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JOINT EVENT ON

ADVANCED NANOTECHNOLOGY AND NANOMATERIALS

&

ADVANCED PHYSICS; APPLICATIONS AND SCIENTIFIC INNOVATIONS

SEPTEMBER 19-20

2024

BARCELONA, SPAIN

PEERS ALLEY MEDIA

PROGRAM-AT-A-GLANCE >>

YOUR FIRST CHOICE FOR RESEARCH INGENUITY

Nano Intellects 2024 & Adv. Physics 2024

DAY 1
SEPTEMBER 19, 2024

Scientific Program

08:30-09:00	**Registrations**
09:00-09:10	**Opening Ceremony**
Moderator	**Francois HENN,** Université de Montpellier, France
Chair	**Ricardo Vera-Graziano,** Instituto de Investigaciones en Materiales, UNAM, México

Topics: Nanoscience and Technology | Nano Medicine | Nano Polymers | Nano Physics | Nano Chemistry | Robotics | Artificial Intelligence | Graphene | Materials Science and Engineering | Physics | Materials Physics | Optics and Photonics | Quantum Materials and Quantum Computing

Distinguished Speaker Talks

09:10-09:35	**Title: Compton suppression and gamma-gamma coincidence spectroscopy in radionuclide identification** **Sheldon Landsberger,** *University of Texas at Austin, USA*
09:35-10:00	**Title: Confinement of a biologic ionic channel in a SWCNT** **Francois HENN,** *Université de Montpellier, France*
10:00-10:25	**Title: Antiviral property of nanoclusters-grafted photocatalysts under indoor light illumination** **Masahiro Miyauchi,** *Tokyo Institute of Technology, Japan*
10:25-10:50	**Title: Modulation of spontaneous activity in Embryonic Cardiomyocytes cultured on Poly (Vinyl-Alcohol)/Bioglass Type 58S Electrospun Scaffolds** **Ricardo Vera-Graziano,** *Instituto de Investigaciones en Materiales, UNAM, México*
10:50-11:15	**Title: Restructuring consciousness through the symintentry hypothesis** **David Leonard Hunter Rail,** *Consultant Neurologist, Australia*

Group Photo 11:15-11:20

Refreshment Break 11:20-11:35

11:35-12:00	**Title: Surprises in the return-rates of photons from a mirror on the Moon** **Hans Deyssenroth,** *Germany*
12:00-12:25	**Title: Classical galvanomagnetic effects as a means of studying solids** **Yurii Uhryn,** *Ivan Franko Drohobych State Pedagogical University, Ukraine*
12:25-12:50	**Title: Porous hexagonal $RuSe_2$ thin films are obtained at low temperature using the simple spray pyrolysis** **Beya OUERTANI,** *University of Carthage, Tunisia*
12:50-13:15	**Title: Numerical evidence of hidden chaotic attractors in integer-order and fractional-order systems** **Marius-F. Danca,** *Babes-Bolyai University, Romania*

Group Photo 13:15-13:20

Lunch Break 13:20-14:05

14:05-14:30	**Title: Zinc oxide nanoparticles exacerbate skin epithelial cell damage by upregulating pro-inflammatory cytokines and exosome secretion in M1 macrophages following UVB irradiation-induced skin injury** **Ying-Jan Wang,** *National Cheng Kung University, Taiwan*
14:30-14:55	**Title: Development of small and large compressive pulses in two phase flow** **Meera Chadha,** *DST Centre of Excellence in Climate Modelling, IIT Delhi, India*
14:55-15:20	**Title: Investigating power loss in a wind turbine using real-time vibration signature** **Kingshuk Banerjee & Vishwaas Narasinh,** *Hitachi India Pvt. Ltd, India*
15:20-15:45	**Title: Use of nanotechnology and liability in the Italian law system** **Giovanna Capilli,** *San Raffaele University, Italy*
15:45-16:10	**Title: SEE failure analysis of Hi-rel ASIC for spacecraft applications** **Padmapriya K,** *U R Rao Satellite Centre, ISRO, India*

Refreshment Break 16:10-16:25

16:25-16:50	**Title: Novel method for preparing an alumina colloidal suspension and its coating by DC pulse mode by electrophoretic deposition method** **Manisha Chauhan,** *Ariel University, Israel*

16:50-17:15	**Title: Preparation and investigation of Montmorillonite-K10 polyaniline nanocomposites for optoelectronic applications** **Ramsha Idrees,** *Pakistan Institute of Engineering and Applied Sciences, Pakistan*
17:15-17:40	**Title: Fluorescence theranostic PROTACs for real-time visualization of ERα degradation** **Xiaohua Wang,** *Wuchang University of Technology, China*
17:40-18:05	**Title: Photovoltaic performance investigation of solar cells based on different compositions of perovskite absorber layer** **Samaneh Soleimani-Amiri,** *Babol Noshirvani University of Technology, Iran*
18:05-18:30	**Title: Investigation of Rietveld refinement and corrosion behaviour of Al–TiO_2 nanocomposite produced using air plasma spray and accumulative roll bonding method** **Hamed Aminian,** *Semnan University, Iran*
18:30-18:55	**Title: 2D magnetic memory based on graphene nanoribbons spin-valves** **Wen-Jeng Hsueh,** *National Taiwan University, Taiwan*
18:55-19:20	**Title: Temporal dynamics of Lung-Deposited Surface Area (LDSA) in Central Los Angeles: Diurnal and seasonal patterns** **Constantinos Sioutas,** *University of Southern California, USA*

Panel Discussion

End of Day 1

DAY 2
SEPTEMBER 20, 2024

Scientific Program

09:55-10:00	**Introduction**

Topics: Nanoscience and Technology | Nano Medicine | Nano Polymers | Nano Physics | Nano Chemistry | Robotics | Artificial Intelligence | Graphene | Materials Science and Engineering | Physics | Materials Physics | Optics and Photonics | Quantum Materials and Quantum Computing

Distinguished Speaker Talks

10:00-10:25	**Title: Investigation of nano and micro-sized amorphous materials under the influence of high-energy radiation** **Mohammed Faeq Mohammed Sabri,** *Koya University, Iraq*
10:25-10:50	**Title: No infections, no failure: 30,000 human implanted nanotextured orthopedic implants and counting** **Thomas J. Webster,** *12 Start-up Companies, Mansfield Bioincubator, USA*
10:50-11:15	**Title: Approaches in line with human physiology to prevent skin aging** **Nazli Karimi,** *Hacettepe University, Turkey*
11:15-11:40	**Title: Introducing the Vitrification potential as a poly-categorial glass-forming ability criterion for metallic glasses** **Abdelmalek ROULA,** *Mohamed Seddik Ben Yahia University of Jijel, Algeria*
11:40-12:05	**Title: Hybrid classical-quantum transfer learning for text classificatio** **Mohammad Mahdi Nasiri Fatmehsari,** *Pasargad Institute for Advanced Innovative Solutions, Iran*

Panel Discussion

End of Day 2

Exclusively for Virtual Speakers

Virtual Presentations Conducted through CISCO Webex

BOOKMARK YOUR DATES

5th Global Conference on

ADVANCED NANOTECHNOLOGY AND NANOMATERIALS

2nd Global Conclave on

ADVANCED PHYSICS; APPLICATIONS AND SCIENTIFIC INNOVATIONS

October 2025
Amsterdam, Netherlands

PEERS ALLEY MEDIA

DISTINGUISHED SPEAKER TALKS

DAY 1

Joint Event

Advanced Nanotechnology and Nanomaterials
&
Advanced Physics; Applications and Scientific Innovations

September 19-20, 2024
Barcelona, Spain

NANO INTELLECTS 2024 &
ADV. PHYSICS 2024

Compton suppression and gamma-gamma coincidence spectroscopy in radionuclide identification

Sheldon Landsberger[1], **Conny Egozi**[2], **W. Charlton**[1], **Nick Kaitschuck**[1] and **Francis Martinez**[2]

[1]University of Texas, Nuclear Engineering Teaching Lab, Pickle Research Campus, USA
[2]Los Alamos National Laboratory, USA

Techniques for low-level radioactivity counting for alpha and beta particles, as well as gamma rays, have been used for many decades. The ability to make low-level counting successful has been a focus in many areas including nuclear engineering, nuclear physics, environmental monitoring, etc. Different techniques for low-level counting have been explored and implemented over the past few decades with varying levels of success. We have successfully employed Compton suppression and gamma-gamma coincidence methods in a variety of specimens in Cs-137, Pu-239, and various neutron activation analysis radionuclides. An overview of these two methods will be given including an emphasis on the need for fully understanding decay schemes.

