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Abstract Book

13th Global Webinar on Materials Science and Engineering

November 05-06, 2025

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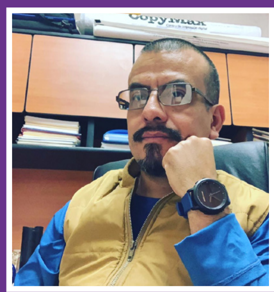
Prof. Dr. Per Arvid Lothman
European University of Applied Sciences
Hamburg, Germany

Conference Co-Chairman



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

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2nd Global Webinar on Obstetrics and Gynecology	March 25–26, 2026

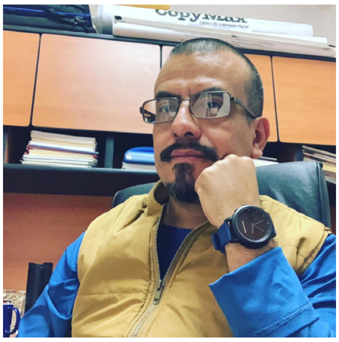
Prof. Dr. Per Arvid Lothman
European University of Applied Sciences Hamburg, Germany

Perspectives on Structures and Life

Life underlies a fundamental organizing principle that governs how living systems structure themselves across all scales of biological organization. This architectural framework reveals that life is not randomly organized but follows specific design principles that ensure stability, function, and evolutionary adaptability. From the molecular level to entire ecosystems, living systems exhibit a hierarchical organization characterized by emergent properties, physical principles, and mathematical patterns. One of the most fundamental architectural principles in biology is tensegrity (tensional integrity). This principle, describes how living systems achieve structural stability through a balance of tensile and compressive forces. Tensegrity structures consist of isolated components under compression (such as bones or cellular struts) suspended within a network of continuous tension (like connective tissues or cellular filaments). This structural principle provides several key advantages: structural stability, flexibility, and the ability to channel forces from macroscale to nanoscale levels. In biological systems, tensegrity operates at multiple scales simultaneously. At the cellular level, the cytoskeleton functions as a tensegrity network, with microtubules providing compression resistance while actin filaments and intermediate filaments create tensional network. Almost all Engineering disciplines are continuously inspired by nature and the evolutionary advantages it provides. Here we elucidate Tensegrity in both Nature and Engineering as a promising venue for smart materials and structures.

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.



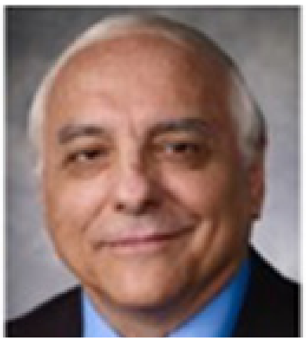
Prof. Victor R. Orante Barron
The University of Sonora, Mexico

Effect Of The Intrinsic And Extrinsic Defects On The Stimulated Luminescence Properties Of Inorganic Oxides Obtained By Solution Combustion Synthesis

Solution combustion synthesis (SCS), also known as self-propagating high-temperature synthesis, is a technique which makes use of highly exothermic redox chemical reactions between metals and non-metals to produce technologically useful oxides and non-oxides. Inorganic oxides were obtained by SCS carrying out a reaction involving metallic nitrates acting as oxidizers, and amino compounds as reducing agents. Results related to the thermoluminescence (TL), as well as TL quenching curves, related with the elemental stoichiometric coefficient and the dopant concentration, illustrated the effect on the TL total signal. Dose response curve, TL fading and signal reproducibility were the evidence to propose the obtained materials to medium and high-dose radiation dosimetry applications.

Biography:

Dr. Victor R. Orante-Barrón, 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).



Prof. Orlando H Auciello
The University of Texas-Dallas, USA

Materials Science and Technologies Development Based on a Unique Multifunc tional/Low-Cost Ultrananocrystalline Diamond (UNC-DTM) Coating for New Genera tions of Industrial, High-Tech and Implantable Medical Devices/Prostheses

This Talk will focus on Materials Science/Technologies Development of a breakthrough multifunctional ultrananocrystalline diamond (UNCDTM) coating, as described below. UNCDTM coatings, co-developed/patented by Auciello, are synthesized by microwave plasma and hot filament chemical vapor deposition, using patented Ar/CH4 gas flow into vacuum chambers, where C, CHx species, produced by plasma or hot filaments, landing on substrate surfaces, induce growth of low-cost UNCDTM (3-5 nm grains) coatings with unique combination of properties, namely: 1) hardest (98 GPa) and highest Young modulus (998 GPa), similar to diamond gem; 2) lowest friction coefficient (0.02-0.04) compared with any materials (≥ 0.5); 3) unique electrically conductive N atoms doped N-UNCDTM coating, grown with Ar/CH4/N2 gas flow; 4) best biocompatibility (made of C atoms-life's element in human DNA, cells); 6) superior surface chemistry for embryonic cell growth/differentiation for treating biological conditions Technological applications include: 1) UNCDTM-coated pump seals/bearings/AFM tips (marketed by ADT (Auciello/co-founder); 2) High-tech/medical devices, marketed by Original Biomedical Implants (OBI-USA)/(OBI-México)/Auciello-co-founder/CEO, namely: a) UNCD-MEMS cantilevers biosensors and biting heart cells energy generation, powering new defibrillator/pacemaker; 4) New generation Li-ion batteries (≥ 10x longer life/safer), using N-UNCDTM-coated metal electrodes; 5) New generation implantable prostheses (e.g., dental implants (clinical trials in 50 patients), hips, knees, stents) coated with UNCDTM, eliminating failure of metal implants via wear / chemical corrosion; 6) UNCD-coated silicon microchip implantable inside eye as artificial retina to restore partial vision to blind by gene-induced degeneration of photoreceptors (Argus II device, marketed by Second Sight, returned partial vision to ~ 450 blind by retinitis pigmentosa).

