Global Summit on

MATERIALS SCIENCE AND ENGINEERING

CONFERENCE PROGRAM

July 21-22

2025

PARIS, FRANCE

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IN-PERSON:
Van der Valk Hotel Paris CDG Airport,
351 Av. du Bois de la Pie, 95700
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VIRTUAL: Central European Summer Time (CEST)

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Day -1
Monday

Global Summit on Materials Science and Engineering

July 21-22, 2025 | Paris, France

08:00 - 08:30 Registrations + Badge Pickup

08:30 - 09:00 Welcome Address by Moderator

09:00 - 10:30 Keynote Presentations

09:00 - 09:30

A.K. Fazlur F Rahman, Oklahoma School of Science and Mathematics, USA

Title: Catalytic Conversion of Ethanol to Butanol: Synthesis and Application of Naphthaquinone and Anthraquinone Coordinated Iridium Compounds

09:30 - 10:00

Reza Ghomashchi, The University of Adelaide, Australia

Title: Green Energy Revolution: Distribution Network Infrastructure for hydrogen

10:00 - 10:30

Jean Michel Mechling, University of Lorraine, France

Title: The study of historical mortars from Notre-Dame de Paris cathedral

Group Photo & Refreshment Break (10:30-10:50)

Expert Panel list member & Moderator: Dr. Jared Jagdeo

Technical Session-I (10:50 - 12:50)

10:50 - 11:10

Goerge Deerberg, Fraunhofer UMSICHT, Germany

Title: Carbon Management – From Vision to Industrial Application

11:10 - 11:30

Li-Ang Lee, Linkou Chang Gung Memorial Hospital, Taiwan

Title: Developing a Novel Neck-Wearable Piezoelectric Sensor for Early Carotid Artery Profile Screening in Habitual Snorers: A Pilot Study

11:30 - 11:50

Anna Stepashkina, Zhejiang Lab, China

Title: Machine Learning Approaches as a Tool for Investigating Properties of Polymer Composites

11:50 - 12:10

Christine Videlot Ackermann, Aix Marseille University, France

Title: Investigations the photostability of Y-series electron acceptors from small molecules to polymers for OPV

12:10 - 12:30

Kanda Kazuhiro, University of Hyogo, Japan

Title: Properties and Classification of Diamond-Like Carbon Films

12:30 - 12:50

Fred Lisdat, Technical University Wildau, Germany

Title: Photoelectrochemical systems for biochemical detection

Lunch @ Restaurant (12:50 - 14:00)

Technical Session-II

14:00 - 14:20

Daniel Qi Tan, GTIIT, China

Title: Lewis Acid Molten Salt-Derived MXene Electrodes: Dual Oxide Coating and Porosity Engineering for Advanced Energy Storage

14:20 - 14:40

Haishan Zeng, University of British Columbia, Canada

Title: Label-free liquid biopsy based on blood circulating DNA detection using SERS-based nanotechnology for nasopharyngeal cancer screening

14:40 - 15:00

Fahimeh Zare, Institute Superior tecnico(IST)- CQE, Portugal

Title: Innovative Cellulose Acetate Hybrid Membranes Combined with Integrating Magnetic Nanoparticle Adsorption for Urea Removal from Spent Dialysate

15:00 - 15:20

Margaret Kabakova, Suny Downstate, USA

Title: Red, near-infrared, and blue light do not induce DNA damage in human dermal fibroblasts

15:20 - 15:40

Xiang Wu, Ningbo University, China

Title: A bioinspired switchable adhesive patch with adhesion and suction mechanisms for laparoscopic surgeries

Refreshment Break + Poster Presentations (15:40 - 16:10)

Poster 1

Emilia Martula, Medical University of Silesia, Poland

Title: The new dipyridothiazine derivatives- synthesis, properties analysis and anticancer activity

Poster 2

Carlyn Danese, Mount Holyoke College, USA

Title:Empirical Potential Influence on Proton Transfer and Trapping in Scandium-Doped Barium Zirconate with Oxygen Vacancies

Poster 3

Hsun-Feng Hsu, National Chung Hsing University, Taiwan

Title: Fabrication of Reduced Graphene Oxide Films on Silicon Nanowire Arrays via Photocatalytic Reduction Method and Their Applications in Infrared Light Sensing

Technical Session-II continues -----

16:10 - 16:30

Adhmoorthy Prasannan, National Taiwan University of Science and Technology, Taiwan

Title: Development of amine/carboxylic terminal functionalities thermo-responsive pluronic coated biodegradable polymer-based micro drug carrier for regeneration of osteoarthritis in vitro

16:30 - 16:50

Jolly Bhadra, Qatar University, Qatar

Title: Triboelectric Nanogenerators based on biodegradable Sodium Alginate/ZnO-Co3O4 polymer nanocomposites

16:50 - 17:10

Iryna Skorochod, National Academy of Sciences of Ukraine, Ukraine

Title: Effect of the Nanocomposite Complex Bacterial Preparation Azogran on the Phenolic Profiles of Different Barley Varieties under Abiotic Stress Conditions

17:10 - 17:30

Valerie Pralong, CNRS, France

Title: Design of new cathode material used as electrode for Li-Na-K-ion batteries

17:30 - 17:50

Zolile Wiseman, Central University of Technology, South Africa

Title: Digital data storage device using sodium alginate

Day 1 Concludes

Panel Discussions

10:00 - 10:25

Serzhik Sargsyan, National Polytechnic University of Armenia, Russia

Title: Nanocomposites of metallic silver in a matrix of 1-vinyl-1,2,4-triazole and N-vinylcaprolactam copolymer

10:25 - 10:50

Jeyavani Vijayakrishnan, CSIR- National Chemical Laboratory, India

Title: Remarkable SO2 and H2S Resistant Ability on CO Oxidation by Unique Pd/WO3 3D Hollow Sphere Nanocatalyst: Correlating Structure−Activity Relationships on SO2 Exposure

10:50 - 11:15

Divyanshi Mangla, K.R. Mangalam University, India

Title: Novel Glutaraldehyde crosslinked Chitosan/GMA/Nickel oxide nanoparticles for Tetracycline, Ofloxacin and Lead removal

11:15 - 11:40

Abbas Alshehabi Jaafar, Bahrain Polytechnic, Bahrain

Title: On the plasmon contribution to X-ray electron emission spectroscopy background:q-statistical analysis

11:40 - 12:05

Pelin Kilic, Ankara University, Turkey

Title:Ensuring quality and consistency in cellular therapeutics: analytical insights from residual protein assessment

12:05-12:30

Osman Adiguzel, Firat University, Turkey

Title: Chemical Factors and Crystallographic Transformations Governing Reversibility in Shape Memory Alloys

12:55-13:20

Wolfgang Quapp, Leipzig University, Germany

Title: Potential Energy Surfaces, Newton Trajectories and Optimal Oriented External Electric Fields

13:20-13:45

Maria Betânia de Freitas Marques, Universidade Federal de Alfenas, Brazil

Title: Evaluating the thermal behavior of materials and determining the kinetics of thermal phenomena for industrial aplications

13:45-14:10

Fernando Pinto Coelho, Federal University of Alagoas, Brazil

Title:The sustainability of beach-cast seaweed biomass for Biorefinery processes: Calorific power heating studies with macroalgae

14:10-14:35

Terry Hendricks, Blue Origin, USA

Title: Review of Latest Advances in Thermoelectric Generation Materials, Devices, and Technologies

11:40 - 12:05

Daron I. Freedberg, OVRR/CBER/FDA, USA

Title: Unveiling solution glycan conformations

Day 2 Concludes

ISBN:
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A.K. Fazlur Rahman[1,2], W.D. Jones[1],
and Miles Wilklow-Marnell[1]

[1]*Department of Chemistry, University of Rochester, NY 14627*

[2]*Oklahoma School of Science and Mathematics, Oklahoma City, OK 73104*

Catalytic Conversion of Ethanol to Butanol: Synthesis and Application of Naphthaquinone and Anthraquinone Coordinated Iridium Compounds

Abstract:

The catalytic upgrading of ethanol to higher-order alcohols such as butanol is a critical step toward the development of sustainable liquid fuels and energy-dense bio-based chemicals. In this study, we report the synthesis and characterization of a new class of iridium complexes coordinated with redox-active naphthaquinone and anthraquinone ligands. These complexes were synthesized via ligand substitution reactions starting from $[Ir(COD)Cl]_2$ (COD = 1,5-cyclooctadiene), and structurally confirmed by NMR, IR, and single-crystal X-ray diffraction.

Catalytic evaluations reveal that these quinonoid-ligated iridium compounds exhibit enhanced activity in the Guerbet-type coupling of ethanol to butanol under mild conditions. The redox non-innocence of the quinone ligands appears to facilitate key dehydrogenation and C–C bond-forming steps through ligand-assisted electron transfer. Compared to classical phosphine- or nitrogen-based systems, these organometallic quinone complexes demonstrate improved selectivity, turnover number (TON), and thermal stability. This work highlights the potential of utilizing redox-active ligands in transition metal catalysis to promote complex multi-step transformations and lays the groundwork for designing advanced catalytic systems for renewable fuel production.

doi.org/10.51219/URForum.2025.A.K.-Fazlur-F-Rahman

Biography:

Dr. A. K. Fazlur Rahman earned his M.A. in Chemistry from Brandeis University and his Ph.D. in Organometallic Chemistry from the Australian National University in Canberra. He pursued postdoctoral research at the University of Tasmania (Australia), Ames Laboratory (Iowa State University, USA), and the University of Oklahoma (USA). Dr. Rahman is a distinguished recipient of the Southwest Regional Award of the American Chemical Society (2009) and the Oklahoma Chemist Award (2015).

Over the course of his career, he has held visiting faculty positions at several prestigious institutions, including Texas A&M University, University of Rochester, California Institute of Technology (Caltech), University of California at Berkeley, Free University of Berlin, Friedrich Schiller University (Jena), Rutgers University, and Columbia University in New York City. Currently, Dr. Rahman holds an endowed professorship and serves as the Sarkeys Energy Foundation Chair in Chemistry at the Oklahoma School of Science and Mathematics. In addition, he serves as an Affiliate Professor of Chemistry and Chemical Engineering at the University of Oklahoma, where he has taught Organic Chemistry as an adjunct professor for many years.

Reza Ghomashchi

School of Electrical and Mechanical Engineering, The University of Adelaide, Adelaide 5000, Australia

Green Energy Revolution: Distribution Network Infrastructure for hydrogen

Abstract:

Global warming is an accepted fact of life, posing grave consequences in the form of weather patterns with life-threatening outcomes for inhabitants and their cultures, especially those of island countries. These wild and unpredictable weather patterns have persuaded authorities, governments, and industrial leaders to adapt a range of solutions to combat the temperature rise on Earth. One such solution is to abandon fossil fuels (hydrocarbons) for energy generation and employ renewable energy sources, or at least use energy sources that do not generate greenhouse gases. One such energy carrier is hydrogen, which is expected to slowly replace natural gas and will soon be pumped into the energy distribution pipeline network. Since the current energy distribution network was designed for hydrocarbons, its use for hydrogen may pose some threat to the safetyof urban society.