Biography

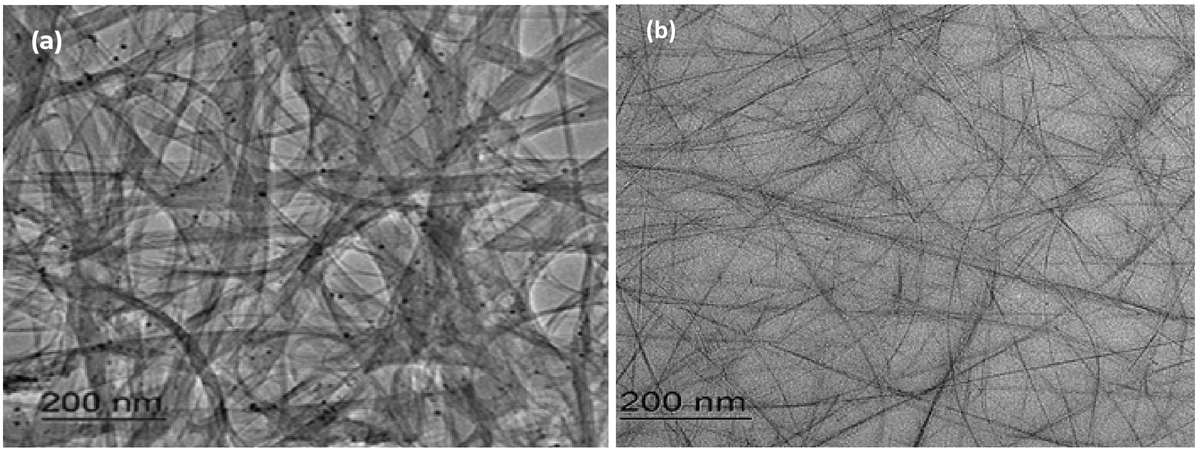
Dr. Landsberger is a Professor in the Nuclear and Radiation Engineering technical area. He has served on the faculty of the Cockrell School of Engineering since 1997. He has published more than 250 peer-reviewed papers and more than 200 conference proceedings mainly in nuclear analytical measurements and their applications in nuclear forensics, natural radioactivity and environmental monitoring of trace and heavy metals.

Confinement of a biologic ionic channel in a SWCNT

F. Henn[1], V.Kotok[1,2], R. Aznar[1], Ph. Dieudonné-George[1], V. Flaud[3], E. Oliviero[3], L. Alvarez[1], J. Cambedouzou[4], N. Izard[1] and **J.L. Bantignies[1]**

[1]Laboratoire Charles Coulomb (L2C, UMR CNRS 5221), Université de Montpellier, France
[2]Processes, Apparatus and General Chemical Technology Department, Ukrainian State University of Chemical Technology, Ukraine
[3]Institut Charles Gerhardt (IGCM, UMR CNRS 5253), Université de Montpellier, France
[4]Institut Européen des Membranes (IEM, UMR CNRS 5635), Université de Montpellier, France

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.



Biography

Dr. François Henn is full Professor of Physical Chemistry at the Faculty of Sciences of the University of Montpellier (France), where he teaches thermodynamics, electrochemistry and materials science. His main area of research concerns ionic and molecular dynamics in solids or at solid/gas-liquid interfaces. He has carried out numerous studies in the field of i) solid electrolytes, ii) gas adsorption (e.g. H_2O) in nanoporous materials such as clays and zeolites, and more recently iii) the transport of liquid electrolytes in ultra-confinement conditions, i.e. single wall carbon nanotubes. He is the author of more than 110 articles in rank A international journal.

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Antiviral property of nanoclusters-grafted photocatalysts under indoor light illumination

M. Miyauchi
Tokyo Institute of Technology, Japan

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.

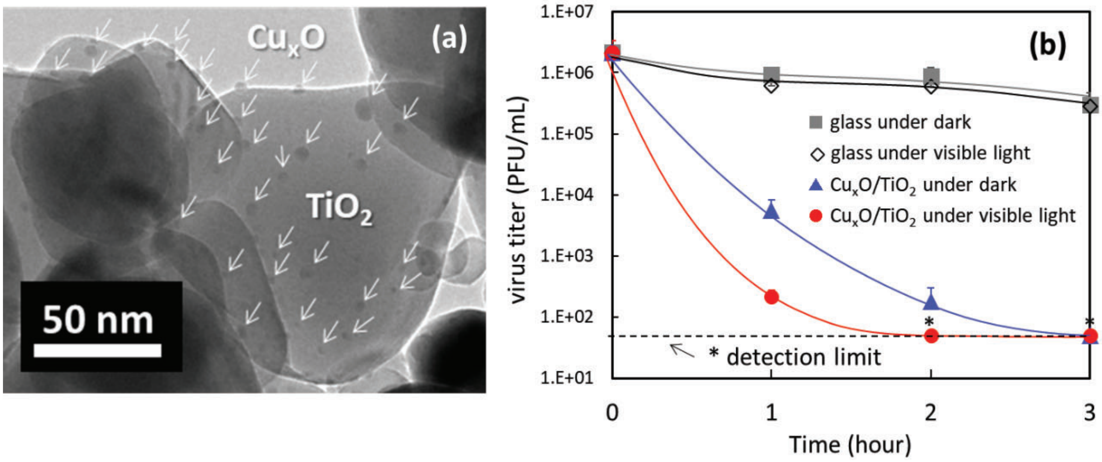

Figure 1. (a) TEM Image of CU_xO/TiO_2. (b) changes of cirus titer of Delta (δ) Variant under light and dark conditions.

Biography

Masahiro Miyacuhi is a professor in Department of Materials Science & Engineering at Tokyo Institute of Technology. He received his PhD in Tokyo University (2002). He was working in TOTO Ltd. (1995-2006) and National Institute of Advanced Industrial Science and Technology (AIST, 2006-2011). He joined Tokyo Institute of Technology as an associate professor in 2011 and was promoted to full professor in 2016. His h-index is 56 in October 2023 (https://scholar.google.co.jp/citations?hl=en&user=f8vRP-QAAAAJ).

Modulation of spontaneous activity in Embryonic Cardiomyocytes cultured on Poly (Vinyl-Alcohol)/Bioglass Type 58S Electrospun Scaffolds

Ricardo Vera-Graziano[1], **Filiberto Rivera-Torres**[2], **Gertrudis H Gonzales-Gomez**[3], **Karla K Gomez-Lisarraga**[1], **Alicia Falcon-Neri**[3] and **Alfredo Maciel-Cerda**[1]

[1]Instituto de Investigaciones en Materiales, UNAM, México
[2]Facultad de Química, UNAM, México
[3]Facultad de Ciencias, UNAM, México

Because of the physiological and cardiac changes associated with cardiovascular disease, tissue engineering can be useful to restore the biological functions of cardiac tissue through the fabrication of nanofibrous scaffolds. With this purpose, hybrid scaffolds of poly (vinyl alcohol) (PVA) and bioglass (Bg) type 58S ($58SiO_2$-$33CaO$-$9P_2O_5$) were fabricated by electrospinning and their effect on the spontaneous activity of chick embryonic cardiomyocytes *in vitro* was determined. PVA/Bg nanofibers were stabilized by chemical crosslinking with glutaraldehyde to study the beating frequency of the cardiomyocytes. Electrospun scaffolds were studied to determine their chemical structure, morphology, and thermal transitions. Seeded cardiomyocytes showed increased adhesion and contractility on hybrid scaffolds with higher Bg concentrations. In addition, the effect of Ca^{2+} ions released from the bioglass on the contraction patterns of cultured cardiomyocytes was investigated. The results indicated that the scaffolds with 25% Bg improved thermal stability and decreased degradation in water after PVA crosslinking and led to a uniform beating frequency that resulted in synchronous contraction patterns.