Biography:

Auciello graduated with honors: M.S. (1973), Ph.D. (1976) – Physics, Institute "Balseiro"/Universidad Nacional Cuyo-Argentina); EE-Universidad Córdoba-Argentina (1964-1970). Postdoctoral-McMaster University, Canada (1977-1979); Distinguished Research Scientist-University of Toronto-Canada (1979-1984), Associate Professor/North Carolina State University-USA (1984-1988), Distinguished Scientist-Microelectronic Center North Carolina-USA (1988-1996), Distinguished Argonne Fellow (1996-2012)-Argonne National Laboratory-USA. Currently (2012-present), Auciello is Distinguished Endowed Chair Professor-University of Texas-Dallas, Materials Science/Engineering and Bioengineering Departments. Auciello directs basic/applied research on multifunctional oxide [ferroelectric (piezoelectric)/high-K dielectrics films], and nanocarbon films (novel Ultrananocrystalline Diamond (UNCDTM) and graphene films) and applications to industrial, high-tech, and external and implantable medical devices. UNCD film technology is commercialized for industrial products by Advanced Diamond Technologies (Auciello et al.-Founders -2003, profitable-2012, sold to large company for profit-2019), and by Original Biomedical Implants (OBI-USA, 2013) and OBI-México (2016) (Auciello and colleagues /founders), for new generations of superior medical devices/prostheses and other implants. Auciello edited 33 books and published about 500 articles in several fields, holds 23 patents, He was Associate Editor of Applied Physics Letter, and currently of Integrated Ferroelectrics, Functional Diamond, and Coatings. He was President of the Materials Research Society (2013) Auciello is Fellow of AAAS, MRS and IAAM, and has numerous Awards.

Dr. Severine A. E. Boyer

French National Centre for Scientific Research, CNRS, France

Structural phenomena in solidified materials: state of art based materials response under Impulse Excitation environmental stress

Materials have an intrinsic damping property, enabling them to dissipate energy when applying excitation environmental stress. Structural characteristics at different length scales can affect the magnitude of damping, i.e. movements of molecules, morphologies, etc.

A part of the state of the art based on a selection of works will be presented. This selection aims to address both organic and metallic materials, with for example: i) beta and alpha relaxation peaks in polymers, ii) structural transformation in alloys.

Biography:

Severine A.E. Boyer has completed her PhD from Blaise Pascal Clermont-Ferrand University, France, and Assistant-Professor studies from the Tokyo Metropolitan University, Japan, and respectively from Mines Paris and IMT Mines Douai, France. She has published more than 50 papers. Her activities aim to conduct combinations of chemo-physics / poly-morpho-genesis / interfaces in hybrids materials to meet the challenges of new materials, new model-experiments and new numerical models.

Biao Yan
The Polytechnic University of Madrid, Spain

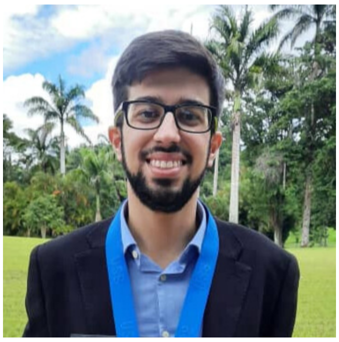
Molecular Simulation of the Isotropic-to-Nematic Transition of Rod-like Polymers in Bulk and Under Confinement

In this research work, we conduct extensive Monte Carlo simulations to investigate the factors that affect the isotropic-to-nematic transition of hard colloidal polymers in bulk and under various conditions of confinement. Polymers are represented as linear chains of tangent hard spheres of uniform length, with the stiffness being controlled by a bending potential leading to rod-like configurations. Confinement is realized through the presence of flat, parallel and impenetrable walls in one, two or three dimensions, and periodic boundary conditions are applied in the unconstrained dimensions. All simulations are performed through the Simu-D software, composed of conventional and advanced, chain-connectivity-altering Monte Carlo algorithms.

The local and global structure of the computer-generated system configurations are gauged through the Characteristic Crystallographic Element (CCE) norm and the long-range (nematic) order parameter. Distinct factors, including chain length and stiffness, confinement and packing density are found to profoundly affect the isotropic-to-nematic transition at the level of chains, and the establishment of close-packed crystallites at the level of monomers.

Biography:

Biao Yan is currently pursuing a Ph.D. in Environmental, Chemical, and Materials at the Polytechnic University of Madrid, and has published one related paper in the journal Polymers.



Diego Enrique Alvarado Martín
The Polytechnic University of Madrid, Spain

Structural Analysis of Primitive Paths: Athermal Semi-flexible Polymers

In the present research we study how chain stiffness and concentration affect the entanglements and the corresponding primitive paths of long, linear polymers of tangent hard spheres. First, through the Simu-D software we generate and equilibrate system configurations under a very wide range of packing densities, from very dilute conditions up to the maximally random jammed state. Chain stiffness is controlled through the equilibrium bending angle, exploring systematically from fully collapsed chains to fully extended ones. Then, we analyse the primitive path network of entanglements of the computer-generated system configurations through the Z1+ software. We study how the aforementioned factors affect the distribution and number of entanglements and the size and shape of the corresponding primitive paths. A detailed comparison with the reference system of fully flexible chains is provided, identifying the differences and similarities in the entanglement statistics.

Biography:

Diego E. Alvarado M. graduated as a Chemical Engineer from Simón Bolívar University (Venezuela) and now has just completed his Master's Degree in Chemical Engineering from the ETSII at Universidad Politécnica de Madrid (UPM), Spain.

