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ABSTRACTS DEADLINE SEPTEMBER 6, 2019

ELECTRONIC MATERIALS AND APPLICATIONS (EMA 2020)

ORGANIZED BY THE ACerS ELECTRONICS AND BASIC SCIENCE DIVISIONS

January 22 – 24, 2020 | DoubleTree by Hilton Orlando at Sea World Conference Hotel | Orlando, FL, USA

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Electronic Materials and Applications (EMA 2020)

Organized by the ACerS Electronics and Basic Science Divisions

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INTRODUCTION

Electronic Materials and Applications 2020 (EMA 2020) is an international conference focused on electroceramic materials and their applications in electronic, 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 2020 will take place at the DoubleTree by Hilton Orlando at Sea World January 22–24, 2020.

EMA 2020 is designed for researchers, engineers, technologists, and students interested in basic science, engineering, and applications of electroceramic materials. Speakers include an international mix of university, industrial, and federal laboratory participants exchanging 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 includes several networking opportunities to facilitate collaborations for scientific and technical advances related to materials, components, devices, and systems. The Basic Science Division will host a tutorial session in addition to the regular conference programming, and a special award-finalist symposium will feature some of the top undergraduate and graduate student researchers in the field.

The grand finale of the meeting will again be the popular 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!

ORGANIZING COMMITTEE

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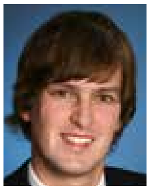

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TECHNICAL PROGRAM

S1: Characterization of Structure-Property Relationships in Functional Ceramics

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

This symposium provides a bridge between the Basic Science and Electronics Divisions. Half of the symposium will focus on rapidly developing experimental techniques best suited for characterizing functional ceramics, including in-situ methods, while the other half will focus on the use of these techniques, together with existing experimental and modelling approaches, to answer open structure-property questions. Materials of interest include, but are not limited to, energy storage materials, ferroics and multiferroics (ferroelectrics, electrocalorics, magnetoelectrics, relaxors), flexoelectrics, optical materials, quantum materials, etc. The symposium is aimed at exposing scientists to new characterization techniques and unfamiliar research questions, to bring about 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. One session will focus on the work of early career researchers (untenured or newly tenured). Contributions integrating novel applications of machine learning and other computational tools to predict and interpret diffraction and microscopy data are also welcome.

Proposed sessions

– 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**, The Ohio State University, USA, mccomb.29@osu.edu
- Abhijit Pramanick, City University of Hong Kong, China, apramani@cityu.edu.hk
- Christopher Fancher, OakRidge National Laboratory, USA, fanchercm@ornl.gov
- James LeBeau, Massachusetts Institute of Technology, USA, lebeau@mit.edu
- Hadas Sternlicht, Brown University, USA, hadas_sternlicht@brown.edu

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

This symposium will 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

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

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

Complex oxides offer an extremely wide range of properties not observed in conventional metals or compound semiconductors. Further, in these correlated materials, new emergent phenomena may arise at intrinsic homointerfaces such as domain walls. This symposium will focus on the interdisciplinary topics related to the physics, materials science, and engineering within the field of ferroic oxides, domains, and domain walls. The topical list for this symposium reflects the materials needs and challenges within the field, with emphasis on synthesis, ferroic domain/domain wall architecture-property correlations, and exploratory devices. The speakers will span the breadth of these interdisciplinary topics in order to accelerate the 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, medical devices

Symposium organizers

- **John Heron**, University of Michigan, USA, jtheron@umich.edu
- Jiamian Hu, University of Wisconsin Madison, jhu238@wisc.edu
- Josh Agar, Lehigh University, joshua.agar@lehigh.edu

S4: Complex Oxide Thin Film Materials Discovery: From Synthesis to Strain/Interface Engineered Emergent Properties

This symposium focuses on recent advances in complex oxide thin films, heterostructures, and nanocomposites. Topics of interest include strain-stabilization, heterostructure interface engineering, emergent interfacial properties, new materials discovery, field tunable responses, device applications, advanced measurement/characterization methods, 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.

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; understanding the relationship between process space and equilibrium defect chemistry; strain induced defects and 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, ionic, and photonic responses, as well as thermal transport phenomena, including 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
- Synthesis and properties of high entropy complex oxides
- The effects of film growth conditions on strain, interface, and functional properties
- New materials/structures enabled via controlled synthesis
- Characterizations of strain, defects, and interface
- Strain relaxation and its correlation to functional properties
- Strain, microstructures and functionality tuning in lateral and vertical nanocomposites
- Phenomena arising from strain couplings and interface couplings, including quantum phases and topological states
- Interface phenomena induced by charge redistribution, magnetic, electronic and orbital reconstructions, intermixing, structural distortion, etc.
- Control of interface phenomena via external stimuli such as electric and magnetic fields, and light
- Strain and interface-controlled device performance in energy harvesting, memories, sensors, etc.