Biography

Ricardo Vera-Graziano is full time professor in polymer science and engineering. He has been teaching at graduate and undergraduate levels at the Materials Research Institute of the National University of Mexico (IIM-UNAM) and other institutions.

He received the doctorate in Macromolecular Science at Case Western Reserve University, USA. He was a pioneer of the Polymer Department at IIM where is has published more than 110 papers and graduated more than 70 students. In 2006 he oriented his studies on polymer materials for tissue engineering, cell culture, and drug delivery systems.

Ricardo supported the academic administration of UNAM as head of department, deputy director and director at IIM, and head of the Graduate Program on Materials Science and Engineering. He was consultant of several industries and registered 4 patents and 4 technologies. He now serves IIM as senior scientist (05/26/2024).

Restructuring consciousness through the symintentry hypothesis

David Rail[1] and **Andrew Selby**[2]

[1]Consultant Neurologist, Australia
[2]Asset Modeller and Engineer, UK

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.

Biography

David Rail trained in Neurology in London at the New Charing Cross and London Hospitals. He recently retired after practicing in Sydney for over 40 years. His longstanding research focus has been in Theoretical Cognitive Neurobiology. For the last 8 years he collaborated with Andrew Selby (mathematician and professional modeller). They studied how Cassirer's mathematical group and symmetry can facilitate modelling of higher cerebral function. For the last 3 years they focused on how this group can elucidate Kant's Transcendental Structuralism to define the structure of consciousness. The major question they ask is how Self – modelling structure phenomenal experience? They postulate that Self – modelling of phenomenal experience depends on group operations. Furthermore, the group operator unifies symmetry (based modelling) and intentionality, a function they call "symintentry". They recently outlined our hypothesis that symintentry - based modelling can underpin the five symmetries structuring consciousness.

Andrew Selby qualified as a Civil Engineer in 1971 and worked for a large water company as a professional engineer until 1997. His roles included design, water asset planning, asset strategy, process modelling and management reporting. He then audited Water Companies on their performance on behalf of Ofwat. In 2001, he moved to an engineering consultants that became AECOM and worked on water and wastewater asset modelling, involving mathematical analysis and programming.

He has always been interested in Maths and Physics and since 1998, to broaden his knowledge, he have studied with the Open University. He have gained BSc (Hons) in Mathematical Sciences (2004) and in Natural Sciences (Physics) (2017) and now in his final year for a Mathematics MSc.

He has worked with Dr. David Rail since 2015, developing a mathematical framework that they believe will help to model/understand the structure of consciousness. This modelling involves Quaternions and Dual Quaternions

Surprises in the return-rates of photons from a mirror on the Moon

Hans Deyssenroth

Germany

What happens to a laser beam that points from the bottom of a train (at rest) to a point in the ceiling when the train is moving very fast. Will the beam still hit this point, or will it hit the ceiling behind this point? In the years around 1900 scientists were convinced that photons get a lateral momentum in the direction of movement, because they are particles. But R. Feynman concluded that a mirror emits new photons and is therefore a light source and together with Einstein's second STR-postulate the laser beam should hit the ceiling behind this point. This can be tested with the return rates of photons from a mirror on the Moon. The results show clearly with an error of probability < 10-80 that photons do not get a lateral momentum but arrive at that location where the Earth was 2.55 seconds before. This presentation will demonstrate that Einstein's famous geometric spacetime idea is wrong because the physical basis for that is wrong.

Biography

Hans Deyssenroth was born in 1937 and studied electrical engineering at the TH Karlsruhe in Germany and physics with a Diploma degree at the University of Basel in Switzerland. He worked as an IT-manager and biometrician in the Pharma industry in Switzerland and was the co-author of about 20 publications.

After retirement he studied the basics of physics again and got more and more doubts that the existing models are correct, though they have been verified by many and varied experiments.

Classical galvanomagnetic effects as a means of studying solids

Y.O. Uhryn and **V.B. Brytan**

Ivan Franko Drohobych State Pedagogical University, Ukraine

Classical galvanomagnetic effects are not only of practical importance, such as for measuring the basic parameters of current carriers in conductors and semiconductors, but their experimental study in combination with theory makes it possible to draw certain scientific conclusions. We will talk about two important conclusions that we have made by measuring and analyzing such galvanomagnetic effects as the Hall effect and magnetoresistance. The first conclusion concerns the nature of superconductivity. As a result of the theoretical search and analysis of experimental data on the two effects mentioned above in superconductors, we have shown that when approaching the critical temperature (from the high temperature side), the mobility of minority current carriers increases rapidly so that they begin to play a major role in conductivity. From this we concluded that the superconducting current is carried by minority current carriers. At the same time, it became clear that the temperature or magnetofield change in the sign of the Hall resistivity if the superconducting onset, which is traditionally interpreted as an anomaly, is not actually an anomaly and fits well within the framework of the semiclassical theory of this phenomenon.

Another interesting result obtained by comparing the experiment on the Hall effect in the CdTe semiconductor with the theory is the experimental detection of light holes in this material.

Biography

He was born on April 12, 1961 in Drohobych, Ukraine. He graduated from high school in 1978 and immediately entered the Faculty of Physics and Mathematics at the Ivan Franko Pedagogical Institute in Drohobych (now a university), graduating with honors in 1983. After graduation, he worked as a school teacher and in 1986 returned to his alma mater as a researcher. In 1991, he defended his PhD thesis on "Quantum oscillations of magnetoresistance in narrow-gap semiconductors". In the same year, he started working as a lecturer and then as a senior lecturer and associate professor at the Department of Physics, where he still works. He was the author or co-author of about 100 scientific papers and textbooks. He has two children and three granddaughters. His son left Ukraine for the UK earlier in search of a better life, and His daughter and granddaughter left for Ireland in February 2022 when the muscovites began their aggression against our country.

Joint Event

Advanced Nanotechnology and Nanomaterials

Advanced Physics; Applications and Scientific Innovations

September 19-20, 2024 | Barcelona, Spain

Porous hexagonal $RuSe_2$ thin films are obtained at low temperature using the simple spray pyrolysis

B. Ouertani[1,2], **M. Trabelsi**[2] and **I. Selmi**[2]

[1]University of Carthage, Higher Institute of Environmental Science and Technology of Borj Cedria, Borj-Cedria Science and Technology Park, Tunisia

[2]Photovoltaic Laboratory, Research and Technology Center of Energy, Borj-Cedria Science and Technology Park, Tunisia

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 ($\sim 10^{-4}$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 ($\alpha > 6x10^4 cm^{-1}$ for the layers selenized at 450°C, and $\alpha > 10^6 cm^{-1}$, λ <1000nm for the layers selenized at 500 and 550°C). The plots of $(\alpha.h.\nu)^2$ vs $(h.\nu)$ 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. Surface 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 obtained 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.

