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Electronic Materials and Applications (EMA 2021)

January 19 –22, 2021 | DoubleTree by Hilton | Orlando, Fla., USA

Organized by the ACerS Electronics and Basic Science Divisions

The American Ceramic Society
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Electronic Materials and Applications (EMA 2021)

January 19 –22, 2021 | DoubleTree by Hilton Orlando at Sea World Conference Hotel | Orlando, Fla., USA

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INTRODUCTION

Electronic Materials and Applications 2021 (EMA 2021) is an international conference focused on electroceramic materials and their applications in electronic, electrochemical, electromechanical, magnetic, dielectric, biological and optical components, devices, and systems. Jointly programmed by the Electronics Division and Basic Science Division of The American Ceramic Society, EMA 2021 will take place at the DoubleTree by Hilton Orlando at Sea World January 20–22, 2021.

EMA 2021 is designed for scientists, engineers, technologists, and students interested in basic science, engineering, and applications of electroceramic materials. Participants from across the world in academia, industry, and national laboratories exchange information and ideas on the latest developments in theory, experimental investigation, and applications of electroceramic materials.

Students are highly encouraged to participate in the meeting. Prizes will be awarded for the best oral and poster student presentations.

The technical program includes plenary talks, invited lectures, contributed papers, poster presentations, and open discussions. EMA 2021 features symposia focused on dielectric, piezoelectric, pyroelectric, magnetoelectronic, (multi)ferroic, quantum, relaxor, optoelectronic, and photonic ceramics; complex oxide thin films, heterostructures, and nanocomposites; semiconductors; superconductors; ion-conducting ceramics; 5G materials for millimeter-wave technology; and functional biological materials. Other symposia emphasize broader themes covering processing, microstructure evolution, and integration; effects of surfaces and interfaces on processing, transport, and properties; point defects, dislocations, and grain boundaries; mesoscale phenomena; and advanced characterization and computational design of electronic materials.

EMA includes several networking opportunities to facilitate collaborations for scientific and technical advances related to materials, components, devices, and systems. The Basic Science Division will again host a tutorial session in addition to the regular conference programming.

The grand finale of the meeting will again be Failure: The Greatest Teacher. We invite anyone interested to submit a brief abstract for this educational and engaging event that concludes the meeting.

Please join us in Orlando, Florida to participate in this unique experience!

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TECHNICAL PROGRAM

S1 – Characterization of Structure-Property Relationships in Functional Ceramics

Probing structure-property relationships in functional ceramics demands an integrated approach that combines complementary experimental probes (light, X-ray, electron, neutron, etc.) with theory and simulation. State-of-the-art scattering, imaging, and/or spectroscopy techniques that address multiple dimensions (2D, 3D, and beyond), are multiscale (both spatially and temporally), and can capture dynamic material structure under external stimuli (electric and magnetic fields, stress and strain fields, etc.), which are necessary to answer many open questions in this field.

This symposium will provide a bridge between the Basic Science and Electronics Divisions of EMA2021. The first half will focus on rapidly developing experimental techniques, big-data analysis, and modeling approaches to answer open structure-property relationship questions in functional ceramic materials. The second half will highlight the use cases of these methods. Materials of interest include, but are not limited to, those used for energy storage, ferroics and multiferroics (ferroelectrics, electrocalorics, magnetoelectrics, relaxors), flexoelectrics, optical, quantum, etc.

The symposium will expose scientists to new characterization techniques, unfamiliar research questions, and stimulate new ideas and new collaborations. Methods for approaching the challenging material problems spanning functional interfaces, short-range structural orders, and long-range crystallinity will be featured. Contributions integrating novel applications of machine learning and other computational tools (such as molecular dynamics) to predict and interpret scattering (such as Monte Carlo methods) and imaging data are also welcome. Tools to predict and interpret diffraction and microscopy data are also welcome.