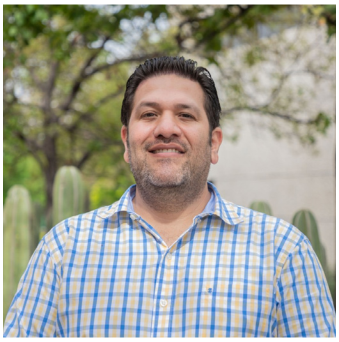
Prof. Gowhar A. Naikoo
The Dhofar University, Oman

Where Atoms Dream Big: The Power of Nanotechnology

Nanotechnology is one of the most powerful tools of modern science, allowing us to design and control materials at the atomic and molecular levels. By connecting the smallest structures to large-scale applications, it has changed the way we approach problems in health, energy, environment, and technology. Today, nanotechnology plays a vital role in developing new medicines, improving healthcare systems, creating better electronic devices, producing clean and renewable energy, and removing pollutants from air and water. It also helps improve agricultural productivity, food safety, and sustainable materials for textiles and industry. These innovations directly contribute to the United Nations Sustainable Development Goals (SDGs), including SDG 3 (Good Health and Well-being), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Although the term nanotechnology is new, its concept is ancient. Centuries ago, Indian metallurgists and artisans used nanoscale principles unknowingly in creating advanced materials like the Damascus swords of Tipu Sultan, the rust-free Iron Pillar of Delhi, the iron beams of the Konark Sun Temple, and herbal kajal. These examples show that humans have long understood how to enhance materials for strength, durability, and beauty. Today, by combining ancient knowledge with modern innovation, nanotechnology continues to shape a cleaner, healthier, and more sustainable world—proving that even the smallest particles can create the biggest change.

Biography:

Gowhar Ahmad Naikoo, PhD, FHEA, MRSC, is an Associate Professor of Chemistry at Dhofar University, Oman, and is ranked among the world's top 2 % scientists (Stanford University – Elsevier/Scopus 2024 & 2025). His research focuses on the rational design of advanced nanomaterials for green hydrogen production, sustainable energy storage, next-generation sensors, and environmental remediation. A defining period of his career was his tenure as a Visiting Scientist under Professor C. N. R. Rao at JNCASR (India), which inspired his pursuit of innovation in materials chemistry. Dr. Naikoo has secured eight competitive research grants, including major projects funded by the Ministry of Higher Education, Research and Innovation (MoHERI) and Dhofar University. His current work emphasizes hydrogen generation from seawater and wastewater and the development of eco-friendly nanostructures for clean energy systems, addressing key United Nations Sustainable Development Goals (SDGs): SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). He has earned numerous distinctions, including the Best Faculty Award (2019), Best Research Scholar Awards (2022, 2024), Young Scientist Award (2020), and the Global Teacher Award. A Fellow of Advance HE (UK) and Editorial Board Member of several journals, Dr. Naikoo stands as a model of scientific leadership, driven by innovation, guided by sustainability, and inspired by the pursuit of positive societal impact.



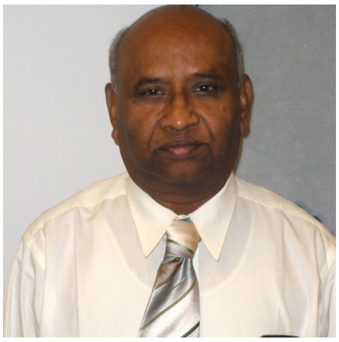
Dr. Jaime Taha-Tijerina
The University of Texas Rio Grande Valley

Nanolubricants for Industrial Plastic Deformation Applications

Technology and industrial developments demand effective energy utilization and its management in a greater extent. Conventional fluids and lubricants are typically low-efficient heat dissipation materials. Wear and thermal management are key factors in a wide variety of fields such as automotive, microelectronics, high-voltage power transmission systems, medical therapy and diagnostics, and bio-pharmaceuticals, among others. The advent of nanofluids greatly improved the issues of conventional materials regarding thermal transport, wear and friction since nanofluids have shown many interesting properties and distinctive features offering extraordinary potential for many applications. Nanolubricants are highly effective media applied in many industrial plastic deformation metal-mechanic processes. This industru is intensive in operations of material transformation that demand a high energy consumption to overcome the friction and wear generated in the manufacturing processes. In metal components field, for instance, there are diverse manufacturing processes which involve the contact of machinery components and tooling. Novel developments on advanced high strength steels are commercially available, which aid on weight reduction, environmental pollution, among others. Proper lubrication or material protection is suitable to avoid critical wear and damage, such as scratches, galling or die fractures, including faults or scrap in the final produced components. The minimization of friction and wear generated could be achieved by applying diverse technologies such as surface engineering (coatings), surface thermal treatments and laser texturing, among others.

Biography:

Jaime Taha-Tijerina completed his PhD in Materials Science and NanoEngineering (MSNE) from Rice University, USA. He has +22 years of industrial experience and +21 years of Academic and Research proficiency. He has wide experience in leadership, planning, development, and maintenance of diverse sets of R&D and cost-reduction projects. He has published more than 70 peer-reviewed papers in congresses and specialized journals. His current research interest focusses on the synthesis and characterization of nanofluids and nanolubricants for energy/thermal management and tribology applications, as well as nanocomposites and metallic components for industrial manufacturing processes.



Dr. Radhakrishnaiah Parachuru
Georgia Institute of technology, USA

Latest Advances in the Field of Smart Wearables

The paper describes how smart wearables have evolved into an interdisciplinary field that merges materials science, artificial intelligence, and biosensing. Notable advances include energy-harvesting systems with triboelectric nanogenerators and flexible graphene batteries powered by motion and heat. Smart textiles now feature multifunctionality with conductive yarns, micro-LED fabrics, and washable sensors, turning clothing into interactive, data-enabled interfaces. Health tracking has advanced with non-invasive biochemical sensors that detect glucose, cortisol, and lactate through sweat. Additionally, cutting-edge neuro-wearables utilize dry EEG electrodes for brain-computer communication. On-device AI, such as TinyML, now processes health and activity information locally, enhancing privacy and reducing dependence on cloud systems. These innovations have fueled rapid applications across healthcare, sports, defense, and lifestyle sectors. In healthcare, wearables enable continuous vital sign monitoring and early disease detection; in sports, smart garments and insoles provide real-time feedback and tracking, thereby optimizing the recovery process. Industrial and military wearables integrate sensors to monitor fatigue, posture, and the work environment to enhance safety and performance. Meanwhile, AR/VR-integrated smart wearables and fashion-tech collaborations blur the line between function and style—creating intelligent clothing that adapts, communicates, and responds. Collectively, these advances position smart wearables as a transformative ecosystem at the intersection of human biology, digital intelligence, and adaptive materials, ushering an era where garments not only sense the world but actively interact with it.