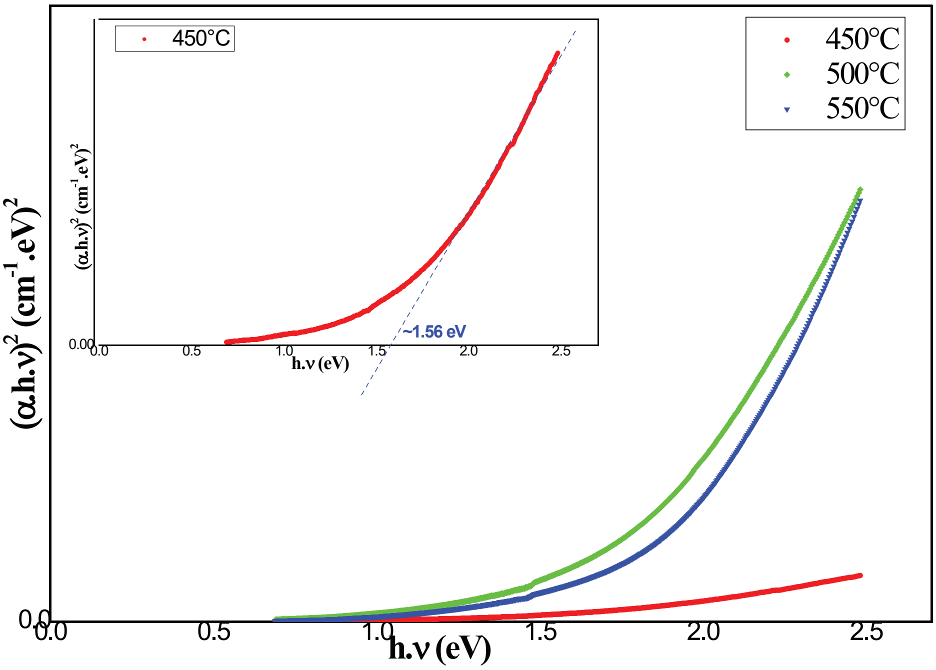

Figure: Plots of: (a) $(\alpha h\nu)^2$ vs. hν, for the h-$RuSe_2$-pyrite thin films obtained after selenization of amorphous ruthenium oxide layers, under vacuum (~10^{-4}Pa) at various temperatures (450°C, 500°C, and 550°C) for 3h in RTP oven.

Biography

Beya OUERTANI is an Associate Professor at the Higher Institute of Environmental Sciences and Technologies of Borj Cédria, University of Carthage, Tunisia. She obtained her Bachelor's Degrees in physical sciences, her "DEA" in quantum physics, her PhD, and her habilitation, in physics, about thin films for low cost solar cells, at the Faculty of Sciences of Tunis, University of Tunis El Manar. She had been researcher at the Photovoltaic and Semiconductor Materials Laboratory, ENIT, Tunisia. Then, researcher at the Laboratory of Semiconductors, Nanostructures and Advanced Technology (LSNTA). She is being researcher at the Laboratory of Phototovolaîc (LPV) at the Research and Technology Center of Energy (CRTEn), Science and Technology Park of Borj Cedria.

Numerical evidence of hidden chaotic attractors in integer-order and fractional-order systems

Marius-F. Danca

STAR-UBB Institute, Babes-Bolyai University, Romania

Hidden attractor (notion introduced by G. Leonov and N. Kuznetsov), especially of chaotic type, represents a recent intriguing subject in the world of complex dynamical systems ranging from the climate, ecosystems to financial markets and engineering applications, which typically have many coexisting attractors (multistability). These kinds of attractors, unanticipated, unknown and often unwanted, can be found in either integer-order or fractional-order systems, continuous or discrete time. To identify a local attractor in a physical or numerical experiment, a usual numerical procedure is to test initial system's states in neighbourhoods of unstable equilibria and observe how the system's state, after a transient process, reaches the attractor. The generally accepted method to find numerically hidden attractors is to test the neighbourhoods of unstable equilibria with a dedicated numerical scheme to integrate the underlying system. With a variable initial condition, one scans numerically a relatively small planar or spatial region containing equilibria. If the obtained trajectories reach the attractor, then the attractor is called self-excited, otherwise it is hidden attractor. Due to the inherent time memory principle (non-locally property) in fractional systems, which states that each integration step a numerical method for a continuous or discrete system requires the knowledge of all previous determined values, finding numerically hidden attractors in fractional-order systems is more time consuming compared to integer-order systems where there are numerical schemes enjoying the local property and where, every determined value depends only on a few previous determined values. Our goal is to present some suggestive examples of chaotic hidden attractors in integer-order and fractional order systems.

Biography

Collaborator at STAR-UBB Institute, Babes-Bolyai University, Romania.

Graduated from Babes-Bolyai University of Cluj-Napoca, Romania, Faculty of Mathematics and Computer Science, and Technical University of Cluj-Napoca, Romania, Faculty of Electronics, Telecommunications and Information Technology. Obtained the PhD in Engineering, Faculty of Automation and Computer Science, Technical University of Cluj-Napoca, Department of Automation and the PhD in Mathematics, Faculty of Mathematics and Computer Science, Babes-Bolyai University. He has 100+ WOS papers with 1500+ WOS citations, WOS IF 22 and in top 100,000 (2%) of scientists by citations-score, and in top 50 of Romanian scientists, in the Scopus Data Base 2019, 2020, 2021. Associate editor at International Journal of Bifurcation and Chaos, Solitons & Fractals. 140+ Verified peer reviews.

Zinc oxide nanoparticles exacerbate skin epithelial cell damage by upregulating pro-inflammatory cytokines and exosome secretion in M1 macrophages following UVB irradiation-induced skin injury

Ying-Jan Wang[1], **Yu-Ying Chen**[1] and **Yu-Hsuan Lee**[2]

[1]Department of Environmental and Occupational Health, College of Medicine, National Cheng Kung University, Taiwan

[2]Department of Cosmeceutics, China Medical University, Taiwan

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.

Biography

Ying-Jan Wang, Ph. D., graduated from Department of Biochemistry, National Taiwan University, College of Medicine, Taipei, Taiwan. Currently served as a distinguished professor in National Cheng Kung University, College of Medical, and Tainan, Taiwan. Academic awards included being selected as World's Top 2% Scientists (2021/2022/2023). The major research focus of his laboratory is to understand the molecular mechanisms responsible for environmental toxicants-triggered toxicity, and carcinogenesis/cancer therapy. He is especially interested in elucidating the role of autophagy in regulating diverse biological processes, such as proliferation, programmed cell death, inflammation, thereby contribute to cytotoxicity, and cancer therapy. In general, basal autophagy helps maintain homeostasis, while additional autophagy is induced in response to many different forms of stress. Thus, he is enthusiastic in exploring whether autophagy acts as a pro-survival or pro-death player in toxic response of environmental toxicants or cancer therapy. By revealing the regulation pathways of autophagy, our research may help to the development of novel and effective preventive strategy to combat diseases.

Development of small and large compressive pulses in two phase flow

Meera Chadha[3], Nishi Deepa Palo[1] and **Jasobanta Jena[2]**

[1]Bharati Vidyapeeth College of Engineering, India
[2]Institute of Mathematics and Application, India
[3]DST Centre of Excellence in Climate Modelling, IIT Delhi, India

The evolutions of small and large compressive pulses are studied in a two-phase flow of gas and dust particles (pseudo-fluid) with a variable azimuthal velocity. The two-phase flow of a mixture of solid particles and a fluid in which the solid particles occupy less than 5% of the total volume of the mixture and mix well with the fluid in the flow field is called a pseudo-fluid. In a rotational flow the fluid particles rotate about their own axes while flowing. The method of relatively undistorted waves is used to study the mechanical pulses of different types and the shock formation distance in a rotational, axisymmetric dusty gas. The results obtained are compared with that of non-rotating medium. Asymptotic expansion procedure is used to discuss the nonlinear theory of geometrical acoustics. The influence of the solid particles and the rotational effect of the medium on the distortion are investigated. The solutions obtained by both the methods were in accordance with each other. In a rotational flow, it is observed that as the value of rotational parameter increases, the steepening of the pulses also increases. The presence of dust in the rotational flow delays the onset of shock formation, thereby increasing the distance where the shock is formed first. The rotational and the dust parameters are observed to have the same effect on the shock strength. Although the pressure in the wavelets is higher initially for higher values of dust parameters, the wavelets decay much faster when compared to the waves with smaller values of dust parameters. An increased value of dust parameters in the mixture reduces the compressibility of the mixture which enhances the decaying of the shock wave.

Biography

Dr. Meera Chadha did her Masters in Mathematics from St. Stephens College, University of Delhi in 1995. She taught Mathematics to school students as well as to B. Tech students. Received her PhD in Applied Mathematics in the year 2015. She was a Principal Investigator of a Research and Development project fully funded by Department of Science & Technology, Government of India, affiliated with Department of Mathematics, Netaji

Subhas University of Technology. She has many research papers to her credit. Her ground-breaking research on mitigation of blast waves produced by nuclear explosion, where it was shown that the deadly effects of nuclear weapons can be partially mitigated or reduced, was published in the Proceedings of the Royal Society A, London. Recently, she was working in the DST Centre of Excellence in Climate Modelling, Indian Institute of Technology, New Delhi, India.

