PEERS ALLEY MEDIA

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GLOBAL CONCLAVE ON

ADVANCED PHYSICS; APPLICATIONS AND SCIENTIFIC INNOVATIONS

September 19-20, 2024 I Barcelona, Spain

Theme:

Frontiers of Interdisciplinary Physics: From Quantum Phenomena to Advanced Materials

Sub-themes:

- Frontiers in Quantum Technologies: Unleashing the Power of Quantum Mechanics
- Emerging Trends in Multidisciplinary Physics: Bridging Disciplinary Boundaries
- Innovations in Applied Physics: From Lab to Market
- Astrophysics and Cosmology: Probing the Mysteries of the Universe
- Advances in High-Energy Physics: Unraveling the Fundamental Forces
- Nanostructured Materials for Advanced Applications: A Synergy of Physics and Chemistry
- Smart and Functional Materials
- Physics and Chemistry Solutions for Sustainable Future

ADV. PHYSICS 2024

https://advanced-physics.peersalleyconferences.com/

2 DAYS WITH MORE THAN 45 SESSIONS, KEYNOTES & ORAL PRESENTATIONS

12+ INNOVATIVE FEATURED SPEAKERS

20+ HOURS OF NETWORKING EVENTS

60+ INTERNATIONAL SPEAKERS

125+ EDUCATIONAL SESSIONS

WHO SHOULD ATTEND?

- Physicists and Chemists
- Materials Scientists
- Nanotechnologists
- Chemical Engineers
- Faculty Members, Lecturers and Educators
- Entrepreneurs or Business Leaders
- Ph.D. Students and Postdocs
- Multidisciplinary Researchers
- Researchers and Scientists In the field of Advanced Physics
- Researchers and Scientists In the field of Chemistry of Materials
- Students
- Professors of Physics

PRESENTATION FORUM

KEYNOTE FORUM / MINI-PLENARY SESSIONS

Presentations under Keynote Forum or Mini-Plenary Sessions includes abstracts with remarkable research value selected by the program committee. These significant speeches are delivered by globally recognized honorable speakers and it is open to all registrants.

DISTINGUISHED SPEAKERS FORUM (ORAL ABSTRACT SESSIONS)

In this forum, speakers and experts of the research field gets an opportunity to showcase their noble research work that involves comprehensive research findings. These formal oral presentations include a wide range of talks covering basic research to advanced research findings in accordance to the theme and scientific sessions of the conference.

STUDENT FORUM
POSTER SESSION

This session is particularly introduced to encourage more number of student participation at international conferences, however it is not restricted only to students since it is also available for the participants with language barrier. There are specific guidelines to be followed to prepare the poster. Poster topic should be selected only from relevant scientific sessions with in-depth technical details.

YOUNG INVESTIGATORS FORUM

An exclusive opportunity for students and young investigators to present their research work through a formal oral presentation. Young Investigators Forum provides a global platform for young researchers and scholars to showcase their valuable contribution to the scientific world and to get acknowledged by the global scientific community of experts. It is an excellent opportunity to recognize young scientific assets with promising research ideas. These oral presentations are of shorter time duration with 10-15 minutes of informative and precise presentations in relevant scientific sessions.

EDUCATIONAL WORKSHOPS/RESEARCH WORKSHOPS/ CORPORATE WORKSHOPS/MINI-SYMPOSIA

With an aim of transferring knowledge among the participants, workshops are introduced as a part of international conferences. These interactive and occasionally practical sessions gives an opportunity for participants to engage in detail discussion. Workshops are mostly scheduled for 60 to 90-minutes. It may range from learning about a specific topic relevant to international education, products and research which sometimes involves practical demonstration. It helps in enhancing skills, knowledge and understanding of the research field in depth through interactive discussions.

HIGHLIGHTS OF THE DAY SESSIONS

"Highlights of the Day Sessions" is introduced to discuss and focus a ray upon previous day ORAL ABSTRACT presentations by experts to summarise the key findings. It helps in getting better insights into the various dimensions of the topic.

MEET THE PROFESSOR @ NETWORKING SESSIONS

This session involves open discussion between the experts and session attendees, it gives enough time for getting answers to specific questions and doubts. It is an opportunity for attendees to increase their professional networking, sometimes also leads to an excellent collaboration opportunity.

EDUCATIONAL SESSIONS/ TRAINING PROGRAMS

Educational Sessions or training programs are specifically designed for a better understanding of the latest findings and technologies. These are generally 45-minute sessions that gives an exposure to the multidisciplinary field, that provides in-depth learning experiences and address educational needs.

REGISTER & PARTICIPATE

in

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TYPES OF ACADEMIC REGISTRATIONS
Speaker Registration
COMBO A (Registration + 2 Night Accommodation)
COMBO B (Registration + 3 Night Accommodation)
Delegate Registration

TYPES OF BUSINESS REGISTRATIONS
Speaker Registration
COMBO A (Registration + 2 Night Accommodation)
COMBO B (Registration + 3 Night Accommodation)
Delegate Registration

TYPES OF STUDENT REGISTRATIONS
Registration
YIF
COMBO A (Registration + 2 Night Accommodation)
COMBO B (Registration + 3 Night Accommodation)
Posters

TYPES OF ADDITIONAL REGISTRATIONS
Accompanying Person
E-Poster
Virtual Presentation
Workshops
Start-Ups

TIME TO CONNECT

WITH YOUR PEERS

CONCURRENT EDUCATIONAL SESSIONS

THURSDAY – SEPTEMBER 19, 2024

- Accelerator Physics
- Acoustics
- Agrophysics

- Astrophysics
- Atomic Physics

GROUP PHOTO | COFFEE BREAK

- Biomaterials
- Biophysics
- Chemical Physics

- Communication Physics
- Condensed Matter Physics

LUNCH BREAK

- Econophysics
- Emerging Trends in Superconductivity
- Energy Storage and Conversion Materials

- Engineering Physics
- Fluid Dynamics

COFFEE BREAK

- Functional Materials for Electronics and Optoelectronics

- Geophysics
- Laser Physics

CONCURRENT EDUCATIONAL SESSIONS

FRIDAY - SEPTEMBER 20, 2024

- Magnetic and Spintronic Materials
- Materials for Quantum Information Processing

- Materials for Quantum Sensing
- Materials for Sustainable Development

GROUP PHOTO | COFFEE BREAK

- Materials Physics
- Medical Physics

- Molecular Physics
- Nanotechnology
- Nuclear and Particle Physics

LUNCH BREAK

- Optics and Photonics
- Perovskite Materials for Photovoltaics and Electronics

- Physical Chemistry
- Physical Oceanography
- Plasma Physics

COFFEE BREAK

- Polymer Physics
- Quantum Chemistry
- Quantum Electronics
- Quantum Materials and Quantum Computing

- Solid-State Physics
- Surface Physics
- Vehicle Dynamics

Title: No Infections, No Failure: 30,000 Human Implanted Nanotextured Orthopedic Implants and Counting

Speaker: **Thomas J. Webster**
Affiliation: Hebei University of Technology, USA

Abstract: Nanomedicine is the use of nanomaterials to improve disease prevention, detection, and treatment which has resulted in hundreds of FDA approved medical products. While nanomedicine has been around for several decades, new technological advances are pushing its boundaries. For example, this presentation will present an over 25 year journey of commercializing nano orthopedic implants now in over 30,000 patients to date showing no signs of failure (over the past 5 years). Current orthopedic implants face a failure rate of 5 – 10% and sometimes as high as 60% for bone cancer patients. Further, Artificial Intelligence (AI) has revolutionized numerous industries to date. However, its use in nanomedicine has remained few and far between. One area that AI has significantly improved nanomedicine is through implantable sensors. This talk will present research in which implantable sensors, using AI, can learn from patient's response to implants and predict future outcomes. Such implantable sensors not only incorporate AI, but also communicate to a handheld device, and can reverse AI predicted adverse events. Examples will be given in which AI implantable sensors have been used in orthopedics to inhibit implant infection and promote prolonged bone growth. In vitro and in vivo experiments will be provided that demonstrate how AI can be used towards our advantage in nanomedicine, especially implantable sensors. Lastly, this talk will summarize recent advances in nanomedicine to both help human health and save the environment.

Title: Temporal Dynamics of Lung-Deposited Surface Area (LDSA) in Central Los Angeles: Diurnal and Seasonal Patterns

Speaker Name: Constantinos Sioutas
Affiliation: University of Southern California, USA

Abstract: In this study, we investigated concentrations of lung-deposited surface area (LDSA), elemental carbon (EC), organic carbon (OC), and particle number concentration (PNC) in Los Angeles. Hourly data were gathered using Discmini and Scanning Mobility Particle Sizer (SMPS) for PNC and LDSA, while OC, OC volatility fractions, and EC concentrations were measured by the Sunset Lab Monitor. Our findings revealed diurnal patterns with early morning peaks in PNC and EC during rush hour, corroborating prior research that associates a significant fraction of EC with ultrafine particles. During high solar radiation periods, PNC increased, likely due to nucleation and new particle formation, whereas EC concentrations did not show a corresponding rise, suggesting a weaker linkage to solar radiation compared to PNC. Evening peaks in PNC, alongside heightened PM2.5 levels, were attributed to atmospheric conditions that impede particle dispersion, such as lower mixing heights and cooler temperatures. Additionally, midday peaks in OC levels, particularly OC4, pointed to secondary photochemical processes occurring with increased solar radiation. Comparing LDSA measurements, we found that Discmini-reported levels were consistently higher than those from SMPS, indicating a significant presence of irregularly shaped ultrafine particles, particularly during morning traffic hours. Also, LDSA levels measured by Discmini were consistently 2.5-3 times higher than those by SMPS in warmer months, a trend likely attributable to the influence of lower relative humidity, which tends to decrease particle water adsorption. The study also noted a strong correlation between EC and PNC across different months, with prominent peaks during weekday mornings, highlighting the influence of vehicular emissions on air quality.

Title: Characterization and Optimization of Multiomic Single-Cell Epigenomic Profiling

Speaker Name: **Leticia Sandoval**
Affiliation: Mayo Clinic, USA

Abstract: The snATAC + snRNA platform allows epigenomic profiling of open chromatin and gene expression with single-cell resolution. The most critical assay step is to isolate high-quality nuclei to proceed with droplet-base single nuclei isolation and barcoding. With the increasing popularity of multiomic profiling in various fields, there is a need for optimized and reliable nuclei isolation methods, mainly for human tissue samples. Herein we compared different nuclei isolation methods for cell suspensions, such as peripheral blood mononuclear cells (PBMC, n = 18) and a solid tumor type, ovarian cancer (OC, n = 18), derived from debulking surgery. Nuclei morphology and sequencing output parameters were used to evaluate the quality of preparation. Our results show that NP-40 detergent-based nuclei isolation yields better sequencing results than collagenase tissue dissociation for OC, significantly impacting cell type identification and analysis. Given the utility of applying such techniques to frozen samples, we also tested frozen preparation and digestion (n = 6). A paired comparison between frozen and fresh samples validated the quality of both specimens. Finally, we demonstrate the reproducibility of scRNA and snATAC + snRNA platform, by comparing the gene expression profiling of PBMC. Our results highlight how the choice of nuclei isolation methods is critical for obtaining quality data in multiomic assays. It also shows that the measurement of expression between scRNA and snRNA is comparable and effective for cell type identification.

Title: Air-coast/inland footprints interaction in stable conditions during the AMMA SOP3 field experiment

Speaker Name: **Mekompoamb Gislain**
Affiliation: University of Yaoundé,France

Abstract: Radiosonde data recorded during African Monsoon Multidisciplinary Analyses Special Observing Period 3 (AMMA SOP3) field campaign in West Africa (August 15-September 15, 2006), were used to examine air-coast/land coupling. Different turbulent radiosonde measurements were averaged over three levels (level 1, ~3 m, next level 2, ~10 m and lastly level 3, ~20 m) in surface layer. These data enabled comparison of turbulent fluxes with other variables, as well as the study of the scaling of surface layer for different areas in aerodynamically smooth/rough and relatively dry or wet conditions. Results showed stable and unstable stratifications at nighttime. Drag coefficient over the coastal and inland footprints presents the same order of magnitude, and could not be an indicator for the two different areas. However, the disparate nighttime variation in sensible heat flux is substantially more pronounced over land than over the coast, and can therefore be considered an indicator of different surfaces. The underlying assumptions of Monin-Obukhov Similarity Theory (MOST) are consistently violated due to surface heterogeneities, but offsets from MOST are smaller for stable and unstable conditions, as well as for scaled standard deviations over coast and overland. In addition, flux-profile relationships from MOST show a poor match with observations.

Tittle: Confinement of a Biologic Ionic Channel in a SWCNT

Speaker Name: Francois HENN
Affiliation: Université de Montpellier, France

Abstract: The yield of desalination or blue energy production depends on the efficiency, i.e. permeability and ionic selectivity, of the semi-permeable membranes in use. Membranes made of Single Wall Carbon Nano Tubes (SWCNT) may prove to be excellent candidates. Although theoretical and experimental studies show that water and electrolyte can diffuse inside SWCNT with diameter lower than 2nm, more rapidly than in the bulk, ion selectivity still requires to be enhanced [1]. In this context, we have launched a bio-inspired project aimed at improving the ion transport properties of SWCNT by confining gramicidin, a rather small and simple biological ion channel (BIC) known for its high ionic permeability and selectivity properties. While it was shown that gramicidin could be confined in nanopores of a track-etched membrane, it has not been experimentally proved yet that it could be inserted in the hollow core of a SWCNT [2]. The first stage of our project is then to check if it is possible to confine gramicidin inside SWCNT based on their hydrophobicity and steric features. We show that gramicidin interacts with SWCNT, making possible their dispersion in ethanol (fig.1). In this work, we discuss outcomes obtained from Transmission Electron Microscopy (figs.2), X-Ray Diffraction (fig.3), μ-Raman spectroscopy and water adsorption isotherms (fig.4) characterization of SWCNT dispersed in ethanol either containing or not gramicidin. All these tools confirm that gramicidin interacts with our SWCNT sample and allows the individualization of some tubes. Besides, they lead to consistent results that seem to indicate that it is indeed possible to confine gramicidin in SWCNTs and that the conformation it adopts in certain tubes might be that of a helix as under biological conditions.

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Title: CE-LIF Analysis of Fluorescent Dyes for Detection of Nanoplastics among Metal Oxide Nanoparticles

Speaker Name: Edward Lai
Affiliation: Carleton University, Canada

Abstract: Capillary electrophoresis (CE) was set up with laser-induced fluorescence (LIF) detection for the analysis of fluorescent dyes ranging from coumarin to rhodamine B and rhodamine 6G. These aromatic dyes interacted with transition metal oxide nanoparticles (TMONPs) and polystyrene nanoplastics present in a water sample, prior to CE-LIF analysis. Their concentrations were determined with high sensitivity based on efficient binding that caused a decrease of CE peak height. Fused silica capillaries, albeit unconditioned, produced repeatable peak heights despite small variations in the migration times. Selectivity was improved by choosing more dyes such as 4-dicyanomethylene-2-methyl-6-4-dimethyl-aminostyryl-4H-pyran (DCM) for the binding test. Sensitivity was maximized by conducting the binding tests at an optimal pH level. This method was further validated by high-performance liquid chromatography (HPLC) with fluorescence detection (FLD), which is commonly accessible, for the versatile control of water quality in public health and safety regulations.

Title: The Study for Reliable Pattern Mining and Its Possible Help in Physics Studies

Speaker Name: Tongyuan Wang
Affiliation: TechEngine Plus Com Montreal, Canada

Abstract: The classic pattern mining is a fundamental topic in data mining and has been studied extensively for over 30 years but left with no reliable mining approach yet. This report will first present why the case is, and then what the author's study has found and what progress has made toward the reliable mining. It includes the appropriate pattern frequentness measure, the pattern generation mode, the adaptation and application of the equilibrium condition, and pattern frequency distribution theory. All the findings are well formed with no exogenous input but rigorous mathematic proofs. Furthermore, the findings extend some new conceptions and rethinking as deep as on set theory and combinatorics, such that the study is not restricted in pattern mining but stretches to data science in general or even broader, for instance, in Physics. It is because, compared with a pattern consisting of singleton elements, the substances of our world comprise quantum particles in modern physics. Then, the reliable solution for pattern mining may help us in physics study.