Proposed sessions

– Advances in scattering, imaging, and analytical techniques
– Integrating machine learning into the structural measurement workflow
– Advances in connecting local and global structure to properties
– Addressing open questions in functional ceramics

Symposium organizers

- **David W. McComb**, Ohio State University, USA, mccomb.29@osu.edu
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- Igor Levin, National Institute of Science and Technology, India igor.levin@nist.gov

S2 – Advanced Electronic Materials: Processing Structures, Properties, and Applications

This symposium brings together materials and engineering researchers to present the latest advances in electronic materials, including synthesis/processing as well as microstructure analysis and characterization of dielectric, piezoelectric, pyroelectric, and ferroelectric properties in the form of bulk ceramics, single crystals, glasses, and multilayers. These materials have tremendous impact on a variety of technologies, including ultrasonic transducers, memories, MEMS devices, actuators, sensors, and tunable microwave devices. Other topics of interest include nanoscale domain phenomena, defect chemistry, structure–property relationships, and electric-field-induced phase transitions.

Proposed sessions

– Advanced electronic materials, including ferroelectric, piezoelectric, dielectric, electrostrictive, and pyroelectric materials
– Materials design, new materials and structures, and their emerging applications
– Reliability and fatigue of ferroelectrics and related devices

Symposium organizers

- **Eric Patterson**, Naval Research Laboratory, USA eric.patterson@nrl.navy.mil
- Satoshi Wada, University of Yamanashi, Japan, swada@yamanashi.ac.jp
- Shujun Zhang, University of Wollongong, Australia, shujun@uow.edu.au
- Kyle Webber, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany kyle.g.webber@fau.de

ELECTRONIC MATERIALS AND APPLICATIONS 2021

S3 – Frontiers in Ferroic Oxides: Synthesis, Structure, Properties, and Applications

This symposium will provide an international interdisciplinary forum for scientists and engineers from academia, industry, and national laboratories to present the latest advances in ferroic oxide materials. Complex oxides offer an extremely wide range of properties not observed in conventional metals or compound semiconductors. In these correlated materials, new emergent phenomena may arise at intrinsic homointerfaces such as domain walls. This symposium will focus on interdisciplinary topics related to the physics, materials science, and engineering within the field of ferroic oxides, domains, and domain walls. The topical list reflects materials needs and challenges within the field, with emphasis on synthesis, ferroic domain/domain wall architecture-property correlations, and exploratory devices. Speakers will span the breadth of these interdisciplinary topics in order to accelerate understanding and development of materials and heterostructures to enable new functionalities for (multi)ferroic oxides.

Proposed sessions

– Magnetic, ferroelectric, and multiferroic films and ceramics
– Synthesis of ferroic oxides
– Structure and defects, structure-property relationships
– Domain and domain walls
– Theory and modeling: domain structure and evolution
– Materials integration and applications: rewritable electronics using domain walls, computational devices, sensors, transducers, actuators, and medical devices

Symposium organizers

- **John Heron**, University of Michigan, USA, jtheron@umich.edu
- Morgan Trassin, ETH Zurich, Laboratory of Functional Materials, Switzerland, morgan.trassin@mat.ethz.ch

S4 – Complex Oxide Thin Films and Heterostructures: From Synthesis to Strain/Interface-engineered Emergent Properties

This symposium covers recent advances in complex oxide thin films, heterostructures, and nanocomposites. Topics of interest include epitaxy of complex oxides, strain-stabilization, heterointerface engineering, emergent interfacial properties, new materials discovery, field tunable responses, advanced characterizations, device applications, and extensions to performance limits. Contributions that connect advances in synthesis science to structure and property trends are of particular interest, as are those which link theoretical/computational and experimental efforts. The goal is to create an international and interdisciplinary forum for scientists, engineers, and researchers from industry, academia, and national laboratories to exchange ideas and foster collaboration. Broad areas of interest include the theoretical understanding and design of material properties using first principles-based methods to enhance and inform synthesis; stabilization of new structures and useful functionality through strain and heterointerface engineering within multilayers and vertically aligned nanocomposites; emergent properties in high entropy complex oxides; understanding the relationship between process space and equilibrium defect chemistry; strain-induced defects, interfacial microstructure, and their relationships to material properties; device fabrication and applications in energy harvesting, memories, sensors, etc. Specific properties of interest are magnetic, electronic, electrochemical, and photonic responses, as well as thermal transport phenomena, including strong correlation and quantum-confinement effects.

