Global Scientific Guild Conference

Abstract Book

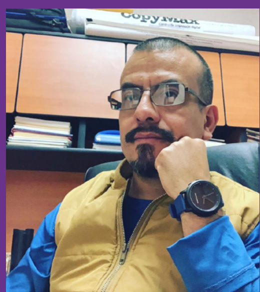
11th Global Webinar on Materials Science and Engineering

February 19-20, 2025

Conference Chairman

Prof. Dr. Per Arvid Lothman
European University of Applied Sciences
Hamburg, Germany

Conference Co Chairman



Prof. Victor R. Orante Barron
The University of Sonora, Mexico

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12th Global Webinar on Materials Science and Engineering	June 25-26, 2025

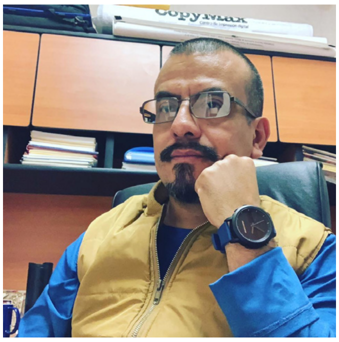
Dr. Isidoro Russo
University of Salerno, Italy

Risk assessment in case of fire in unidirectional road tunnels temporarily used for bi-directional traffic

Tunnels are very important components of a road infrastructure, facilitating the movement of people and goods. To maximize their social and economic benefits, it is vital to keep tunnels open to vehicular flows as much as possible. However, rehabilitation, maintenance, or repair activities could complicate the transit of vehicles through tunnels, sometimes leading to their temporary closure for safety reasons. In such situations, the resulting functionality loss of the transportation infrastructure could be mitigated by diverting or rearranging traffic. For example, in the presence of a twin-tube tunnel, a tube designed for unidirectional traffic could be used for bi-directional traffic while the parallel tube is closed. In this context, Computational Fluid Dynamics (CFD) and people evacuation models were set up to evaluate user safety in the event of a fire in an 850 m long naturally ventilated one-way tube temporarily used for bi-directional traffic, considering both the case of traffic volumes during peak hours (i.e., daytime) and off-peak hours (i.e., overnight). Moreover, several types of burning vehicles and different fire locations along the tube length were investigated. The CFD results demonstrated positive effects on environmental conditions, expressed in terms of temperature, visibility distance, and toxic gas concentration, along the user escape route when the unidirectional tube is used for twoway traffic at night instead of daytime. Particularly, the results provided by the quantitative risk analysis showed a reduction in the risk level of users between 80 and 100% when the one-way tube is employed for bidirectional traffic during nighttime hours rather than daytime hours. This study can serve as a reference for decision-makers to understand when to temporarily close a tube for rehabilitation, maintenance, or repair activities and use the parallel tube for bi-directional traffic.

Biography:

Isidoro Russo graduated with honors in Architecture and Building Engineering at the University of Salerno in 2018. In 2018, he was an intern at Drever International based in Belgium. In 2021, he obtained a PhD title in "Risk and Sustainability in Civil, Architectural and Environmental Systems (XXXIV cycle)" - address "Advanced technologies, infrastructure and land protection for sustainable development" - at the Department of Civil Engineering of the University of Salerno, where since 2022 he is a Junior Researcher in “Roads, railways and airports”. He collaborates by supervising the realization of bachelor’s and master’s degree theses on topics related to roads, railways and airports. Since 2018, he is a member of the Laboratory of "Roads, Railways and Airports" (link) based at the Department of Civil Engineering of the University of Salerno. Since 2023, he contributes to teaching in the course of “Fundamentals of Road Design and Construction” for the bachelor’s degree in Civil Engineering and the bachelor’s degree in Civil and Environment Engineering, as well as in the course of “Roads, railways and airports” for the master’s degree in Civil Engineering. His main areas of research include: statistical analysis of accidents, risk analysis, computational fluid dynamics, people evacuation process, concrete spalling, road pavement combustion, road tunnel resilience, traffic simulation, and electric vehicle safety. He is an Editorial Member of the journal "Digital Transportation and Safety (link)", as well as an Academic Editor of the journal "PLOS ONE (link)". He was Chief Guest Editor of the Special Issue “Risk and Resilience Analysis of Road Tunnels” of “Sustainability”, and is Chief Guest Editor of the Special Issue “Sustainable Transportation: Driving Behaviours and Road Safety” of “Sustainability” (link). He was a speaker at several national and international conferences, receiving the best paper award in the field of road tunnels' safety at "The 9th Symposium on Pavement Surface Characteristics". He is a co-author of 18 papers published in international and national journals and conference proceedings, as well as a reviewer for international journals such as “Applied Sciences”, “Infrastructures”, “Scientific Reports”, “Reliability Engineering & System Safety”, “Transportation Research Record”, “Sustainability”, and “Journal of Transportation Safety & Security”.



Prof. Victor R. Orante Barron
The University of Sonora, Mexico

New Investigations Related with Ceramic Oxides Obtained by Solution Combustion Synthesis: Exerting Influence of Addition of Intrinsic and Extrinsic Impurities on the Thermoluminescence Dosimetry Properties

The glycine molecule has a carboxylic acid group at one end and an amine group at the other end, both of which can participate in the complexation of metal ions. This "zwitterionic" character allows effective complexation with metal cations of different ionic size [1]. Novel MgO:Ln3+,Li+ (Ln: lanthanide) phosphors were obtained for the very first time by solution combustion synthesis (SCS). Results from experiments such as dose response and fading showed that annealed MgO:Ln3+,Li+ powders obtained by SCS are promising materials for radiation dosimetry applications. On the other hand, novel thermoluminescence (TL) features of La2O3 are reported in this work. The TL glow curve obtained after exposure to beta radiation of these samples, displayed two maxima located at ~ 101 °C, ~ 200 °C and a shoulder at ~ 247 °C. Results from experiments such as dose response and fading showed that annealed La2O3 powder obtained by SCS is a promising material for high-dose radiation dosimetry applications.