Title: Designing and Managing Advanced, Intelligent and Ethical Health and Social Care Ecosystems

Speaker Name: Bernd Blobel
Affiliation: University of Regensburg, Germany

Abstract: For meeting the financial, quality and safety challenges as well as expectations of the patients, health and social care systems around the globe currently undergo a transformation towards personalized, preventive, predictive, participative precision medicine (5PM), supported by technology. It considers individual health status, conditions, genetic and genomic dispositions in personal social, occupational, environmental and behavioral context, understanding the pathology of diseases and turning health and social care from reactive to proactive. The aforementioned transformation is strongly supported by technologies such as micro- and nanotechnologies, advanced computing, artificial intelligence, autonomous systems and robotics, knowledge representation and management, etc. Beside their opportunities, those advanced technologies also bear risks to be managed, requiring the detailed consideration from a humanistic, moral and ethical perspective. For enabling communication and cooperation between all actors from different disciplines involved, using different methodologies, perspectives, intentions, languages, we shall understand and formally and consistently represent the multidisciplinary, highly complex and dynamic 5PM ecosystem. The outcome is a system-theoretical, architecture-centric, ontology-based, policy-driven approach for designing and managing intelligent and ethical 5PM ecosystems. The necessary model and framework has been developed by the author and meanwhile standardized as ISO 23903 Interoperability and Integration Reference Architecture. The formal representation of any ecosystem and its development process including examples of practical deployment of the approach are presented in detail. This includes correct systems and standards integration and interoperability solutions.

Title: Effective model for Sodium insertion in Hard Carbon

Speaker Name: Huy Sy Nguyen
Affiliation: University of Ulm, Germany

Abstract: Sodium ion batteries (NIB) are a potential alternatively for Lithium ion batteries (LIB) because of lower cost and more abundance. As anodes, Hard Carbon (HC) seems to be the most promising candidate for NIB with advantages: stable cycling, large specific capacity, and lowcost precursors. Previous theoretical researches studied general conditions for Na insertion in HC; while experimental studies proved that the properties of Na insertion in HC depend strongly on specific properties material of HC. Our target is building an effective model which can link theoretical researches in general conditions and experimental phenomena for specific materials of HC. In our effective model, HC are treated implicitly; while Na are modelled in the confined space, created by HC. To describe the complexity of Na behaviour in HC, different types of Na with different energy level are introduced. The results consist with experimental data; and clarify the contribution of types of Na in open circuit voltage, as well as capacity loss of Na in HC.

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Title: Enhanced visible light-driven photocatalytic activity and stability of novel ternary ZnO/CuO/MoO3 nanorods

Speaker Name: Muhammad Khalid Hussain
Affiliation: Australian National University, Australia

Abstract: A newly developed photocatalyst, ZnO/CuO/MoO3 (ZnO/CuO/M), composed of nanorods, was synthesized through a straightforward hydrothermal treatment. The nanorods were thoroughly characterized, including an examination of their surface morphology, optical properties, and the dynamics of separating photoexcited charge carriers. In terms of photocatalytic performance under visible light, the ZnO/CuO/M nanorods exhibited substantial improvement compared to pristine ZnO, CuO, MoO3, and a binary CuO/M composite. Notably, the nanorods demonstrated superior degradation of organic pollutants, particularly achieving a 97% degradation of rhodamine B (RhB) and a 79% degradation of alizarin yellow (AY) within 120 minutes. Comparative analyses revealed a remarkable enhancement, with the ZnO/CuO/M nanorods surpassing pristine MoO3 by 57 times for RhB and 64 times for AY in terms of photocatalytic activity. This enhanced performance is attributed to the advantageous heterojunction structure of the ZnO/CuO/M nanorods, which facilitates the efficient and rapid transfer and separation of photoexcited charge carriers.

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Title: Restructuring consciousness through the Symintentry Hypothesis.

Speaker Name: David Leonard Hunter Rail
Affiliation: Consultant Neurologist, Australia

Abstract: The Projective Consciousness Model and its extension to phenomenal selfhood is arguably the most comprehensive model of the structure of consciousness. That structure is conceived in terms of 5 symmetries. These symmetries stem from the evolution and emergence of Phenomenal Self through modelling, and that is realized through Phenomenal modelling of the intentionality relationship. In 'Re-evaluating the structure of consciousness through the symintentry hypothesis' we contend that these 5 symmetries are based on a more fundamental symmetry, symmetry-based modelling. The proposal stems from: first, Kant's Transcendental Structuralism that asserts "Objects" conform to models that also are prescribed by the inherent structure of our phenomenal mind. Second, Cassirer proposed that a mathematical group (Cassirer's group, CG) underpins Transcendental Structuralism. To validate our proposal we first stipulated CG. That enabled us to define symmetry-based modelling and subsequently how that could emerge to structure consciousness. We found that CG required a more powerful operator to enable intentionality and the other symmetries. That is, an operator based on Dual Quaternions rather than Quaternions. This was important because we realized that the DQ could potentially underpin the role of intentionality in subserving semiotic relationships. That led to our proposal based on Ockham's razor that the evolution of the more powerful DQ - based form of CG in symmetry-based modelling could underlie Man's ability to structure our world. We call this evolved form of symmetry-based modelling "Symintentry". We argue Symintentry is not just a new form of symmetry but is the archetypical form of symmetry.

Title: Decoding Autoimmune Control: The Intricacies of CLEC16A Regulation

Speaker Name: Andrew John Selby
Affiliation: Asset modeller and Engineer, UK

Abstract: The Projective Consciousness Model and its extension to phenomenal selfhood is arguably the most comprehensive model of the structure of consciousness. That structure is conceived in terms of 5 symmetries. These symmetries stem from the evolution and emergence of Phenomenal Self through modelling, and that is realized through Phenomenal modelling of the intentionality relationship. In 'Re-evaluating the structure of consciousness through the symintentry hypothesis' we contend that these 5 symmetries are based on a more fundamental symmetry, symmetry-based modelling. The proposal stems from: first, Kant's Transcendental Structuralism that asserts "Objects" conform to models that also are prescribed by the inherent structure of our phenomenal mind. Second, Cassirer proposed that a mathematical group (Cassirer's group, CG) underpins Transcendental Structuralism. To validate our proposal we first stipulated CG. That enabled us to define symmetry-based modelling and subsequently how that could emerge to structure consciousness. We found that CG required a more powerful operator to enable intentionality and the other symmetries. That is, an operator based on Dual Quaternions rather than Quaternions. This was important because we realized that the DQ could potentially underpin the role of intentionality in subserving semiotic relationships. That led to our proposal based on Ockham's razor that the evolution of the more powerful DQ - based form of CG in symmetry-based modelling could underlie Man's ability to structure our world. We call this evolved form of symmetry-based modelling "Symintentry". We argue Symintentry is not just a new form of symmetry but is the archetypical form of symmetry.

Title: Controlled Excitation of Colour Centres in Nanodiamonds

Speaker Name: Hamidreza Siampour
Affiliation: Queen's University Belfast, UK

Abstract: In the first part, I discuss the development of integrated quantum optical devices based on dielectric loaded plasmonic waveguides with accurately positioned nanodiamonds containing single vacancy centres (1-4) . By combining resonant and plasmonic enhancement, we significantly increase the spontaneous emission rate of single photons.

Moving on to the second part, I present a chiral nanophotonic platform with embedded single emitters that enables both Purcell-enhanced emission and strong chiral coupling. We observe record-high Purcell factors for quantum dots emitting in the slow-light spectral region and demonstrate chiral routing of spin-carrying photons with exceptional Purcell factors (5). These advancements, combining plasmonic and photonic crystal waveguide modes, enable strong bonding through radiation coupling in a shared mode. They pave the way for nanoscale functional quantum sensors and scalable quantum optical networks.

Title: Effects of Various Nanofluids on the Performance of Double Tube Heat Exchangers

Speaker Name: Ebrahim Tavousi
Affiliation: Birmingham City University, UK

Abstract: In this study, different nanofluids such as SiO2, Al2O3, CuO, and Ag, with water as the base fluid, were numerically investigated to analyze the heat transfer and fluid flow characteristics and their impact on the performance of a double tube heat exchanger. Computational Fluid Dynamics (CFD) simulations were conducted using ANSYS Fluent software. The results indicated that SiO2 nanofluid achieved the highest increase in Nusselt number in the double tube heat exchanger, as well as the largest increase in pressure drop.

Title: Exploring the influence of surface dressing ultrafine

Speaker Name: Paulo Cesar De Morais
Affiliation: Catholic University of Brasilia, Brazil

Abstract: This talk will focus on the description of surface functionalized ultrafine $CoFe_2O_4$ nanoparticles (NPs), with mean diameter ~ 5 nm. The investigated properties include DC magnetization and AC susceptibility measurements over the temperature range of 4 – 400 K. All evaluated NPs present the same $CoFe_2O_4$ core, with different molecular surface coatings, increasing gradually the number of carbon atoms in the coating layer, in the following list: glycine ($C_2H_5NO_2$), alanine ($C_3H_7NO_2$), aminobutanoic acid ($C_4H_9NO_2$), aminohexanoic acid ($C_6H_{13}NO_2$), and aminododecanoic acid ($C_{12}H_{25}NO_2$). Importantly, samples were intentionally fabricated in order to modulate the core-core magnetic dipolar interaction, as the thickness of the coating layer increases with the number of carbon atoms in the coating molecule. The magnetic data of the uncoated $CoFe_2O_4$ NPs it is also presented for comparison. All investigated $CoFe_2O_4$ NPs (coated and uncoated) are in magnetically blocked state at room temperature as evidenced by ZFC/FC measurements and the presence of hysteresis with ~700 Oe coercivity. Low temperature magnetization scans show slightly constricted hysteresis loops with coercivity decreasing systematically while the number of carbon atoms in the coating molecule decreases, possibly resulting from differences in magnetic dipole coupling between NPs. Large thermomagnetic irreversibility, slow monotonic increase in the FC magnetization and non-saturation of the magnetization give evidence for the cluster glass (CG) nature in the $CoFe_2O_4$ NPs. The out of phase part (c'') of AC susceptibility for all samples shows a clear frequency dependent hump which is analyzed to distinguish superparamagnetic (SPM), cluster glass (CG) and spin glass (SG) behavior by using Néel- Arrhennius, Vogel-Fulcher, and power law fittings.

Title: Gold Nanoparticles in Silica Aerogels

Speaker Name: István Lázár
Affiliation: University of Debrecen, Hungary

Abstract: Gold nanoparticles (AuNPs) combine beauty with functionality, exhibiting unique properties due to their size and shape, and displaying vibrant colors in red and purple hues. Their exceptional stability and biocompatibility make them ideal for medical imaging, targeted drug delivery, fuel cells, or chemical catalysis.

Nitrophenols are increasingly contaminating surface and ground water due to the extensive use of dyes, pesticides and pharmaceuticals. On short-term contact, p-nitrophenol (PNP) may cause eye and skin irritation, longer exposure may result in methemoglobinemia, cyanosis, genotoxicity, and chromosome aberrations. The decontamination of PNP may be performed by several methods including reduction to p-aminophenol with sodium borohydride in the presence of metallic nanoparticles, for example iron, silver, or gold naoparticles. The recovery of high-cost AuNPs is a crucial step that cannot be performed efficiently. [1]

Aerogels are extremely porous and lightweight solids made of a large variety of inorganic, organic or natural materials. Silica aerogels are the most widely studied and used ones exhibiting special tunable surface properties, good mechnical strength, transparency and inertness in chemical reactions.[2]

Immobilization of AuNPs in a very porous matrix can preserve their activity and provide easy access to the catalitically active particles without letting them leach in the solution, and facilitate their recovery by traditional filtration/sedimentation and centrifugaion methods. [3]

The purpose of our research was to make catalytically active silica aerogles with embedded gold nanoparticles in order to decontaminate PNP solutions with a managable and scalable process. In the lecture, we shall present the direct and the reverse-engineered synthesis of gold naoparticle-containg silica aerogels, characterization of the particles with SEM, TEM, optical microscopy, UV-Vis spectroscopy, and demonstrate their catalytic efficiencies, recovery and life cycles in batch reactions, as well as in a newly developed continuous-flow reactor.

Title: Antiviral Property of Nanoclusters-grafted Photocatalysts under Indoor Light Illumination

Speaker Name: Masahiro Miyauchi
Affiliation: Tokyo Institute of Technology, Japan

Abstract: Photocatalysis is an effective technology for preventing the spread of pandemic-scale viruses. This paper reports an efficient visible light-sensitive photocatalyst, *i.e.*, copper oxide nanoclusters grafted titanium dioxide (Cu_xO/TiO_2) towards the anti-virus function. Figure 1 (a) shows the TEM image of Cu_xO/TiO_2. The Cu_xO nanoclusters are several nanometers in size and consist of the valence states of Cu(I) and Cu(II). The Cu(I) species denaturalizes the protein of the virus, thereby resulting in significant antiviral properties even under dark conditions. Moreover, the Cu(II) species in the Cu_xO nanocluster serves as an electron acceptor through photo-induced interfacial charge transfer, which leads to the formation of an anti-virus Cu(I) species and holes with strong oxidation power in the valence band of TiO_2 under visible-light irradiation. Figure 1 (b) shows the antiviral property of Cu_xO/TiO_2 versus the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) viruses of the Delta variant. The antiviral function of the Cu_xO/TiO_2 photocatalyst was maintained under dark condition, and its antiviral property was enhanced under visible light irradiation. Based on the enzyme-linked immunosorbent assay (ELISA) and the real-time reverse transcription quantitative polymerase chain reaction (RT-qPCR), we confirmed that both spike proteins and RNAs of SARS-CoV-2 viruses were damaged by the exposure to the Cu_xO/TiO_2 photocatalyst even under dark condition. The Cu_xO/TiO_2 photocatalyst can thus be used to reduce the infectious risk of COVID-19 in an indoor environment, where light illumination is turned on during the day and off during the night.

Title: Road disease detection algorithm based on YOLOv5s-DSG

Speaker Name: Haichen Wang
Affiliation: National University of Singapore, China

Abstract: Automatic detection and classification of road damages are critical for the timely maintenance and repair of road surfaces. To address issues in road damage detection, such as single detection type, low detection efficiency, low-resolution detection objects, and difficulty in detecting small target features, this paper proposes an improved road damage detection algorithm YOLOv5s-DSG based on YOLOv5s. First, optimize the depth and width of the network structure to reduce the impact on road damage image detection performance. Second, the Ghost module replaces the traditional convolution to reduce the number of model parameters, making the model lightweight and improving the detection rate. Finally, the Space-to-depth-Conv module is introduced to adapt to low-resolution and small object detection tasks. Numerous experiments on datasets such as Road Damage Dataset 2022 demonstrate that the improved model's average accuracy increased by 1.1% compared to the original model, FPS increased from 85 to 90, and the parameter quantity decreased by 21.7%. It effectively alleviates problems in recognizing small targets. Compared to existing algorithms, it has significant advantages in road damage detection and classification.

Title: Synthesis of Mo2Ti2C3Tx MXene Electrodes by Lewis Acid Molten Salt Route for Energy Storage

Speaker Name: Daniel Q. Tan
Affiliation: Guangdong Technion-Israel Institute of Technology, China

Abstract: MXenes, a class of two-dimensional transition metal carbides and nitrides, hold significant promise for electrochemical energy storage applications due to their exceptional electronic conductivity, tunable surface chemistry, and pseudocapacitive charge storage mechanisms. In this study, we demonstrate a novel one-step approach of in-situ deposition of Mo and Ti-dual oxide nanoparticles in $Mo_2Ti_2C_3T_x$ MXene (non-conventional nanomaterials) using the Lewis acid molten salt method (LAMS), with meticulous optimization of annealing conditions. The Mo, Ti dual oxide incorporation prevents the collapse of the MXene's layered structure and then results in the remarkable electrochemical performance of supercapacitors in aqueous electrolyte. Remarkable outcomes include a specific capacity of 434 C g^{-1} at 5 mA cm^{-2}, exceptional cycle life with 94% capacity retention after 5000 charge-discharge cycles at 50 mA cm^{-2}, and high-rate capability in 3M KOH aqueous electrolyte. This research underpins the potential of Mo and Ti-based MXenes as high-rate charge storage electrodes and paves the way to design next-generation electrode materials through sustainable synthesis routes.

Title: The effect of doping on the properties of a new kind of C50 solid

Speaker Name: Ang-Yang Yu
Affiliation: Beijing University of Technology, China

Abstract: In this work, a new kind of fullerene solid is constructed using carbon cluster C50 with D5h symmetry. It is found that this solid is softer than the diamond through the comparision of bulk modulus. This new type of semiconductor has the indirect band gap of 0.338 eV. The stability of this solid is further confirmed by the phonon spectra calculation, which indicates that it is a new metastable configuration of carbon. After doping nitrogen atoms into this stable solid, we find that the N-doped system still remains to be the semiconductor, the band gap of which increases to 0.469 eV. The formation energy of the N-doped system is -1.090 eV/cage. Moreover, the lattice parameters of this N-doped system differ little from those of the undoped C50 system, which means that the doped system and the undoped C50 system can connect along some crystal orientations, forming the semiconductor heterojunction.