Biography:

I hold BS, MS, and PhD degrees in textile engineering, as well as an MS in Applied Statistics & Decision Sciences. I consider myself a multidisciplinary scientist with over 40 years of experience in teaching, research, and industry across polymer, fiber, textile, apparel, carpet, and related fields. Before joining Georgia Tech as a textile engineering faculty member, I served as a technical manager and oversaw the erection and commissioning of a comprehensive textile manufacturing plant in India. I have taught nearly all the dry manufacturing courses available to textile engineers at Georgia Tech. As the coordinator of industry support activities at Georgia Tech for 28 years, I completed more than 220 applied research projects benefiting various segments of the textile and allied industries. Projects fall into the following categories: Product design Product/process optimization Technical troubleshooting Testing/evaluation of products and production technologies Design of high-end performance-engineered products for apparel and non-apparel end-uses Application of emerging new technologies such as Nano & Biotechnologies for product innovation Assistance for diversification, product enhancement, material selection, and cost reduction Expert testimony services in legal matters related to raw materials, products, and production technologies I have also conducted basic research in textile manufacturing and served as the primary adviser to several graduate students who earned MS and PhD degrees. I have been an active member of several professional organizations, including the Fiber Society, AATCC, ASTM, and TQCA. I continue to hold leadership roles in several AATCC technical committees, including as the chair of the AATCC Committee on Statistics (since 2003). I have published 65 refereed research papers in reputable journals, delivered 198 conference presentations, including several keynote addresses at national and international conferences, and contributed book chapters to four books. I managed six different characterization labs and three process technology labs for 20 years. Upgraded four characterization labs by adding new equipment (equipment for X-ray diffraction, X-ray fluorescence, Spectrometry, Rheology, and Thermal Analysis). OTHER NOTEWORTHY ACCOMPLISHMENTS Served as a faculty member in charge of laboratory safety for 12 years (24 labs in 4 buildings). Served as an expert witness in 58 litigations involving issues related to raw materials, product safety, product performance, and manufacturing technologies. Testified in courtrooms across eight different states within the US. Resolved dozens of product/material-related disputes through independent testing. Conducted failure analysis, identified root causes, and suggested remedies. Has been serving as Chairman of AATCC Statistics Committee (RA 102) and as a paid AATCC Statistics Consultant since 2003.

Prof. Viktor P. Balema

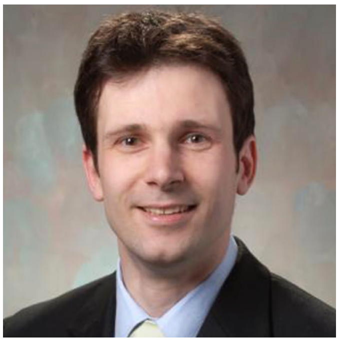
Clemson University, Clemson, SC and ChemImpakt, Milwaukee, WI, USA

Chemistry by Milling: Mechanical Alloying and Solvent-Free Mechanochemistry

The presentation highlights the speaker's experience in applying mechanical milling to solvent-free chemical synthesis of a wide range of metallic, ionic, and molecular materials with diverse applications. It discusses recent advances in mechanochemistry—a branch of chemistry utilizing mechanical processing for performing chemical reactions—and summarizes possible mechanisms of mechanochemical reactions. The use of analytical techniques to monitor mechanochemical transformations is illustrated through the presenter's experimental results. Topics covered include the preparation of metal alloys and metastable metallic phases, complex metal hydrides, organic molecules, 3D heterostructures, high-entropy transition metal dichalcogenides, and rare-earth-based metal-organic frameworks. The talk also addresses the role of mechanical processing in advancing Circular Economy objectives and examines opportunities for scaling up laboratory protocols to enable the transition from mechanochemical research to industrial manufacturing.

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. Hendrik Heinz
The University of Colorado Boulder, USA

Advancing Bioinspired and Low Dimensional Composite Materials Through High-Accuracy Simulations

The simulation of bioinspired materials and hierarchical assembly of building blocks for molecular recognition, electrical, and mechanical functionality is essential for advancing sensor and structural applications. Computational and AI-driven methods accelerate progress, and this work highlights molecular dynamics (MD) simulations of the recognition of peptides, biomolecules, and polymers on 2D materials such as MXenes, MoS2, and metal-organic frameworks (MOFs). Molecular mechanisms of assembly, binding energies, and mechanical properties up to failure are illustrated using molecular simulations in beyond-DFT accuracy. We describe how to achieve exceptional reliability, speed, and compatibility among common simulation platforms using the INTERFACE force field (IFF) and reactive INTERFACE force field (IFF-R). We discuss how understanding from MD simulation as well as through AI/ML can be integrated with findings from experiments (scattering, imaging/microscopy, spectroscopy, binding assays, calorimetry). The critical role of crystallographic facets, electrolyte composition and pH values will be highlighted, which is often elusive or less regarded in experiments.

Biography:

Hendrik Heinz is a Professor of Chemical Engineering, Biological Engineering, and Materials Science at the University of Colorado at Boulder and a Senior Editor for the American Chemical Society (Langmuir). He received his Ph.D. degree from ETH Zurich and carried out postdoctoral work at the Air Force Research Laboratory. His research focuses on the simulation of biomaterials and nanomaterials from atoms to the microscale, including data science methods. He leads the development of the Interface force field and surface models for the simulation of compounds across the periodic table in high accuracy, including minerals, alloys, 2D materials, proteins, polymers. He is a Fellow of the Royal Society of Chemistry and of the International Association of Advanced Materials, received the Career and Special Creativity Awards from NSF, a Sandmeyer Award from the Swiss Chemical Society, the Max Hey Medal from the Mineralogical Society, a NASA Group Achievement Award, and held guest professorships at ETH Zurich, the National Institute of Materials Science in Japan, and the University of Paris. He served as an Amazon Scholar and his contributions support developments by several companies.