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

Kingshuk Banerjee[1], **Vishwaas Narasinh**[1], **Prateek Mital**[1], **Nilanjan Chakravortty**[1], **Swayam Mittal**[1], **Nikhil Kulkarni**[1], **Chandrasekar Venkatraman**[2] and **Anjana Geetha Rajakumar**[1]

[1]Research and Development Center, Hitachi India Pvt. Ltd., India
[2]Research and Development Center, Hitachi America Ltd., USA

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.

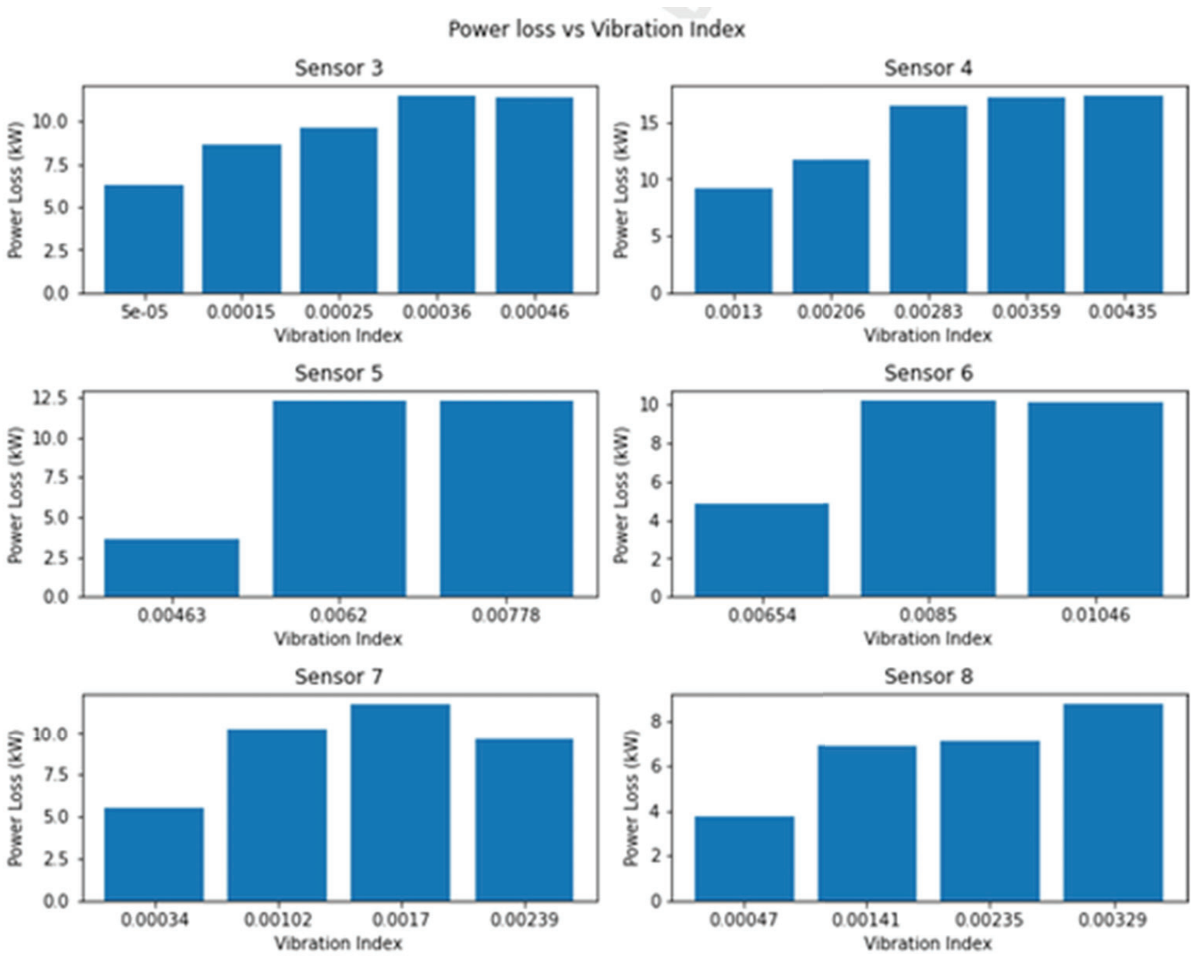

Fig. 16. Variation of power loss with respect to vibration index.

Biography

Kingshuk Banerjee is currently the Head of Hitachi Research and Development Centre, India.

Kingshuk is a specialist in the development and deployment of Artificial Intelligence systems. Prior to his current role, he was a Partner in IBM Services where he led the delivery of Cognitive-Business-Decision-Support (CBDS) services worldwide. A computer science graduate by training, he earned his Doctorate in Engineering Management from George Washington University, USA.

Kingshuk is certified by Cornell and Harvard University in Executive Leadership and Change Management. He loves traveling, Net-surfing and meeting the "new" that includes people, culture and technology.

Vishwaas has 8.5 years of overall experience with 7 years of experience in Data Science, particularly in NLP, Sequence models, Signal processing, and predictive diagnostics.

He has authored several papers and patents. Additionally, he is a musician with a focus on flute and is particularly keen on AI tech + Music.

He has a Masters from Great Lakes University on Data Science and a Bachelors from PES University.

PEERS ALLEY MEDIA

Use of nanotechnology and liability in the Italian law system

Giovanna Capilli

San Raffaele University, Italy

This paper aims to explore the integration of nanotechnology into sectors such as medicine, engineering, and consumer products, with a focus on the legal implications in Italian legal system. The primary objective is to analyze the regulatory framework governing nanotechnology in Italy and its alignment with European Union legislation, particularly concerning liability for damages caused by nanomaterials.

The research scope encompasses an examination of Italian regulations on nanotechnology, specifically within the contexts of cosmetics, toys, and other consumer products. The study also considers relevant European Union directives or regulations, identifying potential gaps and challenges in attributing liability for damages.

The paper employs a legal analysis methodology, reviewing pertinent Italian and EU legislation, case law, and regulatory standards. The analysis focuses on the complexities of risk assessment, the burden of proof in liability cases, and the roles of manufacturers, researchers, and consumers in ensuring product safety. Additionally, the paper evaluates the effectiveness of information and product labeling practices in managing risks associated with nanotechnology and underscores the crucial role of the precautionary principle, which mandates proactive measures to prevent harm in the absence of full scientific certainty about potential risks.

The paper further examines the impact of specific regulatory frameworks, such as the new General Product Safety Regulation, on the safety assessment of nanotechnology-based products.

In conclusion, the paper finds that while Italian legislation aligns with EU directives and regulations, challenges persist in effectively addressing liability issues related to nanotechnology. The study highlights the need for a coordinated approach to regulation, risk management, and legal accountability to ensure public safety in the face of rapid technological advancements. Moreover, it emphasizes the importance of the precautionary principle in product liability cases to anticipate how Courts might respond in cases involving damages caused by nanotechnology.

Biography

- Full Professor of Private Law at the San Raffaele University Rome.
- Titular professor of the courses: Private law | Private Law of Robotics and Artificial Intelligence | Health Private Law.
- Director and Coordinator of the Specialization Course on *Cyber-Security: Policy, Regulatory, and Technical Aspects*.
- PhD in Comparative Private Law and European Union Private Law.
- Investigadora Asociata at the Cátedra Euroamericana de Protección Jurídica de los Consumidores at the Universidad de Cantabria in Santander (Spain).
- Honorary Judge at the regional Civil Court of Rome.
- Member of the Banking and Financial Ombudsman (ABF).
- Lawyer, advocate in the Court of Cassation and in other Higher Jurisdictions.
- She has participated as a speaker in numerous national and international conferences and collaborates as an expert with national and international entities and research institutions.
- Author of various monographs, articles and essays published in Italian and foreign reviews.