Title: Extracellular Vesicles Mediated Pro inflammatory Macrophage Phenotype Induced by Radiotherapy in Cervical Cancer

Speaker Name: Junli Ren
Affiliation: Shanxi Medical University Affiliated Cancer Hospital, China

Abstract: Background: Radiotherapy is a highly effective treatment for cervical cancer. Recent studies focused on the radiotherapy induced anti-tumor immunity. Whether tumor-derived extracellular vesicles (EVs) play roles in radiotherapy induced tumor associated macrophage (TAM) polarization remains unclear.

Aim: To study whether EV mediates radiation-induced anti-tumor immunity and its corresponding molecular mechanisms.

Methods: This study analysed the phenotype of macrophages in cancer tissue and peripheral blood of cervical cancer patients using flow cytometry analysis. The role of EVs from plasma of post-irradiated patients on M2-like transformed macrophages was assessed. The M1- and M2-like macrophages were assessed by expression of cell surface markers (CCR7, CD163) and intracellular cytokines (IL-10, TNFα and iNOS). The capacity of phagocytosis was assessed by PD-1 expression and phagocytosis of pHrodo Red E. coli bioparticles.

Results: Our results demonstrated that radiotherapy of cervical cancer induced an increase in the number of TAMs and a change in their subtype from the M2-like to the M1-like phenotype (increased expression of CCR7 and decreased expression of CD163). The EVs from plasma of post-irradiated patients facilitated the M2-like to the M1-like phenotype transition (increased expression of CCR7, TNFα and iNOS, and decreased expression of CD163 and IL-10) and increased capacity of phagocytosis (decreased PD-1 expression and increased phagocytosis of pHrodo Red E. coli bioparticles).

Conclusions: Our data demonstrated that irradiation in cervical cancer patients facilitated a proinflammatory macrophage phenotype which could eventually able to mediate anti-tumor immune responses. Our findings highlight the importance of EV in the crosstalk of tumor cells and TAM upon irradiation, which potentially leading to an increased inflammatory response to cancer lesions.

Title: Modelling Convective transport of hybrid nanofluid in a lid driven square cavity with consideration of Brownian diffusion and thermophoresis

Speaker Name: Sohail Ahmed
Affiliation: Shanghai Jiao Tong University, China

Abstract: Previously, the homogenous models were predominant in hybrid nanofluid's studies. However, there is a serious deficiency in these models,that is, the heat transfer coefficients obtained by these models are inconsistent with the experimental results. To overcome this issue, we develop a novel hybrid nanofluid model based on the major slip mechanisms of nanofluids caused by Brownian diffusion and thermophoresis. The problem of flow and heat transfer of a hybrid nanofluid in a lid driven square cavity filled with porous medium is studied as an example to show the correctness and validity of this new model. Numerical results are given by means of the novel Coiflet wavelet homotopy analysis method in the terms of the Brownian motion and thermophoresis. The physical behaviors of hybrid nanofluids flow are discussed in terms of various quantities such as the stream-function, the isotherms, and the Nusselt and Sherwood numbers. The average Nusselt number evaluated with the help of the quadratic multiple regression analysis justifies that the thermophoretic effect is more dominant than the Brownian motion on Nusselt numbers at both walls.

Title: Recent Advances of Magnetic Gold Hybrids and Nanocomposites, and Their Potential Biological Applications

Speaker Name: Mirza Muhammad Faran Ashraf Baig
Affiliation: Hong Kong University of Science and Technology, China

Abstract: Magnetic gold nanoparticles (mGNP) have become a great interest of research for nanomaterial scientists because of their significant magnetic and plasmonic properties applicable in biomedical applications. Various synthetic approaches and surface modification techniques have been used for mGNP including the most common being the coprecipitation, thermal decomposition, and microemulsion methods in addition to the Brust Schiffrin technique, which involves the reduction of metal precursors in a two-phase system (water and toluene) in the presence of alkanethiol. The hybrid magnetic–plasmonic nanoparticles based on iron core and gold shell are being considered as potential theragnostic agents. Herein, in addition to future works, we will discuss recent developments for synthesis and surface modification of mGNP with their applications in modern biomedical science such as drug and gene delivery, bioimaging, biosensing, and neuro-regenerative disorders. I shall also discuss the techniques based on my research related to the biological applications of mGNP.

Title: Core State Factor Monitoring of Smart Energy Storage Systems

Speaker Name: Shunli Wang
Affiliation: Smart Energy Storage Institute, China

Abstract: As an important component of the smart grid energy storage system, high-precision state of health estimation of lithium-ion batteries is crucial for ensuring the power quality and supply capacity of the smart grid. To achieve this goal, an improved integrated algorithm based on multiple layer kernel extreme learning machine and genetic particle swarm optimization algorithm is proposed to estimate the SOH of Lithium-ion batteries. Kernel function parameters are used to simulate the update of particle position and speed, and genetic algorithm is introduced to select, cross and mutate particles. The improved particle swarm optimization is used to optimize the extreme value to improve prediction accuracy and model stability. The cycle data of different specifications of LIB units are processed to construct the traditional high-dimensional health feature dataset and the low-dimensional fusion feature dataset, and each version of ML-ELM network is trained and tested separately. The numerical analysis of the prediction results shows that the root mean square error of the comprehensive algorithm for SOH estimation is controlled within 0.66%. The results of the multi-indicator comparison show that the proposed algorithm can track the true value stably and accurately with satisfactory high accuracy and strong robustness, providing guarantees for the efficient and stable operation of the smart grid.

Title: First principles study of co-doping exploration of (Ba, Ra) on bulk like ZnS and ZnO for emerging applications of optoelectronic

Speaker Name: Muhammad Moin
Affiliation: Anhui University of Technology, China

Abstract: This unique research investigates the co-doping effects of Ba and Ra on the structural, electronic, optical, thermodynamics and mechanical response of Bulk-like ZnO and ZnS based 3d-dimensional crystal structures. Using Heydscuseria-Ernzerhof screened hybrid functional (HSE06) and generalized gradient approximation (GGA) with norm-converging pseudopotential approach in the density functional theory. The (Ba, Ra)-doped ZnO (BZO, RZO) and (Ba, Ra)-doped ZnS (BZS, RZS) models with doping concentrations are assembled to systematically declare the impact of doping concentration (x) on the optoelectronic performance of ZnO and ZnS. Additionally, optoelectronic excellency, such as band gap tuning, electronic conductivity, reflectivity, transmittance and absorption as well as mechanical stability have been computed. It is observed that after (Ba, Ra)-doping and its impact on crystal vacancy can influence band levels hence decreasing the band gap of the 3d ZnO and ZnS. As a consequence, the decreased band gap is attributed to the enhanced absorption in the visible region and explores wide the applicable range of ZnS and ZnO. Compared to the ZnO, it is revealed that (BZO RZO) and (BZS, RZS) are remarkably much softer with 18% stiffness and 33% ultimate strengths computed respectively. The excess specific heat (C_V) and enthalpy of mixing (H_m) as well as phonon responses resulting from the concentration x are estimated to investigate the thermodynamic stability responses of the $Zn_{0.97}Ba_{0.03}O$, $Zn_{0.97}Ra_{0.03}O$ and $Zn_{0.97}Ba_{0.03}S$, $Zn_{0.97}Ra_{0.03}S$. Finally, the absorption and conductivity as well as optical performance of BZO, RZO and BZS, RZS materials are found to be extremely sensitive to the dopant concentrations. The obtained theoretical results indicate that the doped BZO, RZO and BZS, RZS materials can be proven as potential promising candidates for optoelectronic applications.

Title: Piezo-Phototronic Effect in Multi-Layer Structured Optoelectronic: Bilateral Piezoelectric Charge Modulation

Speaker Name: Wenbo Peng
Affiliation: Xi'an Jiaotong University, China

Abstract: Piezo-phototronic effect utilizes the strain induced piezoelectric charges inside the piezoelectric semiconductors to modulate the local energy band diagram at the interface of junctions, thus controlling the photo-generated carriers' behaviors and the performance of optoelectronic devices. Since its invention in 2010, piezo-phototronic effect is vastly demonstrated in photodetectors, light-emitting diodes, and solar cells, where only one interface is modulated by piezoelectric charges. In 2018, we first propose to construct multi-layered structure for efficient utilization of piezoelectric charges with both polarities and obtain better performance optimization by piezo-phototronic effect [1], which we recently name as *Bilateral Piezoelectric Charge Modulation* [2]. Here, we summarize the recent progresses of our researches on bilateral piezoelectric charge modulation, including both experimental results and analytical theories.

An n-ZnO/p-Si/n-ZnO double heterojunction bipolar phototransistor is designed, and the regulation of bilateral piezoelectric charges on bipolar phototransistor's performances is studied from the perspectives of theoretical derivation and experimental research simultaneously. A theoretical model of n-ZnO/p-Si/n-ZnO double heterojunction bipolar phototransistor is established, and the influence of four polar combinations of piezoelectric charges induced by different strains formed at the interface of two heterojunctions on the characteristics of phototransistor is carefully studied. The theoretical calculation results show that, when positive piezoelectric charges are generated at both two interfaces, the regulation of strain on the phototransistor is a superposition of two positive effects, which can significantly improve the performances of phototransistor. Then an n-ZnO/p-Si/n-ZnO double heterojunction bipolar phototransistor is experimentally prepared. By rationally designing the device structure, positive piezoelectric charges could be simultaneously generated at the two heterojunction interfaces when an external compressive strain is applied. The saturation current of phototransistor is significantly improved, and the photoresponsivity is also improved to a certain extent by the applied compressive strain. To further optimize the performances, the effects of interdigitated electrode's size, substrate and ZnO layer on the strain regulation of device performance are carefully studied. The experimental results show that when the p-Si substrate is used, the size of interdigitated electrodes is chosen as channel width $W_0 = 80$ μm, the channel length $L = 5$ μm, and the number of electrodes $N = 14$, and the ZnO nanowires layer prepared by low temperature hydrothermal growth method is used as both emitter and collector, the strain induced bilateral piezoelectric charges regulation of the obtained bipolar phototransistor is the best. At a compressive strain of -1.37%, the photoresponsivity is enhanced about 2000%, indicating the significant modulation of applied strain on the performances of heterojunction bipolar phototransistor.

Title: Advancements in Self-healing Water-Sealing Materials for Engineering Applications in Water-Related Environments

Speaker Name: Wentong Lu
Affiliation: Shanghai University of Engineerig Science, China.

Abstract: In various engineering manufacturing sectors, particularly in river and marine engineering, groundwater projects, and deep-sea operations, the presence of water poses significant challenges due to its pervasive nature and the inability to be controlled like soil, rocks, or vegetation. Water, composed of countless tiny molecules, exhibits the characteristic behavior of gravitationally driven flow towards lower points, permeating even the smallest crevices. Prolonged water infiltration can lead to extensive leakage, posing challenges for machinery and metal components requiring dry working environments.In large-scale construction projects, machinery primarily consists of metal and its alloys, often coated with corrosion-resistant layers. However, these coatings have limited lifespans due to corrosion and abrasion during operation. Therefore, sealing materials play a crucial role in isolating water interference. Conventional sealing materials, when subjected to prolonged water exposure, often exhibit inadequate durability. Thus, adopting a "treating water with water" approach, employing elastic materials capable of water absorption and expansion, becomes imperative.Introducing water-absorbing fillers into elastic materials enhances their performance. Common fillers like superabsorbent polymers (SAP) or crosslinked sodium polyacrylate (PAANa) exhibit excellent water absorption properties, expanding their volume hundreds to thousands of times.

This work presents a self-repairing water-absorbing expansion material, wherein the material's expansion within a confined space exerts pressure on fracture ends, promoting self-repair under external forces. Polyurethane materials demonstrate superior repair efficiency compared to rubber elastic materials, especially with repair efficiency often temperature-dependent.Polyurethane materials, synthesized from polyols and isocyanates, offer flexibility in formulation selection. In this invention, polyether polyols are chosen due to their suitability for self-repairing water-absorbing polyurethane elastomers. Hexamethylene diisocyanate (HDI) is selected for its linear structure, facilitating polymer chain formation with polyols. Diamine pyridine (DAP) serves as a chain extender, contributing to both chain extension and repair.

The main theme of this work is the utilization of perfluoropolyether diol (PFPE), possessing dipole-dipole interaction capabilities through C-F bonds. Leveraging dipole-dipole interactions and metal coordination, self-repair is promoted. While water affects metal coordination efficiency, dipole-dipole interactions remain largely unaffected, even in harsh water conditions, facilitating self-repair.This comprehensive approach offers promising avenues for enhancing the durability and performance of materials in water-related engineering applications, addressing critical challenges in construction and maintenance in such environments.

Title: TPPII depletion causes presenile dementia in female mice by downregulating CYP19A1 through ATF6-SYVN1-UCHL1 axis-mediated

Speaker Name: Jisen Huai
Affiliation: Xinxiang Medical University, China

Abstract: Tripeptidyl peptidase II (TPP2) is generally considered as a cytosolic protein which forms the largest known protease complex in eukaryotic cells to operate mostly downstream of proteasomes for degradation of longer peptides by removing tripeptides from free amino termini. However, this canonical function of TPP2 cannot explain its role in a wide variety of biological processes. The mechanistic interrelationships and hierarchical order of these processes have yet to be clarified. Here we show that TPP2 independent of its enzymatic activity is a key maintainer of intracellular calcium (Ca2+) homeostasis and thereby plays a key role in the biosynthesis of Phosphatidylcholine (PC). By generating and exploring the TPP2 knockout 293T cells and ubiquitous/excitatory neuron-specific TPP2 knockout mice, we found that TPP2 gene ablation leads to intracellular Ca2+ dyshomeostasis, PC deficit, and endoplasmic reticulum (ER) stress, which result in ATF6-SYVN1-UCHL1 axis-mediated autophagic CYP19A1 (Aromatase) degradation and ultimately estrogen depletion. Both ubiquitous and excitatory neuron-specific TPP2 knockout mice displayed impairment in learning and memory characterized with presenile dementia. This work therefore uncovers a new working mechanism of TPP2 which is not only of great significance for elucidating the pathogenesis and future treatment of dementia, but also for interpreting the role of TPP2 in other system and treatment of the related disorders.

Title: Zinc oxide nanoparticles exacerbate skin epithelial cell damage by upregulating pro-inflammatory cytokines and exosome secretion in M1

Speaker Name: Ying-Jan Wang
Affiliation: National Cheng Kung University, Taiwan

Abstract:

Background:

Zinc oxide nanoparticles (ZnONPs) are common materials used in skin-related cosmetics and sunscreen products due to their whitening and strong UV light absorption properties. Although the protective effects of ZnONPs against UV light in intact skin have been well demonstrated, the effects of using ZnONPs on damaged or sunburned skin are still unclear. In this study, we aimed to reveal the detailed underlying mechanisms related to keratinocytes and macrophages exposed to UVB and ZnONPs.

Results:

We demonstrated that ZnONPs exacerbated mouse skin damage after UVB exposure, followed by increased transepidermal water loss (TEWL) levels, cell death and epithelial thickness. In addition, ZnONPs could penetrate through the damaged epithelium, gain access to the dermis cells, and lead to severe inflammation by activation of M1 macrophage. Mechanistic studies indicated that co-exposure of keratinocytes to UVB and ZnONPs lysosomal impairment and autophagy dysfunction, which increased cell exosome release. However, these exosomes could be taken up by macrophages, which accelerated M1 macrophage polarization. Furthermore, ZnONPs also induced a lasting inflammatory response in M1 macrophages and affected epithelial cell repair by regulating the autophagy-mediated NLRP3 inflammasome and macrophage exosome secretion.

Conclusions:

Our findings propose a new concept for ZnONP-induced skin toxicity mechanisms and the safety issue of ZnONPs application on vulnerable skin. The process involved an interplay of lysosomal impairment, autophagy-mediated NLRP3 inflammasome and macrophage exosome secretion. The current finding is valuable for evaluating the effects of ZnONPs for cosmetics applications.