Symposium organizers

- **Elizabeth Paisley**, Sandia National Laboratories, USA, eapaisl@sandia.gov
- Hyoungjeen Jeen, Pusan National University, South Korea, hjeen@pusan.ac.kr
- Jon-Paul Maria, Pennsylvania State University, USA, jpm133@psu.edu
- James Rondinelli, Northwestern University, USA, jrondinelli@northwestern.edu
- Sean Smith, Sandia National Laboratories, USA, ssmith5@sandia.gov
- Judith L. MacManus-Driscoll, University of Cambridge, United Kingdom, jld35@cam.ac.uk
- Yingge Du, Pacific Northwest Laboratory, USA, yingge.du@pnnl.gov
- Aiping Chen, Los Alamos National Laboratory, USA, apchen@lanl.gov

S5: Mesoscale Phenomena in Ferroic Nanostructures: Beyond the Thin-Film Paradigm

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 belong to a region 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 may involve the influence of layering, composition variation, and ionic diffusion. This symposium will theoretical modeling, synthesis, characterization, processing, and applications of ferroic nanostructures, with a primary focus on the influence of shape, size, morphology, and interaction strength on their properties and functional behavior.

Symposium organizers

- **Edward Gorzkowski**, Naval Research Laboratory, USA, edward.gorzkowski@nrl.navy.mil
- Serge M. Nakhmanson, University of Connecticut, USA, serge.nakhmanson@uconn.edu
- Seungbum Hong, KAIST, Daejeon, Republic of Korea, seungbum@kaist.ac.kr

S6: Complex Oxide and Chalcogenide Semiconductors: Research and Applications

Many technologies that power the information age are based on covalent semiconductors such as Si and GaAs. Despite this success, harnessing phenomena such as magnetism, superconductivity, metal-insulator transitions, ferroelectricity, etc. (and coupled combinations thereof) for future applications requires a thorough understanding of electronic materials with varying degrees of iconicity and structural complexity. To this end, this symposium will bring together scientists and engineers to discuss the status and the outlook for research and applications of emerging oxide and chalcogenide semiconductors broadly, with an emphasis on the common challenges and opportunities in complex-structured materials. Complex structure is meant to include both atomic structure (e.g. perovskites, spinels, delafossites) and nanometer-scale structure (e.g. heterostructures, superlattices, nanocrystals). Topics to be covered include a wide range of studies from theory, materials synthesis, and characterization, to devices and applications.

Proposed sessions

- Theoretical materials design
- Making complex-structured semiconductors
- Advanced characterization of physical and chemical properties
- Low dimensional systems: layered materials and nanocrystals
- Applications in next-generation technology

Symposium organizers

- **Rafael Jaramillo**, Massachusetts Institute of Technology, USA, rjaramil@mit.edu
- **Ryan Comes**, Auburn University, USA, ryan.comes@auburn.edu
- Andriy Zakutayev, National Renewable Energy Laboratory, USA, Andriy.Zakutayev@nrel.gov
- Jian Shi, Rensselaer Polytechnic Institute, USA, shij4@rpi.edu

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

The discovery and subsequent applications of superconducting and magnetic materials has been a topic of much research spanning the scale from large-scale energy applications at one end to quantum computing at the other. From a fundamental perspective, the elucidation of the fundamental physics underlying these materials through highly advanced characterization techniques is of extreme interest. From the perspective of applications, the tailoring of the structure-property relationship through defect engineering and doping will fully harness the capabilities of these materials. Of additional importance is meso-scale engineering for the development of these materials for devices (e.g. superconducting wires, magnetocalorics, grain boundary engineering, etc.).

This symposium will cover recent developments in the discovery, characterization, and applications of superconducting and magnetic materials. Focus will be paid to new discovery paradigms, advanced characterization and theory of correlated properties, and the engineering of these materials for applications ranging from nanoscale to large-scale.