Proposed sessions

– Theory, modeling, and first principles calculations of complex oxide thin films and heterostructures, with focuses on strain and interface
– Controlled synthesis of lateral and vertical heteroepitaxial thin films and nanocomposites, including heterostructures, superlattices, and vertically aligned nanocomposites for functional properties
– Synthesis and properties of high entropy complex oxides
– Strain, microstructures, and functionality tuning in superlattices, vertical nanocomposites, and high entropy complex oxides
– Phenomena arising from strain couplings and interface couplings, including quantum phases and topological states and their control via external stimuli
– Characterizations of strain, defects, and interfaces
– Strain- and interface-controlled device performance in energy harvesting, memories, sensors, etc.
– In-situ thin film characterization to guide materials synthesis, understand growth mechanism, and probe electrochemical reactions

Symposium organizers

- **Hyoungjeen Jeen**, Pusan National University, South Korea hjeen@pusan.ac.kr
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- James Rondinelli, Northwestern University, USA jrondinelli@northwestern.edu
- Judith L. MacManus-Driscoll, University of Cambridge, United Kingdom jld35@cam.ac.uk
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- Aiping Chen, Los Alamos National Laboratory, USA, apchen@lanl.gov
- Elizabeth Paisley, Sandia National Laboratories, USA, eapaisl@sandia.gov

S5 – Mesoscale Phenomena in Ferroic Nanostructures: From Patterns to Functionalities

Mesoscopic phenomena span length scales that are considerably larger than atomic-bond distances, but small enough that classical continuum physics with materials properties and behavior averaged over many domains, or regions 10–100 nm in size, does not apply. The involved physical processes are bridging quantum-mechanical and macroscopic-continuum materials descriptions, which makes them critically important for the design, modeling, growth, and characterization of ferroic nanostructures. Many such systems exhibit intriguing behavior with nontrivial dependence of their elastic, polar, and magnetic degrees of freedom—including domain pattern formation and evolution—on shape, size, and morphology. Additional interesting effects involve the influence of layering, composition variation, and diffusion. This symposium brings together experts from academia, industry, and national laboratories to discuss current state-of-the-art in theoretical modeling, synthesis, characterization, processing, and applications of ferroic nanostructures, with an emphasis on the influence of morphological patterns (including domains) on physical properties and functional behavior.

Proposed sessions

This symposium will emphasize the following themes related to ferroic nanostructures:

– Synthesis, characterization, and processing
– Chemistry and physics of ferroic materials at mesoscale
– Nano to micro to macro: size dependence of ferroic behavior and properties

– Structure, dynamics, and stability of ferroic domains
– Multiscale modeling of mesoscopic phenomena
– Applications involving electronic, magnetic, thermal, optical, and electrochemical functionalities

Symposium organizers

- **Yogesh Sharma**, Los Alamos National Laboratory, USA, ysharma@lanl.gov
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- Yachin Ivry, Technion – Israel Institute of Technology, Israel ivry@technion.ac.il
- Matjaž Spreitzer, Jožef Stefan Institute, Slovenia, matjaz.spreitzer@ijs.si

S6 – Emerging Semiconductor Materials and Interfaces

This symposium focuses on recent advances in new semiconductor materials and interfaces that will enable novel optoelectronic and photonic devices, power electronics, high frequency electronics, and photovoltaics, all of which will enable paradigm-changing technologies. Topics of interest include wide-band-gap oxides for high power electronics, strong light-matter interactions in chalcogenides, heterointerfaces of traditional semiconductors with functional oxides, stable and all-inorganic perovskites for high-efficiency solar cells, rational design of new functional semiconductors, control over defects and dopants, advances in synthesis, theory and modeling, and characterization. This symposium will provide an international and interdisciplinary forum for researchers with expertise in theory and modeling, synthesis, characterization, and device fabrication and measurements to discuss key challenges and opportunities in these emerging semiconductors.