SEE failure analysis of Hi-rel ASIC for spacecraft applications

K. Padmapriya[1], **B. K. S. V. L. Varaprasad**[1,3] and **Debjyoti Mallik**[2]
[1]U R Rao Satellite Centre, ISRO, India
[2]Semi-Conductor Laboratory, India
[3]Dayananda Sagar College of Engineering, India

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.

Biography

As a Scientist in Indian Space Research Organization (ISRO), she is heading the ASIC/SoC development team at U. R. Rao Satellite Centre. With 20 years' experience in the design and development of ASICs/SoCs for spacecraft applications, have publications in international conferences, journal and a patent on Configurable SRAM device. She has delivered lectures on VLSI design in various engineering colleges in India and for international participants in Unispace Nano Satellite Assembly & Training by ISRO (UNNATI) programme. Her research interests include fault tolerant designs, Radiation hardened designs, analog and digital ASIC/SoC design, and Design for Testability. A graduate in Electronics & communication Engineering and post graduate in VLSI Design, she is currently pursuing PhD from Visveswaraya Technological University. She enjoys music, travel and gardening.

Novel method for preparing an alumina colloidal suspension and its coating by DC pulse mode by electrophoretic deposition method

Manisha Chauhan and **Alexander Sobolev**
Department of Chemical Engineering, Ariel University, Israel

This research introduces an innovative method for synthesizing alumina (Al_2O_3) colloidal suspensions and their subsequent deposition as coatings. The synthesis process involves the dissolution of aluminium isopropoxide in toluene, which is then added to a nitric acid solution, resulting in a mixture that matures over 4-5 days. This green synthesis method produces ultrafine nanoparticles with controlled size, high surface area, purity, and crystallinity, making it an environmentally friendly and cost-effective alternative to traditional methods. The electrophoretic deposition (EPD) process is used to fabricate uniform and adherent coatings from the colloidal suspensions. The process involves the migration and deposition of charged particles onto a substrate under the influence of an electric field. A novel approach to preparing coatings using a direct current (DC) pulse mode in the EPD process represents a significant advancement in this field, yielding more ordered surface coatings with lower particle aggregation. The high-temperature oxidation test of the alumina coating on Ni-Cr alloy is conducted at three different temperatures: 800°C, 900°C, and 1000°C for 100-hours. The results provide valuable insights into the coating's durability and the potential lifespan of the coating. The alumina coating, known for its excellent thermal resistance, acts as a protective barrier for the Ni-Cr alloy, controlling the growth rate of the Thermally Grown Oxide (TGO) and preventing the underlying alloy from excessive oxidation. This research sets the stage for exploring the innovative method of preparing alumina colloidal suspensions and their high-temperature effective coatings. This has potential to enhance the production of high-performance materials in industries like aerospace and automotive.

Biography

Dr. Manisha Chauhan is a distinguished Postdoctoral Fellow at Ariel University, Israel, contributing significantly to the field of Chemical Engineering under the esteemed guidance of Dr. Alexander Sobolev. Dr. Chauhan's work is focused on green chemistry, specifically in the development of eco-friendly and cost-effective methods for creating ultrafine nanoparticles. She has discovered the importance of alumina coatings in controlling the growth rate of TGO and preventing the underlying alloy from oxidizing excessively. Her research has significant impact on the production of high-performance functional materials, demonstrating her dedication to advancing the field of materials science. Her scholarly contributions extend to the publication of several papers in prestigious journals, shedding light on the pivotal role of metal catalytic properties in high-temperature applications. Her ongoing work is in the process of being communicated to the broader scientific community.

Preparation and investigation of Montmorillonite-K10 polyaniline nanocomposites for optoelectronic applications

Ramsha Idrees, Syed Aizaz Ali Shah, Saeed Omer and **Shaukat Saeed**

Department of Chemistry, Pakistan Institute of Engineering and Applied Sciences, Pakistan

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.

Biography

As a materials chemist and burgeoning researcher, her journey is one defined by a relentless pursuit of understanding and innovation. Armed with a master's degree in chemistry from PIEAS, Islamabad, Pakistan, she embarked on a path marked by a fascination with the intricate properties of materials. Her journey has led me to delve deep into the realms of nanomaterials, polymers, and composites, seeking novel solutions to pressing challenges. From conducting groundbreaking experiments to publishing papers in esteemed journals, she has embraced each opportunity to contribute to the advancement of scientific knowledge. Beyond the lab, she enjoys reading fantasy, finding inspiration and balance in life's simple pleasures. As she continues to grow and evolve in her field, she is driven by a vision of harnessing the power of materials to shape a brighter future for generations to come and leave a positive mark on the world.

Fluorescence theranostic PROTACs for real-time visualization of ERα degradation

Xiaohua Wang[1], **Hairong Cui**[1], **Guoyuan Hu**[2] and **Hai-Bing Zhou**[3]

[1]College of Life Sciences, Wuchang University of Technology, China
[2]School of Environmental Ecology and Biological Engineering, Wuhan Institute of Technology, China
[3]Wuhan University School of Pharmaceutical Sciences, China

Proteolysis targeting chimera (PROTAC) technology is an innovative strategy in drug design, utilizing the ubiquitin-proteasome system to degrade pathogenic proteins. While promising, real-time monitoring and visualization of protein degradation have been challenging in drug development. This research combines the protein-degrading capabilities of PROTAC technology with fluorescent probes' visualization attributes, paving the way for a novel class of visual PROTACs. These unique PROTACs offer both fluorescence imaging and therapeutic properties, enabling real-time observation of protein degradation processes.

Our approach uses a highly ER-targeting fluorescent probe, previously developed in our laboratory, which serves as a warhead that specifically binds to the protein of interest (POI). Additionally, a VHL ligand for recruiting E3 ligase and linkers of various lengths were incorporated to synthesize a series of novel ER-inherent fluorescence PROTACs. Among them, compound A3 demonstrated remarkable efficiency in degrading ERα proteins (DC_{50} = 0.12 μM) and exhibited exceptional anti-proliferative activity against MCF-7 cells (IC_{50} = 0.051 μM). It also displayed impressive fluorescence imaging performance, with an emission wavelength of 582 nm, a Stokes shift of 116 nm, and consistent optical properties. These attributes make it particularly suitable for real-time, in situ tracking of ERα protein degradation, suggesting its potential as a privileged visual theranostic PROTAC for ERα+ breast cancer.

This study broadens the application of PROTAC technology and introduces a novel approach for real-time visualization of protein degradation, enhancing the diagnostic and treatment efficacy of PROTACs. By integrating imaging and therapeutic functionalities, this research represents a significant step forward in drug development and the future of targeted cancer therapies.

Biography

Xiaohua Wang is an Associate Professor and Senior Engineer in the Department of Pharmaceutical Sciences at the School of Life Sciences, Wuchang University of Technology. He is also a Visiting Scholar at Wuhan University and serves as the Director of Hubei Collaborative Innovation Center for Bioactive Polypeptide Diabetes Drugs.

With a strong focus on medicinal chemistry, Dr. Wang's research encompasses the discovery and structural optimization of lead compounds, the total synthesis of bioactive natural products, and the development of innovative technologies and methods for drug synthesis. He has published over 20 high-impact research papers in esteemed journals and holds three invention patents.

Dr. Wang's significant contributions to pharmaceutical sciences have earned him numerous accolades, including the Hubei Province Science and Technology Progress Award (Third Prize).

Photovoltaic performance investigation of solar cells based on different compositions of perovskite absorber layer

Samaneh Soleimani-Amiri and **Mohammad Amoozesh**

Faculty of Electrical and Computer Engineering, Babol Noshirvani University of Technology, Iran

Regarding the fast development of perovskite solar cells (PSCs), different compositions of perovskite materials have drawn huge attention to be used as the absorber material of PSCs. Unique electronic and optical properties of the perovskite materials with different atomic compositions help us to design PSCs with higher power conversion efficiency (PCE). This also permit us to design solar cells with new electron and hole transport layers (ETLs and HTLs) and multi-Junction solar cells with all-perovskite tandem architecture. First, we conduct the electrical and optical analysis of the perovskite absorber layer using density functional theory (DFT) and investigate the effect of changing the monovalent cation, divalent cation and halide ion on the material electronic bandstructure and absorption coefficient. After extraction of bandgap, mobility, affinity, and real and imaginary parts of refractive index for the studied material by DFT, the data can be used in device level package to assess the cell performance. Based on the electrical model, the processes of generation, recombination, and drift-diffusion can be used to estimate the performance of solar cell. In the drift-diffusion model, Poisson's equations and current density are solved self-consistently. The Current–voltage (*J*–*V*) characteristics and quantum efficiency (*QE*) will be computed for all of these configurations to understand the impact of the absorber, ETL, and HTL on the PV parameters. This comprehensive simulation study will assist researchers in the fabrication of cheap and efficient PSCs and open new horizons in the field of solar technology.