Title: 2D magnetic memory based on graphene nanoribbons spin-valves

Speaker Name: Wen-Jeng Hsueh
Affiliation: National Taiwan University, Taiwan

Abstract: Using two-dimensional (2D) materials presents a significant leap forward in developing spintronic devices, offering a superior alternative to spin management. The primary focus of this effort is advancing non-volatile memory technologies, particularly magnetic random-access memories (MRAMs), by incorporating 2D materials. Crucial to the writing mode of MRAMs is achieving a substantial spin current density capable of state switching. Overcoming the challenge of surpassing critical values, approximately 2 MA/cm^2, for spin current density in 2D materials at room temperature is a formidable hurdle. In response, we introduce a gate-controllable spin-valve founded on armchair graphene nanoribbons (GNRs) designed to generate a substantial spin current density, which allows us to switch the magnetization state without the aid of an applied magnetic field at room temperature. Dirac Hamiltonian and Landauer–Büttiker formalism are used to simulate the spin-dependent transport properties and performances of the proposed device. Controllable gate voltage proves instrumental in achieving the critical spin current density, with the highest density reaching an impressive 14 MA/cm^2 through adjustments to the band gap energy of GNRs and exchange strength in our proposed gate-controllable spin-valve, as shown in Fig. 1. Moreover, our proposed GNR spin-valve satisfies reading mode criteria, consistently maintaining magnetoresistance (MR) ratios exceeding 100%. Furthermore, realizing an exceptionally low writing power requirement stands as a great advantage offered by the proposed GNR spin-valve. To sum up, this innovation allows for ultralow writing power, overcoming challenges traditional magnetic tunnel junction (MTJ) based MRAMs face. We believe these encouraging results can pave the way for the feasibility of spintronic devices based on 2D materials, indicating potential breakthroughs in integrating spintronics into non-volatile memory technologies.

Title: For high-performance humidity sensors using Fully Printed electronic-based cellulose nanofiber-Ag nanoparticle composites.

Speaker Name: Dong-Soo Kim
Affiliation: Hanbat National University, Korea

Abstract: This study presents a high-performance humidity sensor fabricated using an innovative sensing material consisting of cellulose nanofibers (CNF) and silver nanoparticles (AgNP). The interdigital electrode pattern was created using reverse offset printing with Ag nano-ink, and the sensing layer on the printed interdigit electrode (IDE) was constructed by depositing CNF-AgNP composites through inkjet printing. Sensor performance was evaluated by measuring the change in impedance according to the change in relative humidity. The CNF-AgNP sensor showed a very sensitive and rapid response to the change in humidity compared to the CNF sensor. This means that the improved performance in humidity detection resulted in increased conductivity of Ag nanoparticles and adsorption of free water molecules due to the porous properties of the CNF layer. This suggests that CNF-AgNP composites can fabricate high-sensitivity, fast response, reproducibility, flexibility, and cost-effective humidity sensors.

Title: Nemesis Formation Around Black Holes with Evidence

Speaker Name: Marina Bakay
Affiliation: The Children's Hospital of Philadelphia, USA

Abstract: I briefly present the evidence on extragalactic planets equivalent to the proposed counterpart Nemesis in the solar system. I theorize that the phenomenon is common for black holes and they aid star cluster formation. The observational evidence for these objects are presented with the instances of the Triffid Nebula M20 with ground-based telescope and M87 with the NASA space-based telescope data. I deem that an alternative formation of parallaxes should be in place for the calculations of their absolute magnitude and lensing for white hole observations. Further, I discuss the value of Pluto to an evidence-driven approach to cosmology.

Title: Seismic activity of Moon and Mars

Speaker Name: Boyko Ranguelov
Affiliation: Bulgarian Academy of Science and Arts, Bulgaria

Abstract: T he origin and seismic activity on the extraterrestrial bodies are expected to be similar, but the space missions to the Moon and Mars equipped by seismometric devices, show significant differences in the space-time distribution of the seismicity, as well as about the sources of the Moonquakes and Marsquakes. The Moonquakes and Marsquakes are a clear expression of the strata stress release on these extraterrestrial cosmic bodies. Due to this property these seismic events generate seismic waves which are the most important source of information for the internal structure of the planets and their satellites (if they are solid bodies) and the respective dynamics of their geology evolution. According the recent scientific research of the terrestrial bodies almost all initial space missions include in their scientific programs installation of seismometers and telemetric transfer of information. Almost all missions to the Moon and Mars including seismic studies are successful and the data provided show expected similarities and surprising differences of the registered seismic events. Comparisons of these similarities and differences are important and can help the understanding of seismic processes on the space extraterrestrial studied bodies. And this is the main aim of this study, including similarities and differences of the Moonquakes and Marsquakes. It is important to mention that every seismic event is in fact the sudden stress (accumulated in solid strata) release in a very short time followed by the propagation of the seismic waves. The seismic waves are body-waves (P-primary and S-secondary) and surface waves (Raleigh and Love – named to their discoverers). These waves are registered by seismographs (broadband, short period, accelerometers, etc.) on the seismogram and the final part (tail) of the seismogram is called “coda”. The coda waves are significant different on Mars and Moon than on Erath. The conclusion is that we have rather limited knowledge about the seismic processes on the other extraterrestrial objects.

Title: Review on structural and electrical properties of Co- Mn -Zn ferrite and its applications

Speaker Name: Asmaa Reda
Affiliation: Sadat City University, Egypt

Abstract: Several years of worldwide revolutionary developments in nanoscience, combining physics, chemistry, material science, theory and even biosciences, have brought us to another level of understanding. The remarkable progress in science and technology is established with the advancement in nanoscience and nanotechnology. Basically, ferrites are ceramic materials, dark grey or black in appearance and very hard and brittle. Ferrites may be defined as magnetic materials composed of oxides containing ferric ions as the main constituent. Ferrites have much less electrical conductivity compared to metallic ferro magnets, continues to be the most important magnetic materials in various high-frequency applications, having repressed eddy currents and lowered energy loss in high-frequency use. Therefore, ferrites are playing a great role in many devices of every-day life (ac and dc motors, power distribution systems, video and audio applications, microwave devices, antenna rods, loading coils, core material for power transformers in electronics, high-frequency devices, memory devices such as hard disks, floppy disks, capacitor electrode, catalysis, drug delivery, water treatment, and gas sensor.

Ultrafine Cobalt Zinc ferrite powders have been synthesized by co-precipitation method. Moreover, the effect of substituting Mn^{2+} ions on the crystal structures, microstructure, and dialectical properties of Co-Zn ferrites were studied. The effect of this dopant on the average of crystallite/grain size, lattice parameter, density, the purity of the formed phase, and morphology of the synthesized nanoparticles was determined. The prepared powders were characterized using X-ray diffraction, Fourier Transformation, Infrared Spectra, Transmission electron microscopy, and LCR Bridge. We obtained an improvement in the dielectric properties of the prepared samples, making them suitable for use in high-frequency applications due to the substitution by Mn ions.

Title: Characterization, antibacterial, and cytotoxic activities of silver nanoparticles using the whole biofilm layer as a macromolecule in biosynthesis

Speaker Name: Aghapy Yermans Yakoup
Affiliation: Zewail City of Science and Technology, Egypt

Abstract: Recently, multi-drug resistant (MDR) bacteria are responsible for a large number of infectious diseases that can be life-threatening. Globally, new approaches are targeted to solve this essential issue. This study aims to discover novel antibiotic alternatives by using the whole components of the biofilm layer as a macromolecule to synthesize silver nanoparticles (AgNPs) as a promising agent against MDR. In particular, the biosynthesized biofilm-AgNPs were characterized using UV-Vis spectroscopy, electron microscopes, Energy Dispersive X-ray (EDX), zeta sizer, and potential while their effect on bacterial strains, and normal cell lines was identified. Accordingly, biofilm-AgNPs have a lavender-colored solution, spherical shape, with a size range of 20–60 nm. Notably, they have inhibitory effects when used on various bacterial strains with concentrations ranging between 12.5 and 25 µg/mL. In addition, they have an effective synergistic effect when combined with phage ZCSE9 to inhibit and kill Salmonella enterica with a concentration of 3.1 µg/mL. In conclusion, this work presents a novel biosynthesis preparation of AgNPs using biofilm for antibacterial purposes to reduce the possible toxicity by reducing the MICs using phage ZCSE9.

Title: The application of generalized Rayleigh equation for description of periodic intramolecular

Speaker Name: Vladimir Kirillovich Voronov
Affiliation: Irkutsk National Research Technical University, Russia

Abstract: This work is devoted to the substantiation of a fundamentally new idea of controlling a quantum dot and a method for its synthesis from paramagnetic molecules that are characterized by intramolecular rearrangements, in particular, valence tautomerism. The primary task of the study was to select a model that would allow the experimental implementation of such an idea. In this regard, the possibility of using the self-oscillatory system described by the Rayleigh equation to describe intramolecular periodic oscillations was analyzed. Such a self-oscillating process is nothing but the periodic overcoming of the energy barrier separating the states between which the transitions of the place take place. These states can be realized for molecular systems whose behavior at the macrocosm level is associated with the manifestation of nonlinearity of intramolecular processes. Analysis of the coefficient before the second term of the generalized Rayleigh equation using the Prigogine-Lefebvre model shows that oscillations can be stable over time with very real energy barriers characteristic of intramolecular motions. It is concluded that the generalized Rayleigh equation, in principle, makes it possible to determine specific molecular systems that can be used as starting materials for the creation of quantum dots characterized by states with significantly different magnetic properties. Coordination compounds containing atoms with empty 3d-, 4f-, and 5f- shells are suitable for this purpose. In particular, due to the peculiarities of the electronic and spatial structure of such complexes, nonlinearities of intramolecular rearrangements occur, which provide the periodicity of changes in the parameters characterizing these multielectron systems. Based on the Prigogine-Lefebvre model, a quantum dot that works on the principle of self-organization can control the work of a nanotrigger. Such a nanotrigger is an inverter capable of independently performing the logical operation NOT and ensuring the execution of the quantum counting procedure.

Title: Student's Research Activities in Hybrid Intellectual Environment of Mathematics Teaching

Speaker Name: Eugeny Smirnov
Affiliation: Yaroslavl State Pedagogical University, Russia

Abstract: The maim prospective of the modern society is to manage and develop the project-based and research activities of students. Neural networks, as effective tools for solving complex, multi-component, multifunctional problems, created an opportunity to develop the content and assessment of the quality of project-based and research activities and personal achievements of each student. The purpose of this study is to define and develop the concept of hybrid intelligent system supporting of student's project-based and research activities by mathematical and computer modeling resources. Applied intellectual technology should to support and classify the growth of each student's scientific potential with different opportunities. The paper considers the development of pedagogical, algorithmic and information organization of ontological engineering and model support of student's project-based and research activities and scientific potential growth based on the construction of an artificial neural network with a teacher and an array of training samples using expert systems and the decision theory. It also defines the selection criteria, hierarchies and content of generalized constructs of complex knowledge (modern achievements in science) and parameters of student's scientific potential dynamics by neural network. The study made it possible to create an applied intelligent technology for supporting and displaying the dynamic profiles of each student's project-based and research activities and the growth classifier of their scientific potential. Individual educational support with hybrid intellectual environment will allow the developing of each student's scientific potential and their dynamic profiles, will support to master the student's project-based and research activities and will realize the adapting potential of modern achievements in science to school mathematics, will create the conditions for educational programs modernization in developing digital environment.

Title: Actinides Th and U in Atmospheric Particulate Matter in Yakutsk

Speaker Name: Makarov Vladimir Nikolaevich
Affiliation: Institute of Permafrost Science, Russia

Abstract: The distribution of Th and U was studied in the near-ground atmosphere of the city of Yakutsk. The chemical compositions of particulate matter (PM) in the summer atmosphere and in the solid and soluble phases of the snowpack were studied in 2019–2020. In the summer atmosphere, Th and U are concentrated mostly in the dust fraction of PM, together with a group of siderophile elements. The wintertime PM is characterized by a more homogeneous size of its particles. PM minerals with which concentrations of actinides correlate are amphiboles and pyroxene for Th and carbonates for U. The Th and U concentrations were found out to systematically decrease in the sequence soil–summer PM (dust)–winter PM (snow), at the dominance of Th, but the aqueous phase of the snow contains U concentrations one order of magnitude higher than those of Th.

The bulk (close to 90%) of actinides is deposited during the warm season (table).

The total amount of actinides falling out in Yakutsk is 63 mg/(m^2 year), with two-thirds of this amount being Th. This value may locally increase to 200 mg/(m^2 year) and more in areas of contrasting anomalies, with the predominance of Th. The main sources of actinides entering the near-ground atmosphere of Yakutsk are dusting from the soil surface and emissions from vehicles, with lesser amounts coming from energy-producing and construction-industry facilities.

Title: Morphology, particle size and properties of nanostructures obtained using pulsed plasma and interfacial energies

Speaker Name: Murzabekova Elmira Tungatrovna
Affiliation: Institute of Chemistry and Phytotechnology, Russia

Abstract: Synthesis in heterophase liquid systems, which involves the occurrence of chemical processes at the interface between liquids, is of great interest, which is currently called interfacial synthesis. “The reaction can occur on a flat surface separating immiscible liquids or on a non-planar surface in microemulsions. Surface energy is concentrated at the interphase surface (phase boundary) and is excess compared to the energy in the volume. There are quite a few chemical methods for obtaining nanostructures on the interfacial surface, but due to the existing advantages, each method also has a number of disadvantages. First of all, this requires a lot of time, energy, reagents, and expensive equipment. The proposed method for obtaining nanostructures using the total energy of the interfacial surface and the energy of pulsed plasma can be an alternative method for obtaining nanostructures on the interfacial surface. Water-benzene or water-toluene liquids, which are immiscible under normal conditions, are capable of forming microemulsions with intense stirring. We have synthesized nanostructures of copper, zinc, cadmium, aluminum, and indium at the interface of two immiscible liquids, water-benzene and water-toluene, using pulsed plasma energy. A phase and electron microscopic analysis of the resulting nanostructures was carried out. The photoactivity of ZnO nanorods and indium nanostructures has been studied. The specific surface area and pore size of aluminum and aluminum oxide nanoparticles from microemulsion (water-benzene) were determined.

Title: Stress Analysis on Functionally Graded Rotating Cylinders via IADM

Speaker Name: Servet Mert Kutsal
Affiliation: Kocaeli University, Turkey

Abstract: Functionally graded materials (FGM) are the materials that are developed for special performance or function. In this material, some of the material properties like elasticity modulus, density, etc are chosen as a special function. This may lead to encountering differential equations that are difficult to solve. Analytical approximation methods help overcome the difficulties of solving governing equations using classical analytical approaches. In this study, stress analysis for FG rotating long cylinders is conducted using the Improved Adomian Decomposition Method (IADM). The material properties are assumed to vary according to the power law function. The study is repeated for different gradation parameters and the effect of this parameter on the stresses is also investigated. IADM gives an excellent result in obtaining the stresses on the cylinder.

Title: Approaches in line with human physiology to prevent skin aging

Speaker Name: Marina Bakay
Affiliation: Hacettepe University, Turkey

Abstract: Skin aging is a complex process that is influenced by intrinsic and extrinsic factors that impact the skin's protective functions and overall health. As the body's outermost layer, the skin plays a critical role in defending it against external threats, regulating body temperature, providing tactile sensation, and synthesizing vitamin D for bone health, immune function, and body homeostasis. However, as individuals age, the skin undergoes structural and functional changes, leading to impairments in these essential functions. In contemporary society, there is an increasing recognition of skin health as a significant indicator of overall wellbeing, resulting in a growing demand for anti-aging products and treatments. However, these products often have limitations in terms of safety, effective skin penetration, and potential systemic complications. To address these concerns, researchers are now focusing on approaches that are safer and better aligned with physiology of the skin. These approaches include adopting a proper diet and maintaining healthy lifestyle habits, the development of topical treatments that synchronize with the skin's circadian rhythm, utilizing endogenous antioxidant molecules, such as melatonin and natural products like polyphenols. Moreover, exploring alternative compounds for sun protection, such as natural ultraviolet (UV)-absorbing compounds, can offer safer options for shielding the skin from harmful radiation. Researchers are currently exploring the potential of adipose-derived stem cells, cell-free blood cell secretome (BCS) and other endogenous compounds for maintaining skin health. These approaches are more secure and more effective alternatives which are in line with human physiology to tackle skin aging. By emphasizing these innovative strategies, it is possible to develop effective treatments that not only slow down the skin aging process but also align better with the natural physiology of the skin. This review will focus on recent research in this field, highlighting the potential of these treatments as being safer and more in line with the skin's physiology in order to combat the signs of aging.

Title: Decoding Autoimmune Control: The Intricacies of CLEC16A Regulation

Speaker Name: Aayasha Negi
Affiliation: IFTM University Moradabad

Abstract: Growing concerns over the toxicity of metallic nanocomposites synthesized using physical and chemical techniques seems to be a major hurdle for researchers.Green synthesis of NCs is one of the promising, eco friendly and safer methods. Ag/ZnO NCs were prepared by green method. The obtained NCs were characterized by UV-Vis, XRD, FT-IR, TEM and EDX. The results indicated that high purity of nanosized Ag and ZnO-NCs were successfully obtained having cubic and hexagonal crystalline structures respectively. The band gap energies of Ag/ZnO NCs were estimated using UV-visible absorption spectra using tauc plot. In addition, the photocatalytic property of these nanocomposites were divulged by their rose bengal, Methylene blue dye degradation potential. The residual concentration of dyes was monitored using UV-visible absorption spectrometry. In this case the degradation efficiency of the photocatalyst nanoparticles after 2h irradiation time was about 93% with a reaction rate of 3.61×10^{-3} min^{-1}. Further, these NCs rrevealed antimicrobial effects against clinical pathogens such as *Staphylococcus aureus*, *Escherichia coli* and *Klebsiella pneumoniae*. The research further evaluated the antioxidant capabilities of these NPs using H_2O_2 radical scavenging assay.

