices. Her work supports national innovation strategies and has been presented in academic journals and industry platforms. She is committed to leveraging science for sustainable impact, particularly in communities where waste can be transformed into opportunities for economic and social growth.

A Novel High-Performance Two-Input NOR Logic Gate Based on OPE Molecular Transistor

Masoumeh Tirgar Fakheri[1], **Mohammad A. Tehrani**[2] and **Keivan Navi**[3]

[1,2]Nanotechnology and Quantum Computing Lab., Khatam University, Iran
[3]Department of Computer Science, California State Polytechnic University Pomona, USA

This presentation introduces an innovative approach to designing a high-performance two-input NOR logic gate utilizing a molecular field-effect transistor based on oligo (phenylene ethynylene) (OPE) molecules. Leveraging a dual-gate transistor configuration, this design harnesses the superior electronic properties of OPE molecules to achieve nanoscale dimensions, low power consumption, and enhanced performance. Simulations conducted using Density Functional Theory (DFT) and Non-Equilibrium Green's Function (NEGF) methods demonstrate remarkable current-voltage characteristics and high efficiency of the proposed NOR gate. Compared to conventional CMOS and FinFET technologies, the proposed gate achieves a 99% reduction in propagation delay and at least a 25% improvement in Power Delay Product (PDP). The presentation will detail the transistor design, simulation results, and comparisons with existing technologies, highlighting the potential of this approach for future nanoelectronic applications.

Biography

Dr. Masoumeh Tirgar Fakheri, is a nanoelectronics researcher at Khatam University, holding a Ph.D. in Computer Engineering (Computer Architecture) from Islamic Azad University, Central Tehran Branch, Tehran, Iran. Her research centers on molecular transistors and nanoscale logic circuit design, offering innovative solutions to nanotechnology challenges. She has published one paper in the prestigious "*IEEE Transactions on Electron Devices*", two in "*Journal of Computational Electronics*", and have a submission under review in "*IEEE Transactions on Nanotechnology*". These achievements reflect her commitment to advancing low-power, high-speed circuit designs at the molecular scale. At this conference, she will present an innovative two-input NOR logic gate based on an OPE molecular transistor, achieving a 99% reduction in propagation delay and a 25% improvement in Power Delay Product. This work marks a significant step toward future nanoelectronic systems, and She aim to inspire further innovation in this field.

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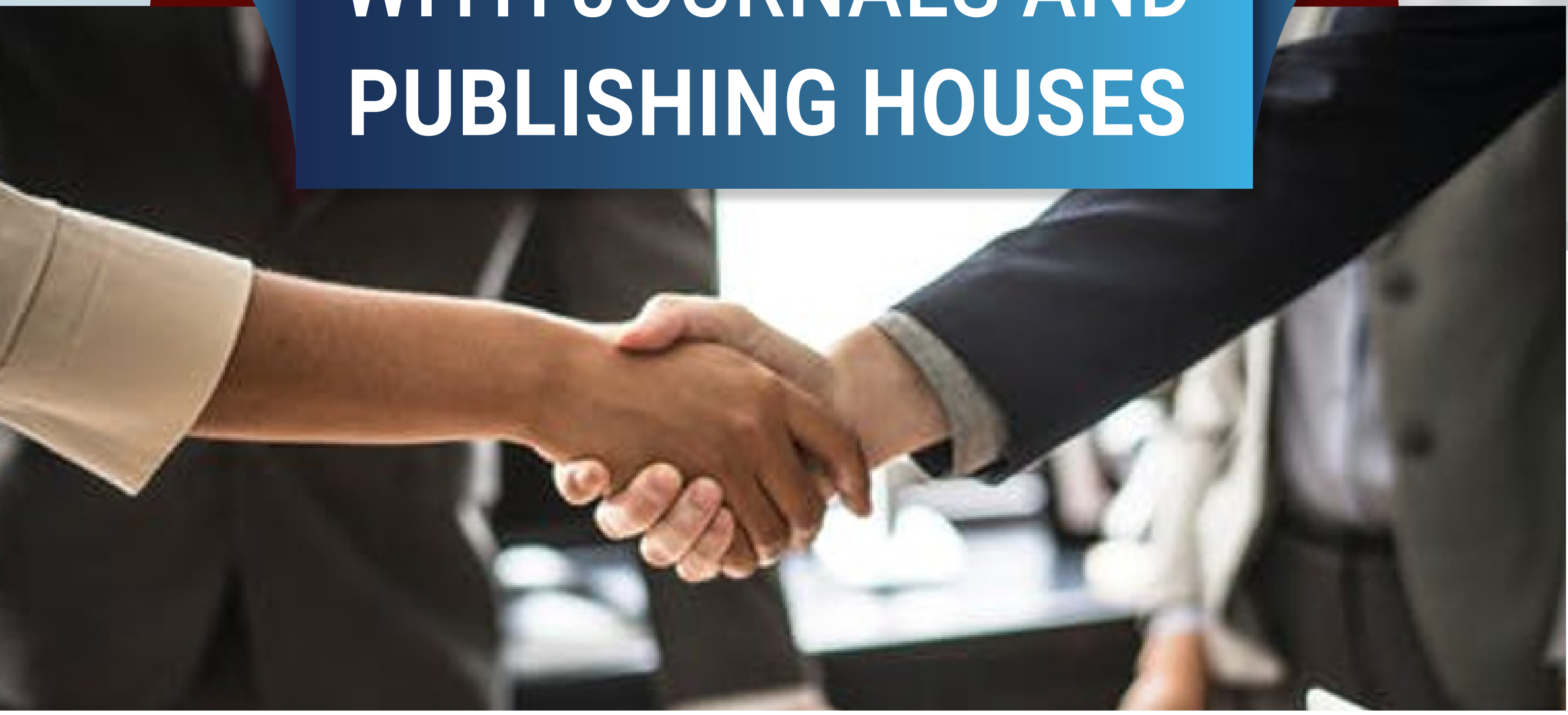

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