This is the first time a conference presentation has examined the replacement of hydrocarbons by hydrogen from a totally different angle and perspective, by incorporating material science viewpoints. This article discusses hydrogen properties and warns about the issue of hydrogen embrittlement in the current pipeline network if hydrogen is to be pumped through the current energy distribution network, i.e., pipelines. It is recommended that sufficient study and researchbe planned and carried out to ensure the safety of using the current energy distribution network for hydrogen distribution and to set the necessary standards and procedures for future designand construction.

doi.org/10.51219/URForum.2025.Reza-Ghomashchi

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978-1-917892-15-5

Jean-Michel Mechling

Université de Lorraine, CNRS, IJL, Nancy, France

The study of historical mortars from Notre-Dame de Paris cathedral

Abstract: The fire at Notre-Dame cathedral in Paris on April 15th 2019 was a catastrophic event but also a real opportunity to develop scientific studies. Access to inaccessible parts of the partially destroyed cathedral was made possible by the presence of scaffolding inside and outside the buildings thus facilitating unusual sampling opportunities and observations. Along with other subjects (structural stability, metal reinforcement, materials supplies, etc.), the study of historical mortars contributes to our understanding of the construction of a cathedral during the Middle-Age. Indeed mortars are the material that binds the stones together and participates in load transmission in the structural elements of the buildings.

From a historical point of view, many questions remain such as the constancy of the mix design (components, mix proportioning, etc.) during the 80 years of construction or how well the mix properties were adapted to usage (pilars, vaults, wall filling, etc.). Specific analyses in different fields (chemistry, petrography, physics) using a wide range of techniques (X-rays diffraction / fluorescence / tomography; thermo-analyses; mercury intrusion porosimetry; optical and electronical microscopy, etc.) have enabled seven types of mortar to be defined that are based on two chemical binders – pure lime and plaster. Their respective mix proportionings were also defined and reproduced experimentally to produce equivalent mortars. These 'copies' are used in mechanical tests that enable us to understand the properties (mechanical strength, deformation modulus) of the historical mortars in their fresh and the hardened states. The first results of this study were also used to define the mortars for the reconstruction of the vaults of Notre-Dame de Paris.

Biography: Jean-Michel Mechling is a Professor at the Université de Lorraine and Head ot the Team Materials for Civil Engineering at the Institut Jean Lamour (UMR CNRS 7198, Nancy, France). His research focuses on current cementitious binders with the objective of recycling industrial waste and demolition concrete or of reducing the environmental footprint of civil engineering materials. Also, for over twenty years, he has studied ancient mortars from different archaelogical sites (France, Jordan, etc.) and several epochs of Antiquity (Gallo-Roman, Bysantine) up to the Middle-Age and the Renaissance.

doi.org/10.51219/URForum.2025.Jean-Michel-Mechling

Prof. Dr.-Ing. Görge Deerberg

Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, Oberhausen, Germany

Carbon Management – From Vision to Industrial Application

Abstract: Carbon is a key element in industrial production, but CO_2 is also a greenhouse gas whose release into the atmosphere must be avoided. If its generation cannot be avoided for process-related reasons, then a comprehensive carbon management is required to enable climate-neutral production in industry. In the Carbon2Chem$^{®}$ project, partners from industry and science are successfully researching technical components that enable the implementation of concepts for CO^2 capture and utilization (CCU) as part of carbon management.

Keywords: carbon management, CO_2 capture and utilization (CCU), circular carbon use, industrial transformation, system integration

Biography: Görge Deerberg has had a long and distinguished career in environmental, safety, and energy technology. He began his academic journey studying Chemical Engineering at the University of Dortmund from 1983 to 1990, where he earned his diploma degree in June 1990. He then worked as a scientific assistant at the Institute for Environmental and Safety Technology in Oberhausen starting in October 1990. In July 1995, he became head of the working group "System dynamics" at the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT. Following this, he completed his doctoral thesis in December 1996 at the Chair of Fluid Separation Processes under Prof. Paul-Michael Weinspach at the University of Dortmund. In July 1997, he took on the role of head of the department "Process simulation, optimization and monitoring" at Fraunhofer UMSICHT. By January 2003, he had become a member of the institute’s management and a scientific director. From June 2006 to August 2022, he served as deputy head of the institute and Division Director for Processes. Since January 2011, he has also held an adjunct professorship in "Environmental and Process Engineering" at Ruhr University Bochum’s Faculty of Mechanical Engineering. In June 2019, he was appointed professor in "Environmental Sciences" at FernUniversität in Hagen, Faculty of Cultural and Social Sciences. As of August 2022, he holds the position of Director for Transfer at Fraunhofer UMSICHT.

doi.org/10.51219/URForum.2025.Goerge-Deerberg

Anna Stepashkina, Lijun Huang

Zhejiang Lab/Hangzhou, China

Machine Learning Approaches as a Tool for Investigating Properties of Polymer Composites

Abstract: Polymer composite materials (PCM) are advanced materials that combine two or more constituent materials to achieve superior properties. They are widely used across various industries due to their numerous benefits, such as weight reduction in the aerospace industry and the combination of mechanical properties with electrical and thermal conductivity in electronics. However, understanding the relationship between the properties of composites can be challenging. The study of electrical and thermal conductive properties under various operating conditions is complex, and rheological and mechanical tasks also require special attention. In the context of this complexity, the research has focused on the impact of mechanical deformation on the electrical conductivity properties of PCMs. A predictive model based on Boltzmann statistics has been developed to forecast the loss of electrically conductive properties when materials are subjected to mechanical stress. The application of a machine learning predictive algorithm offers the opportunity to develop a robust approach for forecasting the mechanical properties of PCM. All proposed models demonstrate an accuracy rate exceeding 95%, indicating a high level of reliability in predicting these properties.

Keywords: polymer composite materials, machine learning, mechanical properties, electrical conductivity.

Biography: A research expert at Zhejiang Lab, Anna Stepashkina has dedicated over a decade to tackling challenges in polymer science. Holding a PhD from St. Petersburg University of Industrial Technologies and Design, her contributions have been recognized through the publication of more than 50 scientific papers. Her work has significantly advanced the field, and she continues to be a driving force in material innovation.

doi.org/10.51219/URForum.2025.Anna-Stepashkina

Kazuhiro Kanda

University of Hyogo, Kamigori, Japan

Properties and Classification of Diamond-Like Carbon Films

Abstract: Diamond-like carbon (DLC) films, which are amorphous, contain sp^2 hybridized carbon corresponding to a graphite structure and sp^3 hybridized carbon corresponding to a diamond structure. DLC films have been utilized as the coating material on cutting tools, molds, food vessels, and medical devices owing to their excellent properties: high hardness, low friction coefficient, gas barrier, chemical inertness and biocompatibility. Thus, huge market has been expected in the DLC industry and various DLC films are synthesized and utilized in plenty of purposes. On the other hand, because the structure of the DLC film is amorphous, its definition is ambiguous and difficult to evaluate. Systematic knowledge on DLC films has not been obtained at all, such as which carbon film can be called a DLC film, what physical properties of DLC films exist, what kind of evaluation is objectively convincing to others, and which DLC film is suitable for what kind of application. Therefore, there were major issues in protecting intellectual property rights, evaluation criteria for producers, and selection criteria for users. To solve these issues, it was necessary to establish criteria to evaluate structures and properties of DLC films and to classify DLC films with various compositions and properties. In 2006, a NEDO project in Japan evaluated 58 types of DLC films for about 20 test items, including structure, mechanical properties, chemical properties, biocompatibility, and so on. Based on the results of this round-robin test, standardization of the classification of DLC films was promoted, and an international standard (ISO 20523: Carbon based films - Classification and designation) published in 2017, in addition, several ISO standards have been established for evaluation methods of DLC films

Keywords: diaond-like carbon, structural analysis, sp^2/sp^3 ratio, hydrogen content, ISO

Biography: Dr. Kazuhiro Kanda is a professor at the Laboratory of Advanced Science and Technology for Industry, University of Hyogo, which has a synchrotron radiation facility for soft X-rays, “NewSUBARU”. He specializes in the material properties of thin films and surfaces, with particular emphasis on structural analysis using quantum beams (synchrotron radiation, high-energy ion beam, positron beam, etc.). In recent years, his research has focused on amorphous carbon films, and he contributed to the ISO standardization of DLC films as a member of the international standardization project of the Ministry of Economy, Trade and Industry in Japan.

doi.org/10.51219/URForum.2025.Kanda-Kazuhiro

Gero Göbel[1], Athina Zouni[2], Wolfgang Parak[3], Martin Eickhoff [4], **Fred Lisdat[1]**

1 Biosystems Technology, Institute for Life Sciences and Biomedical Technologies, Technical University of Applied Sciences Wildau, Hochschulring 1, 15745 Wildau, Germany
2 Biophysics of Photosynthesis, Institute of Biology, Humboldt University of Berlin, Germany
3 Department of Physics, CHyN, Universität Hamburg, 22761 Hamburg, Germany,
4 Institute of Solid State Physics, University of Bremen, Bremen, Germany

Photoelectrochemical systems for biochemical detection

Abstract: Photobioelectrochemical systems have become an interesting new research field with applications in biosensing, bioenergetics and biocatalysis. Here light-sensitive elements are coupled with biocatalytic reactions for the generation of photocutrrents. The light sensitive element can consist of semiconductor materials or their combinations but can also comprise photoactive proteins. Significan progress has been achieved within this research fiel, however limitations can occur because of small sensor signals, a limited number of analytes and also in applications for which a close contact of the sensing surface with biological systems such as a cell culture is essential.
Different approaches have been developd in order to address these bottlenecks. For example, semiconductor nanostructures such as quantum dots (QDs) can be replaced by InGaN nanowires. This allows direct detection of analytes, but also combinations with enzymes.

Recently we have combined a second semiconductor material TiO_2 with quantum dots. This high band gap material is not excited by visible light, but improves charge carrier sepration within the QDs. Such systems result in significantly improved photocurrent signals, but also in enhanced signals when analyte molecules such as hydrogen peroxide are converted. Furthermore, it is demonstrated that living celles can be cultivated on top of such a sensing platform without impacting viability.
These studies may illustrate that advantages of photoelectrochemical sensing systems can be combined with enhanced analytical performances such as increased sensitivity and stability - and therefore, resulting in an improved applicability.

doi.org/10.51219/URForum.2025.Fred-Lisdat

Keywords: semiconductor nanostructures, enzymes, photocurrent generation, cell culure measurements, combination of two light sensitive systems.

Biography:

Fred Lisdat studied chemistry at Humboldt University and got phd in 1992. Research interest moved from chemical sensors towards biosensors. 1994 he joined the research group of Prof. Scheller at Potsdam University. He finalised habilitation in 2004. 2001 he was working as guest professor at Tokyo University. 2004 he got the Professorship of Biosystems Technology at Technical University Wildau. He has been active in several national and international organisations, e.g. as chair of division 2 of International Society of Electrochemistry, board of biosensor division of the GdCh, head group of sensor section of Dechema or president of the Bioelectrochemical Society. 2024 he got the Bioelectrochemistry Prize of ISE.

doi.org/10.51219/URForum.2025.Fred-Lisdat

Daniel Q. Tan and Dayakar Gandla

Guangdong Technion Israel Institute of Technology, Shantou, China

Lewis Acid Molten Salt-Derived MXene Electrodes: Dual Oxide Coating and Porosity Engineering for Advanced Energy Storage

Abstract: MXenes, a class of two-dimensional (2D) transition metal carbides and nitrides, offer significant potential for electrochemical energy storage applications due to their excellent electronic conductivity, tunable surface chemistry, and layered architecture. However, conventional synthesis using hydrofluoric acid (HF) is toxic and corrosive and possesses safety risks. Additionally, 2D MXenes experience limited ion transport and structural instability, hindering long-term performance. In this study, we present a 3D flower-like double transition metal MXene, Mo2Ti2C3Clx, featuring engineered in-plane mesoporosity, synthesized via a HF-free Lewis acid molten salt method combined with intercalation and freeze-drying. Controlling the molar ratio of Lewis acid to eutectic salts creates stable mesoporosity, preserved through freeze-drying. Molecular dynamics (MD) simulations show the effect of in-plane pore sizes on electrolyte transport, while density functional theory (DFT) calculations demonstrate that chlorine surface groups significantly lower Li-ion diffusion barriers. Electrochemical tests reveal that small-sized (2-5 nm) mesoporous Mo2Ti2C3Clx achieves a specific capacity of 324 mAh g-1 at 0.2 A g-1 and retains 97% capacity after 500 cycles at 0.5 A g-1, outperforming larger-pored (10 nm) and nonporous Mo2Ti2C3Clx variants. This work highlights a scalable strategy for creating mesoporous MXenes that enhance ion transport and structural stability, essential for next-generation highperformance energy storage systems.