Biography:

Victor R. Orante-Barrón, Associate Professor since february, 2010 at Departamento de Investigación en Polímeros y Materiales, Universidad de Sonora, México. Ph.D. in Materials Science from Universidad de Sonora, México, 2009. Post-Doctoral Fellowship, in the Radiation Dosimetry Laboratory of Oklahoma State University, from 2009 to 2010. Visiting Researcher, in the Department of Physics of University of South Africa (UNISA), from September 4 to December 6, 2015. Member of the National System of Researchers of the National Council of Science and Technology, Level 1, since January, 2011. Participation with 107 presentations of scientific contributions in national and international conferences. With 25 articles published in international journals. Member of organizing committees for three international conferences. Advisor of five M.Sc. theses (all concluded), and two Ph.D. theses (both in progress).

Dr. Sunirmal Jana
CSIR-Central Glass & Ceramic Research Institute (CSIR-CGCRI), Kolkata, India

Sol-Gel based Functional Nanostructured Coatings for Strategic, Energy and Health Sectors

Beyond the classical decorative and protective properties of a functional coating (FC), it possesses additional functionalities suitable for a particular application.Presently, the FC is really undergoing a renaissance to overcome the challenges majorly arising from various sectors like strategic, energy and environment keeping its sustainability and safety issue. The most important aspect is to develop a right kind of FC for a particular application. It is to be noted that metal oxide based functional coatings, the nanocomposite (NC) based organic-inorganic nanohybrids, a class of nanomaterials are very important now-a-days. To design and development of NCs, the nanotechnology based on nanoscience and nanoengineering is playing significant role via bottom-up/top-down method, primarily exploiting solution chemistry and one of such a well-known is sol-gel processing under bottom-up approach.

In this talk, I will discuss some of our recent development of functional coatings by employing simple sol-gel processing for application in strategic, energy and health sectors..

Biography:

Dr. Sunirmal Jana born on 12th July, 1966. He did his Master of Science Degree in Chemistry in the year 1991 from Kalyani University, India and obtained his Ph.D. (Science) degree in 1998 from Jadavpur University, India. He also completed Bachelor of Education degree (B. Ed.) and "Council of Scientific and Industrial Research (CSIR) organized "Leadership Development Programme (LDP 0905)" Management Course for middle to senior level leaders" at CSIR HRDC, Gaziabad, India. In December 1997, Dr. Jana joined CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata, India as a Junior Scientist. Presently, he is working at the same Institute (CSIR-CGCRI) as Chief Scientist of CSIR under Ministry of Science & Technology, Government of India and Senior Professor of Academy of Scientific & Innovative Research (AcSIR). Dr. Jana is also performing his duties as a Course Co-ordinator and as a Professor for the course, “Structural and Functional Coatings” of AcSIR. He is also worked for 6 years as Guest Teacher for B. Tech. students in Chemical Technology, University of Calcutta, Kolkata, West Bengal, India on the subjects, “Sol-gel materials, carbon nanotubes, sonochemical synthesis etc.” from 2016 to 2021. Dr Jana is actively involved / coordinated / performed / performing as Principal Investigator (PI) / Co-PI of various National and International Research Projects. His current research activities basically are dielectric / metal oxide semiconductors (MOS) based sol-gel thin functional nanostructured films/coating, superhydrophobic cum antibacterial coatings, carbon based nanomaterials, low thermal expansion nanostructured glass-ceramics etc. for different applications. At present, he has published over 80 SCI/peer reviewed research papers (h-index: 24; i10-Index 51, Citations: ~2000) in internationally reputed different journals, 9 Book Chapters, 8 Conf. Proceeding, 85 conference papers and 5 Indian Patents. He has already guided 6 Ph.D. (Science/Engineering) students and also guiding several Ph.D. students. In addition, he has already supervised 15 M.Tech/M.Sc/B.Tech. students for the projects to fulfill their respective degrees. Under his active leadership, three major facilities (Solar Panel Coating, Drain Coating and Smelter cum Reactor) of national importance have been created indigenously at CSIR-CGCRI. He is the Fellow and Life Member of International Society for Development and Sustainability (ISDS), Japan and Indian Institute of Ceramics. Dr. Jana is an elected member of the Council of Indian Ceramic Society for the four terms (years 2015 and 2016; 2017 and 2018; 2019 and 2020; 2023 and 2024) and he is working as one of the EC members of Materials Research Society of India (MRSI), Kolkata Chapter, India. He is also the life members of CHD C Division Council, Bureau of Indian Standards, Materials Research Society of India, Indian Ceramic Society, Electron Microscopy Society of India, Indian Association for the Cultivation of Science and NCE Bengal & Jadavpur University, Kolkata, India. Dr. Jana is the life-time Fellow of International Society for Development and Sustainability (Japan) and Indian Institute of Ceramics, India. Dr Jana is one of the Senior Members of International Engineering and Technology Institute (IETI), Hong Kong. Dr. Jana availed Brain Pool Fellowship from Korean Federation of Science & Technology Societies (KOFST) and worked as a visiting scientist at Korea Research Institute of Chemical Technology (KRICT), Daejeon, South Korea for one year during 2005-2006. He also did his research work as visiting scientists in other prestigious research Institutes in abroad (Slovenia and Portugal). Presently, Dr. Jana is functioning as one of the Editor/Associate Editor/Editorial Board Member including Advances in Nanoparticles (Scientific Research Publishing), General Chemistry (USA), Kenkyu Journal of Nanotechnology and Nanoscience (Kenkyu Group, India), Journal of Advanced Nanomaterials (Isaac Publishing Co. Ltd., Hong Kong), Source Journal of Nanoscience and Nanotechnology (USA), Journal of Material Science and Nanoengineering (Neonex International Online Publishing Pvt. Ltd, India). He also delivered 26 Plenary / Keynote / invited talks in India/abroad and also chaired the technical sessions at various national/international conferences / seminars / symposia. Dr. Jana also evaluated / examined several PhD theses / conducted PhD Viva voce Examinations as an external examiner of many Indian Universities (e.g. Karunya University, Sastra University, Manonmaniam Sundaranar Univerisity, Alagappa University, Periyar University, Indian Institute of Engineering Science and Technology, Shibpur; Formerly Bengal Engineering and Science University, Shibpur, West Bengal, India, Academy of Scientific & Innovative Research (AcSIR), India). He has participated in different events as a speaker, panelist, roundtable moderator / session chairman. He is a regular reviewer of research manuscripts from American Chemical Society (ACS), Royal Society of Chemistry (RSC), Elsevier, Spingers, Taylor &

Francis, IOP, SCIRP etc. In addition to winning several poster paper awards, Dr. Jana won prestigious Distinguished Scientist Award of Venus International Research Awards (VIRA-2016) by Venus International Foundation, Chennai, India in the year 2016.