Title: Decoding Autoimmune Control: The Intricacies of CLEC16A Regulation

Speaker Name: Ramen Kumar Parui
Affiliation: ARC, Mall Enclave

Abstract: Recent discovery of cosmic baby i.e. Swift J1818.0-1607 with the characteristic age ~ 240 years offers us to search its associated supernova from ancient guest stars whose records are available in China, Korea. Gravitational lensing effects reveal the re-explosion images of supernovae with delay time. Analysis of Hubble Space Telescope captured images of two supernovae (i.e. SN Requiem and SN Refsdal) indicates the special property —

the disappearance (or feded) and re-appearance (or revealing as re-explosion) of supernova. Matching these facts with ancient Chinese records of guest stars I conclude that Guest Star 1789AD was associated with the Swift 1818.0-1607 e.g. the harbinger of Swift 1818.0-1607 formation.

Title: Horizontal rate of spread of Polycyclic Aromatic Hydrocarbons in soil

Speaker Name: Prahash Chandra Sarma
Affiliation: Cotton University

Abstract: The rate of horizontal spread of Anthracene, Fluorene and Phenanthrene in soil is determined in an experiment spread over a year under natural environment. The study regarding their natural degradation or enhanced degradation by different addendums have been widely done and reported. However, the study regarding their vertical and horizontal movement in soil is very limited and is not reported. Since, soil is one of the best supporters of life on earth; rate of horizontal movement of a pollutant such as polycyclic aromatic hydrocarbons in soil plays a major role in animal health. As such, the work needs extensive awareness and systematic study.

In the present work, Known amount of the hydrocarbons were added to prepared and protected soil beds, extraction of the same were done later on at definite time intervals, at definite distances from the point of application and quantitative determinations were done by HPLC analysis of the extract. An experiment in internal plot of soil was also set up in order to study the extent of degradation during the study period. The quality of the experimental soil was determined by analyzing the soil with respect to important physico-chemical parameters and the concerned aromatic hydrocarbons.

The values of soil parameters were in agreement to the characteristics of a good soil. It has been found that one-year time is sufficient for the applied quantity of the hydrocarbons to spread uniformly to attain a concentration, which is at par with natural concentration of the hydrocarbons in the experimental soil. Studies on kinetics of the reaction imply that the reaction occurs in different phases, rate constants being gradually increased with time. It has been found that the most probable rate of horizontal spread of the hydrocarbons Anthracene, Fluorene and Phenanthrene is 4.83, 2.80 and 2.89 $X10^{-8}$ m s^{-1} respectively.

Title: Time Reversed States in Barrier Tunneling

Speaker Name: Kanchan Meena
Affiliation: S N Bose National centre for Basic Sciences

Abstract: Tunneling, though a physical reality, is shrouded in mystery. Wave packets cannot be constructed under the barrier and group velocity cannot be defined. The tunneling particle can be observed on either side of the barrier but its properties under the barrier has never been probed due to several problems related to quantum measurement. We show that there are ways to bypass these problems in mesoscopic systems and one can even derive an expression for the quantum mechanical current under the barrier. A general scheme is developed to derive this expression for any arbitrary system. One can use mesoscopic phenomena to subject the expression to several theoretical and experimental cross checks. For demonstration we consider an ideal 1D quantum ring with Aharonov–Bohm flux , Φ connected to a reservoir. It gives clear evidence that propagation occur under the barrier resulting in a current that can be measured non-invasively and theoretically cross checked. Time reversed states play a role but there is no evidence of violation of causality. The evanescent states are known to be largely stable and robust against phase fluctuations making them a possible candidate for device applications and so formalizing the current under the barrier is important.

Title: SEE Failure Analysis of Hi-rel ASIC for Spacecraft Applications

Speaker Name: Padmapriya K.
Affiliation: U R Rao Satellite Centre

Abstract: Miniaturized electronic devices are essential to improve the performance, reduce the weight and volume, and improve reliability of electronic packages in a spacecraft. With technology scaling, a prime reliability challenge for CMOS devices used in spacecrafts is the occurrence of soft errors due to the propagation of Single Event Transients (SETs) in the space radiation environment. ASICs undergo stringent quality tests to ensure reliable operation of the spacecraft during its mission life. In general, Single Event Effect (SEE) tolerance qualification tests estimate the heavy ion radiation tolerance of CMOS devices for space application. A new SEE test methodology using available scan structure in digital ASICs is presented. Here, different patterns are loaded in the scan chain which helps to differentiate between Single Event Upset (SEU) and SET-induced SEU soft errors, and localize SEU fault location by test data analysis. The SEE test methodology combines both static and dynamic testing in the two modes viz., scan test mode and functional mode of testing. Two different ASIC designs realized in 180 nm CMOS technology are tested successfully in this methodology. Failure analysis of multifunctional configurable ASIC is carried out using logged test data and know-how of functionality and structural implementation of the design. The identified SET susceptible cell is replaced with four different structures, re-fabricated and tested again to ensure the correctness of the analysis. This methodology can be used for complex designs, designs incorporating radiation mitigation, as well as to evaluate the logic cells in a new standard cell library for radiation tolerance.

Title: Biotoxicity of Achrostichum aureum L. synthesized Zinc Oxide Nanoparticles against Aedes albopictus, and impact on predation efficiency of

Speaker Name: Roni.M
Affiliation: University of Calicut

Abstract: Millions of people worldwide are at risk of death from diseases carried by mosquitoes. India is currently dealing with the threat posed by *Aedes* mosquitoes, which spread the arboviruses that cause dengue and Chikungunya and instill fatal terror in the population throughout the world. Control of arthropod pests in growing countries is a key issue with different aspects. Therefore, in this research, we synthesized ZnONPs from *Achrostichum aureum* L. to manage mosquito vectors. The synthesized ZnONPs were characterized by using SEM and TEM, with a size ranging from 36.8 nm to 68.4 nm. Further, XRD analysis indicates the crystalline nature of the face-centered cubic structures of synthesized ZnONPs. Also, the FTIR confirms the role of a variety of phytoconstituents that are involved in binding with nanomaterials in order to stabilize them for a long period of time. Insecticidal assays showed that both ethanolic leaf extract of *A. aureum* and its fabricated ZnONPs had significant toxicity on different life stages of targets with LC_{50} values were 15.65-I instar, 17.07-II instar, 18.59-III instar, 18.35-IV instar, and 19.50-puape respectively. Concerning non-target effects, the predatory potency for *Gambusia affinis* was 46.73%, and 32.87% on III and IV larval instars of *A. albopictus* in standard laboratory settings while in ZnONPs treated aquatic environmental settings, the predatory efficiency of fish was boosted to 60.06%, and 40.86%, respectively. In conclusion, this research explored that both *A. aureum* extract and its fabricated ZnONPs may be considered as an alternative tool against dengue vector.

Title: Nanofluid Based Pipe Flow Analysis in Absorber Pipe Of Flat Plate Solar collector: Effectes of Inclination and Porosity

Speaker Name: Lipika Panigrahi
Affiliation: Gandhi institute for education and technology

Abstract: Nanofluid applications in solar collectors are an emerging area for enhanced heat transfer resulting in heat gain for domestic and industrial use. In the present work, the performance of a Flat Plate Solar Collector (FPSC) having water-CuO-based nanofluid has been studied. The effect of the tilting angle of cylindrical pipe and porosity of porous material is investigated for this nanofluid-based FPSC. A numerical approach has been adopted to stimulate the governing equations in the tube. The similarity transformation simplifies the model (PDEs) into ordinary differential equations (ODEs). The governing non-dimensional PDEs along with their appropriate boundary conditions are solved numerically using the 4th order Runge-Kutta method cum shooting technique. The impacts of significant and relevant physical parameters and physical quantities of interest are analyzed. From the present study, it is observed that amplification of tilting angle and curvature parameter ameliorates the heat transfer rate while that of porosity parameter controls it effectively. A similar approach can be employed for other solar collectors to assess the heat transfer augmentation by using nanofluids instead of existing fluids.

Title: Ecologically Sustainable Graphene Aerogel for theeffective Adsorption of Indoor Air pollutants

Speaker Name: Aryan Singh
Affiliation: Indian Institute of Petroleum and Energy

Abstract: The hazardous nature of volatile organic compounds (VOCs) and toxic gases (TGCs), which are produced from diverse natural and anthropogenic activities, poses a serious threat to human health.[1] Consequently, it is essential to implement effective methods for the removal of TGCs like adsorption, absorption, condensation and membrane separation.[2] Adsorption is preferred over conventional methods because of its selectivity, regenerability, versatility and compact environmental friendly. Graphene aerogel (GA) has gained importance because of its remarkable adsorption capability and unique structural characteristic.[3] Herein, the synthesis of ultra-light weight, coarse pore structure nitrogen doped-GA (N-GA) from biomass (Guava) is reported. Further, The N-GA was used as adsorbent for the effective adsorption of TGCs. These N-GA exhibit high adsorption of TGCs with high recyclability due to high porosity and surface area. N-GA show fairly good adsorption of TGCs such as NH3 (~408 mg g-1), formaldehyde (~332.03 mg g-1), carbon disulfide (~186.4 mg g-1), hydrochloric acid (~319.7 mg g-1), acetone (~341.8 mg g-1), ethanol (~184.5 mg g-1). The results indicate that N-GA exhibit considerable potential for diverse applications in air purification.

Title: Adaptive Fuzzy Clustering Based Atom Search Optimization Segmentation for Accurate Alzheimer's Disease Detection on Magnetic

Speaker Name: Nirupama S. Patodkar
Affiliation: MGM University

Abstract: The algorithm incorporates adaptive fuzzy clustering to enhance the precision of cluster assignments, allowing for a more nuanced representation of neuroanatomical structures. The integration of Atom Search Optimization further refines the segmentation process, optimizing the spatial distribution of clusters and improving the overall accuracy of region-of-interest identification.

The research outlines the algorithm's architecture, detailing the implementation steps involved in applying ASO for neuro-imaging data segmentation. A comprehensive evaluation is conducted using local and global datasets, demonstrating the algorithm's effectiveness in accurately segmenting brain regions relevant to Alzheimer's pathology. The results showcase the algorithm's potential in achieving improved sensitivity and specificity in comparison to existing segmentation methods.

By introducing this innovative algorithmic approach, the research contributes to the advancement of Alzheimer's Disease detection methodologies, specifically focusing on the critical step of accurate segmentation. The proposed technique holds promise for enhancing the precision of neuroimaging analyses, ultimately leading to more reliable early detection and diagnosis of Alzheimer's Disease.

Title: Synthesis of Multi-position 3-PRS Manipulator based on Spherical Constraints by Eliminating the PARA

Speaker Name: Srinivasa Rao Pundru
Affiliation: Mahatma Gandhi Institute of Technology

Abstract: This work presents synthesis of 3-PRS manipulator based on spherical constraints by eliminating the PARA. The PARA can occur due to constrained mobility of the manipulator. The 3-constrained variables of manipulators are rotational freedom along z-axis and 2-translational freedom about x and y-axis of the fixed reference frame. The PARA motions are usually nonzero and are determined by the geometrical parameters of the manipulator. These PARA motions cause crucial problems in some cases. In general the amplitude of PARA motions are very small, but shows more impact on precision of motion, quality and accuracy of the mirror images of 3-PRS manipulator. To prevent these undesirable PARA motions, the synthesized architectural parameters of 3-PRS manipulator are identified by eliminating the PARA motions. The prospective application of this manipulator is in mirror image telescopic process used for alignment applications where tip, tilt and image focus of primary and secondary mirrors and positions are important.

Title: Development of Super Sensitive Moisture Sensor by Ceramic Nanoporous Thin Film: A Comparative Study

Speaker Name: Manju Pandey
Affiliation: Ajeenkya D.Y. Patil University

Abstract: In this paper we report super sensitivesensitive capacitive humidity sensor whose stability and response is completely unaffected in toxic ambience.The developed sensor has fast response and recovery time, and high selectivity for moisture. Standard characterization techniques such as AFM, FESEM, BET,XRD and impedance spectroscopy were employed for micro-structural and electrical characterization of RH sensor. The nano porous alumina film developed by sol-gel technique undergoes a huge change in dielectric upon adsorption of moisture, ensuring large change in capacitance. The prototype instrument can be used for sub ppm level moisture detection in highly toxic environment for different applications. Response and recovery time of developed sensor are in seconds. Novelty of this sensor is ,its performance remains same in toxic environment which is confirmed by experiments.

Title: Investigating power loss in a wind turbine using real-time vibration signature

Speaker Name: Kingshuk Banerjee
Affiliation: Research and Development Center

Abstract:

Objective: Wind energy's rapid growth underscores the importance of understanding the environmental and mechanical factors affecting wind turbine power output. Despite the significance of vibration as an indicator of turbine health, its relationship with power loss remains largely unexplored.

Scope: This study aims to introduce a novel approach, utilizing a vibration index derived from turbine vibration data, to investigate power loss in wind turbines. Specifically, it focuses on modeling gearbox health, considering the loss of generator speed, and examines the impact of vibration on power loss.

Methods Used: The methodology involves a data-driven approach to model gearbox health, using the vibration index as an input. This includes analyzing vibration data from different parts of the turbine hub to understand its effect on generator speed and subsequent power loss. Linear mapping techniques are employed to correlate generator speed with power loss, based on the observed vibration data.

Results: The analysis reveals a significant correlation between turbine vibration and generator speed, with vibration explaining approximately 57% of the speed loss. Furthermore, the study demonstrates an 85% accuracy in predicting power loss based on generator speed, with a 55% accuracy in predicting actual power loss in the turbine.

Conclusion: The proposed methodology, applied to real-world data from an onshore wind farm in the western coast of India, offers a data-driven and efficient approach to enhance understanding of wind turbine operations. By considering vibration as a crucial factor in power loss, this study contributes valuable insights for optimizing turbine performance and maintenance strategies.

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Title: Role of Nano candle carbon soot in nanotechnology

Speaker Name: **Shivani Dhall**
Affiliation: DAV College

Abstract: In recent years, carbon materials are widely investigated because of their extraordinary chemical, electrical and physical properties. But most of the researchers utilize graphite, graphene, reduced graphene oxide (rGO), carbon nanotubes (CNT), etc., as carbon material due to their excellent aforesaid properties. Keeping this in mind, we have synthesized the candle carbon soot using candle flame at room temperature conditions. I have found that a simple flame of candle is used to synthesize the layers of carbon soot with low cost. Candle carbon soot is attractive material for research community for various applications such as in battery, photovoltaic cell, electronics and gas sensor.

Title: Secondary mandibular reconstruction with patient specific 3D printed implant

Speaker Name: Harsimran Singh
Affiliation: C.K.Birla Hospital, India

Abstract: 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.

Title: ACBSO: a hybrid solution for load balancing using ant colony and bird swarm optimization algorithms

Speaker Name: Yogita Yashveer Raghav
Affiliation: K R Mangalam University

Abstract: In order to balance the load in cloud comput- ing, this study suggests a hybrid technique called "ACBSO" that uses both ant-colony and bird swarm optimization techniques. Comparative analysis of the proposed hybrid algorithm has been done with Ant-colony optimization and bird swarm optimization techniques. Simulation results show that the hybrid approach outperforms both the ant-colony optimization approach and the bird swarm optimization approach.Comparison has been done based on primary factors such as makespan, throughput, ftness score, and resource consumption. To obtain the outcomes of the necessary simulations,the cloudsim simulator is employed.

Title: MoS2 coated fabrics for Triboelectric Nanogenerator as Harvesting Energy for Future Clothes

Speaker Name: Narjes Ben Brahim Aouani
Affiliation: University of Tunis El Manar

Abstract: Two-dimensional (2D) materials composed of single or multiple chemical elements have garnered significant attention due to their unique properties and potential applications. Among these materials, transition metal dichalcogenide molybdenum disulfide (MoS2) stands out as a promising candidate for a wide range of applications, including triboelectric nanogenerators to Harvesting energy devices.