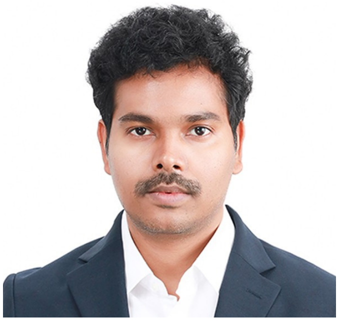
Prof. Devika Chithrani
The University of Victoria, British Columbia, Canada

Combination of radiotherapy, chemotherapy, and nanotechnology to improve outcomes in cancer treatment

Radiotherapy (RT) is one of the main modalities of cancer treatment and more than half of cancer patients can benefit from RT in the management of their disease. Currently, we are at the limit of RT dose given to patients, creating a clear need for novel methods to enhance current RT dose. Our goal is to enhance the RT dose given to the tumor locally for maximizing the effect of dose given to the tumor while minimizing normal tissue toxicity. We are testing a unique combination of two radiation dose enhancers such as gold nanoparticles (GNPs) and docetaxel (DTX). GNPs can interact with photons and produce cell damaging species causing more cell death while DTX can put cells in state that they are most sensitive to radiation. GNPs are biocompatible (based on early phase clinical trials) and DTX is clinically approved. Therefore, we believe our work can be easily translatable to the clinic. I will share our latest results towards this initiative.

Biography:

Prof. Devika Chithrani is the recipient of faculty gold medal and the gold medal for physics when she received her bachelor's degree in physics. She is a recipient of many fellowships by Natural Sciences and Engineering Research Council of Canada during her graduate and post-doctoral work. Now, she is a full professor at University of Victoria. She is also the director of Nanoscience and technology Development laboratory at University of Victoria. She leverages nanotechnology to create innovations that advance the care of cancer patients. Her work is featured on the cover of journals and her publications have received over 13,000 citations in few years. She is among the world's top 2% scientists according to the published data by Stanford University. Her passion is to develop smart nanomaterials to improve exiting cancer therapeutics.



Prof. Manmatha Mahato
Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea

Ultralow-Voltage High-Performance Soft Actuators Based on Polysulfonated COF Hosts

Tailoring ion dynamics at the solid–state electrolyte–electrode interface is key to advancing high– performance electro–ionic soft actuators. Actuation performance depends on the ability of ions in the electrolyte to interact effectively with electrode surfaces under an applied electric field. In this work, we present a novel approach using a polysulfonated covalent–organic framework (pS–COF) as a multifunctional host material for both electrolyte and electrode integration. This unique structural configuration, combined with a Nafion membrane and 1–ethyl–3–methylimidazolium cations, enables exceptional actuation performance metrics (Figure 1). 1 The developed soft actuator achieves significant bending deformation at near zero voltage (~0.01 V) and produces a blocking force of 34 times its own weight. It also exhibits fast response times (rise time of 1.59 seconds) with no back– relaxation and maintains stable performance at high frequencies up to 5 Hz. These features highlight its potential for applications in advanced soft robotics requiring precise, energy-efficient actuation. As a demonstration, we constructed a soft fluidic switch to illustrate the versatility of the pS–COF electro–ionic soft actuator in engineering applications. This work provides insight into the design of materials and systems for next-generation soft robotics and adaptive devices.

Biography:

Dr. Manmatha Mahato currently serves as a Research Associate Professor at the Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea. He holds a Ph.D. in Materials Science from the Indian Institute of Technology (IIT) Kharagpur, India. Dr. Mahato specializes in designing advanced electroactive flexible devices using functional nanomaterials, such as COFs, MOFs, and MXenes. His notable research achievements include pioneering developments in electrochemical actuators, soft robotics, energy storage solutions, and smart composite materials. He has received prestigious accolades, including the 2024 AMSM Young Scientist Award and the 2022 NANO KOREA Young Scientist Award. Dr. Mahato has published extensively in high-impact international journals, secured multiple patents, and regularly delivers invited talks at prominent international conferences.

Prof. Dr. Kaushik Pal
The University Center for Research and Development (UCRD), Punjab, India

Emerging Avenues in Nanoarchitectonics in Materials Science and Nanotechnology

Dielectric relaxations are studied at three different frequencies of a hydrogen bond liquid crystal chloro benzoic acid with nonyloxy benzoic acid. The process of synthesis is described and the synthesized mesogen is a monophase variant with nematic phase. Carbon-based nanomaterials (CNMs), like CNTs, graphene, carbon dots (C-dots), and some other CNMs, have recently drawn a lot of interest in their future application as an elevated-performance sensor implementation. For the first time in the history of liquid crystal dielectric work, we observed that in the present sample at higher frequency the process mentioned above is reversed. All the dielectric data points obtained at various temperatures when plotted they are found to converge at the $\varepsilon \infty$ values and diverge at $\varepsilon 0$ values. This process is referred as frequency cross over. Nematic growth order derived from dielectric studies is also presented. We explored that qualitatively different behaviors could emerge via the specific nature of the inter-component interaction. Mastering this mechanism could lead to various applications based on phase tunable properties and novel switching.