Prof. Dr. Per Arvid Lothman
European University of Applied Sciences Hamburg, Germany

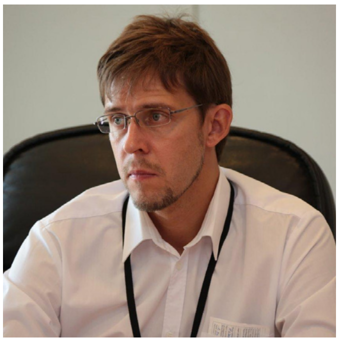
Bio Mechatronics – a novel perspective

In this contribution I would like to promote the idea of BioMechatronics and how it differs from classical Biomechatronics and the plausibility to establish it as a novel research /academical field. History shows how classical Biomechatronics has narrowed the meaning of the field and it has become a field of bionics and applied biomedical engineering, often focusing on, the indeed undoubtedly very important areas, prosthesis and exosceletons. However, several important aspoects such as the micro and nanoscale and, most of all, the living organism itself has been unnecessary excluded. A single cell constitutes a BioMechatronic system.

BioMechatronics is inclusive and make the claim to even catch the whole picture – especially based upon system thinking – than say bionanotechnology. Here we discuss background, development and future of BioMechatronics and address some recent examples such as Magnetotactic Bacteria or Microphysiological systems (Organ on Chip).

Biography:

Professor des. Dr. Per Arvid Löthman obtained his Ph.D. degree from Twente University , The Netherlands in the field of Magnetics and Self-assembly, conducted research in Canada, France and Germany on carbon nanotubes, Graphen and related 2D nanomaterials. His research is interdisciplinary and involve sensors and sensing, 2D advanced materials, BioNanotechnology including DNA, S-layers, Viruses (archaea, bacteriophages), Biomolecular Architecture, Botany and functional surfaces, Mechatronics and BioMechatronics. Dr. Löthman has published over 90 scientifical articles, several book chapters & books and serves as a reviewer and he is on the editorial board for several journals such as Nature, Nature Materials, Journal of Bioanalytical and Analytical Chemistry, Journal of Colloid and Interface Science, Thin Solid Films, Sensors and Actuators, Microsystems Technologies. Dr. Löthman is Professor des. in BioMechatronics at the European University of Applied Science Hamburg, and researchgroup leader at University of Bayreuth in the field Organ-on-a-Chip and 3D Bioprinting. Furthermore, Dr. Per Arvid Löthman is Senior lecturer in “Nanomedicine, Nanopharmacy” and “Sensors and Sensing in Engineering, Biology and Medicine” (Kaiserslautern University) and Mechatronics Systems and Design (Hamburg University), Germany and Manufacturing Engineering (HTW Berlin) Germany.



Mr. Valeriy V. Bykouski
Radiobiology Institution of National Academy of Science of Belarus, Russia

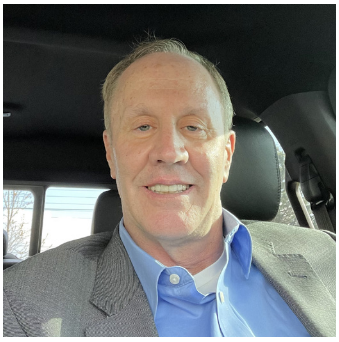
The object-oriented method and concept of deposits and treatments specialization and studying for solving of the salts and deposits complication in oilfield

Sediments deposition tendency, complex method, partial analytical prediction, chemical treatments efficiency, cross-complication, partial impact, laboratory testing and field screening, Laboratory to Field Research result conversion, oilfield circle.

The authors provide their complex method and concept of salts and sediments deposition tendency and complication partiality prediction, laboratory testing and field screening. Discussed concept since 2008 become to more complex by incorporation of cross-complication from technologically or self-activated chain reactions i.e. specific sediments like ferrous hydroxide and so on. Main idea of our concept is more clearly and kinetically backgrounded determination of number of the complications and its partial impact on total aging of equipment. The practical application of our idea, method and concept at one hand is the control of salts and deposits preventive technologies and chemical treatments efficiency, and in other ones the quantitative identification of influence of complications at each stage (step) of oilfield circle. Complexity of the method based on classical chemical concept of solubility of low soluble salts and other compounds joined with particle size and sedimentation theories and analytical practice. All of showed points of view updated and detailed by results of criticism of the basic standards methods by nowadays and deeper empirical studies of chemical composition of oilfield fluids, especially their water part and sediments and particles separated by serial filtrations up to ultrafiltration “on site” as well as “in situ” for wells and plants in onshore and offshore oilfields environments. Now it was tested with in indicated areas for research purpose, Lab to Field results transferring and as control of chemical treatments for new reagents as direct application of research results in practice. Our method provided for discussion and will be shared for collecting statistical data of application in the different areas worldwide to determine level of universality and borders of application.

Biography:

Valeriy V. Bykouski (Bykovskiy) completed Master of Science equal degree from Chemistry Department of the Chemistry and Biology Faculty Gomel State University named after F. Scorina, Belarus. He has been working as a Senior Scientist of Radiochemistry Department at Radiobiology Institution of National Academy of Science of Belarus, and as a Senior Scientist of Chemistry, Corrosion Protection, Material specialization and testing, Microbiology and associated researches Department in NOC Belarusneft, LLC LUKOIL and LLC LUKOIL-Engineering for onshore and offshore objects. He has published more than 20 papers and 5 of which in reputed journal.