In this study, MoS2 was synthesized using a hydrothermal method subjected to elevated, pressure and temperature,, followed by liquid phase exfoliation (LPE) to facilitate the separation of the Van der Waals sheets. The liquid phase exfoliation method was employed to obtain monolayer or few-layer flakes from the synthesized MoS2 nanoparticles. 30mg of MoS2 was immersed in 2-propanol and deionized water. Characterization techniques including optical microscopy, X-ray diffraction (XRD), photoluminescence, UV-visible spectroscopy, and Raman spectroscopy were employed to analyze the structural and optical properties of the 2D MoS2 material.

Furthermore, 2D MoS2 deposited onto cotton substrates was utilized in a triboelectric nanogenerator (TENG) for energy harvesting applications. The nanogenerator play a role in converting mechanical energy into electrical energy primarily through the triboelectric mechanism.

The Sliding Mode TENG comprises two primary elements: the slider and the stator as shown in figure. The stator in our work is based on cotton The Cotton, which typically ranks poorly in the triboelectric series and does not generate significant triboelectric charges through friction alone, exhibited considerable improvement in TENG performance upon deposition of 2D MoS2. The efficiency of the TENG based on cotton fabrics was found to vary depending on the number of layers of deposited 2D MoS2.

The TENGs for energy harvesting applications, particularly in the realm of wearable electronics and smart textiles.

Title: Enhanced Zeolite/Activated-Carbon Composite for the Removal of Volatile Organic Compounds from Indoor Air in Hospital Environments

Speaker Name: Imen Amri
Affiliation: University of Gabès

Abstract: In this study, we investigated the potential of a newly developed synthetic Na-P1 zeolite/activated carbon composite as an effective adsorbent for volatile organic compounds (VOCs) such as chloroform and dimethyl disulfide. The Na-P1 zeolite was synthesized from local Illito-Kaolinitic clay sourced from the Tejra region in South-east Tunisia, while the innovative activated carbon was derived from waste generated by wooden tongue depressors collected from hospitals during the initial wave of the COVID-19 pandemic.

The mineralogical properties of the raw clay and the synthesized materials were determined using X-ray diffraction (XRD) and Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy. Morphological characteristics were examined through scanning electron microscopy (SEM), revealing a high level of particle size uniformity in Na-P1 zeolite and a well-defined structure in the activated carbon.

The Na-P1 zeolite exhibited a remarkable cation exchange capacity, reaching 279 meq/100 g. The BET (N2 adsorption–desorption) analysis of the synthesized activated carbon revealed a high specific surface area of 1511.842 m^2/g and a mean pore volume of 0.621 cc/g. The addition of synthesized activated carbon to Na-P1 zeolite enhanced its mesoporous characteristics, increasing adsorption capacity. Kinetic data fitted well to the pseudo-second order, and the Langmuir model showed the Na-P1-activated carbon composite's maximum adsorption capacity: 54.13 mg/g for chloroform and 28.16 mg/g for dimethyl disulfide. These findings underscore the composite's potential for efficient VOC removal, making it a promising solution for hospital indoor air purification.

Title: Porous hexagonal RuSe2 thin films are obtained at low temperature using the simple spray pyrolysis

Speaker Name: Beya Ouertani
Affiliation: University of Carthage

Abstract: The aim goal of the present work is to develop the field of low cost materials for highly efficient hydrogen evolution electro-catalysis, photo-catalysis, and low cost solar cells applications, thin films of transition metal dichalcogenide materials ($RuSe_2$, $FeSe_2$, RuS_2, FeS_2, etc) are promising candidates especially. Indeed, thin films of transition metal dichalcogenide (TMD) materials, such as $RuSe_2$, are promising alternatives to platinum (Pt) for the hydrogen evolution reaction (HER). Herein, growth of $RuSe_2$ thin films, having desired properties for several applications, using the simple and non-cost technique, spray pyrolysis, makes the main object of this work. In a first step, an aqueous solution of $RuCl_3.3H_2O$ (0.03M) was sprayed for 5 min onto ordinary glass substrates pre-heated at 350°C. Dark amorphous thin films were obtained. After that, the as obtained amorphous thin films were heat treated under selenium atmosphere (~10^{-4}Pa) at various temperatures (450, 500, and 550°C) for 3hours in RTP oven. A single hexagonal $RuSe_2$-phase (h-$RuSe_2$) was picked up by the XRD analysis. The obtained layers presented a high absorption coefficient (> 6x$10^4$$cm^{-1}$ for the layers selenized at 450°C, and > $10^6$$cm^{-1}$, <1000nm for the layers selenized at 500 and 550°C). The plots of (.h.)² vs (h) showed direct band gaps corresponding to the photon energies of about 1.56 eV, 1.75 eV, and 1.86 eV of the layers selenized at 450, 500, and 550°C, simultaneously. Surfuce morphology was treated by SEM: clustred structure was observed for the layers obtained after selenization at 450°C, and grannular structures were observed for the layers abtained at 500 and 550°C. The grain size becomes so large for the layers obtained at 550°C; that confirms their high absorbance. The interesting obtained results provide for improving more the domain of low cost materials having encouraging properties for several applications domains (photovoltaic, hydrogen evolution, electrocatalysis and photocatalysis) using the spay pyrolysis technique.

Title: Preparation and investigation of Montmorillonite-K10 Polyaniline nanocomposites for optoelectronic applications

Speaker Name: Ramsha Idrees
Affiliation: Pakistan Institute of Engineering and Applied Sciences

Abstract: One-dimensional polyaniline (PANI) nanostructures were synthesized in situ via a surfactant/template-free modified solution polymerization technique in the presence of two-dimensional (2D) Montmorillonite (MMT) clay nanosheets. Strong interactions between the polymer and MMT platelets in the nanocomposites were confirmed through spectroscopic studies. X-ray diffraction and scanning electron microscopic studies revealed the clay's profound effect on the polymer's crystallinity and morphology. The clay nanosheets induced higher crystallinity and well-defined nanorod morphology in the polymer structure. Consequently, the nanocomposite showed an electrical conductivity of 8.72 S/cm, closer to that of the pristine polymer (8.97 S/cm),despite the presence of highly insulting clay material. Surprisingly, a notable decrease in the optical bandgap of the polymer from 3.73 to 2.88 eV of the nanocomposite was also observed. This novel integration of a narrow band gap and high conductivity in PANI/MMT nanocomposites can expand their utility for visible light interactions in areas encompassing photocatalysis, photovoltaics, electro/photochromism, and related technologies.

Title: Hepatoprotective role of thymoquinone coated zinc oxide nanoparticles against aflatoxins induced hepatotoxicity

Speaker Name: Huma Mujahid
Affiliation: University of Veterinary and Animal sciences

Abstract: Aflatoxins (AFs) are the group of highly carcinogenic mycotoxins produced primarily by the fungus *Aspergillus flavus.* Feed contamination might increase the risk of aflatoxins spreading into animal-derived goods resulting in major economic losses, refusal of supplies for national or international exchange, as well as causing human and animaldeaths. Conjugation of TQ with Zinc Oxide Nanoparticles and to analyze the hepatoprotective effect of thymoquionone laded ZnONPs against aflatoxins induced hepatotoxicity in albino rat.Thymoquinone loaded ZnO nanoparticles have hepatoprotective effect against the aflatoxin inducedhepatotoxicity.Thymoquinone solution (2 mg/mL), 10 mg ZnO nanoparticles in 1 mL acetone. Adding thymoquinone to ZnO. TLC and HPLC measured toxin extracted in acetonitrilewater. After the estimation of the toxin, a 28-day feeding trial was conducted at the Animal House, UVAS, Lahore. One month old, 20 albino rats were randomly selected and divided into 5 groups, each including 4 rats. Group A was given (normal feed), B (aflatoxin contaminated feed), C (aflatoxin contaminated feed +25ppb ZnONPs), D (aflatoxin contaminated feed + 10ppb TQ), E (aflatoxin contaminated feed + 25ppb TQ-ZnONPs). Experimental rats were slaughtered and blood was drawn for biochemical testing and liver tissue samples were collected for histopathological observations. All the results were analyzed statistically by one way ANOVA and means were compared by Duncan's Multiple Range test. The P-value < 0.05 was considered as significant. Results of Biochemical evaluation showed that thymoquinone coated zinc oxide nanoparticles improved the liver function tests ALT (28±1.00) and AST (35±4.00). Histopathological findings of liver also showed that thymoquinone coated zinc oxide nano particles treated group retained the normal architecture of cells as compared to aflatoxin treated group. In conclusion thymoquinone coated zinc oxide nano particles effectively reduced the hepatotoxic effects caused by aflatoxins present in animal feed.

Title: Cognitive Therapy for Human Mental illness Detection using Naïve Bayes Algorithm

Speaker Name: Shahid Naseem
Affiliation: University of Education

Abstract: Mental Stress and anxiety are a necessary part of our lives and can have both beneficial and negative effects. The stress response is primarily determined by our perception of an event, transition, or problem. Finding a balance in our lives and managing our stress can be an immense challenge. WHO forecasted that one in four people will suffer from mental and other neurological disorders in near future. Thus, the computation, detection, and providing a solution for stress anxiety and depression has become an important point of focus for the researchers and also for the psychologists. Psychologists utilized various scales to quantify a degree of mental issue. On the other hand, to measure such an Illness level, we are dealing with a knowledge-based expert system that will be used to process such an illness level among students and employees who are not associated with technology by surveying among them. Many methods for detecting the cause of these mental issues and stress computation have been introduced by various researchers. This paper focuses on the use of one of the AI methods like naïve Bayesian for predicting sentiments. Our developing and ever-evolving human society has become a great cause of stress and mental issues for its natives. These mental stress and anxiety issues have been a critical point of focus for the researchers because of their endless and strong effects on human behavior. Many methods for detecting the cause of these mental issues and stress computation have been introduced by various researchers.

Title: Vibration analysis of laminated composite beams reinforced with different fractions of nano-particles

Speaker Name: Saman Momeni
Affiliation: Sharif University of Technology

Abstract: Composite structures (beams) are being used in many engineering applications, especially in high technology, including wind turbine blades, helicopter blades, industries, etc. The dynamic response of laminated composite beams reinforced with nano-particles has been investigated in the present work. Most of the existing works on the effects of nano-particles on the stiffness of composite structures are limited to very low-weight fractions, around 3% to 5%. This work studies the effect of a higher percentage of nanoparticles (up to 10%) on the dynamic behavior of the composite structures via experimental tests. Adding nano clay up to 3% of weight fraction increases the natural frequency; beyond that, up to 5 %, the natural frequency slightly decreases, and at 10%, a sharp reduction in natural frequency is observed. An in-house experimental setup has been developed to validate the experimental results with theoretical ones. Another feature of importance is the increasing damping coefficient of the laminated beam when the amount of nano-particles reaches 10%.

Title: Electrochemical properties of CNT doped nanoporous tin oxide hybrid electrode formed on cold spray tin coating for supercapacitor application

Speaker Name: Mehdi Zarei
Affiliation: Babol Noshirvani University of Technology

Abstract: In this study, a hybrid electrode by combining a nanoporous tin oxide thin film with carbon nanotubes on a tin cold sprayed coating was formed. Field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM) were used to conduct structural examinations. The characterization results indicate that employing the pulsed electrophoretic technique for depositing carbon nanotubes on nanoporous tin oxide resulted in the formation of a homogeneous arrangement of carbon nanotube particles on the surface. The electrochemical properties of the resulting electrode were analyzed using cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS). The excellent electrochemical performance of the hybrid electrode can be attributed to its high surface area and exceptional conductivity, which are a result of the inclusion of carbon nanotubes. Incorporating carbon nanotubes into the porous tin oxide framework leads to a substantial enhancement in capacitance. The electrode made of a combination of nanoporous tin oxide and carbon nanotubes had a specific capacitance of 0.036 F.cm-2 when tested at a scan rate of 50 mV·s -1 . The findings indicated that the nanoporous tin oxide-CNT hybrid electrode has the potential to be utilized in energy storage applications.

Title: Enhancing Planar Perovskite Solar Cell Performance: Fabrication, Simulation

Speaker Name: Razieh Teimouri
Affiliation: University of Tehran

Abstract: Recent advancements in photovoltaic research have focused on optimizing perovskite solar cells (PSCs) through precise material engineering and innovative characterization methods. This manuscript reviews findings from our recent research articles, each offering distinct insights into the intricate dynamics of materials and device architectures in the realm of PSCs.

The first study investigates the efficacy of SnO_2 as an electron transport layer (ETL) material in PSCs. Through meticulous experimentation, including surface modifications with urea treatment, the study demonstrates significant enhancements in SnO_2 conductivity and electron transport properties. These improvements yield notable increases in PSC power conversion efficiency (PCE), with surface spin-coated urea-treated SnO_2 layers achieving the highest recorded efficiency of 16.50%. Computational simulations using SCAPS software validate these experimental findings, providing crucial insights into charge transport mechanisms at the SnO_2 interface.

The second research endeavor addresses the challenge of accurately characterizing parasitic resistances in PSCs. By challenging conventional methodologies and proposing a novel approach based on oblique asymptotes, the study introduces a robust method for quantifying parasitic resistances with unprecedented accuracy. Experimental validation and SCAPS simulations affirm the efficacy of this method, highlighting its potential to overcome inaccuracies inherent in conventional characterization techniques.

Lastly, the exploration of novel materials for PSC applications is elucidated through the investigation of Cs_2TiBr_6 metal halide perovskite (PVK) in conjunction with molybdenum disulfide (MoS_2) as a hole transport layer (HTL). Through meticulous simulation and comparative analysis, the study unravels the intricate interplay between material properties and device performance, offering valuable insights for future device optimization endeavors.

In summary, these seminal studies underscore the critical role of material engineering, characterization, and simulation techniques in advancing PSC efficiency and reliability. Through experimentation and innovative methodologies, these studies contribute significantly to the ongoing quest for high-performance photovoltaic technologies.

Title: Treadmill exercise with nanoselenium supplementation afects the expression of Irisin/FNDC5 and semaphorin 3A in rats exposed to cigarette smoke extract

Speaker Name: Fatemeh Rostamkhani
Affiliation: Islamic Azad University

Abstract: In the current study, we investigated the impacts of 6 weeks of aerobic interval training (AIT) with selenium nanoparticles (SeNPs) on muscle, serum, and lung irisin (FNDC5) and Sema3A in rats exposed to cigarette smoke extract (CSE). To this end, 49 male Wistar rats (8 weeks old) were divided into seven groups: control, SeNPs (2.5 mg/kg b.w by oral gavage, 3 days/week, 6 weeks), AIT (49 min/day, 5 days/week for 6 weeks, interval), SeNPs+AIT, CSE (150 µL by IP injection, 1 day/week for 6 weeks), CSE+AIT, and CSE+SeNPs+AIT. The CSE group showed a signifcant reduction in irisin and Sema3A serum levels, as well as a decrease in FNDC5 and Sema3A gene expression in lung tissue ($p<0.05$). A combined treatment (AIT with SeNPs) signifcantly increased the serum level and the expression of muscle and lung irisin (FNDC5) and Sema3A in CSE received groups ($p<0.05$). There was a positive and signifcant correlation between muscle FNDC5 and lung FNDC5 in the CSE+SeNPs+AIT group ($r=0.92$, $p=0.025$). In addition, there was a positive and signifcant correlation between serum Sema3A and lung Sema3A of CSE+SeNPs+AIT group ($r=0.97$, $p=0.004$). Seemingly, performing aerobic exercises with the antioxidant and anti-infammatory supplement nano-selenium in the model of lung damage (similar to COPD) can boost myokine irisin and Sema3A, especially in serum and lung tissue. These results displayed the paracrine/ endocrine regulatory function of these myokines on other tissues. In other words, these interventions emphasized the creation of crosstalk between skeletal muscles and damaged lung, focusing on its recovery; however, further research is needed.

Title: A Superconductor Model for Fundamental Particles

Speaker Name: Mohammad Javanshiry
Affiliation: Independent Researcher

Abstract: Objectives: It has been nearly 130 years that, in the view of physicists, the definition of the Lorentz force indicates that an external magnetic field exerts force on a moving charged particle. However, it is very possible that this deduction has arisen from a misapprehension according to which any external magnetic field is, intrinsically, capable of exerting force on moving electric charges as a fundamental physics law.

Scope: We demonstrate, however, that the origin of the Lorentz force can be a "local" electric field, rather than a magnetic field, circulating the external magnetic field lines at, respectively, the right- and left-hand sides of the moving particle as it moves through the external magnetic field from left to right. To draw plausible conclusions in this configuration, it suffices to, as an auxiliary assumption, claim that every charged elementary particle of finite size behaves as a superconductive material that nullifies any internal magnetic field as the particle is subjected to any external magnetic field.