Biography

Samaneh Soleimani was born in Babol, Iran, in June 1983. She received the B.Sc. degree from the University of Mazandaran, Mazandaran, Iran, in 2005 and the M.Sc. and Ph.D. degree from the University of Tehran, Tehran, Iran, in 2009, in electronic engineering. Currently, she is assistant professor of Babol Noshirvani university of Technology. She is interested in opto and nano-electronic devices.

Investigation of Rietveld refinement and corrosion behaviour of Al–TiO_2 nanocomposite produced using air plasma spray and accumulative roll bonding method

Hamed Aminian[1], **Ehsan Borhani**[1], **Mohammad Mahmoudi**[2], **Omid Amouaghaei**[2] and **Ali Shafyei**[2]

[1]Department of Nanotechnology, Faculty of New Sciences and Technologies, Semnan University, Iran
[2]Department of Materials Engineering, Isfahan University of Technology, Iran

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-TiO_2 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.

Biography

Hamed Aminian, a distinguished scholar in Material Science and Engineering, holds a B.Sc. in Industrial Metallurgy and a M.Sc. in Nano Materials from Semnan University, Iran, achieving a remarkable CGPA of 8.3/10. His Master's thesis, "Application of Plasma Spray in the Production of Aluminum Nanocomposite Reinforced with Ceramic Nanoparticles using ARB," demonstrated his pioneering approach to Materials Engineering.

Hamed has published two journal articles with several others currently undergoing compilations and publications, showcasing his dedication to advancing knowledge in the field. He has served as an advisor and colleague on numerous research endeavors and master projects, leveraging his expertise to address complex issues. His keen interest lies in surface engineering and quantitative XRD, areas where he continues to explore innovative solutions to enhance material performance and functionality.

2D magnetic memory based on graphene nanoribbons spin-valves

Wen-Jeng Hsueh, Shih-Hung Cheng and **Chun-Pu Wang**

National Taiwan University, Taiwan

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.

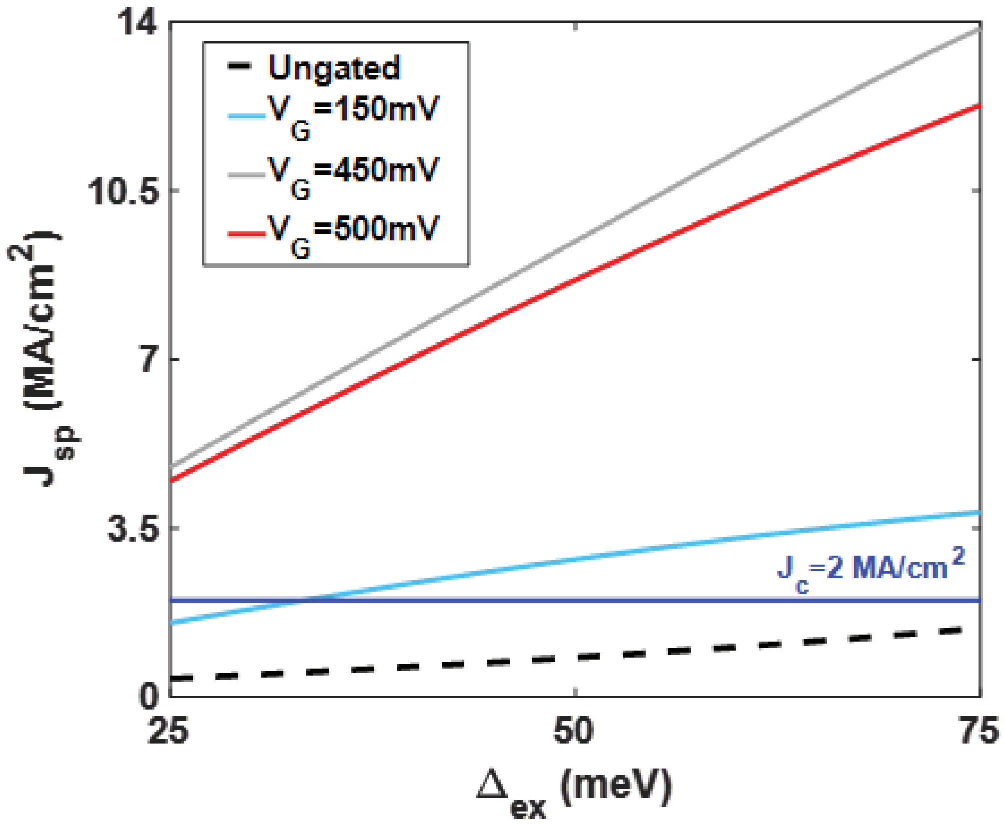

Fig. 1: Spin current density in gate-controllable graphene nanoribbons spin-valves.

Biography

Wen-Jeng Hsueh was born in 1958, Taiwan. He received the B. S., M. S. and Ph. D. degrees from National Taiwan University, Taiwan, in 1980, 1984 and 1992 respectively. He was the visiting scholars of Massachusetts Institute of Technology in 1993 and University of California at Berkeley in 1994. In 1985 he joined the faculty of National Taiwan University, where he is now a professor. He led the nanoelectronics and photonics group in the university. His research interests include nanoelectronics, spintronics, MRAM, optoelectronics, photonic crystals, and quasicrystals. He has supervised more than 70 PhD and Master's students in the university. He has published more than 70 journal papers. He received the outstanding research award from National Taiwan University. He was one of the recipients of the excellent research award sponsored by the National Science Council, Taiwan.

Temporal dynamics of Lung-Deposited Surface Area (LDSA) in Central Los Angeles: Diurnal and seasonal patterns

Constantinos Sioutas[1], **Mohammad Mahdi Badami**[1], **Yashar Aghaei**[1], **Mohammad Aldekheel**[1,2] and **Ramin Tohidi**[1]

[1]Department of Civil and Environmental Engineering, University of Southern California, USA
[2]Department of Civil Engineering, Kuwait University, Kuwait

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 $PM_{2.5}$ 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 OC_4, 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.

Biography

Prof. Constantinos Sioutas, holding distinguished roles in Civil and Environmental Engineering, was honored as the first Fred Champion Professor at the Department of Civil and Environmental Engineering of the University of Southern California (USC) on July 1, 2007, a title held for five years, backed by the Fred Champion endowment. His academic journey began with a Mechanical Engineering degree from Aristotelean University, followed by master's degrees and a Ph.D. from Harvard. Joining the Viterbi School of Engineering faculty in 1998, he co-directs the SCPC, focusing on particulate matter air pollution. His work, leading to legislative changes and shaping the US EPA's NAAQS, is backed by over 600 publications and 14 patents. Recognitions include the Fulbright Fellowship, the 3M Technical Excellence Award, and the USC Junior Faculty Research Award, reflecting his pivotal role in air quality research and policy.