Proposed sessions

– Wide bandgap and ultra-wide bandgap semiconductor thin films and heterojunctions
– Chalcogenide semiconductors with novel optical and electrical properties
– Stable, all-inorganic perovskite semiconductors
– Integration of functional oxides with semiconductors
– Control over dopants and defects
– Rational design of functional semiconductors
– Advances in synthesis

Symposium organizers

- **Rohan Mishra**, Washington University in St. Louis, USA rmishra@wustl.edu
- Matthew Brahlek, Oak Ridge National Laboratory, USA, brahlekm@ornl.gov
- Jaekwang Lee, Pusan National University, South Korea jaekwangl@pusan.ac.kr
- Sriram Krishnamoorthy, The University of Utah, USA sriram.krishnamoorthy@utah.edu

S7 – Superconducting and Magnetic Materials: From Basic Science to Applications

Superconductivity, magnetism, and their correlation to spin, charge, and orbital order parameters are the dominant research topics in quantum material research, from fundamental research to their large-scale energy applications. Developing both theoretical and advanced characterization tools to probe these multi-orbital systems with interacting charge, spin, orbital, and lattice degrees of freedom, rational synthesis of materials with enhanced functionalities, and developing new materials platforms to enhance device performance to facilitate their application in quantum computing and spintronics, are fundamentally very interesting. Meanwhile, they are equally important for large scale energy-relevant technology applications, including high power transmission, energy and information storage, THz and GHz electronics, and processing technologies.

This symposium will bridge fundamental research and device performance/applications. We will focus on recent developments in the materials discovery, synthesis, and advanced characterization, theory of their correlated properties, device fabrications, and the engineering of these materials for applications of superconducting, magnetic, and related materials.

Proposed sessions

– New superconducting and magnetic materials
– 2D correlated materials: synthesis, characterization, and tailoring of properties
– Characterization and theory of structural, magnetic, and superconducting properties
– Tailoring magnetic and superconducting properties for applications
– Device fabrication: nanoscale to industrial

Symposium organizers

- **Bing Lv**, University of Texas at Dallas, USA, blv@utdallas.edu
- Timothy Haugan, Air Force Research Laboratory, USA tjhaugan@hotmail.com
- Gang Wang, Institute of Physics, Chinese Academy of Sciences, China gangwang@iphy.ac.cn
- Haiyan Wang, Purdue University, USA, hwang00@purdue.edu

S8 – Structure-Property Relationships in Relaxor Ceramics

Relaxor materials are finding increasing application in fields like telecommunications, energy storage, sensors, and actuators. In relaxors, the role of differently charged substituents, their distribution in the lattice, and the arrangement of polar order/disorder on multiple length scale needs to be uncovered to enable advanced property tuning. Various models (random fields theory, polar nanoregions, slush-ice and dipolar glass models, etc.) were proposed to describe relaxor behavior from an atomistic viewpoint, however no unified theory of relaxors is available yet. This symposium specifically targets the interplay of local structure, chemistry, configurational entropy, ergodic-nonergodic behavior, and instabilities induced by substitution and electric polarization on multiple length scales, and how it impacts macroscopic properties relevant for applications (energy storage, electromechanical and electrocaloric applications, among others). It welcomes contributions in the field of materials genomics, for example, with the use of high-throughput density functional theory and artificial intelligence methods applied to the science of relaxors. Both lead-based and lead-free perovskite relaxors are addressed here, together with relaxors in non-perovskite crystalline forms. Contributions involving

advanced nano- to micro-scale characterization methods in synergy with multiscale modeling are also welcome to provide key insights to better understanding the structure-property relationships in relaxors.