Mr. Robert Oshea

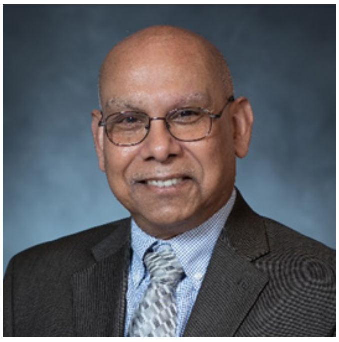
Principal Engineer and Sr. Metallurgical Engineer – AMTI, USA

Explaining Your Case Visually in Litigation

This presentation will briefly introduce some of the tools and techniques that have been used to collect, analyze and present data and findings of a technical nature involving product liability litigation. The details and theories behind the various technologies will not be presented at any great length, only their application. This will assist other people involved in the field to better understand what tools are available, when to use them and how to present them visually.

Biography:

B.S. Metallurgical and Materials Engineering, Illinois Institute of Technology and M.S Material Science and Mechanical Engineering, University of Notre Dame. Over 30 years' experience in Accident Reconstruction, Code & Standard Compliance Issues, Material Failure Analysis & Metallurgical Testing, Fire Cause and Origin (Commercial and, Residential), Utility Investigations (Gas, Electric and Steam), Gas Turbines and Underwater Structural Inspection Management. Mr. O'Shea founded Applied Materials Technologies, Inc. in 2001. His project management experience includes inspections on hundreds of QA/QC inspections and forensic investigations. He has authored numerous presentations related to failure analysis and engineering investigations and is active in many Technical Societies. Like Dr. Johnson, Mr. O'Shea believes proactive actions prior to incidents are critical in avoiding potential catastrophic events.



Dr. Ajay Misra
University of Akron, Akron, OH, USA

Challenges and Opportunities for Advanced Materials in Sustainable Aviation

Aviation currently accounts for approximately 2.5% of global greenhouse gas emissions. With the anticipated growth in aviation worldwide, this contribution is expected to increase significantly. To mitigate the environmental impact of this growth, a suite of technological advancements will be essential. Key technologies include improving aircraft efficiency, developing electric aircraft, and transitioning to hydrogen-powered aircraft, all of which rely heavily on advanced materials. Enhancing the efficiency of current-generation aircraft will require innovations in high-temperature gas turbine engine materials and lightweight airframe materials. Electric aircraft concepts depend on high-power-density motors, advanced power electronics, lightweight and efficient thermal management systems, high-voltage power transmission, and high energy density energy storage systems—all of which demand breakthroughs in material science. For hydrogen-powered aircraft, one of the primary challenges is reducing the weight and volume of cryogenic hydrogen storage tanks. Advanced materials will play a pivotal role in overcoming this challenge. This presentation will provide an overview of current material development efforts aimed at enabling sustainable aviation and highlight the future material advancements needed to achieve these goals.

Biography:

Dr. Ajay Misra is an adjunct faculty member in the Department of Mechanical Engineering at the University of Akron, bringing a wealth of experience from an illustrious career at NASA. He retired as the Deputy Director of Research and Engineering at NASA's John H. Glenn Research Center in Cleveland, where he led advancements in propulsion, power, materials and structures for extreme environments, communications, and physical sciences. Dr. Misra has played a pivotal role in developing technologies for electrified aircraft, providing strong leadership in advancing battery technologies critical for electric aviation. Over his NASA career, he held several key positions, including Chief of the Materials and Structures Division, Acting Director of the Fundamental Aeronautics Program, and Program Executive for the Radioisotope Power Systems Program. He earned his Ph.D. in Materials Science and Engineering from the University of California, Berkeley, and has an impressive scholarly record with over 60 publications and four book chapters. Among his many honors, Dr. Misra was awarded the Presidential Rank Award for Meritorious Executives.

Prof. Tomasz Krystofiak
Poznan University of Life Sciences, Poland

Some aspects of gluing of modified wood with the use of waterborne adhesives

Wood modification has been of interest to scientists for many years. By using it, the properties of lignocellulosic materials can be significantly improved.

This issue has been addressed in several COST Actions (FP0904, FP1006, FP1303, FP1407) and the results have been presented at many international conferences.

Thanks to the modification of wood, it is possible to improve the aesthetic and decorative features of the surface by making the color more attractive and the gloss degree.

This issue is undertaken by m.in scientists from the Laboratory of Gluing and Finishing of Surface PULS (Poland), who conduct research, scientific, research and teaching activities with scientists from many scientific and research centers.

This paper presents the results of research on the impact of wood modification in the aspect of its gluing processes.

The results of adhesion, strength of the obtained glue lines, and directions of further research on the assessment of surface properties will be presented.

In conclusion, it was stated that modified wood is an interesting material for applications in wooden building construction and interior design..

Biography:

Dr. Tomasz Krystofiak in 1994 was finished study of Faculty of Wood Technology at Agriculture Academy in Poznan. In 2002 he prepared a PhD dissertation and in 2019 habilitation. Author or co-author of more than 300 scientific publications in the scope of gluing and finishing of wood and wood based composites. To his research activities belongs surface phenomena, wettability, adhesion and adherence, modification, gluability and paintability of lignocellulosic materials. He was a Management Committee Member of COST Actions FP1006 and CA15216 and Working Group Member (FP1303 and FP1407). Since 2021 Guest Editor in 6 Special Issues in Coatings, Forests, Materials journals.

Dr. Severine A. E. Boyer
French National Centre for Scientific Research , CNRS, France

Hybrid-polymers Solidification: how to revisit model experiment

Theory of polymer crystallization is based on exploring thermo-chemo-physical concepts. In the present work, it is proposed to revisit some of them. First, the kinetic theory of Hoffman & Lauritzen explains the formation of chain-folded crystals in semi-crystalline polymers. The theory is extended to the statement of pressure dependences. Second, when promoting lignocellulosic fibers as sustainable materials, columnar-shaped solidification of the matrix of the composites can be induced. We will see how the number of seeds activated at the fiber/matrix interface can lead to a double rate of kinetics.