Keywords: metal carbide, MXene, batteries, electrochemical, Lewis acid, porous electrode

Biography: Prof. Tan is the deputy director of the Department of Materials Science and Engineering and the director of the Guangdong Key Laboratory of Energy Conversion. In 1989, he obtained a PhD in Physics from Chinese Academy of Sciences. He then taught at the University of Science and Technology of China. From 1994 to 2018, he received PhD from the University of Illinois at Urbana-Champaign. Then, he entered the industry to study dielectric ceramics and polymers, energy storage materials, and filtration membrane technology for 20 years. He has published 120 papers and 60 issued patents.

doi.org/10.51219/URForum.2025.Daniel-Qi-Tan

Haishan Zeng

Department of Dermatology and Skin Science,
University of British Columbia, Vancouver, Canada

Label-free liquid biopsy based on blood circulating DNA detection using SERS-based nanotechnology for nasopharyngeal cancer screening

Abstract: Development of a sensitive, rapid and easy-to-use liquid biopsy method is of imperative clinical value for point-of-care caner diagnostics. In this work, a label-free and modification-free nanotechnology based on surface-enhanced Raman spectroscopy (SERS) was developed for **DNA** analysis. Using the SERS signals of phosphate backbone as internal standard, quantitative detection for nucleobases was achieved at single base level. Combined with principal component analysis (PCA) and linear discriminant analysis (LDA), the method was applied for real blood circulating DNA detection, and a diagnostic sensitivity of 83.3% and specificity of 82.5% was achieved for differentiating the nasopharyngeal cancer from the normal group. This proof of concept experiment demonstrated promising potential for this method to become a rapid, easy-to-use, cost-effective and sensitive method for nasopharyngeal cancer detection based on liquid biopsy.

Keywords: DNA, SERS, nasopharyngeal cancer, liquid biopsy, nanotechnology, Raman spectroscopy

Biography: Haishan Zeng is a distinguished scientist with the BC Cancer Research Institute and a professor at the University of British Columbia. Dr. Zeng's research focuses on biophotonics and its medical applications. His group has pioneered the multiphoton-absorption based laser therapy and is at leading position in endoscopy imaging and Raman spectroscopy for noninvasive early cancer detection. He has published over 200 refereed papers and holds 30 granted patents. Several medical devices derived from these patents including fluorescence endoscopy (ONCO-LIFE™) and rapid Raman spectroscopy (Aura™) have passed regulatory approvals. The Aura™ device was awarded the Prism Award in 2013 by the International Society for Optics and Photonics.

doi.org/10.51219/URForum.2025.Haishan-Zeng

Zare, Fahimeh [*a,b]; Faria, Mónica [b]; Monteiro, Carlos.E. [a] and Gonçalves, M. Clara

[a] *Centro de QuímicaEstrutural - Institute of Molecular Sciences, Universidade de Lisboa.*
b Center of Physics and Engineering of AdvancedMaterials (CeFEMA), ChemicalEngineering Department, Instituto Superior Técnico, Lisboa.

Innovative Cellulose Acetate Hybrid Membranes Combined with Integrating Magnetic Nanoparticle Adsorption for Urea Removal from Spent Dialysate

Abstract: Efficient urea removal from spent dialysate (SD) is a major challenge in the advancement of sustainable hemodialysis technologies. This study presents the development and characterization of an asymmetric cellulose acetate-based hybridmembrane, designed for selective urea separation, and its integration with Magnetic silica nanoparticle-assisted adsorption for enhanced removal performance.

The hybrid membrane was synthesized to achieve an optimized asymmetric structure, and its properties were thoroughly characterized using Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM),atomic force microscopy (AFM), mechanical strengthtesting, Raman spectroscopy, and hydraulic permeability measurements. These analyses confirmed the membrane’s asymmetric architecture, well-defined surface morphology, and robust mechanical properties suitable for practical application in dialysis systems.

In the current phase of our research, we are investigating a two-step process: first, urea is adsorbed from SD using silica nanoparticles with high affinity for urea; second, the urea-laden nanoparticles are separated from the solution using the synthesized hybrid membrane. Preliminary characterization and membrane performance evaluations have been successfully completed, and ongoing experiments are focused on the adsorption and separation stages. The final results of these experiments, including urea removal efficiency and membrane retention performance, will be presented at the conference.
This work demonstrates the potential of combining hybrid membrane technology with nanoparticle- assisted adsorption as a scalable and energy-efficient strategy for advanced urea removal and dialysate regeneration. The proposed approach could significantly contribute to the development of next-generation hemodialysis systems with improved sustainability and cost-effectiveness.

Keywords: Hybrid cellulose acetate membrane,urea removal, spent dialysate, magnetic silica nanoparticles, adsorption, membrane technology.

Acknowledgments:
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Biography:
Fahimeh Zare is a PhD candidate and researcher specializing in membrane technology, nanoparticle synthesis, and porous thin film characterization. She contributes to the HORIZON PHOTONGATE project, focusing on advanced photonic multi-sensing systems.Fahimeh has presentedat various international conferences and published four peer-reviewed articles, with another under review. Her work appears in top journals like Membranes, Sensors, and Hydrogen Energy. She received several honors, including the BIC France-Portugal scholarship. Her researchtargets advanced membranematerials, uremic toxin removal, and hydrogen production technologies, aiming to drive innovation in separation science and sustainable energy through collaborative, high-impact research.

Margaret Kabakova, BS, Jessica Mineroff, MD, Jennifer Wang, BS, Raichel Philip, BA, Julia Stolyar, BS, Evan Austin, PhD, MD, and Jared Jagdeo, MD, MS

SUNY Downstate Health Sciences University, Brooklyn, NY

Red, near-infrared, and blue light do not induce DNA damage in human dermal fibroblasts

Abstract: Photobiomodulation (PBM), the use of non-ionizing light to modulate biological activity, is increasingly utilized in dermatology for wound healing, skin rejuvenation, and anti-inflammatory effects. Despite its widespread clinical and consumer use, concerns remain regarding the potential of visible and near-infrared light to induce DNA damage. In this series of in vitro studies, we systematically investigated the genotoxic potential of red (633 ± 6 nm), near-infrared (830 ± 5 nm), and fluorescent blue (417 ± 5 nm) light across a range of clinically relevant and supratherapeutic fluences.

Using well-established enzyme-linked immunosorbent assay (ELISA) and DNA immunoblotting, we quantified the formation of cyclobutane pyrimidine dimers (CPDs) and (6-4)- photoproducts (6-4PPs)—two hallmark markers of ultraviolet-induced DNA damage—in human dermal fibroblasts (HDFs) immediately, 3 hours, and 24 hours post-irradiation. Across all wavelengths and fluences tested, no significant induction of CPDs or 6-4PPs was observed relative to matched controls. Ultraviolet-B (UVB) exposure was included as a positive control and consistently induced robust DNA damage.

These findings collectively demonstrate that red, near-infrared, and blue light do not induce measurable DNA damage in HDFs at fluences used in dermatologic practice and home devices. This work provides important preclinical safety data and supports the continued investigation and responsible use of PBM technologies in clinical dermatology. Future studies will be necessary to assess the impact of these wavelengths on other cell types, particularly pigmented or keratinized cells, and to evaluate additional biomarkers of phototoxicity and long-term genomic stability.

doi.org/10.51219/URForum.2025.Margaret-Kabakova

Keywords: photobiomodulation, cyclobutane pyrimidine dimers, 6-4 photoproducts, DNA damage, human dermal fibroblasts

Biography: Margaret Kabakova is currently a dermatology research fellow and third-year medical

student at SUNY Downstate Health Sciences University in Brooklyn, NY. She actively participates in basic science research at the Jagdeo Lab at SUNY Downstate Medical Center and clinical studies at the VA New York Harbor Medical Center – Brooklyn Campus. Previously, Margaret contributed to clinical research at the Pearlmutter Cancer Center NYU Langone Health.

Margaret earned her BS degree from American University in Washington, DC, and subsequently completed a pre-medical post-baccalaureate program at Columbia University in New York, NY.

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Effect of the Nanocomposite Complex Bacterial Preparation Azogran on the Phenolic Profiles of Different Barley Varieties under Abiotic Stress Conditions

Abstract: Hordeum vulgare L. is a valuable cereal crop worldwide. However, its yield is decreasing due to increasing abiotic stresses. The prolonged action of oxidants creates an imbalance in the functioning of antioxidants. One of the stabilization ways of redox-homeostasis in the plants is the use of microbial preparations. Plant Growth Promoting Rhizobacteria (PGPR) are the main components of these preparations. PGPR are contribute to the development of stress-tolerance through activation of the synthesis of phenolic metabolites (Ph-OH) in the plants.HPLC was used to determine the composition of phenolic profiles extracted from the barley samples. Inoculation of seeds of barley varieties (Burkhant, Virazh and Copeland) with the nanocomposite complex bacterial preparation Azogran (Azotobacter vinelandii IMV B-7076 + Bacillus subtilis IMV B-7023 + nanostructured mineral bentonite) increased the levels phenolic acids and flavonoids in the free and bound fractions. Whereas in plants whose seeds were stressed with H_2O_2 and inoculated with Azogran, Ph-OH with a high ability to inactivate the harmful effects of H_2O_2 dominated. The concentration of free chlorogenic, syringic, benzoic, p-coumaric acids, rutin and bound chlorogenic, benzoic and trans-ferulic acids increased in plants of the Burkhant barley variety. In plants of Virazh barley, the levels of free caffeic and syringic acids, quercetin and bound 4-hydroxyphenylacetic (4-HPA), trans-ferulic, sinapic, trans-cinnamic acids, quercetin and kaempferol increased. In Copeland barley plants, only 4-HPA and trans-ferulic acids in the free fraction and syringic acid in the bound fraction were increased. Thus, in spite of the different responses of the different barley varieties to the action of the bacterial preparation Azogran, the synthesis of those Ph-OH which are an effective buffer against peroxide stress increased in their plants.

doi.org/10.51219/URForum.2025.Iryna-Skorochod

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Design of new cathode materialused as electrode for Li-Na-K-ion batteries

Abstract: One of the major challenges of the 21st century is our ability to solve energy-related problems caused by ever-higher consumption, demography and standardof living. It is therefore imperative to anticipate this energy demand and this in a context of sustainable development. Storage technologies are highly dependent on the materials used and it is necessary to search for new materials with advanced properties that are also ecological and economical. Despite the high performance of lithium-based materials, its cost is driving scientists to develop alternative systems based on sodium and potassium, which are widely abundant in the earth's crust.

Manganese based oxide materials are promising cathodes for alkaline ion batteries due to their high energy density, low-cost and low-toxicity. Focusing on layered-type structures, one has to cite of course the AxMnO2 families showing interesting insertion properties in all the system based on lithium, sodium and even more recently potassium. Moreover, we notice that the system A-Mn-Oare extremely rich in term of original structures. For example, we found a new lithium rich composition Li4Mn2O5 with a disordered rock salt structure that was showing an exceptional capacity of about 300mAg/g [1]. Interestingly, the material Na4Mn2O5 has been reported with a layered type structure, different from the lithiated phase and we will discuss the relationship between the structure and insertion properties [2]. Recently we report the electrochemical activity of potassium insertion into K3MnO4 [3]. In the frame of this presentation, we will discuss our strategy and result regarding the generation of green materials for the energy storage.