Proposed sessions

– Local structure of relaxors
– Multiscale modeling of relaxors
– Advanced nano- and microscale characterization methods for relaxors
– Computational materials design for relaxors
– Applications of relaxors

Symposium organizers

- **Marco Deluca**, Materials Center Leoben Forschung GmbH, Austria marco.deluca@mcl.at
- Prasanna V. Balachandran, University of Virginia, USA, pvb5e@virginia.edu
- Antonio Feteira, Sheffield Hallam University, United Kingdom, A.Feteira@shu.ac.uk
- Jiri Hlinka, Institute of Physics, Academy of Sciences of the Czech Republic Czech Republic, hlinka@fzu.cz

S9 – Ion-Conducting Ceramics

Ionic transports in functional ceramics are vital components of an increasingly demanding global energy and electronic future. Prevailing technologies ranging from clean energy production, electrical energy storage, chemical separations, and ionic memory devices will require the development of robust, highly functional conducting ceramics in either bulk, nanostructure, or thin film form. This symposium will bring together researchers from academia, government labs, and industry to discuss critical properties-process-performance relationships central to the effective development of ion-conducting ceramic materials and devices. Presentations and discussions will address technical challenges and insights across a wide range of spatiotemporal scales, address ionic transports, and consider a variety of ionic-conducting ceramics relevant to a diverse application space, e.g. energy and ionotronic applications. This symposium welcomes relevant presentations and contributions from experimental work, theory, and modeling, and advanced characterization of these technologically interesting and important materials.

Proposed sessions

– Influences of synthesis and processing conditions on ionic conduction
– Ionic-conducting ceramics for energy storage and energy conversion
– Ionic conduction in solid state batteries
– Electrostatic or electrochemical gating in ceramics via electrolytes (liquid or gel)
– Membranes for chemical separations and environmental remediation
– Theoretical and computational studies of ionic transports in functional ceramics
– Emergent and novel ionotronic devices (e.g. memristor, sensor, actuator, logic devices)

Symposium organizers

- **Hua Zhou**, Argonne National Laboratory, USA, hzhou@anl.gov
- Erik David Spoerke, Sandia National Laboratory, USA, edspoer@sandia.gov
- Wei Tong, Lawrence Berkeley National Laboratory, USA, WeiTong@lbl.gov
- Jon Ihlefeld, University of Virginia, Charlottesville, USA, jfi4n@virginia.edu

S10 – Point Defects and Transport in Ceramics

This symposium highlights experimental and computational research aimed at understanding point defect equilibria and kinetics in ceramic materials. Defect chemistry governs conductivity in electronic, ionic, and mixed-conducting ceramics, and these materials are important for numerous applications, including solid-state batteries, memristors, dielectrics, solid-oxide fuel cells, and sensors, many of which operate under extreme electrochemical conditions.

In addition, defect transport is intimately related to microstructure evolution and many material degradation phenomena. We encourage symposium contributions that help establish a greater understanding of our ability to predict, design, and control defects to enhance ceramic properties and performance, including under extreme far-from-equilibrium conditions.

Proposed sessions

– Predictive point defect energetics and equilibria from density functional theory and other computational methods
– Structure and stability of defects and defect complexes via in-situ measurement (EPR, TSDC, EXAFS, etc.)
– Point defect segregation to dislocations, surfaces, grain boundaries, and interfaces
– Defect mobility and transport behavior
– Defect mediated properties (conductivity, grain growth, creep, magnetism, ferroelectric imprint, dielectric degradation)

Symposium organizers

- **Douglas L. Irving**, North Carolina State University, USA, dlirving@ncsu.edu
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- Dong Yanhao, Massachusetts Institute of Technology, USA dongyh@mit.edu
- Derek Sinclair, University of Sheffield, United Kingdom d.c.sinclair@sheffield.ac.uk
- Roger A. DeSouza, RWTH Aachen University, Germany desouza@pc.rwth-aachen.de

S11 – Dislocations in Ceramics: Processing, Structure, Plasticity, and Functionality

In the field of functional ceramics, the importance of dislocations for materials processing and properties recently gained attention. For example, some oxides were discovered to allow considerable plastic deformation, even at room temperature as, for example, in single-crystalline strontium titanate.