Biography:

Séverine A.E. Boyer is a CNRS Researcher (France). She has completed her PhD from Clermont-Ferrand University (France) and was associate-researcher from Tokyo Metroplitan University (Japan), and Mines Paris and Mines Douai (France). Topics: Functional Meta-Structures activities to conduct combinations of chemo-physics / morphologies / poly-morpho-genesis / interfaces in hybrids materials (ceramics and polymers composites) to meet the challenges of energies of tomorrow, i.e. to develop new materials, new model-experiments and new numerical models based on the understanding phenomena. International recognitions: 'William F. Giauque Student Award, CALCON 2003 (USA)'; 'ICTAC Young Scientific Award, ICTAC 2012 (Japan)' (1st time awarded to a French researcher); 'First Place Best Poster, PPS 2019 (South Africa)'; and Awards deserved to her collaborative colleagues.

Dr. Khashyar Ghandi
University of Guelph, Canada

Using particle accelerators to investigate corrosion in nuclear materials

To study corrosion in nuclear materials typically used in nuclear reactors, we need to study both the surface and under the surface of the materials. The latter requires access to particle accelerators that can generate a high-intensity muon beam. Negative muons behave like heavy electrons and positive muons as light protons. The negative muon-based spectroscopy will use X-rays from the interaction of muons and the material, and the positive muon spectroscopic techniques are spin spectroscopy techniques that can be used to study reactive intermediates and magnetic properties of the material. In this presentation, I will describe how each of them can be used to study the corrosion of nuclear material and how these nuclear probes can be combined with other spectroscopic techniques to study the solid-state material used in nuclear reactors. The examples will be Copper on Carbon steel and different types of steel material, including one that is coated with a polymer.

Biography:

Dr. Ghandi received his PhD in experimental chemical physics with a focus on radiation chemistry from Simon Fraser University in 2002. He did his postdoctoral research at the University of British Columbia and TRIUMF National Laboratory on materials science. He has also been invited visiting scientist at Rutherford Appleton Laboratory in the UK before joining Mount Allison University in 2005. Dr. Ghandi received his early tenure in 2009, and he was a member of the Chemistry and Biochemistry department as well as a member of the physics department of Mount Allison University until July 2018. In July 2018, he joined the Department of Chemistry at the University of Guelph as an associate professor. Dr Ghandi has published more than 120 refereed papers, book chapters and patents that span a broad range of interests in material science, nuclear energy, physical chemistry, analytical chemistry, green chemistry, nanotechnology, and radiation physics and chemistry. The results of this research have implications for the development of new antimicrobial material, sensors, and energy technologies, increasing the lifetime of nuclear reactors as well as material to reduce radiation therapy side effects. He has also been one of the founding members of the Atlantic Green Centre and was the president of the International Society of Muon Spectroscopy. He was the VP of America (North, Central and South America) of the International Society for Muon Spectroscopy before that. He is the National Representative of the Physical and Biophysical Chemistry Division of IUPAC, the Co-Chair of the Environment Waste Management and Decommissioning Division of the Canadian Nuclear Society and the president of the Physical, Theoretical and Computational Chemistry Division of the Chemical Institute of Canada. In 2009, he received the NBIF Breakthru (first prize) for opening inventive frontiers in the fields of polymeric materials, nanotechnology, and green chemistry. In 2010 he received the KEK Visiting Scientist Fellowship award for distinguished contributions to applications of muon science in studies of green technologies. In the same year, he received the Paul Paré Excellence Award for outstanding research without compromising excellence in teaching and service. He received this award again in 2013. In 2008 he received the leadership Mount Allison award for his contributions in training undergraduate research students at Mount Allison University (from both chemistry and physics programs). In the same year, he received the Marjorie Young Bell Award for his research on green chemistry. In 2017/2018 he received the Jean d'Alembert chair from the University of Paris/ Saclay in France. In 2024, he received the best paper award from the journal, nanomaterials. Ghandi was selected as one of the members of the five-year plan steering committee for TRIUMF national lab (selected by the director of TRIUMF) (2012-2015). He was the chair-elect of the TRIUMF national lab user group which is an elected position, by international users of TRIUMF and the chair of the user group selection committee for a new director of TRIUMF. He has been the Chair of many sessions and invited, and keynote speaker at many conferences on material science, nuclear chemistry, radiation chemistry, green chemistry, polymer science and muon science. He has been on the International advising board of the central laser facility in the UK. He has been on the review panels of different international particle accelerator proposal evaluation committees over the last few years. He was invited by CIC as a delegate of the Canadian Chemical Society, Environmentally Friendly and Sustainable Chemistry to China (2008). He has organized international conferences, and symposia and serves often as a grant and paper reviewer and he is on the editorial board of several international journals.

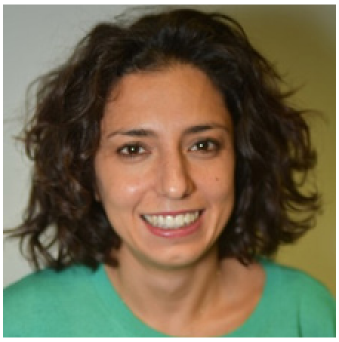
Dr. Neel Kamal Gupta
Technische Universität Bergakademie Freiberg (TUBAF), Germany

Enhancing Mechanical and Metallurgical Properties of Wire Arc Additive Manufactured Components Through In-Situ Processing

Additive manufacturing (AM) is an emerging technique where components grow layer-by-layer from a computer-aided design (CAD) file. As per ASTM/ISO 52900: 2021 standards, AM is broadly categorised into seven processes, one of which is directed energy deposition (DED). DED is the process in which a focused thermal energy source is used to melt the metallic material in wire or powder form. Wire arc additive manufacturing is one type of DED process that uses an electric arc to melt the material in wire form. WAAM is the most commonly used process due to its high deposition rate, cost-effectiveness, and ease of material handling. However, a major challenge associated with WAAM is the development of residual stresses due to the high thermal gradients and cyclic heating and cooling that occur during the deposition process. These residual stresses can adversely affect the structural integrity and dimensional stability of components. To address this issue, various in-situ processes, such as pre-heating and hammering, are implemented. Studies indicate that pre-heating effectively diminishes thermal stresses, and an induction-based pre-heating system is more effective. Additionally, pre-heating alone is insufficient, and further in-situ processing, such as applying compressive loading, is necessary to alleviate locked-in residual stresses and enhance mechanical and metallurgical properties. Various peening techniques, including shot peening, hydraulic pressing, laser peening, and pneumatic hammering, have been extensively investigated by researchers In this work, the effect of an induction-preheating system and pneumatic hammering has been studied for ER70S-6 material. The results showed a nearly 50% reduction in residual stress with pre-heating and an almost 100% reduction with hammering. The metallurgical results showed a significant improvement in grain size and its orientation. Based on these results, it can be concluded that pre-heating and hammering is an effective approach in WAAM to mitigate residual stress and enhance the quality and durability of WAAM-manufactured components.