Biography:

Professor (Dr.) Kaushik Pal belongs to an Indian citizen. He currently leads as a ‘Associate Dean- Research’ at University Center for Research and Development (UCRD), Chandigarh University, Punjab (India). He was the former “Distinuish Chair Professor” at Laboratório de Biopolímeros eSensores, Instituto de Macromoléculas, Universidade do Rio de Janeiro, Brazil and Advisory Chair Professor in Liquid Complex System and Solid State Research Laboratory, University of MaribÖr, Slovenia. Most recently, achieved Honorìs Cauśa DOCTOR OF SCIENCE (D.Sc.) award from Ministry of Education, Govt. of Malasia IKTBN Sepang, Selangor in this session June, 2020. He also acts as Distinguish Chair Professor in Wuhan University, Hubei, Republic of China. Before, he worked as a “Visiting Professor” at IIUCN, School of Energy Materials, Mahatma Gandhi University, Kottayam, Kerala. As a full-time “Research Professor” in the Department of Nanotechnology worked at Bharath University (BIHER), Chennai. He completed a Doctorate in Philosophy (Ph.D.) in Physics (Expt. Materials Science and Nanotechnology) from University of Kalyani, Govt. of India. Most significant prestigious awards “Marie-Curie Experienced Researcher (Postdoctoral Fellow)” offered by the European Commission in Greece and “Brain Korea (BK-21) National Research Foundation Visiting Scientist Fell wship” in South Korea achieved in his research career. He was appointed “Senior Postdoctoral Fellow” at Wuhan University, China and within a year achieved a prestigious position “Chief-Scientist & Faculty Fellow” offered by Chinese Academy of Science. His current spans are focusing e.g. Nanofabrication, Chemical nanoengineering, solid-state condensation chemistry, Renewable green energy revolution, functional Materials hybridization, CNTs/Graphene, Liquid crystalline optical materials, Polymeric nanocomposite, Switchable device modulation, Spectroscopy and electron microscopy, Bio-inspired materials for Nano- biotechnology, Drug delivery, Tissue engineering, Nano-imaging and cell culturing and integration, Flexible and transparent electrodes, Supercapacitor, Optoelectronics, Green nanotechnology and novel biosensor applications. He supervises a significant number of Bachelors, Masters, Ph.D. and Postdoctoral scholar’s thesis in Foreign University collaborations. His outstanding research finding and novelty published around 250+ significant research/ review articles in SCI & SCOPUS based peer-reviewed international top-tier journals likewise: IOP Nanotechnology, Royal Chemical Society, Elsevier, Springer, InTech, Taylor & Francis, Wiley-Scrivener, IEEE publications got the highest citation in every year and leading editors more than 15- SCI/ SCOPUS journal. Throughout his academic experiences, skills and research background deserve him as an editorial member of Elsevier, Springer, IOPSciences, Wiley, Taylor & Francis, InTech Open, CRC Press etc. as well as edited several 32-Book’s along with Authored and Co- authors chapters and since several last decades reviewed approximate 450-articles and expert editor of Elsevier, Springer, Wiley, IOP journals. Prof. Pal is an expert group leader as well as the associate member in various scientific societies, reorganizations past decades, he organized mostly 52-National or International and professional bodies. In Conferences and workshops leaded as Chairperson/Convener/Co-convener, Workshops, Summer Internship program, and himself contributed around 40-Plenary, 38-Keynote and 45-Invited lectures worldwide. Outstanding achievements belongs to Prof. Kaushik Pal was selected worldwide as highly cited researcher leading Top 2% Scientist based Stanford University SCOPUS database since in the year 2022,2023,2024,2025.

Prof. Khalid Mujasam Batoo
King Abdullah Institute For Nanotechnology, King Saud University, Saudi Arabia

Piezo-plasmon phototronic effect enhanced direct solar-chemical translations in Au-decorated BiFeO3 3D nanostructures

Bismuth ferrite-based oxide nanostructures were chemically processed to offer an effective solution for the growing energy crisis and environment pollution by employing them as photoelectrodes for water splitting reactions and remediation of organic pollutants through photocatalysis. The influence of plasmonic effects via gold (Au) incorporating the physicochemical properties and their resulting impact on the application performance has been studied systematically. The processed materials were examined using X-ray diffraction (XRD), absorbance, and transmission electron microscopic instruments. Au interaction in the host BFO nanoparticle surface was affirmed through an in-depth examination of their photoelectron spectroscopic data. The plasmonic effect was also visualised in the absorbance spectra and a significant change in the optical spectrum on Au decoration. Photoluminescence spectra approved the quality of defect states to be significantly influenced by the BFO nanoparticles, and the Au nanoparticles influenced charge transmigration and separation. Enhanced photocatalytic and photoelectrochemical performance from the Au-decorated BFO nanostructures was evaluated by comparing pristine BFO. Time-dependent photocurrent density studies also proved the stability of processed photoelectrode materials in efficient water splitting via Au nanoparticles, which enhanced the charge transfer efficiency by offering improved conductivity as studied via Nyquist plots. The piezo photocatalysis activity of the nanocomposite exhibited a high degree of degradation of organic pollutants and better hydrogen production from water splitting reaction upon direct sunlight illumination.

Biography:

Professor Khalid Mujasam Batoo, received his Ph.D. in Applied Physics from Aligarh Muslim University, India, in 2009. He is a full Professor at King Abdullah Institute for Nanotechnology, King Saud University, Riyadh, Saudi Arabia 2010. He has been consecutively listed among the world's top 2% of scientist data published by Stanford University, USA, for the last 4 years. His international acclaims comprise an award of Junior Research fellowship from Inter-University Accelerator Center, New Delhi, India 2007, Speakers award in NANO-15 held at KSR Institutes, Tirchendode, Tamil Nadu, India, ICNA-III-2016 Award from South Valley University, Egypt, young Faculty Award-2016 by Venus International Research Foundation, India, speakers award in Kingdom Plastic Summit 2017, Riyadh, Saudi Arabia, an outstanding scientist in nanotechnology award by Venus International Foundation 2017, Chennai India, Bharat Vibhushan Young Scientist award, New Delhi, India 2024. As a principal investigator, he has completed several large and small grant research projects funded by the Kingdom of Saudi Arabia. He has authored over 342 research papers in peer-reviewed Journals of International commendation and conference papers. He currently serves on the editorial board of more than 13 international Journals. Among his various research interests include the study of magnetic nanomaterials, graphene materials, solar cells, batteries, e-textiles, magnetic tunnel Junctions, sensors, and biomedical application of nanomaterials and spintronic materials with an emphasis on understanding micro and nano-structural properties of these materials.