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Digital data storage device using sodium alginate

Abstract: The current state of environmental contamination caused by discarded electronic waste (e-waste) is troubling. The infiltration of e-waste into aquatic and subterranean environments can harm living organisms, including humans, due to the presence of harmful compounds. The mitigation of e-waste can be achieved through the incorporation of biodegradable materials in the manufacturing of electronic devices. Memory devices are components of the electronics industry and significantly contribute to the increasing e-waste due to the use of semiconducting materials and other heav metals. This study examines sodium alginate, a biodegradable polymer, for its potential use in the novel biodegradable memory technology known as resistive switching memory (ReRAM). A sodium alginate solution was applied by the drop casting process onto a PCB substrate with copper traces. The solution was alower to dry at room temperature to form a film. Next, a conductive silver ink based pen was used to draw silver traces on the film. These silver traces were oriented perpendicular to the copper traces, thus forming an array of "copper-sodium alginate-silver" device at the intercection points. The device underwent testing with the memristor characterisation apparatus. The voltage was applied between the copper and silver electrodes and a current through the device was measured. The device exhibited two unique resistance states: a high resistive state and a low resistive state, indicating its capability for digital data storage. This study has shown the manufacturing of a ReRAM device with a reduced environmental footprint, produced by a more cost-effective approach that did not require heating and utilized minimum electricity.

Keywords: Resistive switching memory, biodegradable, sodium alginate, electrical conduction, BioReRAM

Biography: Zolile Dlamini serves as a senior lecturer at the Central University of Technology and does research in the discipline of physics. His research focuses on biodegradable resistive switching memory devices. He is a member of the South African Institute of Physics and a co-researcher at the University of South Africa. He also, shares a funding from the National Research Foundation's African University Twinning Program with the Namibian University of Science and Technology. Zolile has published research articles, book chapters, and patents concentrating on digital data storage utilizing biodegradable materials and bio-composites.

doi.org/10.51219/URForum.2025.Zolile-Wiseman

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The new dipyridothiazine derivatives- synthesis, properties analysis and anticancer activity

Abstract: In recent years, the scientific world has seen a high level of interest in the search for new phenothiazine derivatives with diverse biological activities. Diazaphenothiazines are modified phenothiazine systems that exhibit a broad spectrum of actions, which include anticancer activity, reversal of multidrug resistance, antibacterial, antiviral or antioxidant activity [1,2]. The aim of the research was to design and obtain a new group of modified dipyridothiazines with a dimeric structure. For this purpose, isomeric 1,6-, 1,8-, 2,7- and 3,6-diazafenothiazines were synthesized and then combined with selected linkers that increased the anticancer potential [3,4]. As a result of the syntheses, 16 new derivatives with dimeric structure were obtained. The structure of the new derivatives was characterized spectroscopically using ^{1}H and ^{13}C NMR, 2D NMR and HR MS techniques. Preliminary in silico tests were conducted to identify molecular targets for all compounds. For all compounds, the lipophilicity parameter was determined, both in a mathematical model and experimentally using a reversed-phase thin-layer chromatography technique (RP TLC). The in vitro cytotoxicity (MTT assay) of the compounds was tested using the following cell lines: breast cancer, colorectal cancer, glioma, lung cancer, and normal skin and muscle cells. Reference drugs doxorubicin and cisplatin were used as controls. The results confirmed the anticancer potential of the new compounds. The new dimers represent promising anticancer heterocyclic derivatives and further studies of their mechanism of action are planned.

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Keywords: phenothiazines, dipyridothiazines, derivatives, anticancer potential

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Biography: I am a final-year PhD student in the Silesian Medical University in Katowice. I graduated with a degree in chemistry. In my research, I focus on the synthesis of new dipyridothiazine derivatives. I analyze the newly obtained compounds for their structural, pharmacokinetic and biological properties. Phenothiazine and its derivatives exhibit significant anticancer activity. Therefore my interest in acquiring new substances that may be promising drugs in the fight against cancer. In addition to pursuing my research, I share my passion of chemistry with students during the classes I teach for them.

Carlyn Danese*, Shirui Li, Annabeth Loftman, Puja Chakraborty, Katrina Holbrook, Lia Gish, YunTong Liu, Fannie Fouron, Qingyin Yang, Qianyue Chen, Maria Gomez

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Empirical Potential Influence on Proton Transfer and Trapping in Scandium-Doped Barium Zirconate with Oxygen Vacancies

Abstract: Scandium-doped barium zirconate ($BaZrO_3$) is a promising material for hydrogen fuel cells due to its high proton conductivity, warranting further investigation into the influence of oxygen vacancies on the proton conduction landscape. This study employs empirical interatomic potentials to identify geometric and energetic factors governing local proton mobility and long-range diffusion through analysis of intraoctahedral transfers, transition energy barriers, and site energetics. Sites within 2–4 Å of an oxygen vacancy were prone to proton trapping, driven by increased octahedral tilting and the formation of multidirectional bonding environments. Transition state analyses revealed distinct energy profiles across single-, bi-, and unidirectional proton interactions, with unidirectional pairs exhibiting inverted barriers that hinder net conduction. A systematic comparison demonstrated that, relative to Buckingham potential, the Morse (Gale, Islam) potentials introduce larger energy fluctuations and more pronounced interaction cutoff dependence, especially for O-H interactions. Rotational and translational barriers diverge in their cutoff preferences, suggesting trade-offs in empirical parameter selection. Centrality and Kinetic Monte Carlo simulations further confirm that steeper Morse parameters suppress diffusive motion. These findings underscore the importance of potential tuning and local structural descriptors in capturing the complex conduction behavior of proton-conducting perovskites.

Keywords: proton conduction, fuel cells, perovskites, computational

Biography: As an undergraduate chemistry student at Mount Holyoke College, Carlyn Danese studies polymer thin film crosslinking under Dr. Wei Chen and perovskite proton conduction under Dr. Maria Gomez. Carlyn is also serving as a DAAD RISE Fellow in Germany this summer, investigating surface modifications of porous carbon materials at the Helmholtz Institute for Polymers in Energy Applications.

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Developing a Novel Neck-Wearable Piezoelectric Sensor for Early Carotid Artery Profile Screening in Habitual Snorers: A Pilot Study

Abstract: Carotid intima-media thickness (CIMT) and atherosclerosis, exacerbated by risk factors such as habitual snoring, are key indicators of cardiovascular disease. This study presents a novel wearable neck piezoelectric sensor (NPS) for non-invasive detection of snoring vibrations and carotid pulsations. We previously and successfully developed a curved NPS alongside a deep learning algorithm to differentiate severe sleep apnea from habitual snoring in a pilot study. The device was tested on 40 habitual snorers, measuring neck snoring vibration energy (SVE) over the common carotid artery during sleep. Multivariate linear regression models revealed that normalized SVE-10Hz ($\beta = -0.12$, 95% CI: -0.23 to -0.01), male gender ($\beta = -0.18$, 95% CI: -0.33 to -0.03), and neck circumference ($\beta = 0.04$, 95% CI: 0.02 to 0.06) were independently associated with ultrasound-determined CIMT (adjusted $R^2 = 0.34$). Furthermore, a robust multivariate categorical regression model for predicting atherosclerosis levels incorporated the 3% oxygen desaturation index ($\beta = 0.03$, $SE = 0.07$), diastolic blood pressure ($\beta = 0.36$, $SE = 0.19$), and normalized SVE-28Hz ($\beta = 0.03$, $SE = 0.08$) (adjusted $R^2 = 0.51$). These results highlight the NPS's potential as a materials-driven solution for early and convenient screening of unfavorable carotid artery profiles in high-risk individuals. Further research is necessary to validate these promising results in larger cohorts.

Keywords: neck piezoelectric sensor, atherosclerosis, carotid intima-media thickness, sleep apnea, snoring, ultrasound

Biography: Dr. Li-Ang Lee, MD, MSc, PhD, is a Professor in the Department of Otorhinolaryngology–Head and Neck Surgery at Linkou Chang Gung Memorial Hospital and Chang Gung University in Taoyuan, Taiwan. He also serves as Vice Director of the School of Medicine at National Tsing Hua University in Hsinchu, Taiwan. His areas of expertise include Otorhinolaryngology, Head and Neck Surgery, Sleep Medicine, and Medical Education.

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A bioinspired switchable adhesive patch with adhesion and suction mechanisms for laparoscopic surgeries

Abstract: Medical adhesives play an important role in clinical medicine because of their flexibility and convenient operation. However, they are still limited to laparoscopic surgeries, which have demonstrated urgent demand for liver retraction with minimal damage to the human body. Here, inspired by the suction cup structure of octopus, an adhesive patch with excellent mechanical properties, robust and switchable adhesiveness, and biocompatibility is proposed. The adhesive patch is combined by the attachment body mainly made of poly(acrylic acid) grafted with N-hydroxysuccinimide ester, crosslinked biodegradable gelatin methacrylate and biodegradable biopolymer gelatin to mimic the adhesive sucker rim, and the temperature-sensitive telescopic layer of microgelcrosslinked poly(N-isopropylacrylamide-co-2-hydroxyethyl methacrylate) to shrink and form internal cavity with reduced pressure. Through mechanical tests, adhesion evaluation, and biocompatibility analysis, the bioinspired adhesive patch has demonstrated its capacity not only in adhesion to tissues but also in potential treatment for medical applications, especially laparoscopic technology. The bioinspired adhesive patch can break through the limitations of traditional retraction methods, and become an ideal candidate for liver retraction in laparoscopic surgery and related clinical medicine.

Keywords: Hydrogel Suction cup Adhesive patch Biocompatibility Liver retraction

Biography: Doctor of Ningbo University, resident physician of hepatobiliary surgery department of Li Huili, Ningbo Medical Center, mainly studies the clinical application of medical biopolymer materials and basic research of tumors.

doi.org/10.51219/URForum.2025.Xiang-Wu

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Triboelectric Nanogenerators based on biodegradable Sodium Alginate/ZnO-Co3O4 polymer nanocomposites

Abstract: The design and development of the flexible wearable triboelectric nanogenerator has attracted a lot of interest in the application of self-powered multifunctional electronic devices. The present work aims to develop polymer composite films for designing self-powering nanogenerator. In this work, Sodium Alginate (SA)-based nanofiller composite films are proposed as a highly triboelectric material for improving the performance of TENGs in mechanical energy harvesting applications. ZnO-Co3O4, with a high surface area greatly improved the electroactive β-phase formation.

The XRD study reveals that the crystallinity structure of the composite has improved, leading to increased triboelectricity. It also demonstrates that the composite's dielectric constant has improved, indicating that the developed material's storage capabilities have improved. The as-prepared SA/ZnO-Co3O4 based TENGs showed an excellent output performance. The increased output performance is due to the increase of the β-phase fraction, polymer dipole moment alignment, filler alignment dispersion, filler dispersion, and the interfacial interaction between the polymer chains and the ZnO/Co3O4 particles. This research effectively used ZnO/Co3O4 nanoparticles to improve the efficiency of TENG's energy harvesting, providing the way to a new class of tribomaterials. The nanocomposite additionally possesses a high dielectric constant, which makes it suitable for energy storage applications.