Results and Discussion: As it is shown in the figure, a rectangular charged object of $+q$ moves perpendicular to the magnetic field lines. The smaller dotted rectangles inside (left) and outside (right) the object show the infinitesimally small places of a width dx that are, respectively, left and filled due to the motion of the charge at a time dt in case (b). **(b)** Some induced electric fields of E^* are produced due to the appearance and vanishing of the magnetic fields at the location of, respectively, the left and right dotted rectangles, yet with the opposite directions. These fields are anticipated to produce a (Lorentz) force of F perpendicular to both v & B.

Methods: The relevant calculations can easily be done using the Faraday's law of induction or Kelvin-Stokes theorem.

Conclusion: We have shown that if we assume some (super)conducting properties for fundamental particles, the origin of the second term in the Lorentz force formula can arise from a local electric field.

Title: An approach to the quasi-equilibrium state of a self-gravitating system

Speaker Name: Amirabbas Khodahami
Affiliation: Shiraz University

Abstract: An approach will be proposed to find out when a self-gravitating system is in a quasi-equilibrium state. This approach is based on a comparison between two quantities identifying the behaviour of the system: a measure of interactions intensity and the area. Gravitational scattering cross section of the system, defined by using the two-particle scattering cross section formula, is considered as the measure of interactions intensity here. A quasi-equilibrium state of such system is considered as a state when there is a balance between these two quantities. As a result, an equation will be obtained which relates density and temperature for such a system in the non-relativistic classical limit. This equation is consistent with the TOV equation as expected.

Title: Quantum entanglement between a hole spin confined to a semiconductor quantum dot and a photon

Speaker Name: Meisam Memarzadeh
Affiliation: University of Tabriz

Abstract: We demonstrate quantum entanglement between a single hole spin confined to a positively charged semiconductor quantum dot (QD) and a photon spontaneously emitted from the matter's excited state. The QD system is in the Voigt geometry with two ground hole spin states and two excited trion states. We consider the light-matter coupling initially prepared in one of the ground hole spin states. For very weak Rabi frequencies, the spin-flip process transfers most of the population to another hole spin state, leading to the disentanglement between the single photon and single QD hole spin. A maximum entanglement is achieved by increasing the intensity of Rabi frequencies. In this case, the population almost equally distributes among all the bare quantum states. Our results may pave the way toward creating a scalable QD quantum computing architecture relying on the photon as flying qubits to mediate entanglement between distant nodes of a QD network.

Title: Diffusion Weighted MRI Monitoring of Embolic Brain Stroke for COVID-19 Patients

Speaker Name: Hossein Taheri
Affiliation: Isfahan University of Medical Sciences

Abstract: Background: Covid-19 pandemic around the world have some unknown adverse effects on human body. To the best of our knowledge, there is a limited data about the impacts of this pandemic disease on embolic brain stroke. This study aimed to compare the embolic brain stroke diffusion weighted MR images in Covid-19 patients with non-covid patients.

Methods: Fifty-six patients suspected to have embolic brain stroke and Fifty-two Covid-19 patients with embolic brain stroke were included in this study. The Covid-19 patients were diagnosed according to their clinical findings. The patients were undergone DWI and the ADC values of different points of their brain were calculated using MRIcro software.

Results: The embolic strokes were mostly diagnosed in the medial temporal lobe for both Covid-19 and others. In addition, combination of Covid-19 with other inflammations and infections was not diagnosed for the studied patients. The mean ADC values of the central region was significantly lower than other regions of the brain stroke for the Covid-19 and other patients. Whereas, the mean and minimum ADC values of the brain's normal regions was not significantly different in the edge regions for both groups, while in the Covid-19 and other patients the maximum ADC value of the edge regions was considerably lower compared to the normal regions.

Conclusion: The embolic stroke of the Covid-19 patients is likely to occur in the medial temporal lobe of brain. Moreover, the ADC and rADC values of embolic brain stroke Covid-19 patients are not significantly different compared to others.

Title: Curved Momentum Spaces: Investigating G.Z.K Cutoff Energy and Modified Compton Scattering

Speaker Name: Arash Majidian
Affiliation: Mazandaran University

Abstract: This study delves into the extension of the G.Z.K equation within a curved momentum space, demonstrating its congruence with experimental data on the cutoff energy displacement. Furthermore, an analysis of Compton scattering, incorporating a modified dispersion relation derived from this model, was investigated. The analysis specifically focused on exploring energy cutoffs and the behaviour of Compton scattering in a spatial geometry defined by de-Sitter properties. The results show that a limit value for momentum is obtained in the desired de-Sitter momentum space.

Title: An insight into SDG 12 through the heat treatment industry's sustainable waste valorization by hydrated nano-structures formation in alkali-activated ceramic

Speaker Name: Farzaneh Mohammadi
Affiliation: Ferdowsi University of Mashhad

Abstract: Depleting natural resources, increasing greenhouse emissions, and socio-economic concerns have led to the recognition of sustainable development as the most important concept in environmental policy. An essential aspect of sustainable development is the reuse of waste and its transformation into valuable materials. Slags are by-products of smelting ores and are generally sorted as waste in most industries while they contain valuable metal and oxides. Reusing/recycling slags can reduce the environmental pollution of slag disposal in landfills. Two challenging issues in ceramic membrane synthesis are the high cost of starting materials and the sintering process. So, finding a technology that utilizes low-cost materials and reduces the synthesis temperature would be highly beneficial. Slags in joint with alkali-activation technology and geopolymers, offer promising opportunities in this regard. This research represents the first attempt to address the challenges of alkali-activated blast furnace slag ceramic membranes by exploring the potential of alkali-activated phosphorus slag as a material for synthesizing ceramic membranes. Furthermore, a comprehensive analysis was conducted to examine the interplay between key factors influencing the properties of common alkali-activated cementitious materials and their impact on membrane properties. This analysis included aspects such as hydrophilicity, flexural strength, topographical properties, thermogravimetric characterization and membrane performance. By employing FESEM & AFM imaging techniques at various scales ranging from microns to nanometers, a striking resemblance between the morphology of alkali-activated ceramic membranes (AACMs) and alkali-activated cementitious materials was established. The main hydration product identified was calcium silicate hydrate (C-S-H). The optimal membrane exhibited a pervaporation separation index, flux, and separation factor of 954.52, 3.61 kg/m2 .h, and 264.41, respectively, in ethanol dehydration through pervaporation. Notably, this result was achieved without zeolite coating. Therefore, the novel and sustainable application presented in this study can reduce environmental pollution associated with phosphorus slag and highlight the circular economy in ceramic membranes.

Title: The use of keratin-7 antisense represents a novel and highly effective strategy to suppress tumorigenesis and promote apoptosis in cases of breast cancer.

Speaker Name: Hamed Hosseinalizadeh
Affiliation: Guilan University of Medical Sciences

Abstract: Expression of the keratin-7 (KRT7) is upregulated in breast cancer, and has been shown to correlate with cancer's poor prognosis; however, the precise mechanisms underlying its involvement in tumorigenesis and apoptosis are largely unexplored. In the present study, by using specific oligonucleotide antisense against KRT7, in combination with KRT7-AS overexpression, we investigated the in vitro effects of the knockdown of KRT7 on tumorigenesis and apoptosis of breast cancer cell lines. According to the results, antisense targeting KRT7 exerted a dose-dependent inhibitory effect on the viability of MDA-MB-468 and MCF-7 cell lines, whereas no cytotoxic effect was observed in normal cells. Our results suggest that KRT7 plays a significant role in directed migration, invasion, and proliferation during tumor growth, leading us to interpret that KRT7 is a metastasis-associated protein and has regulatory activity in EMT and subsequent cancer metastasis. In addition, our cellular studies showed that this approach resulted in a remarkable decrease in mammosphere formation (37% in mammosphere's number and 25% in size; in comparison to the control group of MDA-MB-468 and MCF-7 cells), as well as a decrease in cancer cells migration and an increase in cancer cell apoptosis (48% and 45%, respectively). Altogether, our findings have effectively established the involvement of KRT7 in the advancement of breast cancer through its regulation of the post-transcriptional sense mRNA.

Title: Predicting the physicochemical properties of drugs for the treatment of Parkinson's disease using topological indices and MATLAB programming

Speaker Name: Mehri Hasani
Affiliation: Semnan University

Abstract: In this study, we analyzed twelve drugs used to treat Parkinson's disease. We created graphs of the drugs' structures and used computational techniques, and vertex and edge partitioning methods to calculate the topological indices derived from the M-polynomial. To simplify calculations and data analysis, a computer-based computing technique along with the algorithm has been employed. Topological indices are numerical values that describe the properties of chemical compounds based on their molecular structure and connectivity. These indices can be used to predict various physicochemical properties of compounds such as boiling point, flashpoint, enthalpy of vaporization, molar refractivity, molar volume, polarizability, surface tension, and surface area. Analyzing drugs used in treating a specific disease through topological indices is a valuable technique to reduce unnecessary laboratory expenses. We utilized linear, quadratic, cubic, logarithmic, inverse, power, compound, s-curve, growth, and exponential regression model analyses to create QSPR models between the topological indices and eight physicochemical properties of the drugs to determine their effectiveness. Confidence intervals at a 95% level were computed for both the slope and intercept of the linear regression models. Additionally, based on the maximum R^2, optimal equations for estimating the boiling point, enthalpy of vaporization, molar refractivity, polarizability, and molar volume using different indices have been determined, and linear, quadratic, and cubic equations have been specified. For example, the optimal equation for estimating Molar volume (MV) using the harmonic index is a cubic equation with a maximum R^2 of 0.931 and a maximum F value of 60.95. Calculated feature values are strongly correlated with actual values, indicating reliable predictive capabilities of the indices. For statistical analysis and to determine if there is a significant difference between the averages of the two groups, we used either an independent T-test or Welch's T-test. The results indicate that the p-value is less than 0.05, showing that the mean difference between the samples is statistically significant.

Title: The new era of immunological treatment, last updated, and future consideration of CAR T cell-based drugs.

Speaker Name: Siavash Taremi
Affiliation: Zanjan University of Medical Sciences

Abstract: Cancer treatment is one of the fundamental challenges in clinical setting, especially in relapsed/refractory malignancies. The novel immunotherapy-based treatments bring new hope in cancer therapy and achieve various treatment successes. One of the distinguished ways of cancer immunotherapy is adoptive cell therapy (ACT), which mainly utilizes genetically modified immune cells against cancer cells. In ACT, one of the frontier ways is the chimeric antigen receptor (CAR), using a unique structure to create armored-immune cells targeting a particular antigen on the cancer cells. Among all the immune cells, the T cells are pioneers due to their particular cytotoxicity action against tumor cells; therefore, CAR-engineered T cells have emerged as a potentially effective way to treat cancer patients. This technology progressed until it introduced six US Food and Drug Administration-approved CAR T cell-based drugs. These drugs act against hematological malignancies appropriately and achieve exciting results, so they have been utilized widely in cell therapy clinics. In this review, we introduce all CAR T cell-approved drugs based on their last data and investigate them from all aspects of pharmacology, side effects, and compressional. Also, the efficacy of drugs, pre-and post-treatment steps, and expected side effects are introduced. Then, we decipher the differences among the drugs and compare them from various clinical aspects. Finally, in the last speech, we will discuss the challenges and new solutions in CAR T cell therapy.

Title: Investigation of Rietveld refinement and corrosion behaviour of Al–TiO2 nanocomposite produced using air plasma spray and accumulative roll bonding method

Speaker Name: Hamed Aminian
Affiliation: Semnan University

Abstract: This study provides valuable insights into the corrosion behaviour of Al-TiO_2 nanocomposites produced using the Accumulative Roll Bonding (ARB) method after being coated with nano Titania powder through Air Plasma Spray (APS).

The XRD analysis revealed qualitative evidence of the presence of both aluminium and titania phases after the coating process by APS. Quantitative XRD analysis using the Rietveld method showed a significant decrease in crystallite size of aluminium after ARB cycles, indicating grain refinement and an increase in dislocation density.

ARB process led to a reduction in surface roughness and porosity caused by the APS process. As the ARB cycles increased, local porosity decreased, and cracks due to titania sprayed droplets disappeared in the matrix, resulting in an improved surface structure.

Tafel polarization tests revealed that the corrosion resistance of the nanocomposites decreased as the number of ARB cycles increased. Samples rolled in one cycle exhibited the highest corrosion resistance due to reduced defects and porosity caused by plasma spraying and grain refinement induced by ARB. However, samples rolled in five cycles showed the lowest corrosion resistance, attributed to agglomeration of Ti-reinforcing particles and the formation of galvanic cells between Al-matrix and Ti-reinforcing particles .EIS measurements confirmed the corrosion behaviour observed in Tafel polarization tests. Samples rolled in one cycle exhibited the highest corrosion resistance, while those rolled in five cycles showed the lowest. The electrical equivalent circuit used for data simulation provided insights into the corrosion mechanisms and highlighted the role of surface properties and interface characteristics in determining corrosion resistance.

Overall, the study demonstrates the influence of ARB cycles on the microstructure and corrosion behaviour of Al-TiO2 nanocomposites. It emphasizes the importance of optimizing processing parameters to achieve desired mechanical and corrosion properties in metal matrix composites. Additionally, the research contributes to a better understanding of the relationship between microstructural features and electrochemical performance in nanocomposite materials.

Title: Multonutrient phyto-engineered nanofertilizers for sustainable crop production

Speaker Name: Karen Jacqueline Cloete
Affiliation: University of South Africa

Abstract: Crop production to feed a growing population is currently facing a multitude of challenges brought about by climate change, low nutrient-use efficient fertilizers, and the high cost of procuring fertilizers. In a bid to circumvent these challenges, the application of novel technologies in the agricultural sector has been promoted. One of these revolutionary new technologies developed to promote agricultural productivity is nanofertilizers. Nanofertilizers represent a novel approach to nutrient management, offering precise and efficient delivery mechanisms for essential plant nutrients. More specifically, nanofertilizers can be effectively designed to have unique physico-chemical properties that mediate nutrient uptake and increase plant nutrient use to ultimately boost crop performance. Compared to traditional fertilizers, smaller amounts can be applied either to the soil, leaves, or roots. A more environmentally safe approach that has been suggested, also include seed imbibition. Recently, to promote biocompatibility and the introduction of less reactive nanomaterials into the agricultural environment, developing nanofertilizers using green chemistry approaches have been receiving increased interest. This talk will primarily focus on the development of multinutrient nanofertilizers using phytoengineering and computational modelling, their characterization and physico-chemical characteristics, their interaction with the seed ionome and metabolome, and effect on seed morphological parameters such as porosity using benchtop and advanced ion beam methodologies. Bean and tomato seeds was used as the model plant. The discussion will address the results obtained from diverse nanofertilizer studies, challenges in the field, and future considerations including safety aspects. Through this exploration, the presentation aims to underscore the potential significant role nanofertilizers may play in advancing sustainable agricultural practices to improve future food security and environmental stewardship.

Title: A Review of the Efficiency of White Light (or Other) Emissions in Singly and Co-Doped Dy3+ Ions in Different Host (Phosphate, Silicate, Aluminate) Materials

Speaker Name: Leelakrishna Reddy
Affiliation: University of Johannesburg

Abstract: In this wide-ranging work, we examine a collection of research papers devoted to the investigation of white light emission, both from Dy^{3+} doped and undoped phosphor materials, with a particular emphasis on optimizing the optical emission properties for commercial white light emitting diodes (wLEDs). In a quest of a singular phosphor material capable of delivering high-quality white emitting light when excited by UV or near UV radiation remains an active area of research for researchers today. Amongst the various rare earth elements employed, Dy^{3+} stands out as the unique rare-earth ion capable of simultaneously emitting both blue and yellow light upon UV excitation. Fine-tuning of the intensity ratios of these yellow to blue emissions becomes crucial in achieving the desired white light emission. The Dy^{3+} ($^4f_9$) ion exhibits approximately four emission peaks at 480 nm, 575 nm, 670 nm, and 758 nm, corresponding to transitions from the metastable $^4F_{9/2}$ state to various lower states ($^6H_{15/2}$ - blue, $^6H_{13/2}$ - yellow, $^6H_{11/2}$ - red, and $^6H_{9/2}$ - brownish red). Remarkably, the hypersensitive transition at $^6H_{13/2}$ (yellow) is inherently electric dipole in nature, exhibiting prominently when Dy^{3+} ions occupy a low symmetry site that lacks inversion symmetry in the phosphor host matrix. Conversely, the blue magnetic dipole transition at $^6H_{15/2}$ becomes pronounced when Dy^{3+} ions are strategically located at highly symmetric sites within the host material with inversion symmetry. Despite the achievement of white color emission from Dy^{3+} ions, these transitions primarily involve parity-forbidden 4f-4f transitions, occasionally leading to reduced white light emissions. Consequently, the inclusion of a sensitizer becomes crucial in enhancing the forbidden transitions experienced by these Dy^{3+} ions. Throughout this review, our focus extends to the variation in yellow-to-blue emission intensities observed in various host materials, covering phosphates, silicates, and aluminates, whether Dy^{3+} ions are doped or undoped. The investigation involves a thorough examination of their photoluminescent properties (PL), CIE chromaticity coordinates, and correlated color temperature (CCT) values, with the goal of achieving compliant white color emissions suitable for varied environmental temperature applications.