Prof. Richard E. Riman

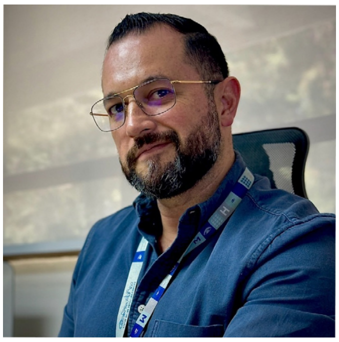
Laboratory for Sustainable Manufacturing, School of Engineering, Rutgers University, USA

Building a Circular Supply Chain for Concrete

Concrete is a material used in quantities second only to water. Cement, a critical concrete component, is the world's largest source of industrial CO_2 emissions. Our research is focused on making concrete the world's largest CO_2 sink. This is possible only if the concrete industry is willing to switch to CO_2 instead of water to solidify concrete. By making this transition, concrete rubble can become both a raw material source and the first step towards converting concrete to a material that can be recycled repeatedly, like glass, steel, and aluminum. Our method of recycling cement starts with carbonating calcium silicate hydrate, then upcycles to calcium silicon oxide phases, which can be reversibly carbonated to bond concrete aggregate, and decarbonated to recycle the material back to cement powder aggregate granules. One of the technological barriers to recycling concrete is having access to 10 times more CO_2 than the CO_2 market can now provide. This presentation will discuss how the same recycling process can establish a solid-state CO_2 supply chain. This supply chain can effortlessly capture CO_2 from air, water, or flue gas, store, transport, and dispense CO_2 without compression, cryogenic, or high-pressure storage. Its simplicity enables a new industry to emerge, making CO_2 available anywhere concrete is needed. The convergence of the CO_2 and concrete industries will make concrete the most sustainable material in the world. Time permitting, constructability, material properties, and performance of carbonate concrete will be discussed, further creating justification for transitioning to this new technology.

Biography:

Richard Riman is a Distinguished Professor of Materials Science and Engineering. His current focus is on transforming the cement and concrete industry into a sustainable one that consumes more CO2 than any other industry. His work has received many national and international awards, including the Edison Patent Award, Innovate 100, NJ Inventor's Hall of Fame, R&D 100, the ISHA Lifetime Achievement award, and many industrial and federal recognitions. He has received many mentions on television, radio, the internet, and magazines. He is a fellow of the American Ceramic Society, the National Academy of Inventors, and the World Academy of Ceramics.



Prof. David Andres Fernandez Benavides

The Center for Industrial Engineering and Development (CIDESI), Mexico

Direct Ink Writing of ceramic Slurries and Hydrogels: Challenges in Formulation, Rheology, and Print Strategies for Medical and Industrial Applications

Direct Ink Writing (DIW) is a highly adaptable additive manufacturing method, especially suited for creating complex shapes using materials with viscoelastic and shear-thinning properties. In this work, we study the formulation and processing of ceramic slurries, and hydrogel-based inks designed for DIW. The research addresses key issues in materials design for DIW, including particle dispersion, binder selection, and solid loading optimization, to produce printable materials with suitable rheological properties. A systematic method was employed to evaluate the rheological behavior of each formulation, focusing on viscosity, yield stress, and storage moduli, which are crucial for ensuring flow through fine nozzles and maintaining dimensional stability after printing. Binders or additives were examined as rheology modifiers to stabilize ceramic particles and tailor the printability of ceramic and hydrogel-ceramic hybrids. The interactions between inorganic particles and organic matrices were thoroughly studied to optimize extrusion and layer-by-layer accuracy. Different printing strategies were developed to address material-specific requirements, such as extrusion pressure, speed, and post-processing conditions (e.g., drying and sintering protocols for ceramic parts). Potential applications include bioactive scaffolds for tissue engineering, customized implants, and porous components for thermal or structural uses in the industrial sector. This work enhances understanding of slurries and inks formulation, as well as printing strategy development for multimaterial systems in DIW, bridging the gap between material science and functional design. The insights gained are valuable for future research and the development of custom additive manufacturing solutions for both biomedical and high-performance industrial applications.

Biography:

David Andrés Fernández Benavides, Ph.D., is currently a professor-researcher at the Center for Industrial Engineering and Development (CIDESI), where his activities are focused on Additive Manufacturing Management within the Emergent Technologies area. He is a mechatronic engineer from the Universidad Autónoma de Occidente and holds a Master's degree in Engineering from the Pontificia Universidad Javeriana, both in Cali, Colombia. He also earned his Doctorate in Materials Science at CINVESTAV, Querétaro, Mexico. His main research interests involve the development of multifunctional materials through the study of structural, microstructural, dielectric, and electromechanical properties, and their subsequent analysis using advanced experimental design techniques. Additionally, it focuses on the development of devices, such as biodetection platforms, specifically for detecting viruses and toxic substances. He has experience in advanced manufacturing processes, including additive manufacturing of metals, polymers, polyacrylates, and ceramics.

Prof. Monika Kinga Michalska
VSB - Technical University of Ostrava, Czech Republic

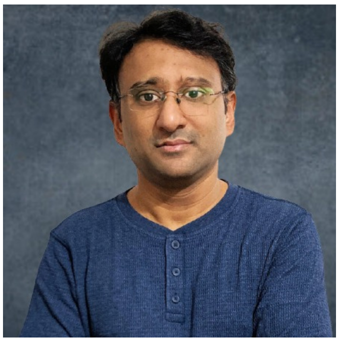
Enhanced energy storage and wastewater treatment through the surface functionalization of various materials with silver nanoparticles

The incorporation of silver nanoparticles (Ag NPs) into carbon-based materials and transition metal oxides has been shown to significantly improve their performance in both energy storage and environmental applications. Carbon materials such as activated carbon, carbon nanotubes, and graphene, known for their large surface area and high electrical conductivity, experience further enhancement upon Ag deposition. The introduction of Ag NPs reduces internal resistance, facilitates electron transport, and provides additional electrochemically active sites, leading to improved capacitance and superior overall electrochemical behavior in supercapacitor systems. Similarly, the presence of Ag increases the conductivity and structural stability of transition metal oxides, including Co_3O_4 and Mn_3O_4, enabling more efficient charge storage processes.