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

- **Gang Wang**, Institute of Physics, Chinese Academy of Sciences, China, gangwang@iphy.ac.cn
- Michael Susner, Air Force Research Laboratory, USA, mike.susner@gmail.com
- Timothy Haugan, Air Force Research Laboratory, USA, tjhaugan@hotmail.com
- Haiyan Wang, Purdue University, USA, hwang00@purdue.edu
- Charles Rong, CIV US ARMY RDECOM ARL, USA, cr12102000mail@gmail.com
- Bing Lv, University of Texas at Dallas, USA, blv@utdallas.edu

S8: Structure-property Relationships in Relaxor Ceramics

Relaxor materials are finding increasing application in fields like telecommunications, energy storage, sensors, and actuators. Although it is universally accepted that relaxor behavior occurs in chemically-substituted systems, the range of phenomena leading to relaxor behavior is very broad and at large, still unclear. In particular, 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. The combination of advanced nano- to micro-scale characterization methods in synergy with multiscale modeling (from ab initio to molecular dynamics) can be expected to deliver key insights to better understand the structure-property relationships in relaxors. This symposium targets specifically the interplay of local structure, chemistry, and instabilities induced by substitution and electric polarization on multiple length scales, and how it impacts macroscopic properties relevant for application. Both lead-based and lead-free perovskite relaxors will be addressed, together with relaxors in non-perovskite crystalline forms.

Proposed sessions

– Local structure of relaxors: from polar nanoregions to dipolar glass behavior
– Multiscale modelling of relaxors
– Advanced nano- and microscale characterization methods for relaxors
– Perovskite relaxors
– Non-perovskite 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 to electrical energy storage and chemical separations will require the development of robust, highly functional conducting ceramics. 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 ceramics. Presentations and discussions are expected to 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 battery
– 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, which are important for numerous applications including solid-state batteries, memristors, dielectrics, solid-oxide fuel cells, and sensors. Furthermore, 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 defect equilibria to enhance ceramic properties and performance.

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

- **Elizabeth Dickey**, North Carolina State University, USA, ecdickey@ncsu.edu
- 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: New Directions in Sintering and Microstructure Control for Electronic Applications

The development of new sintering techniques, such as field assisted sintering, spark plasma sintering, flash sintering, laser flash sintering, and cold sintering, has led to material consolidation at significantly lower temperatures and shorter times. Microstructure formation and corresponding structure-property relations of materials consolidated using these new techniques need to be determined for the optimum performance of redox materials, sensors, ferroelectric actuators, dielectrics, as well as oxygen- and lithium-ion conductors. Tailoring the materials' sintering behavior, microstructure, grain boundary structure, local defect distribution, space charges, anisotropy of transport processes at interfaces, and texture enables new applications in energy harvesting and storage.

This symposium covers the fundamental understanding of sintering and grain growth in functional materials as well as their application to current technological challenges. Special emphasis is on new sintering techniques that go beyond traditional thermal processing.

Proposed sessions

- Current issues in sintering science
- Laser flash sintering
- Selective laser sintering for additive manufacturing
- Cold sintering and hydrothermal processing
- Constrained sintering of multilayered materials
- Nanosintering
- Sintering in solid state batteries

Field-assisted techniques

- Spark plasma sintering: science and application
- Impact of electric fields on interfacial thermodynamics, segregation, and transport
- Electric field effects on sintering and grain growth

Sintering and grain growth: transport and thermodynamics

- Grain boundary and interface anisotropy effects
- Effects of interface structural transitions
- Liquid phase sintering and transient liquid phase sintering
- In situ measurements of sintering and grain growth
- Grain growth control approaches
- Modelling and simulation of microstructural evolution

Symposium organizers

- **Wolfgang Rheinheimer**, Purdue University, USA, rheinheimer@purdue.edu
- Lauren Hughes, Lawrence Berkeley National Laboratory, USA, lauren.an.hughes@gmail.com
- John Blendell, Purdue University, USA, blendell@purdue.edu
- Klaus van Benthem, University of California Davis, USA, benthem@ucdavis.edu

S12: Electronic Materials Applications in 5G Telecommunications

Currently, there is a worldwide race to implement millimeter-wave (mmWave) technologies for 5th generation (5G) communication systems and win a piece of the $5.6T telecommunications gross revenue. 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 the 5G challenges by accessing fundamental physics including phase transitions, controlling loss, enhancing transport, physical models, etc. In this symposium, we identify how ceramics can help. Presentations and discussions are expected to 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

- Invited panel: What is 5G and how can materials help?
- 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
- Geoff Brennecka, Colorado School of Mines, USA, geoff.brennecka@mines.edu
- Ling Cai, Corning, USA, CaiL@corning.com
- Turan Birol, University of Minnesota, USA, tbirol@umn.edu