Keywords: Triboelectric nanogenerator; Zinc oxide, Cobalt oxide, Nanocomposite

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Biography: Dr. Jolly Bhadra is a material scientist by profession. Currently, she is serving as a Senior Module Development and Publication Specialist in Young Scientist Center, Qatar University. Along with the routine duties, she is also mentoring several STEM workshops. During her research career, she had wide experience in the synthesis of varieties of materials, such as polymers, conducting polymers, hydrogels, metal ions and nanoparticles.

She has also gained exposure in a large number of characterization methods for morphological, electrical, mechanical, thermal and rheological studies. Additionally, she has had hands on experience on the fabrication of electronic devices, including Field Effect Transistor (FET), thermo-electric generator, super-capacitor and chemical gas Sensors. During her research career, she has published more than 55 journal papers and several conference papers and book chapters including both scientific and STEM. She has been part of 6 UREP, 3 QNRF-NPRP projects and 4 Qatar University research grants as LPI/PI.

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Development of amine/carboxylic terminal functionalities thermo-responsive pluronic coated biodegradable polymer-based micro drug carrier for regeneration of osteoarthritis in vitro

Abstract: Osteoarthritis (OA) is a common degenerative disease that primarily affects joint cartilage. It impacts over 303 million people globally, making it a significant cause of disability. Treatment options are limited due to the difficult-to-reach damage, poor blood circulation to the joints, and the limited regenerative ability of cartilage. For OA treatment, we have developed a biodegradable, thermoresponsive injectable hydrogel made from poly(ε-caprolactone) (PCL) and poly(ε-caprolactone)/polylactide (PCL/PLA) microcarriers coated with Pluronic (P-123) for the localized delivery of methotrexate (MTX), a widely used immunosuppressive drug for OA. P123 is a triblock copolymer featuring a hydrophobic PO chain weighing 4000 Da and a hydrophilic EO chain with a 30% weight ratio. It shows thermal gelation at body temperature and has a Hydrophilic-Lipophilic Balance (HLB) between 8 and 14. We will fabricate size-controlled MTX-loaded thermally responsive microcarriers using an energy-efficient emulsification method with an oil-in-water emulsion. These biodegradable microcarriers aim to provide controlled drug release, acting as lubricants and alleviating pain in OA-affected joints. Moreover, the microparticles will serve as a temporary scaffold to promote cell attachment and growth, thereby aiding in cartilage regeneration. Further modifications to the Pluronic will introduce amine or carboxylic end terminals (EDP-123 and ADP-123, respectively), potentially improving the mechanical stability and thermal responsiveness of the microcarrier-hydrogel system. Thus, we hypothesize that adjusting the amount and ratio of ADP-123/EDP-123 copolymers used to coat the PCL microcarriers will enhance the injectability, gelation properties, and mechanical stability of the system.

doi.org/10.51219/URForum.2025.Adhmoorthy-Prasannan

Keywords: Osteoarthritis, PCL microcarrier, Injectable thermal gelling method, tissue regeneration.

Biography: Dr. Adhimoorthy Prasannan serves as an Assistant Professor in the Department of Materials Science and Engineering at NTUST, Taipei. He holds a Ph.D. in Materials Science and Engineering from NTUST and an M.Sc. in Polymer Science from the University of Madras, India. Dr. Prasannan specializes in polymer science, with a strong focus on fabricating polymer-based membranes, composites, and hydrides utilizing nanomaterials for diverse applications. With a prolific academic record of approximately 70 published research articles, his work has made significant contributions to advancements in membrane fabrication, polymeric micro- and nanomaterials, environmental science, and biomedical applications.

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Self-Powered Acceleration Sensor for DistancePrediction via Triboelectrification

Abstract: Accurately predicting the distance an object will travel to its destination is very important in various sports. Acceleration sensors as a means of real-time monitoring are gaining increasing attention in sports. Due to the low energy output and power density of Triboelectric Nanogenerators (TENGs), recent effortshave focused on developing variousacceleration sensors. However, thesesensors suffer from significant drawbacks, including large size, high complexity, high power input requirements, and high cost. Here, we described a portable and cost-effective real-time refreshable strategy design comprising a series of individually addressable and controllable units based on TENGs embedded in a flexible substrate. This results in a highly sensitive, low-cost, and self-powered acceleration sensor. Putting, which accounts for nearly half of all strokes played, is obviously an important component of the golf game. The developed acceleration sensorhas an accuracy controlled within 5%. The initialvelocity and acceleration of the forward movement of a rolling golf ball after it is hit by a putter can be displayed, and the stoppingdistance is quicklycalculated and predicted in about 7 s. This research demonstrates the application of the portable TENG-based acceleration sensor while paving the way for designing portable, cost-effective, scalable, and harmless ubiquitous self-powered acceleration sensors.

Keywords: triboelectric nanogenerator; self powered; acceleration sensor; distance prediction

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Investigations the photostability of Y-series electronacceptors from small molecules to polymers for OPV

Abstract: In recent years, organic photovoltaics (OPVs) have seen a huge increase in the value of their power-conversion efficiencies (PCEs) as high as 18-19% to now approaching 20% on small-cell level. This is essentially due to the development and the incorporation in bulk heterojunctions (BHJs) of non-fullerene acceptors (NFAs). Among NAFs, Y-series have attracted the most attention as acceptors. They are characterized by a curved-shaped molecular configuration with fused-ring based A-DA’D-Astructure. Despite the state-of-the-art PCEs achieved, an approach is needed to better understand the relationship between molecular structure and Y-NFA photostability. This understanding is crucial for envisioning innovative photovoltaic applications. The present study focuses on the intrinsic photostability of Y derivative acceptors (Y5, Y6, Y7 and Y12 as small moleculesand PY-IT polymer)in neat layersand blends with a fluorinated donor polymer (PM6). The evolution of the absorption spectra over time was monitored under constant irradiation using an Atlas Sun Test XXL HD chamber. A preliminary study by light soaking in presence of oxygen and water has demonstrated the degradation of the Y derivative acceptors and donor polymers in the solid state. Additionally, to assess molecular conformation and chemical structurechanges induced by air exposurein both neat materials and blends, variousspectroscopic techniques (FTIR, Raman) are performed on both fresh and degraded films.

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Morphological and structuralanalyses of both neat materials and blends are conducted using AFM and GIWAXS. To prevent any interaction with oxygen and water during illumination, encapsulation has been performed. Compared to their total degradation in ambient atmosphere, all encapsulated neat and blended layers exhibit high photostability.

Keywords: non-fullerene acceptors, organic semiconductor, photovoltaic, efficiency, stability.

Biography: Christine Videlot-Ackermann obtainedher PhD in 1999 from University of Orsay (Paris, France) and jointed for one year the University of Groningen in The Netherlands as a postdoctoral position. In 2000, she joined the CNRS at Marseille, France, where she presently holds the position of researcher in the Nanoscience Center (CINaM). She has published more than 120 papers in reputed journals.

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Divyanshi Mangla

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Novel Glutaraldehyde crosslinked Chitosan/GMA/Nickel oxide nanoparticles for Tetracycline, Ofloxacin and Lead removal

Abstract: Emerging micro-pollutants and the resistant bacteria in the water samples related to antibiotic pollution has raised concerns in the scientific community. To tackle this, either the problem should be targeted at the source, or the solution should be top-notch. Thus, we developed biopolymer-based composite using chitosan, glycidyl methacrylate, and nickel oxide to remediate two antibiotics, Tetracycline and Ofloxacin and one heavy metal ion, Lead from their aqueous solution. Batch method was used to optimise the synthesized composite against different parameters which affects the rate of adsorption. The results indicated upto 100% removal of tetracycline and 95% removal of ofloxacin under normal conditions. The material was well-characterized using various spectroscopic techniques like FTIR, SEM-EDX, TEM, XRD, and TGA-DTA. The adsorption isotherm study indicated that the process follows multilayer adsorption governed by Freundlich isotherm model and reaction kinetics followed pseudo-second order rate. Thermodynamic study also revealed the process to be spontaneous, endothermic and favourable at all temperatures. The maximum adsorption capacity was achieved as 394.2, 277.5 and 113.8 mg/g for tetracycline, ofloxacin and lead ions, respectively. This composite showcased outstanding performance while being regenerated upto 6 adsorption-desorption cycles. The novelty and efficacy of this composite makes it a potential candidate as a solution to this existing problem.

Keywords: Chitosan, nickel oxide, nanocomposite, antibiotic, adsorption

Biography: Dr. Divyanshi Mangla is a visionary and versatile professional with a strong foundation in chemistry and an extensive academic and research background. She holds a Ph.D. in Chemistry from Jamia Millia Islamia, New Delhi, with her doctoral thesis focused on developing bio-polymer-based systems for antibiotic removal from wastewater. Dr. Mangla is also a NET-JRF (CSIR-UGC) qualified scholar, reflecting her academic rigor. Her research interests lie in biopolymers, nanocomposites, bio-adsorbents, wastewater remediation, and antibiotic adsorption, underscoring her commitment to addressing critical environmental challenges. With more than 510 citations and an impressive h-index of 7, Dr. Mangla has established herself as a notable researcher in her field.

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Remarkable SO_2 and H_2S Resistant Ability on CO Oxidation by Unique Pd/WO_3 3D Hollow Sphere Nanocatalyst: Correlating Structure−Activity Relationships on SO_2 Exposure

Abstract: We report a simple inorganic route for synthesizing a Pd/WO_3 3D hollow sphere nanocatalyst, where Pd nanoparticles are encapsulated and well distributed on porous tungsten oxide nanospheres. The synthesized nanocatalyst exhibited 100% CO to CO_2 conversion efficiency at 260 °C. In addition, the nanocatalyst demonstrated remarkable SO_2 (3 ppm) tolerance during the CO oxidation reaction for prolonged SO_2 sulfation of 1−21 h at 260− 400 °C. This represents the longest SO_2 exposure time reported to date based on a single metal Pd/support-based nanocatalyst. No decrement in CO conversion efficiency was observed even after SO_2 (3 ppm) treatment for 21 h for the first time based on a single metal Pd-based nanocatalyst.

Moreover, the synthesized nanocatalyst shows H_2S (4 ppm), even in situ H_2S tolerance during the CO oxidation reaction at 260 °C for 1−3 h and exhibited less sensitivity to prolonged and stringent sulfur exposure, with the highest H_2S concentration and maximum 100% CO to CO_2 conversion efficiency obtained after H_2S treatment for the first time based on a Pd-based nanocatalyst to the best of our knowledge. The composition and structure of the R-Pd/WO_3 nanocatalyst were not much influenced, even after the prolonged SO_2 and H_2S exposure during the CO oxidation reaction, as verified from spent catalyst analysis. Finally, our DFT-based model provides insights into understanding the observed sulfur resistance on Pd/WO_3 by analyzing the underlying electronic structure. Therefore, our strategic synthesis methodology will open up many opportunities to select Pd/metal oxide-based nanomaterials for designing highly efficient, stable, and SO_2/H_2S-resistant nanocomposite catalyst.

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Keywords: palladium (Pd), tungsten oxide (WO_3), nanocatalyst, CO oxidation, SO_2 and H_2S resistant ability, DFT calculation.

Biography: In 2017, I've joined as a project assistant in CSIR-National Chemical Laboratory, Pune, India. After three years I've registered for the PhD program (Chemical Sciences) in Academy of Science and Innovative Research (AcSIR), India, under the guidance of Dr. Shatabdi Porel Mukherjee, Physical and Material Chemistry Division, CSIR- National Chemical Laboratory, Pune. I've successfully defended my PhD thesis titled "Synthesis of Oxide-based Nanomaterials: Catalysis, Electrocatlysis and Adsorption Applications" and rececived my PhD award on 23th November, 2024. During my research journey I've published five first author paper and one granted patent (In) and three complete filing patents (In and WO).