Biography:

Dr. Neel Kamal Gupta is a dedicated researcher with a PhD from the prestigious Indian Institute of Technology Bombay (IIT Bombay), Mumbai, India, specializing in metal additive manufacturing. A young and dynamic expert in his field, Dr. Gupta holds two patents, with five more under review, and has published over 10 papers in renowned journals and conference proceedings, with several book chapters and publications under review. In addition to his research contributions, he serves as a reviewer for leading journals in his domain. Dr Gupta previously worked as a research scientist at IIT Bombay, where he worked on the development of a multi-material additive manufacturing setup with PhD students. Currently, he continues his work as a research scientist at TU Bergakademie Freiberg in Germany, driven by his passion for advancing metal additive manufacturing technologies.



Dr. Alessandra Pallela

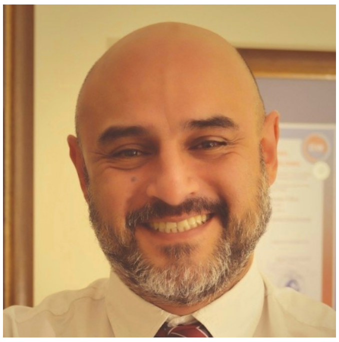
Cnr, Istituto Di Tecnologie Avanzate Per L'energia "Nicola Giordano", Italy

Unlocking the green chemistry potential of multilayer nano-minerals: A comprehensive evaluation of HNT's acid-base properties through theoretical and experimental studies

This paper presents a multidisciplinary approach in which computational chemistry has been combined with experimental data in order to shed light on the acidification mechanism and reaction pathway of acid-modified halloysite, a non-toxic and environmental-friendly mineral widely distributed in nature. Catalysts are synthesized starting from a commercial halloysite and treating it with different concentrations (0-5-10-15-20-30%) of hydrochloric acid. The chemical-physical characterization of the materials is performed through nitrogen physisorption, XRD, XRF and TGA-DSC measurements. Pronation mechanism is assessed by computational analysis and experimentally proved by characterization of the acidic properties using both spectrophotometric measurements and ZPC determination. Moreover, catalytic hydro-isomerization of o-xylene has been used as model reaction to determine the acidity functionalities of the materials and correlating them with the reactivity in a model acid-catalysed reaction. In agreement with DFT studies, the acid activation effectively enhances the acidity of halloysites nanotubes, even at low HCl concentration, with a sharp increase of acid sites up to a maximum value of 78.6 µmol/g for the HNT_10 sample. Then, the higher concentration of acid sites on the surface, the higher activity in o-xylene isomerization reaction, reaching a maximum value for the HNT_10 sample, thus reflecting its superior acidic character. On this account, the activation carried out with medium-low concentrations of hydrochloric acid (max. 10%) proved to be particularly efficient, allowing the best balance between acidity and chemical stability, thus making the acid-treated halloysite nanotubes a promising eco-friendly catalytic material for different applications.

Biography:

Alessandra Palella is a Researcher of the National Research Council, Institute for Advanced Energy Technology (CNR-ITAE). The research activity mainly focuses on the development and study of materials and processes for the clean energy generation, developing three main research themes: materials for energetic appilactions; catalytic/photocatalytic processes for the production of bio-/e-fuels and H2; materials and integrated systems for environmental protection/safeguard. She is scientific supervisor of several activity lines in National and International Research Programs. She is author of 31 scientific papers and 100 products (proceedings, reports, book chapters, etc.). She is winner of the IAAM Scientific Medal (2023).



Mr. Alberto Bejarano
National University of Colombia, Colombia

State of the Art in Additive Manufacturing of Stainless Steels

This conference presents a state-of-the-art review of additive manufacturing (AM) applied to stainless steels, emphasizing advanced techniques such as laser powder bed fusion and electron beam melting. AM of stainless steels has shown growth rates exceeding 20% annually, driven by increasing demand in industries requiring high-performance, corrosion-resistant materials. Challenges in controlling microstructure and optimizing process parameters—critical for achieving targeted mechanical properties—are examined, with current research demonstrating that parameter tuning can reduce defects by up to 35%. Recent advancements in alloy design, particularly for high-chromium and duplex stainless steels, have expanded AM's application scope, with tensile strengths reaching up to 800 MPa in select alloys. Quality control, notably through in-situ monitoring and non-destructive testing, has enhanced defect detection by nearly 40%, improving overall component reliability. This analysis provides an updated perspective on trends and technological developments in AM, underscoring the potential of stainless steels for critical applications in sectors such as aerospace, medical devices, and energy.

Biography:

José Alberto Bejarano Ulloa is a Mechanical Engineer specialized in welding and materials engineering, with a Master's degree from Pontificia Universidad Católica del Perú. He is a certified International Welding Engineer, Certified Welding Inspector, and International Metal Additive Manufacturing Coordinator, with extensive experience in industrial consulting, inspection, and academia across Latin America. His work spans collaborations with key industry players and contributions to international conferences in countries including Colombia, Peru, the Netherlands, and India. His research focuses on the intersection of additive manufacturing and stainless steel applications, emphasizing quality control and advanced alloy design for critical sectors.

Dr. Viktor P. Balema
Clemson University, Clemson, SC and ChemImpakt, Milwaukee, WI, USA

Mechanochemistry As Advanced Materials Preparation Technique

The presentation explores the mechanochemical approach to solid-state chemical synthesis, enabling the solvent-free preparation of a diverse array of molecular, ionic, and hybrid inorganic-organic materials. It includes a brief review of state-of-the-art advancements in Mechanochemistry and highlights the application of solid-state NMR for monitoring mechanochemical transformations, illustrated through the authors' experimental results. The mechanochemical synthesis of novel hybrid and complex materials is discussed, including complex metal hydrides, 3D heterostructures, high-entropy transition metal dichalcogenides, and rare-earth-based metal-organic frameworks (MOFs). The talk also addresses the applications of Mechanochemistry in Circular Economy, showcasing recent breakthroughs such as the mechanochemical recycling of magnets, battery materials and the room-temperature depolymerization of polystyrene.