In environmental remediation, Ag-modified graphitic carbon nitride (g-C_3N_4) demonstrates markedly enhanced photocatalytic activity toward the degradation of organic contaminants in wastewater. The silver nanoparticles improve light absorption and promote the separation of photogenerated electron-hole pairs, resulting in higher degradation efficiency under both ultraviolet (UV) and visible (VIS) light irradiation. This makes Ag-decorated g-C_3N_4 a promising, sustainable material for advanced wastewater treatment. In both energy storage and photocatalytic systems, Ag NPs were introduced through a simple, low-temperature wet-chemical synthesis, offering an environmentally friendly and cost-effective route for functional material modification.

Biography:

Monika Michalska received her Ph.D. at the Institute of Electronic Materials Technology, Poland, in 2016. She was on a scientific internship (postdoc) in Taiwan, the Czech Republic, Hungary, Slovakia, Japan, and Poland. She has been working as a researcher at the VSB-Technical University of Ostrava, Czech Republic, since 2020. Before joining VSB-TUO, she worked as an assistant professor at ITME. Her research area is a "crossroads of materials science, chemistry, and nanotechnology", including nanomaterials' synthesis and physicochemical characterization of electrodes for secondary batteries and supercapacitors, using various chemical and solid-state methods. She also deals with the surface modification of electrode materials with ceramic oxides and metallic as well as carbon coatings. Her scientific research also includes materials that have applications as photocatalysts in wastewater treatment and photoluminescent materials.



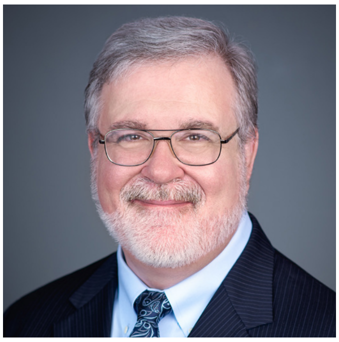
Dr. Md Salah Uddin
North South University, Dhaka, Bangladesh

Artificial Intelligence for Predictive Modeling in Metal Additive Manufacturing

Metal additive manufacturing (MAM) is a transformative technology in industrial production. The technique provides designers with unique freedom to produce complex geometrically structured parts and supports manufacturers in reducing material waste in production. The technique is globally popular and is most commonly known as metal 3D printing. During the metal 3D printing fabrication stage, the process parameters significantly influence the quality of the product. The process parameter optimization may reduce the defects, such as porosity formation, and enhance the mechanical behavior of the materials. Researchers use physics-based modeling techniques to understand the phenomena, such as porosity development in the materials. However, the technique is computationally intensive and unable to provide predictive information in product manufacturing. In this research, we employ artificial intelligence to develop a predictive model for the metal additive manufacturing technique. A lightweight material, with good mechanical properties and machinability has been chosen for this work. AlSi10Mg Aluminum alloy is a popular lightweight metal alloy for a wide variety of structural and functional parts production in industries. The alloy was manufactured by the metal 3D printing process. Process parameters induced porosity was present in the materials. The experimental data for the porosity were used to develop a predictive model using an artificial intelligence technique, categorized by a deep learning neural network approach. We find that the technique shows strong prominence in developing a predictive model for metal additive manufacturing.

Biography:

Dr. Md Salah Uddin has a combined decade of work experience in advanced manufacturing, spanning both academic research and industrial settings. After completing his PhD from Montana Technological University, USA, he accepted a Welch Postdoctoral Fellowship position at Southern Methodist University, USA. Dr. Uddin worked in varied industries, ranging from industrial laboratories to manufacturing facilities. He received an MS degree in Materials Science and Engineering from Montana Technological University. He also obtained a master's degree in Physics from Miami University, USA. Currently, Dr. Uddin is an Assistant Professor at the Department of Mathematics and Physics, North South University, Bangladesh.



Prof. Richard J. Spontak
North Carolina State University, USA

Water-Activated Polymers to Address Global Challenges in the Healthcare, Energy and Environment Sectors

Humanity faces existential threats that range from climate change, contaminated water and food shortages to infectious diseases and dwindling energy reserves. While efforts piecewise provide solutions to these global challenges, this presentation collectively addresses three of them – mitigating climate change, preventing microbial transmission and providing sustainable and clean energy – from a functionalized polymer perspective based on a simple premise: just add water. "Hybrid integrated" carbon-capture membranes are nanofabricated by modifying the surfaces of high-flux polymers through surface polymerization, followed by targeted amination. Incorporation of an amine-rich polymer nanolayer on polymer surfaces generates a CO_2 -philic "nanosponge" upon hydration and concentrates CO_2 molecules from mixed gas streams, resulting in a revolutionary membrane design that far surpasses the Robeson upper bound. We also discovered a game-changing design for fast-acting, broad-spectrum, self-cleaning antimicrobial surfaces. Our approach utilizes an anionic elastomer that pumps protons to the polymer surface upon hydration. This mechanism yields a highly acidic water contact layer yielding a dramatic pH drop capable of killing nearly all microbes tested to > 99.9999% typically within 5-10 minutes. Moreover, upon hydration, this anionic elastomer can serve as the basis for a broad range of energy-related technologies, such as solar cells, Li-ion batteries and bipolar electrolyzers.

Biography:

Richard J. Spontak, a Distinguished Professor at NC State University, received his Ph.D. from UC Berkeley and pursued post-doctoral research at Cambridge University before joining P&G in 1990 and NC State in 1992. He has published over 300 peer-reviewed journal papers. He has received numerous research awards including the NC State Holladay Medal for Excellence, the ACS (PMSE) Tess Award, the SPSJ International Award, the IChemE Underwood Medal, the ACS (Rubber) Chemistry of Thermoplastic Elastomers Award, and the IOM3 Colwyn Medal. An elected APS, IOM3, ACS-PMSE, and RSC fellow, he is a member of the Norwegian Academy of Technological Sciences.

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