Beyond purely mechanical considerations of plasticity in oxides, particular interest lies in the impact of dislocations on functional properties as, for example, thermal, electronic and ionic conductivity, and ferroelectricity. The foundation of this impact is related to the atomic structure, chemistry, and charge of dislocations in oxides, their percolation, and their response to mechanical, electrical, thermal, and chemical parameters.

Beyond properties, dislocations are considered to be of central importance for processing, for example, in the field of sintering and flash sintering, high-pressure powder processing, and aerosol deposition. These methods offer the potential to engineer materials, phases, and structures with new functionality while overcoming limitations of conventional processing.

This symposium brings together experimentalists and modelers in the field of dislocations in functional materials. While the focus is on functional oxides,

many concepts in this field are well established for metals. Accordingly, related contributions from other materials including metals are welcome as well.

Proposed sessions

– Mechanisms of plasticity in ceramics at low and high temperatures
– Modeling of dislocations, plasticity, and impact on properties
– Room temperature plasticity
– Dislocation and functionality
  » Ionic, electronic, and thermal conductivity
  » Ferroelectricity
– Applications and Techniques
  » Dislocations in ceramic processing and sintering
– Chemical and structural characterization of dislocations
– High pressure torsion
– Aerosol deposition
– Resistive switching and dislocations
– Micromechanical testing and related methods

Symposium organizers

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- Atsutomo Nakamura, Nagoya University, Japan, anaka@nagoya-u.jp

S12 – Evolution of Structure and Chemistry of Grain Boundaries and Their Networks as a Function of Material Processing

Electronic and mechanical properties that control the function of ceramic devices, like capacitors and sensors, are highly dependent on the structure and chemistry of grain boundaries and the subsequently formed grain boundary network. The atomic structure, bonding configuration, defect distribution, segregation behavior of these boundaries, and the overall microstructure of the system, are altered by material processing techniques. Developing a fundamental understanding of the effect of processing techniques on modifying interfaces, and in turn, impacting the microstructure of ceramic materials is needed in order to tailor their properties and optimize their application in device technology.

This symposium explores fundamental research into the modifications of interfacial structure and composition as well as microstructure evolution in functional materials as it relates to processing techniques. These processing techniques include sintering, electric fields, high temperature and cryogenic application, and gas environment.

Proposed sessions

– Interface structure and chemistry
  » Atomic structure, chemistry, bonding configuration
  » Defect and segregation behavior
  » In-situ microscopy evaluation
– Microstructure evolution
  » Grain growth and mobility
  » Nanocrystalline ceramics
  » Material properties
– Processing parameters
  » Mechanical and electric fields (SPS, FAST, HIP, etc.)
  » Extreme temperatures (cold sintering, SPS, etc.)
  » Environments (oxygen, hydrogen, etc.)

Symposium organizers

- **Lauren Hughes**, Lawrence Berkeley National Laboratory, USA lauren.an.hughes@gmail.com
- Wolfgang Rheinheimer, Technische Universität Darmstadt, Germany wolfgang.rheinheimer@gmail.com
- James Wollmerhauser, Naval Research Laboratory, USA james.wollmershauser@nrl.navy.mil
- Edward Gorzkowski, Naval Research Laboratory, USA edward.gorzkowski@nrl.navy.mil

S13 – 5G Materials and Applications Telecommunications

As 5th generation (5G) communication systems prepare for rollout, 5G millimeter-wave (mmWave) handsets are still in field tests because of poor energy efficiency that cause systems to overheat and turn off. New technologies spanning the space between analog and digital electronics require innovations in material science and measurement to facilitate commerce in the mmWave regime. Novel materials can help manufacturers tackle 5G challenges by accessing fundamental physics including phase transitions, controlling loss, enhancing transport, physical models, etc. In this symposium, we kick off a discussion between worldwide experts from academia, government labs, and industry to identify how ceramics can help. Presentations and discussions will address technical challenges and insights across a wide range of topics, ranging from materials-by-design to proof-of-concept device development, all of which are relevant to a diverse application space. The broader impacts of this symposium will facilitate innovations in mmWave technology.