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PEERS ALLEY MEDIA

Investigation of nano and micro-sized amorphous materials under the influence of high-energy radiation

Mohammed M. Sabri
Koya University, Iraq

This research explored the behaviour of the glass when bombarded by a high-energy radiation, especially electron beams inside transmission electron microscopy (TEM). Six types of glasses are investigated under e-beam. The work is conducted using three types of TEMs of energies of 120, 200, and 300 keV. The findings show that these microscopies have a significant impact on the glass, as various observations were documented. Using a wide electron beam, morphology changes combined with bubble formation are observed in the glass. These changes are rounding and smoothening of glass edges and surfaces. In addition, the findings show that there is no material loss due to irradiation as confirmed by the energy dispersive X-ray spectroscopy. The results also show that high silica glass is very sensitive, while high boron glass is found to be less sensitive to irradiation. Using a smaller size electron beam, on the other hand, resulted in the fabrication of a nanoring/nanocrater in glass. The possible applications of this research can be in the protection and packaging of three-dimensional electronic equipment and nanoscale pattern formation through roughening of the external glass contour through phase separation and the opposite through local changing of a part of the glass through the pseudo-melting and the stability of loaded and un-loaded glasses to the irradiation. Furthermore, by generating a nanoring or a nanocrater through e-beam, the lithography process is successfully performed, as the effect of the electron beam is solely at the irradiation region, while the regions outside the e-beam remain unaffected.

Biography

He was an assistant professor in Nano Materials at Physics Department at Koya University-Iraq. He has started at Koya University since January 2005. He has gained his B.Sc. degree in Materials Science from School of Applied Sciences at University of Technology-Baghdad in 2001, followed by the master study in Applied Physics from the same department and University in 2004. In 2012 he has started his PhD in Nano Materials at University of Sheffield-United Kingdom and successfully completed it in 2016. During the period of his PhD, he has participated in many conferences and meetings. In addition, he published many journal and conference papers with high impact factors. During the period between November 2016 and September 2020, he was the head of Physics Department-Faculty of Science and Health at Koya University. Finally, his research interest is materials investigations, nano materials, nano precipitation, amorphous materials and electron microscopy (TEM and SEM).

No infections, no failure: 30,000 human implanted nanotextured orthopedic implants and counting

Thomas J. Webster[1,2,3]

[1]School of Health Sciences and Biomedical Engineering, Hebei University of Technology, China
[2]School of Engineering, Saveetha University, India; and Program in Materials Science, UFPI, Brazil
[3]Division of Pre-College, CSO and Co-founder, 12 Start-up Companies, Mansfield Bioincubator, USA

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.

Biography

Thomas J. Webster's (H index: 125; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health in over 20,000 patients. His technology is also being used in commercial products to improve sustainability and renewable energy. He is currently helping those companies and serves as a professor at Brown University, Saveetha University, Vellore Institute of Technology, UFPI, and others. Dr. Webster has numerous awards including: 2020, World Top 2% Scientist by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); 2022, Best Materials Science Scientist by Citations (Research.com); and is a fellow of over 8 societies. Prof. Webster is a former President of the U.S. Society for Biomaterials and has over 1,350 publications to his credit with over 55,000 citations. He was recently nominated for the Nobel Prize in Chemistry. Prof. Webster also recently formed a fund to support Nigerian student research opportunities in the U.S.

Approaches in line with human physiology to prevent skin aging

Nazli Karimi

Department of Physiology, Faculty of Medicine, Hacettepe University, Turkey

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.

Biography

- Dr. Nazli Karimi, M.D., Ph.D.
- Hacettepe University Medical Faculty, Physiology Department
- Expertise: Physiology of skin, Skin aging, Mitochondrial Targeted Antioxidants, Acne Research, EDA, Cell Culture. Dr. Nazli Karimi is an accomplished researcher and educator at Hacettepe University's Physiology Department. With a focus on skin physiology and aging and various aspects of dermatological research and has made contributions to the understanding of skin aging and related areas. With a strong background in medicine and research.

Introducing the Vitrification potential as a poly-categorial glass-forming ability criterion for metallic glasses

A. Roula
Mohamed Seddik Ben Yahia University of Jijel, Algeria

Glass scientists always consider the aptitude for glass formation of any melted material with a lot of thermal criteria. Among them, the Crystallization Driving Force seems to be the most effective because considering that ''both the stability of the liquid phase and the resistance of the glass against crystallization'': $CDF= (CDF)_T/(R.T)$ where ΔG, T and R are the Gibbs free energy change for solidification, temperature and the universal gas constant, respectively. Aiming to describing the vitrification as opposite phenomena to the glass formation, authors suggests to amend the CDF criterion with the Relative Glass-Forming Ability RGF^{BMG} =1/(CDF)l-g=R.(Tl-Tg)/ΔG(l-g) (2) using the CDF inverse mathematical formulation in one hand and the ΔTl-g = (Tl-Tg) instead of any other chosen temperature or temperature range (not Tl, Tx, Tg nor (Tx – Tg) neither (Tl – Tx) in the other hand. ΔTl-g is the representative temperature interval where the competition Vitrification Vs Crystallization is occurring (not before, staring with nucleation and ending at Tg and nor after). The application of this model with technical data of different metallic glasses systems revealed a strong correlation with Dmax and Rc and therefore has proven its suitability to quantify the GFA of melted solid materials. For a better and easier reading of these values, author introduces the Vitrification potential as ***pV***= $\mathbf{log_{10}}(RGFA^{BMG})$ and finally, discusses the results with a comparative statistical analysis and some adequate graphical representations.

Biography

Abdelmalek ROULA born in 1959, M. Sc. In 1983, he earned his PhD on May 1988, full professor since December 2010. He is the Member of pedagogic staff of Process Eng. Department at Fac. Sci. & Technol., He is the Head of a research group ''Chemical combinations in Inorganic Solid Materials'' at LIME Lab of M. S. Benyahia University in Algeria. He is a Metallurgist but reoriented and began studying the Glass-forming ability of oxides, glasses....and metallic alloys since 2011. His Research Interests: Metallurgy, Glasses & Ceramics, Thermodynamics, Statistics & Data mining, Glass-Forming Ability and Bulk Metallic Glasses.

Hybrid classical-quantum transfer learning for text classification

Mohammad Mahdi Nasiri Fatmehsari[2] and **Ebrahim Ardeshir-Larijani**[1]
[1]School of Mathematics and Computer Science, Iran University of Science and Technology, Iran
[2]Pasargad Institute for Advanced Innovative Solutions, Iran

Quantum machine learning (QML) is a promising field that combines the power of quantum computing with machine learning. Variational quantum circuits, where parameters of circuits are learned classically, have been widely used in many recent applications of QML. This is an instance of a hybrid quantum-classical framework, where both classical and quantum components are present. However, applying these techniques to applications involving massive data is a challenging task. One way to overcome this is using the concept of classical-quantum transfer learning with the help of a dressed quantum circuit, introduced recently, where the underlying neural architecture is pre-trained classically, but at the final steps (decision layer), a quantum circuit is used, followed by quantum measurements and post-processing to classify images with high precision. In this paper, we applied hybrid classical-quantum transfer learning to another task of massive data processing, i.e., natural language processing (NLP). We show how to (binary) classify short texts (e.g., SMS) with classical-quantum transfer learning, which was originally applied to image processing only. Our quantum network uses pre-trained Bidirectional Encoder Representations from the Transformers (BERT) model, and its variational quantum circuit is fine-tuned for text processing. We evaluated the performance of our hybrid neural architecture using the receiver operating characteristic (ROC) curve, which is typically used in the evaluation of classification problems. The results indicate high precision as well as lower loss function. To our knowledge, our work is the first application of quantum transfer learning to the area of NLP. Finally, a comparison with a tool that uses learning but in a different way than transfer learning is presented.

Biography

Mohammad Mahdi Nasiri Fatemehsari is a dedicated researcher specializing in quantum materials, nanotechnology, and quantum computing. He earned his Master of Science degree in Quantum Materials, Energy, and Technologies from Khatam University, in collaboration with Sorbonne

University within the Materials Science and Nano-Objects (SMNO) program. His research focused on the emergence of qubits using the DMRG method.

Currently a junior researcher at the Pasargad Institute for Advanced Innovative Solutions (PIAIS), Mohammad has contributed to various innovative projects, including programming with a D-Wave quantum computer and developing hybrid classical-quantum models. His skills encompass machine learning, quantum algorithm development, and experimental setup in quantum technologies. His proficiency in multiple programming languages, he is passionate about advancing the field of quantum information science and contributing to groundbreaking research across various domains of quantum technologies.

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