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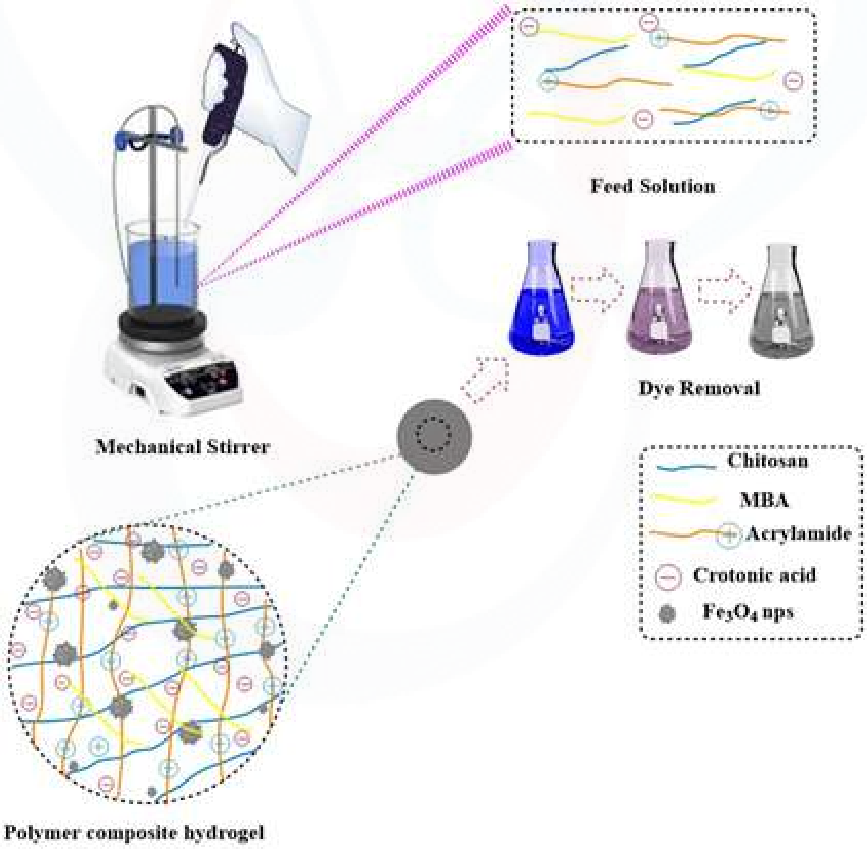
A Chitosan-Derived Magneto-Responsive Hydrogel Matrix for Efficient Capture of Charged Organic Pollutants: Pseudo-Second-Order Kinetics and Langmuir Isotherm Compatibility



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Abstract: Industrial and natural wastewater streams often contain a complex mixture of persistent organic pollutants, particularly synthetic dyes, which pose serious environmental and health concerns. The development of efficient, multifunctional adsorbents is thus imperative for effective wastewater treatment. In this study, magnetite-incorporated chitosan/poly(acrylamide-co-crotonic acid) (CS/AM-CA) composite hydrogels were synthesized via a one-pot free radical polymerization technique. The adsorptive performance of the synthesized composites was evaluated using Methyl Orange (MO) and Malachite Green (MG) as model anionic and cationic dyes, respectively. Spectroscopic analyses, coupled with batch adsorption experiments, revealed that electrostatic interactions, hydrogen bonding, and π–π stacking are the principal mechanisms governing dye adsorption. The influence of critical operational parameters—such as pH, initial dye concentration, adsorbent dosage, and contact time—was systematically studied to optimize adsorption efficiency. Kinetic modeling indicated that the adsorption followed a pseudo-second-order model, suggesting chemisorption as the rate-limiting step. Equilibrium data showed strong agreement with the Langmuir isotherm model, confirming monolayer adsorption behavior. Under optimized conditions, the composite hydrogel achieved dye removal efficiencies exceeding 95% for both MG and MO. Furthermore, the adsorbent demonstrated excellent reusability, retaining high performance over five successive adsorption–desorption cycles without significant loss of efficiency or structural integrity. These findings establish the magnetite CS/AM-CA composite hydrogel as a robust, reusable, and highly effective adsorbent for the simultaneous removal of oppositely charged dyes from aqueous systems. The composite's high removal capacity, regeneration potential, and broad applicability suggest its strong potential for use in large-scale, sustainable wastewater remediation technologies.

Keywords: Chitosan hydrogel, Fe_3O_4 nanoparticles, Adsorption kinetics, Isotherm models, Dye removal.

Biography: Isha Patel is a doctoral researcher specializing in polymer-based nanocomposite hydrogels for environmental remediation. Her research focuses on the synthesis of chitosan-derived composite materials for the adsorptive removal of organic contaminants from wastewater. She specializes in kinetic and isothermal modeling, as well as mechanistic elucidation of dye–adsorbent interactions. Her work integrates polymer chemistry, nanotechnology, and environmental engineering, aiming to develop sustainable, multifunctional materials for wastewater remediation. She has presented her findings at national and international scientific forums.

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Sai P. Katke [1] · Jayashree N. Kudalkar [1] · Ekta P. Asiwal [1] · Suresh D. Pawar [1]

Department of Chemistry, University of Mumbai, Mumbai 400098, India

Cuboidal Zn-MOF Enabled Solar Photocatalysis for Efficient Cr(VI) Reduction and Rhodamine B Degradation

Abstract: In this study, a novel cuboidal Zn-based metal-organic framework (Zn-MOF) was synthesized using a dual-ligand strategy involving succinic acid and terephthalic acid as carboxylate bi-linkers. The incorporation of these two linkers enhanced the structural stability and photocatalytic efficiency of the Zn-MOF. The resulting material exhibited outstanding performance under natural sunlight for the simultaneous reduction of toxic hexavalent chromium (Cr(VI)) and oxidative degradation of the organic dye Rhodamine B (RhB). The dual-functional Zn-MOF achieved an 86.70% reduction of Cr(VI) to the less toxic Cr(III) within just 60 minutes of solar irradiation. In parallel, the oxidative degradation of Rhodamine B reached an efficiency of 93.50% in 80 minutes. This superior activity is attributed to the efficient generation of reactive oxygen species (ROS) facilitated by the Zn-MOF framework under sunlight, driving both reduction and degradation processes. The study demonstrates how the synergistic effect of dual linkers contributes to enhanced light harvesting, structural integrity, and active site availability, making this Zn-MOF a potent photocatalyst for environmental remediation. This solar-driven, sustainable approach offers a green and efficient solution for the detoxification of water contaminants, underlining the significant role of advanced MOFs in promoting eco-friendly chemistry for water purification.

Keywords: Zn-MOF · Bi-Linker · Cr (VI) reduction · Rhodamine B · Sunlight

Biography: Sai P. Katke is a dedicated professional researcher in the field of Chemistry, currently pursuing a Ph.D. from the University of Mumbai under the guidance of Prof. Dr. Suresh D. Pawar. His research focuses on the design, construction, and application of metal-organic frameworks (MOFs) using carboxylate-based ligands, with applications in environmental remediation and energy storage. With several international publications, he explores innovative approaches such as solar-driven catalysis using MOFs. Known for his scientific integrity and creative insight, he remains committed to developing sustainable materials that address real-world environmental and energy challenges.

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Selective Depolymerization of Lignin into High-Value Aromatic Monomers via Hydrothermal and Ionic Liquid-Assisted Approaches

Abstract: Lignin, the underutilized structural component of lignocellulosic biomass, represents a promising renewable feedstock for aromatic chemical production. This study demonstrates an efficient depolymerization strategy employing synergistic hydrothermal liquefaction and 1-butyl-3-methylimidazolium methyl sulfate ([Bmim][$MeSO_4$]) catalysis to convert diverse lignin feedstocks, including agricultural residues (sugarcane peel, corn stover) and commercial alkaline lignin, into high-value aromatic compounds. Systematic optimization of reaction parameters (80–180°C, pH, solvent systems) revealed temperature-dependent product distributions, with maximum vanillin yields achieved at 120°C under mild acidic conditions. Ethanol co-solvent significantly enhanced ketone formation while improving product stability, whereas the ionic liquid catalyst expanded product diversity at the expense of generating reactive intermediates requiring careful process control. Advanced analytical characterization (GC-MS) coupled with kinetic modeling (activation energies: 16.9–62.2 kJ/mol) provided mechanistic insights into the depolymerization pathways. The developed process demonstrates remarkable tunability, enabling selective production of target aromatics (vanillin, 2-methoxy-4-vinylphenol, 2,3-dihydrobenzofuran) while minimizing char formation, a critical advancement for industrial implementation. These findings establish a robust technical foundation for sustainable lignin valorization, offering a viable pathway to transform abundant biomass residues into renewable alternatives for flavor, fragrance, and biofuel applications. The work presents significant progress toward economically viable biorefinery operations by addressing key challenges in selectivity, energy efficiency, and scalability of lignin conversion technologies.

Keywords: Lignin valorization, Hydrothermal depolymerization, Ionic liquid catalysis, Renewable aromatics, Kinetic modeling

Biography: Dr. Shuguang Deng is a Professor of Chemical Engineering at Arizona State University. He earned his Ph.D. from the University of Cincinnati and specializes in nanomaterials, adsorption, carbon capture, and biomass conversion for sustainable energy and environmental applications. Recognized among the world's top 2% of scientists (Stanford University database), he has published over 370 peer-reviewed articles with more than 25,600 citations (H-index: 86) and holds multiple patents.

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Darón I. Freedberg OVRR, CBER, FDA

Silver Spring, Maryland, USA

Unveiling solution glycan conformations

Abstract:

Despite the vast diversity of glycans, we face common, and often interconnected, challenges in their solution NMR structural studies:
1) discrimination of distinct conformations amongst a conformation-rich landscape,
2) limited structural data and
3) spectral overlap, especially observed for homopolymers.

We've addressed these issues by improving spectral analysis, sensitivity and resolution, though not simultaneously. To address the first challenge, we've developed new methods to determine solution conformations and extract thermodynamic and kinetic data for these conformational equilibria in glycans in the fast exchange limit. We will show how using labile ^{1}H signals help alleviate two of these challenges and thus increase the repertoire of structural data. To address the second and third challenge, we've added OH detection as a way to increase spectral dispersion. Once detected, we can also detect hydrogen bonds through heteronuclear J-coupling. Ultimately, these help to discriminate unique, potentially biologically active conformations and refine structural models and improve vaccines and therapeutics. Finally I will present our latest results in structure determination demonstrating the combined power of the methods we developed and our latest results that use the above methods in our efforts to enable and enhance the structural studies of larger homo- and hetero-oligosaccharides.