Biography:

Dr. Viktor Balema is an expert in novel electronic and energy materials, as well as non-conventional materials preparation techniques. He earned his BS/MS degrees from L'viv State University, Ukraine, and PhD from the A. Nesmeyanov Institute of the Academy of Sciences in Moscow. Subsequently, he conducted research at the universities of Karlsruhe and Leipzig, Germany as Visiting Scientist, then joined Ames Laboratory of the US Department of Energy. Over two decades, Dr. Balema directed the Hard Materials Segment and Materials Science R&D at Sigma-Aldrich Co. and held Senior Scientist and CTO positions at Ames Laboratory and in the chemical industry. Currently, he is an Adjunct Professor at Clemson University, SC, USA. Dr. Balema has authored over 100 papers and patents, delivered numerous invited talks, and served as a reviewer for the US DOE, NSF, US CRDF, ACS PRF, and numerous peer-reviewed journals. His research has also been featured in popular scientific magazines, including New Scientist and Scientific American.

Prof. Ashish Thakur
Mekelle University, Ethiopia

Sensor solution for thermal runaway detection and mitigation

This research study presents reception of electric vehicles (EVs) mainly focus on security and effectiveness. As electric vehicles are emerging since years, electrical vehicle safety including thermal runaway detection is in the focus of regulatory activities. Thermal runaway in electric vehicle batteries posses a significant risk and the major standard and regulations governing safety are ISO26262 and GTR20. Triggers for thermal runaway are a complex topic, as well as the thermal runaway sequence itself. The exact behavior of thermal runaway depends upon various influences like cell chemistry, system topology and the failure origin. Additionally, the cell voltage drops to zero and charge carriers move unctrolled from one side to others followed by an accelerated local heat generation. As known there is no 100% universal thermal runaway sequences, that is why this is remain challenging for the application of the detection system to fit model for all relevant possibilities. Shocks and thermal damage may also lead to thermal runaway event and there is a learning task how to design, implement compliant challenges of building high voltages automotive applications and sensor solutions to mitigate thermal runaway risks and ensure safe battery performance. Couple of sensors can be used to mitigate are mainly cell voltage sensing, cell temperature sensing, pressures sensor without low power monitoring mode and venting gas sensors with low power monitoring mode. Sensor data acquisition, wireless data transmission and analytical processing, cable assembly with embedded battery monitoring, and fault analysis are decision analysis tools. Fire assurance is another significant part of EV BMS plan, as lithium particle batteries, generally utilized in EVs, are vulnerable to warm out of control occasions that can prompt blasts. Electric vehicle battery packs operate with cell temperature ranging from -200C to 600C, while thermal events can spike locally to over 1500C within seconds. The core challenge lies in achieving comprehensive thermal monitoring of densely packed cells without compromising the battery’s energy density to the pack assembly. The challenge of monitoring and protecting modern electrical vehicles systems requires integrating thermal, electrical, and chemical sensor data across multiple timescales from microsecond cell measurements to pack-level thermal management. A battery electrical vehicle (BEV) is one of the central goals with decrbonization trend and is generally equipped with a suitable thermal management to keep the battery cells in their required thermal range in operation, so a simple over- heating is typically not the origin of a thermal runaway event in the field. Battery cell impurities (e.g. particles) that pears the separator and lead to micro short-circuit. The transition from internal combustion engines (ICE) to battery electric vehicles is one of the central goals within decarbonization trend. There may be cooling systems with proper selective thermal management, centralized controller for pack switching and voltage balancing, dynamic control systems with reduced order models, BMS with distributed feedback control systems with algorithmic optimization and multiple function monitoring are further studies to check longevity. The recommendation is that electric vehicle has to detect the start of a first single cell thermal runaway event and provide a gentle warning to the driver and vehicle occupants.

Biography:

Ashish Thakur is Professor of Solid Mechanics and Design, Mechanical Engineering at Mekelle University. His work engages with materials science in the Ethiopia, Thailand and India and cut across metallurgical, mechanical and industrial engineering regime. He is involved in various researches and consultancy activities and published couple of research articles on mechanical, materials and industrial engineering domain on his credit. He has won multiple awards for his research and teaching work across the borders of African states. He is a citizen of the India Nation. He received his Ph.D in metallurgical-mechanical from IIT Bombay in Year 2007.

Prof. Baiyan Li
Nankai Univeristy, China

Functional Organic Materials for the Efficient Capture of Low-Concentration Iodine at High Temperatures

Capturing radioactive iodine (I2) vapor from nuclear waste under industrial conditions is challenging, due to its high temperatures (≥150 oC) and low I2 concentrations (150 ppmv), which are not conducive for I2 adsorption. The current industrial technology for I2 capture relys on silver-based adsorbents, which often exhibit low I2 uptake capacity due to limited number of adsorption sites. Although various organic frameworks and polymers have been developed for high-efficient I2 capture, most of these materials were evaluated at relatively low temperatures (<80 °C) and high I2 concentrations (>10,000 ppmv), which are not applicable for industrial conditions. Herein, we develop a series of functional organic materials to efficiently capture low-concentration I2 at high temperatures. (I) A novel guanidinium-based covalent organic framework (COF), exhibits an I2 uptake of 30 wt % at 150 °C and150 ppmv I2, which is significantly higher than that of the industrial silver-based adsorbents such as Ag@MOR (17 wt %). (II) Two 2D COFs were modified with synergistic adsorption sites at adjacent spatial positions to construct "3D" I2 nanotraps, which deliver ultrahigh I2 uptake capacities of 37 wt% and 34.8 wt%, respectively. (III) A nitrogen-rich porous organic cage (POC) was quaternized to form ionic POC, which exhibits a record-high I2 uptake capacity of 48.35 wt% among all reported porous materials under industrial operating conditions. These functional organic materials provide good platforms for effectively capturing radioactive iodine from nuclear waste under practical conditions.