Proposed sessions

– The millimeter-wave race: industry
– Materials-by-design for telecommunications applications
– 5G materials synthesis
– Metrology and characterization of materials
– Microwave and millimeter-wave devices

Symposium organizers

- **Nate Orloff,** National Institute of Standards and Technology, USA orloff@nist.gov
- Mitch Wallis, National Institute of Standards and Technology, USA thomas.wallis@nist.gov
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ELECTRONIC MATERIALS AND APPLICATIONS 2021

S14 – Agile Design of Electronic Materials: Aligned Computational and Experimental Approaches and Materials Informatics

Given the pressing requirements for new high-performance electronic and other functional materials to meet important application needs, both computational and experimental approaches are required to understand unusual phenomena and to design new classes of materials. The collaborative effort between the two disciplines allows for an efficient exploration of materials property landscape, with the potential to mitigate cost, risk, and operation time for taking materials from research to manufacturing. In addition, it could yield valuable insights into the fundamental factors underlying materials behavior. This symposium will bring together materials scientists and engineers from academia, industry, and national laboratories to discuss cutting-edge methods within a broad range of materials modeling, experiments, and materials informatics-driven efforts, aimed primarily at electronic materials, which may benefit from methodological developments for other applications as well.

Proposed sessions

- Materials by design: emerging computational/experimental strategies for searching, designing, and discovering new electronic materials
- High-throughput computational/experimental screening, data mining, machine learning, and materials informatics
- Multiscale modeling (first principles, force fields, phase field, statistical mechanics, etc.) and computational tools for energy storage and conversion
- Novel phenomena at interfaces and heterostructures: synthesis, characterization, and modeling of interface-driven functional materials
- Predictive modeling, experimental synthesis, and characterization of novel electronic materials:
  - » Topological quantum materials (such as topological insulators, topological semimetals, and quantum magnets)
  - » Functional (hybrid) perovskite materials
  - » Stoichiometry control and polymorphic expressions in functional electroceramics
  - » Low-dimensional electronic materials (quantum dots, nanowires, 2D materials, and related systems)

Symposium organizers

- **Mina Yoon**, Center for Nanophase Materials Science, Oak Ridge National Laboratory, USA, myoon@ornl.gov
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- Payam Kaghazchi, Forschungszentrum Jülich GmbH, Germany p.kaghazchi@fz-juelich.de
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S15 – Functional Materials for Biological Applicationss

Functional biomaterials that actively communicate with the body by monitoring body functions, delivering drugs at a specific target, or by promoting tissue recovery, are in high demand. Mechanical, electrical, and biochemical boundary conditions vary significantly depending on the location within the body or the diagnostic aim of a lab on chip device. As a result, biomaterials have to be tailored toward their specific boundary conditions. In addition, they have to remain reliably functional for the duration of their task, which can be up to several decades.

This symposium will provide an interdisciplinary forum to discuss demands and challenges in materials and device development for functional biomedical applications. Topics will span from advances in material synthesis and processing to specialized characterization techniques, as well as strategies necessary to bridge the gap from lab to clinic.

Proposed sessions

- Synthesis, functionalization, and characterization of piezoelectric and other functional ceramic-based biomaterials
- Therapeutic, diagnostic, and biosensing applications
- Lab on a chip, BioMEMs
- Approaches for benchtop to clinic translation
- Emerging materials

Symposium organizers

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