Keywords: glycan conformation, hydrogen-bonding, hidden conformation, NMR

Biography: My group has been working to characterize the three-dimensional structure and dynamics of polysaccharides in solution. Our prime tool is NMR spectroscopy because it allows us to obtain structural details at atomic resolution. We have characterized larger and larger oligosaccharides by developing new methodologies that overcome technical limitations. These will help us enhance our understanding of polysaccharide structure-function relationships

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Terry J. Hendricks[1]

[1]Retired - Former Director – Thermal Control Systems & Technical Program Director Space Systems Development, Blue Origin LLC, Kent, WA
Retired - Former Technical Group Supervisor, Power Systems Group, NASA – Jet Propulsion Laboratory, Pasadena, CA

Review of Latest Advances in Thermoelectric Generation Materials, Devices, and Technologies

Abstract: The last decade created tremendous advances in new and unique thermoelectric generation materials, devices, fabrication techniques, and technologies via various global research and development. This presentation will elucidate and highlight some of these advances to lay foundations for future research work and advances. New advanced methods and demonstrations in TE device and material measurement, materials fabrication and composition advances, and device design and fabrication will be discussed. This presentation will also discuss additional new research into materials fabrication and composition advances, including multi-dimensional additive manufacturing and advanced silicon germanium technologies. Further advancements in properties and module developments of relatively established champion materials such as skutterudites will be presented, and several high performance ($ZT \geq 2$) new material systems such as GeTe, $Mg_3(Sb,Bi)_2$ have also been relatively recently unearthed and module applications will be discussed. This presentation will discuss the most recent results and findings in thermoelectric system economics, including highlighting and quantifying the interrelationships between thermoelectric (TE) material costs, TE manufacturing costs and most importantly, often times dominating, the heat exchanger costs in overall TE system costs. We now have a comprehensive methodology for quantifying the competing TE system cost-performance effects and impacts. Recent findings show that heat exchanger costs usually dominate overall TE system cost-performance tradeoffs, and it is extremely difficult to escape this condition in TE system design. Novel or improved enhancement principles in TE device and material performance eminating from this cost-performance work will be presented, such as more stringent requirements from electrical and contact resistance effects and commonalities with solar cell design.

doi.org/10.51219/URForum.2025.Terry-Hendricks

Biography: Dr. Hendricks has recently re-retired from Blue Origin LLC (2024), where he served as the Director - Thermal Control Systems and Technical Program Director in the Advanced Development Program and Space Systems Development business unit. He briefly retired from NASA–Jet Propulsion Laboratory (JPL) / California Institute of Technology in 2021. He has over 40 years of professional expertise in thermal & fluid systems, nano-scale and micro-scale heat transfer, energy recovery, energy conversion and storage systems, terrestrial & spacecraft power systems, micro electro-mechanical systems, and project management. While at JPL, he was responsible for designing spacecraft thermal and propulsion systems, solar power systems, radioisotope power systems, thermal management and thermal energy storage systems critical to NASA missions. Prior to JPL, he was the Energy Recovery Program Director at Battelle Memorial Institute and Senior Program Manager at U.S. Department of Energy (DOE) Pacific Northwest National Laboratory, where he guided and managed U.S. DOE and Army projects in hybrid power system development, automotive & industrial waste energy recovery, military energy recovery, and advanced nano-scale heat transfer.

He received his Ph.D. and Master of Science in Engineering from the University of Texas @ Austin and Bachelor of Science (Summa Cum Laude) in Physics from the University of Massachusetts @ Lowell. His extensive expertise is embodied in 3 book chapters published by Taylor and Francis and Elsevier; and over 100 reports, conference papers, and journal articles in the Journals of Electronic Materials; Energy; Materials Research; Heat Transfer; Thermophysics and Heat Transfer; and International Heat & Mass Transfer. Among his numerous ASME, IEEE, and NASA recognition awards, he was inducted into the University of Texas at Austin Mechanical Engineering Academy of Distinguished Alumni in 2019.

Dr. Hendricks holds 9 patents and is a Registered Professional Engineer in California and Texas.

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Osman Adiguzel

Firat University, Department of Physics, Elazig, Turkey

Chemical Factors and Crystallographic Transformations Governing Reversibility in Shape Memory Alloys

Metals and many alloy systems have different phases at different conditions and these phases are described in phase diagrams. Shape memory alloys exhibit a peculiar property called shape memory effect in β-phase region with chemical composition. These alloys are very sensitive to external conditions, and crystal structures turn into other structures by lowering temperature and stressing material, by means of crystallographic transformation, thermal and stress induced martensitic transformations. Lattice vibrations (phonons), atomic bonds and interatomic interactions play an important role in the processing of transformation. Shape memory effect is initiated on cooling and deformation, and performed thermally on heating and cooling, with which shape of the material cycles between original and deformed shapes in reversible way. Therefore, this behavior can be called Thermoelasticity. This phenomenon is characterized by the recoverability of two certain shapes of material at different temperatures.

Thermal induced martensitic transformation occurs on cooling with cooperative movements of atoms in <110 > -type directions on the {110} - type planes of austenite matrix, along with lattice twinning and ordered parent phase structures turn into the twinned martensite structures. The twinned structures turn into the detwinned structures by means of stress induced martensitic transformation with deformation in the martensitic condition. These alloys exhibit another property called superelasticity, which is performed by stressing and releasing material in elasticity limit at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing. Superelasticity is also result of stress induced martensitic transformation and ordered parent phase structures turn into detwinned martensite structure with stressing. These alloys exhibit another property called superelasticity, which is performed by stressing and releasing material in elasticity limit at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing.

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Superelasticity is also result of stress induced martensitic transformation and ordered parent phase structures turn into detwinned martensite structure with stressing. Lattice twinning and detwinning reactions play important role in martensitic transformations and they are driven by internal and external forces, by means of inhomogeneous lattice invariant shears. Copper- based alloys exhibit this property in metastable β-phase region. Lattice twinning is not uniform in these alloys and gives rise to the formation of complex layered structures. The layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice.

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

Keywords: Shape memory effect, martensitic transformation, thermoelasticity, superelasticity, twinning, detwinning

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

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Ensuring quality and consistency in cellular therapeutics: analytical insights from residual protein assessment

Abstract: The reliability and safety of cell-based therapies hinge on rigorous quality control measures, particularly in identifying and mitigating residual impurities that may impact therapeutic performance. Residual proteins originating from culture systems, enzymatic treatments, and purification processes pose significant risks, potentially triggering immunogenic responses, altering cellular functionality, or compromising batch-to-batch consistency. As regenerative medicine advances, ensuring a standardized and analytically robust approach to impurity detection is crucial for regulatory compliance and clinical success. This presentation takes a broad analytical perspective on quality assessment in cell-based therapy manufacturing, highlighting key methodologies for impurity detection with a focus on electrophoretic and chromatographic techniques. By drawing from our recent study on sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE)-based residual trypsin and trypsin inhibitor analyses in bone marrow-derived mesenchymal stem/stromal cell (BM-MSC) products,

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the speech examines the practical applications, advantages, and limitations of these approaches within the broader quality control (QC) framework. Beyond method selection, the critical role of residual protein analysis in assessing stem cell functionality, immunogenicity, and long-term therapeutic viability is explored. Conclusively, by integrating targeted analytical strategies into standard workflows, manufacturers can improve process reproducibility, enhance product safety, and meet evolving regulatory expectations for cell-based therapies. This talk provides a research-driven and practical outlook on the evolving landscape of quality assurance (QA) in regenerative and restorative medicine applications, emphasizing the need for comprehensive analytical frameworks to support the widespread clinical adoption of cellular therapeutics.

Keywords: cellular therapeutics, chromatography, electrophoresis, mesenchymal stem/stromal cells (MSCs), residual protein, sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE).

Biography: Born in Ankara in 1978, Dr. Pelin Kılıç received her pharmacy and pharmacology master's degrees from Gazi University and her doctorate in forensic toxicology from Ankara University. She researched gene technology at INSERM, France, and shaped Türkiye's advanced therapy regulations as a Turkish Medicines and Medical Devices Agency (TİTCK) government officer (2004–2016). An academic since 2017, she specializes in stem cell and regenerative medicine. As also the founder of HücreCELL® Biotechnology, Inc., she mentors young scientists. Her R&D covers iPSC-based models for diabetes/associated cardiovascular complications, extracellular vesicle-defined biosensors for cancer screening, and upstream/downstream process engineering of cellular therapeutics.

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W.Quapp

Mathematical Institut, University Leipzig

Potential Energy Surfaces, NewtonTrajectories and Optimal Oriented External Electric Fields

Abstract: The talk begins with a discussion of Newton trajectories (NT). An NT is a curve where the gradient of the PES points in the same direction at every point. NTs connect stationary points of the PES, so they can be used to find saddle points. Application: NTs describethe curves of the change of stationary points under a mechanochemical or electric force. A special application is the study of the smallest amplitude electric field that renders a barrierles chemical process with the smallest possible strength. For this we search for an optimal bond breaking point. An example PES is explained.

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Theoret.Chem.Acc. 142 (2023) 22; J.Chem.Phys. 159 (2023) 114112;
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Evaluating the thermal behavior of materials and determining the kinetics of thermal phenomena for industrial applications

Abstract: In the industry, there is a constant demand for advancements in material technology to develop new products. Thermal stability is a critical factor for the development and application of materials. Among the most crucial aspects are the thermal properties, as temperature plays a key role in various unit operations for transformation purposes. Thermoanalytical techniques, such as thermogravimetry (TG) and differential scanning calorimetry (DSC), are particularly important for evaluating thermally reactive or sensitive materials. Thermodynamic properties such as the specific heat capacity (Cp), glass transition (Tg), solid-liquid and solid-solid transitions, melting range, crystallization, heat-induced polymorphic conversion, thermal stability, and enthalpy variation (DH) were determined. Consequently, research on identification, characterization, pre-formulation, compatibility, and quality control is enriched with insights into the thermal behavior of materials.

By analyzing the enthalpy and mass variations during a controlled heating program, it is possible to establish a conversion factor (a) for the material and calculate the kinetic parameters, activation energy (Ea), effective collisions, and mechanisms based on the Arrhenius equation. This information is vital in determining the stability, manufacturing, and usage parameters of industry. Thermally stable materials maintain their chemical structures, physical properties, and performance throughout their storage, transportation, and use. For instance, stability is essential for preserving the efficacy and safety of drug products and preventing degradation or unwanted chemical reactions that could compromise patient safety. In industrial applications, beyond ensuring safe manipulation through temperature and heating time, calorimetry aids in safely determining the shelf life of products and provides essential insights across various sectors, including health and food. The thermal stability of health materials directly impacts their performance, reliability, and ability to meet regulatory standards in the healthcare industry.

doi.org/10.51219/URForum.2025.Maria-Betânia-de-Freitas-Marques

Keywords: calorimetry, thermal analysis, critical material attributes, critical process parameters

Biography: Undergraduate Pharmacy at the Universidade Federal de Alfenas (Unifal-MG). Master of Science in Pharmaceutical Sciences from Unifal-MG. PhD in Pharmaceutical Sciences, Universidade Federal de Minas Gerais (UFMG). She holds the 1st and 4th Post-doctorate in Chemistry from UFMG, the 2nd Post-doctorate in Pharmaceutical Sciences from UFMG and the 3rd Post-doctorate in Pharmaceutical Sciences from the Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM). Research on the evaluation of thermal behavior and thermostability of materials and determination of kinetics in phenomena and phase transitions induced by heat.