Biography:

Prof. Li is an expert in the field of crystalline framework materials. He completed his PhD from Jilin University, China. Then he has worked as a postdoctoral researcher in the University of South Florida, Rutgers University, USA and King Abdullah University of Science and Technology, KSA. Since 2019 he has been working as a Professor in the School of Materials Science and Engineering, Nankai University (NKU) in China. His research focuses on the design, synthesis, and functionalization of novel porous materials (such as MOFs, COFs, etc.). He has published more than 60 papers in academic journals, including Nat. Commun., J. Am. Chem. Soc., Angew. Chem. Int. Ed., which have been cited more than 7000 times. Many articles were selected as ESI highly cited papers.

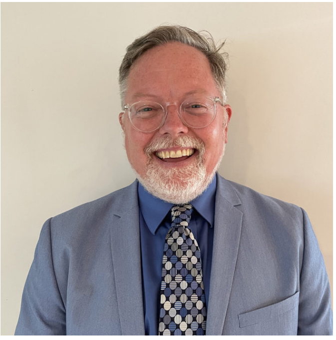
Dr. Jingjie Wei
Missouri University of Science and Technology, USA

Enhanced Performance of Low-Carbon Concrete with Adapted Rheology for Infrastructure Construction

This study aims to enhance fiber-reinforced low-carbon concrete (FR-LCC) by optimizing the system of shrinkage-reducing admixture (SRA) and macro-synthetic fiber (MSF) for low shrinkage and uncompromised mechanical properties. A factorial design approach was employed to model the effect of fiber content, SRA dosage, and combined ratios of two types of MSF on performance of FR-LCC. MSF content had the greatest impact on mechanical properties, followed by SRA and MSF combination. Using MSF increased equivalent flexural strength ratio by 310% compared to the control mixture, regardless of MSF combination and SRA. SRA had the most significant effect on drying shrinkage, followed by MSF content and MSF combination. The combination of SRA and MSF factors reduced 7- and 56-d drying shrinkage by up to 60% and 35% compared to the control mixture without compromising mechanical properties. The developed models accurately predicted engineering properties of FR-LCC with relative errors of less than 15%. The high-desirability mixtures with 0.5% fiber content, 1:0-0.75:0.25 fiber combination, and 1.25%-2.5% SRA were verified and recommended.

Biography:

Dr. Jingjie Wei completed his undergraduate studies in Civil Engineering at Nanchang University, followed by a master's degree at Shenzhen University. Subsequently, he earned his Ph.D. from Missouri University of Science and Technology in the United States, specializing in the development and design of environmentally friendly, high-performance cement-based composite materials. Currently, Dr. Wei holds a Post-Doctoral Fellowship at the Center for Infrastructure Engineering Studies (CIES) and the CLAYCO Advanced Construction and Materials Laboratory (ACML) at Missouri University of Science and Technology. In addition to his research role, he imparts knowledge to undergraduate students through Material Mechanics courses, focusing particularly on the experimental aspects. His primary responsibilities include spearheading the development and design of environmentally sustainable, high-performance cement-based composite materials. Dr. Wei boasts over 30 publication records, contributing to esteemed journals such as Cement and Concrete Composites, Journal of Cleaner Production, and Construction Building Materials. His expertise extends to delivering professional academic reports on fiber-reinforced high-performance concrete, and actively participated in formulating technical specifications for high flowable concrete. Moreover, He authored the book "High-Damping Cement-Based Composite Materials: Design, Performance, and Mechanism" in the capacity of an editor. Dr. Wei currently serves as editorial board member of two journals including “Urban Planning and Construction” and “Journal of Civil, Construction and Environmental Engineering” and is working as a review editor of “Frontiers in Built Environment”. Additionally, Dr. Wei also serves as MDPI "Building" guest editor and a diligent reviewer for 26 leading international journals, including Cement and Concrete Composites, Construction Building Materials, Developments in the Built Environment, and Journal of Materials in Civil Engineering. Furthermore, He is also a member of the American Concrete Institute (ACI), and International Federation for Structural Concrete (fib) the International Union of Laboratories and Experts in Construction Materials, Systems, and Structures (RILEM).



Prof. Thomas J. Webster
Hebei University of Technology and Interstellar, USA

Nanotechnology in Medicine: From its Foundation to Now Saving Human Lives

This presentation will cover a close to 30 year journey researching and commercializing nanotechnology for improving disease prevention, diagnosis, and treatment which has led to numerous products including nano spinal implants now in over 30,000 patients to date showing no signs of failure according to the FDA MAUDE database. Traditional orthopedic implants face a failure rate of 5 – 10% and sometimes as high as 60% for bone cancer patients. The talk will cover not only human clinical evidence of the unprecedented efficacy of nanotechnology in medicine but also fundamental evidence of how nanotechnology can be used clinically to kill bacteria, inhibit inflammation, and promote tissue growth (if needed) without drugs. This talk will also describe the future of nanotechnology and how it will in the not too distant future combat traditional failures in our global healthcare system including reversing the current decrease in global average life expectancy, creating a reactive compared to predictive healthcare system, transforming a healthcare system that relies too much on drugs and pharmaceutical agents to treat ailments, facilitating a non-personalized healthcare system, combating increasing costs, treating a growing global population, and more through the future use of implantable nano sensors, 4D printed nano materials, smart nano materials, environmentally-friendly nanomaterials, and AI as well as other predictive models in medicine and more.

Biography:

Thomas J. Webster's (H index: 124; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health in over 20,000 patients. His technology is also being used in commercial products to improve sustainability and renewable energy. He is currently helping those companies and serves as a professor at Brown University, Saveetha University, Vellore Institute of Technology, UFPI, and others. Dr. Webster has numerous awards including: 2020, World Top 2% Scientist by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); 2022, Best Materials Science Scientist by Citations (Research.com); and is a fellow of over 8 societies. Prof. Webster is a former President of the U.S. Society For Biomaterials and has over 1,350 publications to his credit with over 55,000 citations. He was recently nominated for the Nobel Prize in Chemistry. Prof. Webster also recently formed a fund to support Nigerian student research opportunities in the U.S.

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