S13: Thermal Transport in Functional Materials and Devices

Thermal energy in electronic materials and their associated devices can be either an unwanted byproduct or a technological enabler, depending on the application (e.g., microelectronics versus pyroelectrics). Thermal conductivity, heat capacity, and thermal diffusivity must be optimized for device performance according to the type of device. Consequently, a fundamental understanding of thermal transport properties, heat storage characteristics, and thermo-electronic property coupling are critical to many electronic materials and devices. This symposium explores the basic science of thermal properties in electronic materials with a focus on enabling electronic devices and applications. Relevant topics include carrier transport and multi-carrier interactions in solids, nanosystems, and across interfaces. It also encourages contributions on technological aspects of the use and control of thermal energy (e.g., refrigeration), and aims to increase interactions between the thermal sciences and materials research communities, as well as those designing electronic devices by enabling discussions about the interdependencies between defect chemistry/microstructure and the resultant thermophysical properties, property optimization, caloric effects, interface engineering, heat exchange, and related applications.

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Proposed sessions

- Fundamentals of thermal transport within materials and across interfaces
- Materials development and structure-thermal property relationships
- Thermal transport in low-dimensional materials/systems (2D transition metal dichalcogenides, electron/hole gases, topological insulators, etc.)
- Computational methods for material and device optimization
- Dynamic thermal properties of materials and applications
- Thermal management and metrology of electronic devices (transistors, diodes, lasers, etc.)
- Materials for thermal management in extreme environments

Symposium organizers

- **Brian M. Foley**, Georgia Institute of Technology, USA, brian.m.foley@gatech.edu
- Brian F. Donovan, United States Naval Academy, USA, bdonovan@usna.edu

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

Given the pressing requirements for new high-performance electronic 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 exploring novel material properties quickly, with the potential to mitigate the cost, risk, and operation time, for taking materials from research to manufacturing. Further, it could yield valuable insights into the fundamental factors underlying materials behavior. This symposium will discuss current state-of-the-art (and future outlook) methods within a broad range of materials modeling, experiments, and materials informatics-driven efforts, aimed primarily at electronic materials.

Proposed sessions

- Materials by design: computational/experimental emerging 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, etc.) and computational tools for energy storage and conversion
- Novel phenomena at interfaces and heterostructures: interface driven functional materials (such as novel quantum materials and perovskites) and experimental synthesis challenges and modeling
- 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
- Aloysius Soon, Yonsei University, South Korea, aloysius.soon@yonsei.ac.kr
- Sergey Levchenko, Skolkovo Institute of Science and Technology, Russia, s.levchenko@skoltech.ru
- Payam Kaghazchi, Institut für Energie und Klimaforschung (IEK-1), Forschungszentrum Jülich, Germany, p.kaghazchi@fz-juelich.de

S15: Functional Materials for Biological Applications

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. Furthermore, they have to remain reliably functional for the duration of their task, which can be up to several decades.

This symposium will discuss the 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 to 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

- **Jennifer Andrew**, University of Florida, USA, jandrew@mse.ufl.edu
- Julia Glaum, Norwegian University of Science and Technology, Norway, julia.glaum@ntnu.no

S16: Molecular, Inorganic, and Hybrid Ferroelectrics for Optoelectronic and Electronic Applications

In recent years, metal-halide perovskites have enabled various optoelectronic applications such as highly-efficient solar cells and light-emitting diodes. These materials and other molecular, inorganic, and hybrid ferroelectrics are also beginning to attract significant attention for their promising ferroelectric and electromechanical properties. As we understand more about the fundamentals of these materials, strong parallels with material properties that were pioneered in metal oxide ceramics are starting to emerge. Of particular interest is the ferroelectric modulation of charge carrier transport and the influence of domain structures and topological features.

As the optoelectronic application of these materials marches forward and the ferroelectric and electromechanical possibilities continue to grow, this symposium aims at bringing together scientists from optoelectronics and energy research, with material scientists from ceramics and crystallography to discuss new opportunities in this area. The symposium will be split into two main sessions focused on optoelectronics and ferroelectric/electromechanical material properties as well as applications.

Proposed sessions

- Optoelectronic functionality and applications
- Ferroelectric and electromechanical functionality and applications

Symposium organizers

- **Alexander Colsmann**, Material Research Center for Energy Systems (MZE), Karlsruhe Institute of Technology, Germany, alexander.colsmann@kit.edu
- Tobias Leonhard, Material Research Center for Energy Systems (MZE), Karlsruhe Institute of Technology, Germany, tobias.leonhard@kit.edu
- Julian Walker, Department of Materials Science and Engineering, Norwegian University of Science and Technology, Norway, julian.walker@ntnu.no
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