Title: Nickel ferrite synthesized in a solar furnace

Speaker Name: Muhammad-Sultanxan Payzullakhanov

Affiliation: Institute of Materials Science of the Academy of Sciences of the Republic of Uzbekistan

Abstract: Nickel-ferrite material was synthesized by melting a mixture of initial oxide components (NiO + Fe2O3) in a solar furnace. The material was a single-phase cubic spinel of nickel ferrite NiFe2O4 with a lattice parameter of 8.87 Å. For the freshly synthesized material, the values of the coercive force Hc and the saturation magnetization Ms were Hc=60 Oe, Ms=30 emu/g, respectively. While the material fired at 1100°C showed reduced parameters Hc=80 Oe, Ms=50 emu/g. Such values of the structure and magnetic parameters suggest that the material synthesized from a melt in a solar furnace can be used in catalytic processes for the synthesis of hydrogen by reforming.

The properties of ferrites are largely determined by the characteristics of their microstructure. The particle size and shape may vary for ferrites synthesized by different methods [1]. Another feature of such structures, for example, NiCoFe2O4, is mixed conductivity, which allows them to be used as catalytic materials replacing expensive platinum in solid oxide fuel cells. Interest in materials of this class is especially increasing in the conditions of rapidly developing hydrogen energy [2,3]. However, such a material interacts well with carbon dioxide and decomposes into carbonates and oxides, which limits its applicability [4]. Perovskites are used in solid oxide fuel cells to convert chemical energy into electricity [5,6]. Moreover, such devices have a high efficiency (more than 80%) and a very low level of emissions of harmful gases. with high efficiency, low emissions and fuel flexibility [7].

It is clear a priori that the synthesis method plays an important role in obtaining a material with a given particle size, structure, microstructure and specific surface area, and phase stability. These parameters together determine certain properties. The main synthesis methods are solid-phase reactions, thermal decomposition, hydrothermal and solvothermal methods, co-precipitation, sol-gel and microwave processing. Moreover, each method has its own advantages and disadvantages, and there is no optimal way to obtain high-quality ferrite materials from spinel [8, 9]. In this work, the electrical and magnetic properties of nickel ferrite NiFe2O4, synthesized from a melt of a mixture of Fe2O3 + NiO in a solar furnace, are studied. To synthesize nickel ferrite, we used a mixture in a stoichiometric ratio of components - iron and nickel oxides of analytical grade. (Fe2O3 + NiO). The mixture was ground in an agate mortar with the addition of ethyl alcohol (10 wt.%) and molded into tablets with a diameter of 12 mm and a height of 15 mm. The tablets were placed on a melting table located on the focal spot of a circle with a diameter of 30 mm in a solar oven [10-14]. Melt droplets fell into the water and cooled at a rate of 10^3 deg/s. Such cooling conditions made it possible to record high-temperature structural states of the material.

Drops of the melt, when loaded into water, cracked into small glass-like particles of arbitrary shape. To study such material, they ground it to a fineness of 60 microns, dried it at 400°C, and molded samples in the form of ∅8mm cylinders with a height of 15mm. A sample of such material was designated as freshly synthesized - C1. The sample fired at a temperature of 1100°C followed by random cooling was designated C2. The obtained samples were subjected to microstructural analysis on a JEOL scanning electron microscope, and X-ray diffraction analysis on a Panalytical Empyrean diffractometer with a copper anode with K-α radiation in the Bragg-Brentano reflection geometry with CuKα radiation (λ = 1.5418˚A).

Saturation magnetization (Ms), coercivity (Hc) and remanent magnetization (Mr) were determined using a KIM-2M coercimeter.

Studies of the morphology and microstructural features of material samples were carried out using scanning electron microscopy (SEM) at the Center for Advanced Technologies of the Ministry of Innovative Development. Electrical resistance was measured using the four-contact method in the temperature range 300 – 1300 K.
fired at 1100°C showed reduced parameters Hc=80 Oe, Ms=50 emu/g. Such values of the structure and magnetic parameters suggest that the material synthesized from a melt in a solar furnace can be used in catalytic processes for producing syngas by reforming organic raw materials.

Title: Artificial neural network (ANN) used to optimized the hydrophilic and hydrophobic studied by Emulsion method

Speaker Name: Djebbar Mustapha
Affiliation: University of Mascara

Abstract: The loading of (AP) in a solution contains surfactants are natural candidates for stabilizing emulsions provided by water (hydrophilic) and Active principle often fatty, oil (hydrophobic) was studied by EMULSIONS method. The results were modeled using artificial neural network (ANN) and pseudo-first and second order. We used MATLAB and HYSYS software to determine the test, validation and overall regression. The synthesis method was Stacking of natural kaolinite solid particles into zeolite by thermal activation at 500°C which was improved by increasing the temperature. The maximum capacity (AP) on untreated and treated zeolite X at equilibrium (Qe) 130 mg/g and maximum charge adsorption capacity was found to be 100.09. % of (AP) per gram of zeolite X respectively.

Title: Time-domain Green's function associated to the Interface problem for the Klein-Gordon equation

Speaker Name: Khedidja Salhi

Affiliation: Higher School of Economics in Oran

Abstract: The main goal is to show how to obtain a representative form of the Green's function associated with the source or interface problem of the Klein-Gordon equation from a known result of the solution of the non-dispersive wave equation. The results can be extended to more general situations, particularly stratified media where the Cagniard-de Hoop method fails.

Title: Sediment transport in accelerated flows

Speaker Name: Arno Roland Ngatcha Ndengna
Affiliation: University of Douala

Abstract: Several coastal flows observed in the nature are turbulent or accelerated due to the morphology of the bottom. When bottom moves, small vortical structures are created and become important over time. The literature does not provide an averaged hyperbolic sediment transport model (STM) for coastal zones that accounts for turbulence arising by the presence of an abrupt mobile bottom. Models based on classical shallow water are commonly used to describe sediment transport, but they are not applicable when the flow becomes distorted or when there are vortical structures. These models only consider the mean motion and neglected the fluctuating motion arising by the fluid velocity fluctuation correlations. We propose a new description of the sediment transport with accounting the turbulence in long-wave approximation. The model obtained in this study builds upon previous work by authors in 1980, 2007, 2012, and 2018, while also improving upon more recent models developed in 2020-2023.

Title: Magnetocaloric effect (MCE) of a quantum pseudodot

Speaker Name: Nguepnang Jean Valere
Affiliation: Université de Yaoundé

Abstract: The magnetocaloric Effect (MCE) of a quantum pseudodot was investigated by considering the influence of spin–orbit interaction (SOI). The entropy and internal energy change have been calculated using the Tsallis formulation. Our results reveal that both the SOI effect and external parameters have a significant impact on the entropy and internal energy changes of a quantum pseudodot. It is important to note that the MCE is closely linked to the behaviour of the magnetic dipoles, and the presence of external magnetic fields and SOI exert considerable influence on the entropy change, both analytically and numerically. Additionally, our results highlight the sensitivity of the MCE to the extensivity parameter.

Title: Production of a Higgs boson in association with a pair of fermions in the presence of a circularly polarized laser field

Speaker Name: Moha Ouali
Affiliation: Polydisciplinary Faculty of Beni Mellal

Abstract: W have investigated the process of Higgs-strahlung production in association with a pair of fermions, $e^{+}e^{-}\rightarrow f\bar{f} H$, at the leading order in the presence of an intense electromagnetic field with circular polarization. We have considered only the initial particles inside the laser field as a first step. In the second part, we have embedded both initial and final particles in the laser field. We have analyzed the angular distribution of the produced Higgs boson as a function of the laser parameters in both cases. We have found that, the order of magnitude of the differential cross-section of both processes $e^{+}e^{-}\rightarrow\mu^{+}\mu^{-}H$ and $e^{+}e^{-}\rightarrow b\bar{b} H$ is reduced more significantly in the case where both initial and final particles are embedded in the laser field.

Title: Penile amputation after neonatal circumcision: a case report

Speaker Name: Omar Adam Sheikh Nur
Affiliation: Somali National University

Abstract: Introduction and Importance

In children, one of the most common surgical procedures worldwide is circumcision, which has strong religious implications and is frequently performed for non-therapeutic reasons. Circumcision is typically associated with old customs. Complete penile amputation is extremely uncommon, and the prognosis is little understood.

Casepresentation
A 7-day-old male term baby was circumcised with a cauter by an unexperienced practitioner, and the patient was admitted to the department of pediatric surgery. Both the glans and the body had become discolored and necrotic. The patient was taken into the theatre and given general anesthesia. We removed the debridement and inserted a catheter into the urethra to prevent urethral stenosis.

Discussion

The procedure of circumcision has several medical benefits and is widely performed for religious, cultural, and medical reasons. It is generally agreed that circumcision prevents against Sexually transmitted diseases, penile and cervical cancer in adults, as well as urinary tract infections in children.

Partial or complete penile amputation injuries are rare and frequently the result of psychotic self-harm. Operators must correctly conduct the circumcision in order to prevent the potential complications that can happen when the procedure is performed out by untrained hands.

The most common cause of penile amputation injuries, whether partial or total, is psychotic self-harm. Operators must carry out the procedure carefully to prevent the potential complications that can happen when circumcision is performed by untrained hands.

Conclusion

We present here a case of a 7-day-old boy who had ritual circumcision with a cauter complicated by an entire penile amputation, which was treated with the insertion of a catheter to prevent the closure of urethra. The patient reported his penis was circumcised with cautery one day later the glans and the entire penis became discolored and necrosis, unfortunately, the entire penis was lost with the overlying skin.

Title: Analysis of the Spatial and Temporal Variability of Direct Rainfall in Lake Tana, Ethiopia

Speaker Name: Eshete Getasew Derso
Affiliation: Bahir Dar Institute of Technology

Abstract: The Blue Nile's source, Lake Tana, is the biggest lake in Ethiopia and offers multiple services to local, regional, and international communities. The first step to effectively, efficiently, and sustainably utilize the services that the lake may provide is to analyse its water balance using accurate estimations parameters, including direct rainfall. Direct rainfall to Lake Tana is one of the most important water balance terms of the Lake that needs precise estimate. This study tries to analyse the spatial and temporal variability of direct rainfall to the Lake and estimate the mean annual and mean monthly direct rainfall to the lake using sufficient data and appropriate methodologies. Thirty years (1986–2015) monthly and mean annual data from 13 meteorological stations were collected and used to analyse the spatial and temporal variability.

Spatial and statistical tools were used for data processing, analysis, and presentation. Five interpolation techniques: Thiessen polygon, spline, isohyetal, inverse distance weighting, and Kriging were considered, and their performances were assessed with evaluation criteria. The results indicate that the isohyetal method is better than the other four methods to implement in a geographic information system (GIS) with Geostatic Analysis in ArcGIS. Further, the analysis has shown that the mean annual direct rainfall to Lake Tana is 1313.43 mm. In addition, we find significant spatial and temporal variability of direct rainfall on Lake Tana. In terms of spatial variability, the Lake gets maximum direct rainfall in the south-eastern part and a minimum value in northwest part with an annual mean value of 1720 mm and 860 mm, respectively. In terms of temporal variability, maximum direct rainfall is estimated in July as 374.11 mm in the summer season and the minimum is less than 12.3 mm in December to March in winter season.

Title: The Impact of Zn2+ Ions on Dielectric Properties and Initial Permeability of Ba-Ni Ferrite Nanoparticles through Nonmagnetic Doping

Speaker Name: Sadiq Hassan Yahya Khoreem
Affiliation: Al-Razi University

Abstract: The effects of composition, temperature, and frequency-dependent dielectric properties of barium-nickel-based ferrites have been investigated. The conventional ceramic technique prepared the compositions BaNi2-xZnxFe16O27 (at x = 0.0, 0.4, 1.2, and 2). According to the frequency and Zn concentration, the dielectric parameters were properly set. Overall, the dielectric properties of this sample make them a suitable candidate for flexible super capacitors and are best suited for high-frequency region applications. The initial magnetic permeability of the prepared sample was increasing as the Zn ions contents increase. The produced samples were suitable for application as microwave absorbers, data storage appliances, and magnetic recording mediums. Generally, the decrease in dielectric parameters such as loss tangent and increased dielectric constant resulting from the incorporation of Zn+2 ions advocate appropriation of these materials in high-frequency applications such recording media, sensors, circulators, microwave devices, electronic devices, and phase shifters. The samples' frequency-dependent ac conductivity has grown as their frequencies got higher. The samples' initial permeability to magnetic fields showed an upward trend as Zn concentrations rose and displayed ferromagnetic activity. As Zn2+ ion replacement increases, the initial magnetic permeability increases. This might be accounted for by magnetic Ni2+ ions replacing non-magnetic Zn2+ ions. Based on the generated samples may be employed in microwave absorbent and data storage devices based on their magnetic characteristics.

Title: Influence of Axle Load on the Wear of Railway Wheel Material

Speaker Name: Hewan Getachew Yenealem
Affiliation: Addis Ababa University

Abstract: This study investigated the influence of axle load on the wear rate of railway wheel material. Excessive wear of wheel/rail materials and reduced service life of the wheel/rail system might be caused by the increase in axle load and traffic volume. Two kinds of rail and wheel steels have been studied against different axle load steps, simulating them for wear performance analysis using multibody simulation software (SIMPACK) and MATLAB programming (table 1). The simulation model results are validated against the vehicle's specifications and wear depth measured on Ethiopia—Addis Ababa Light Rail Transit (LRT), and experimental results from the literature. The result shows that the wear rate increases proportionally with the increasing of applied load and that the proportionality coefficient is 0.1393, which has a very good agreement with the experimental results from the works of literature. Likewise, the estimated total tread wear amount after a mileage of 52,000 km is 2% larger than the measured one in LRT, which is indeed an excellent result taking into account the inaccuracy of the wheel diameter gauge used to measure the wheel transversal profile. In normalized UIC 50 kg/m rail and S1002 wheel profile, the wear rate increases linearly from 5110.02, 9997.87, and 18990.17 mm3 /km on 11, 21, and 30 tones applied load, respectively. Apparently, on the hardened UIC 60 kg/m and S1002 wheel profiles, the wear rate has been improved by 14.5%, 10.8%, and 7.5% on 11, 21, and 30 tones applied load, respectively, in comparison to normalized rail/wheel match (figure 1). Briefly, the wheel wear rate is highly influenced by the increasing applied load, referring proportionality coefficient of 0.1393

Title: Assessment And Characterization of Agricultural Salt-Affected Soils Around Abaya and Chamo Lakes, South Ethiopia Rift Valley

Speaker Name: Azmera Walche Mengesha
Affiliation: Arba Minch University

Abstract: Soil salinity/sodicity is becoming a challenge for crop production in Ethiopia's semi-arid and arid regions. However, more information on soil salinity/sodicity needs to be available around Abaya and Chamo Lakes, South Ethiopia Rift Valley. This study aimed to assess and characterize soil salinity/sodicity and determine salt-affected soils' morphological, physical, and chemical properties. The representative soil pits that were 60*60*60cm in size were examined, and samples were taken from 0-20, 20-40, and 40-60 cm depths based on the criteria set for agricultural salt-affected soil studies. The soil properties determined include soil color, structure, consistency, bulk density, particle density, porosity, texture, pH, EC, SAR, ESP, CEC, BS, OC, TN, available P, $CaCO_3^-$, exchangeable bases, and soluble ions (Na^+, Ca^{2+}, Mg^{2+}, K^+, Cl^-, SO_4^{-2}, NO_3^-, $CO_3^{-2}$and HCO_3^-). The soil analyzed results was rated and interpreted following a guide to standardized analysis methods for soil data. The results of this study reveal that the soils had considerable heterogeneity in soil morphological, physical, and chemical properties. The soils of the study site were highly alkaline and had very high sodium content, very high CEC value, and low levels of organic carbon and exchangeable calcium. The dominant soluble cation was sodium, followed by magnesium, calcium, and potassium in all soil depths of the pits. Similarly, Cl^- was dominant among the anions throughout the soil depth, followed by HCO_3^-, SO_4^{2-}, and NO_3^-. The findings of this study imply that removing sodium and salts from the soil depth may improve the salt-affected soils' productivity in the study area. Application of organic amendments, including manures and crop residues, may also be beneficial in increasing fertility and organic matter content.

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