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Global Summit on
Materials Science and Engineering

July 21-22, 2025 | Paris, France

Serzhik Hakob Sargsyan[a],*, Artur Serzhik Sargsyan[b], Karina Martiros Khizantsyan[a,**], Tatev Serzhik Sargsyan[b], Ida Garnik Agajanyan[a], Karine Sergey Margaryan[b]

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Nanocomposites of metallic silver in a matrix of 1-vinyl-1,2,4-triazole and N-vinylcaprolactam copolymer

Abstract: A current trend in materials science is the creation of new materials used in technology and science. The production of new functional copolymer nanocomposites with metal nanoparticles, in particular silver, based on non-toxic hydrophilic polymers can expand the range of polymeric substances used in the medical industry. Polymers and copolymers of 1-vinyl-1,2,4-triazole (VT) can be used as a polymer matrix, since they have film-forming ability, solubility, biocompatibility and non-toxicity(LD_{50}>3000 $mg\cdot kg^{-1}$). The areas of possible practical use of the types of thermosensitive polymers under consideration are constantly expanding. They are used as flocculants in synthetic latexes and components of extraction systems. Polymers isolated from solution as a separate phase can be used in the creation of nanomaterials. As a polymer matrix for stabilizing silver nanoparticles, we used a copolymer of VT with N-vinylcaprolactam (VC), obtained by electrochemical synthesis. Experiments have shown that electrolysis of aqueous or aqueous-ethanol solutions of VT and VC or their mixtures in various ratios in the presence of $AgNO_3$ and chitosan leads to the formation of nanocomposites and nanocomposite coatings with a silver content of 1–9 wt. % only in the presence of a peroxide-type initiator 4-tred-butylperoxy-4-oxobutanoic acid (TBOBA), the electroreduction potential of which is close to the potentials of cathodic deposition of metals - 0.6–1.2 V (s.ch.e.). Thus, we have established the ability of the VT-VC copolymer to the effectively stabilize metallic silver nanoparticles. The effect of the polymer matrix on the size of nanoparticles during their stabilization with different silver contents is the shown. Water-soluble nanocomposites are promising for the production of effective medical products with a wide range of antimicrobial activity. Silver nanocomposites were that formed from VT-VC monomer systems by a single-stage electropolymerization method. The composition and architectonics of the created nanocomposites and coatings were studied by various physicochemical methods. The synthesized metallic nanocomposites are recommended for use in medicine, in the creation of thromboresistant, antimicrobial polymeric materials, as well as in electronics and catalysis.

doi.org/10.51219/URForum.2025.Serzhik-Sargsyan

Keywords: electropolymer, nanoparticles, 1-vinyl-1.2.4-triazole, silver, electrocopolymerization, N-vinylcaprolactam.

Biography: Serzhik Hakob Sargsyan was born in 1953 in the Nagorno-Karabakh Republic. 1970-1975 studied at the Chemistry Department of the Yerevan State University. 1976-1978 worked at the A.L. Mndzhoyan Institute of Fine Organic Chemistry (Academy of Sciences of the Armenian SSR). 1978-1981 entered and completed postgraduate studies at the Frumkin Institute of Electrochemistry and defended his PhD thesis in the specialty "Electrochemistry". Since 1982, he worked at the Institute of Organic Chemistry of the Academy of Sciences of the Armenian SSR.

He studied the processes of electrochemical polymerization of nitrogen-containing heterocyclic monomers. Sargsyan developed a unique electrochemical method for the synthesis of coordination polymers. In this case, he was the first to show that azoles undergo electrochemical reduction on transition metals in absolute organic solvents in the presence of quaternary ammonium salts. Sargsyan also developed a new method for producing spatially structured polymer coatings based on the same monomers. He found out the mechanism of the deposition process. Summing up these studies, Sargsyan defended his doctoral dissertation in 1996. Currently, he is engaged in the synthesis and study of the properties of polymer nanocomposites. Since 2004, he has been working at the Department of TE and ZOS of the Armenian State Polytechnical University. In 2008, he received the academic title of professor. In 2012, he was appointed acting head of the Department of “Thermal energy and environmental protection”, and then elected head of the department. He was the executor of the project A-948 of the Institute of Scientific Research of the National Academy of Sciences of the Republic of Armenia, the scientific director of the projects A-1358, A-1841. He is a member of the specialized council 010 of the National Academy of Sciences of the Republic of Armenia, as well as a member of the specialized councils 057 and 055 of the National Polytechnical University of Armenia. He is the author of 178 scientific works, including 12 original and 14 scientific-methodical manuals, including 2 textbooks. He participated in numerous international conferences, where he made reports.

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Global Summit on Materials Science and Engineering

July 21-22, 2025 | Paris, France

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On the plasmon contribution to X-ray electron emission spectroscopy background:q-statistical analysis

Abstract: A baseline approximation is essential for a qualitative and quantitative analysis of XPS data, especially if several components interfere in one spectrum. Despite the success of the Shirley, method, it does not still solve the plasmon contribution to the background, and there is still a debate about the contribution of intrinsic and extrinsic plasmons in XPS spectra. In this paper I am presenting a new, experiment-based understanding of X-ray plasmon creation in solids shirely baseline methodology. While the photoelectron on its journey to the surface can excite extrinsic plasmons at a well-defined energy loss, it can also lose “unquantized” energy by electron-electron and electron-ion collisions, thus contributing to a featureless smooth background in the X-ray Photoelectron Spectra (XPS).

As the plasmon energy loss peak spectrum decays exponentially from the 1st loss to the higher orders, the deviation from Tsallis exponential statistics in plasmon energy loss peak decay may be interpreted by the long-range interaction through the Tsallis parameter q, and can be utilized accordingly to estimate the unquantized plasmon contribution to the background. In this paper, the q-Tsallis exponential function has been used to analyze the decay of energy loss peaks from the first order to the highest orders. In addition, the deviation factor q-Tsallis has been determined and integrated into the Shirley baseline formula. Besides a q-Tsallis-modified Shirley formula was proposed, the unquantized contribution of energy loss plasmons to the background has also been estimated.

Keywords: Shirely baseline, X-ray Plasmon, Extrinsic, Intrinsic, XPS, EELS.

Biography: Graduated from the University of Bahrain in 1999 with a BSc in Physics, and pursued his graduate studies at Kyoto University to have his MEng, and PhD in Materials Science and Engineering in 1999. Worked on X-ray Surface analysis techniques including XRR, XRD, XRF, XPS, and EELS in the total reflection condtion. Has experience in industrial research consultancy in broad themes in Japan, and currently engaged in energy materials and Beyond-Li ion battery research.

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The sustainability of beach-cast seaweed biomass for biorefinery processes: calorific power heating studies with macroalgae

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

Key words: biomass, coral reefs, energy, sampling studies, seaweed, sustainability.

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Fabrication of Reduced Graphene Oxide Films on Silicon Nanowire Arrays via Photocatalytic Reduction Method and Their Applications in Infrared Light Sensing

Abstract: Graphene has become emerged as a promising material studied by many researchers due to its high electrical conductivity, high carrier mobility, low cost, and ability to absorb visible and infrared light. Chemical vapor deposition is a widely used technique for fabricating graphene on a substrate, but it is costly and environmentally unfriendly. Preparing reduced graphene oxide (rGO) films via photocatalytic reduction method is a low-cost, simple, and environmentally friendly process. The metal-rGO-metal photodetector fabricated on a silicon nanowire (SiNW) array substrate with the anti-reflection properties, is expected to exhibit excellent performance in infrared light sensing. In this study, a SiNW array, serving a photocatalyst, was prepared by metal-assisted chemical etching and then placed in a previously prepared graphene oxide suspension. Then, the rGO film was formed on the SiNW array by reducing graphene oxide in the suspension under full-spectrum light irradiation. The optical sensing results show that for 940 nm near-infrared light sensing, the response and recovery time of the devices were less than 0.017 s, and the sensitivity increased with light intensity. The SiNW array substrate exhibits 'photogate ' effect. When electron-hole pairs are generated by illumination, electrons accumulate at the top of the SiNW, which can be regarded as a negative bias gate. The negative bias gate induces the formation of an electron channel in the rGO film near its interface with SiNW array. For 2100 nm mid-infrared light sensing, the photocurrent is only caused by the in-band transport of carriers in the rGO films and electron-hole pairs in SiNW cannot be excited to induce the 'photogate' effect."

Keywords: rGO, silcon, nanowire array, photodetector, infrared light sensing

Biography: Dr. Hsun-Feng Hsu Obtained Her Ph. D. degree in 2003 from Department of Materials Science and Engineering, University of the National Tsing Hua University, Taiwan. After that, she did his postdoctoral study in Department of Materials Science and Engineering, University of the National Tsing Hua University, Taiwan. She then moved to Department of Materials Science and Engineering, University of the National Chung-Hsin University as an assistant professor. In 2010, she was promoted to Associate Professor. Her current research focuses in the fields of semiconductor nanomaterials, 2D materials, and photodetectors.

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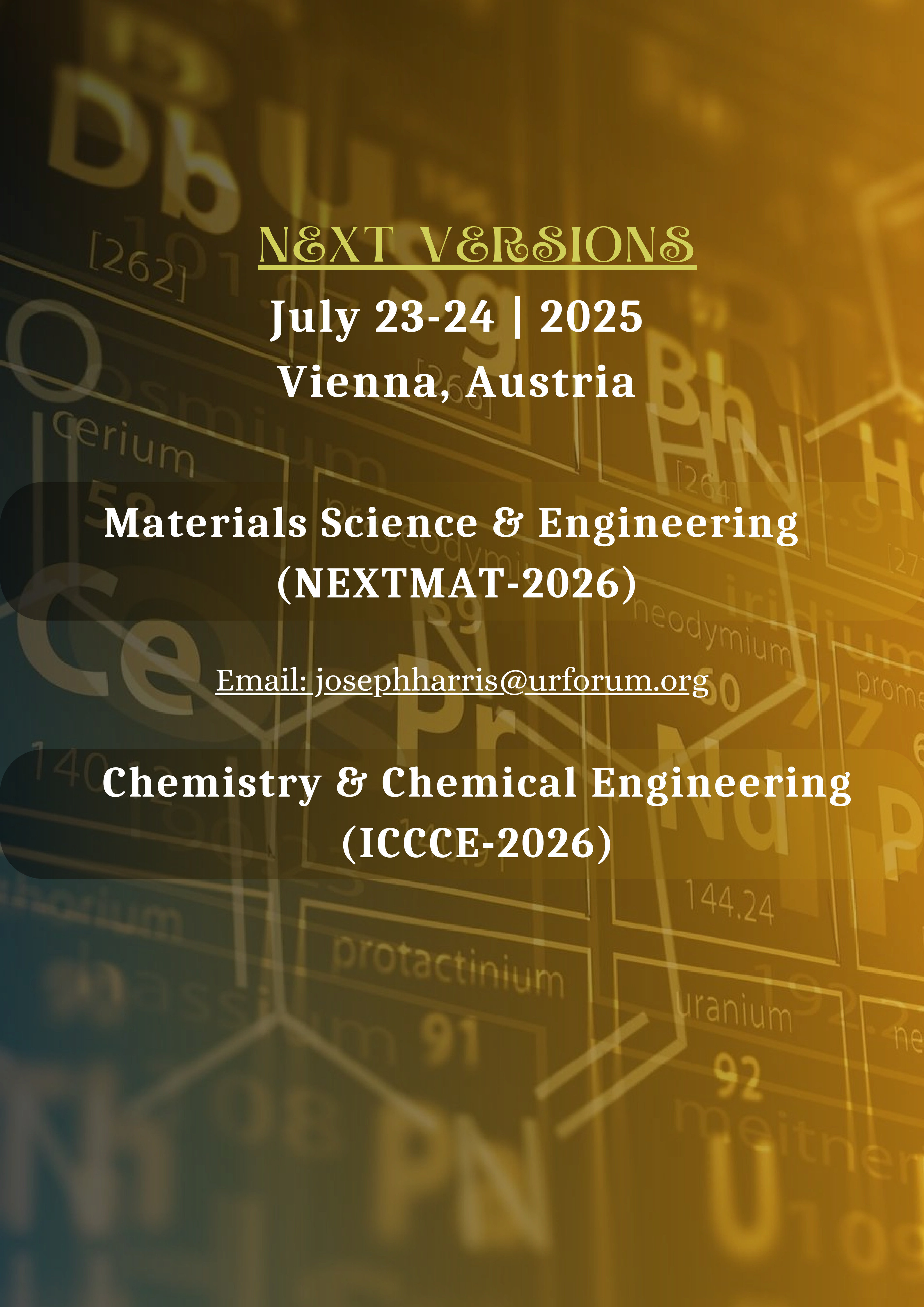

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