2018

CONFERENCE ON ELECTRONIC AND ADVANCED MATERIALS

ceramics.org/eam2018

January 17 – 19, 2018 | DoubleTree by Hilton Orlando at Sea World Conference Hotel | Orlando, Fla., USA

CALL FOR PAPERS!

Abstracts due on Sept. 6, 2017

The 2018 meeting has expanded programming and is organized by ACerS Electronics and Basic Science Divisions.

The American Ceramic Society
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INTRODUCTION

The 2018 Conference on Electronic and Advanced Materials (formerly Electronic Materials and Applications) is an international conference focused on fundamental properties and processing of ceramic and electroceramic materials and their applications in electronic, electro/mechanical, magnetic, dielectric, and optical components, devices, and systems. Jointly programmed by the Electronics Division and Basic Science Division of The American Ceramic Society, EAM 2018 will take place at the DoubleTree by Hilton Orlando at Sea World® January 17–19, 2018.

EAM 2018 is designed for researchers, engineers, technologists, and students interested in basic science, engineering, and applications of electroceramic materials. Speakers include an international mix of academic, industrial, and national laboratory participants exchanging information and ideas on the latest developments in theory, experimental investigation, and applications of electroceramic materials. Students are especially encouraged to participate in the meeting. Prizes will be awarded to students making the best oral and poster student presentations.

The technical program includes plenary talks, invited lectures, contributed papers, poster presentations—including an interactive multimedia experience for a few featured posters—and open discussions. EAM 2018 features symposia focused on complex oxide and chalcogenide semiconductors, thermal energy conversion, multifunctional nanocomposites, superconductors, ion-conducting ceramics, and materials for millimeter-wave applications. Other symposia emphasize broader themes covering sustainable processing, microstructural evolution, and integration; effects of surfaces and interfaces on processing, transport, and properties; mesoscale phenomena; and computational design of materials.

EAM 2018 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 on "Defect Chemistry in Perovskite Ceramics and Its Impact on Materials Processing and Properties," and special lunchtime sessions geared toward young professionals will discuss the impact of the Divisions' work for society. The grand finale of the meeting again will be the popular session titled "Failure: The Greatest Teacher." We invite anyone interested to submit a brief abstract for this educational and engaging event that concludes the meeting.

We are pleased to build upon the success of this conference series by again providing a distinctive forum to address emerging needs, opportunities, and key challenges in the field of advanced and/or electronic materials and applications. This meeting will continue to highlight the most recent scientific advances and technological innovations in the field and to facilitate the interactions and collaborations that will help shape its future.

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

ORGANIZING COMMITTEE

Gibbons

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2016-2017 OFFICERS

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Chair: **Xingbo Liu**

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Programming chairs:
Wayne Kaplan and **John Blendell**

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Brady Gibbons, Jon Ihlefeld, Rick Ubic

ABSTRACT SUBMISSION INSTRUCTIONS

- Visit **ceramics.org/eam2018** to review session topics.
- Select "Submit Abstract" to be directed to the Abstract Central website. Abstract title and text character limit (including spaces) is 1,500 characters.

If you have questions, please contact **Marilyn Stoltz** at **mstoltz@ceramics.org** or +1 614-794-5868.

Submit your abstracts at

https://eam2018.abstractcentral.com/admin

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PLENARY SPEAKERS

Driscoll

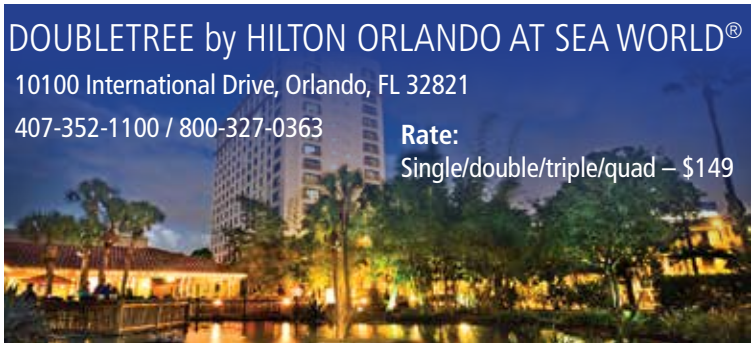
Judith Driscoll

Department of Materials Science and Metals, University of Cambridge

de Souza

Roger de Souza

Institute of Physical Chemistry, RWTH, Aachen University, Germany

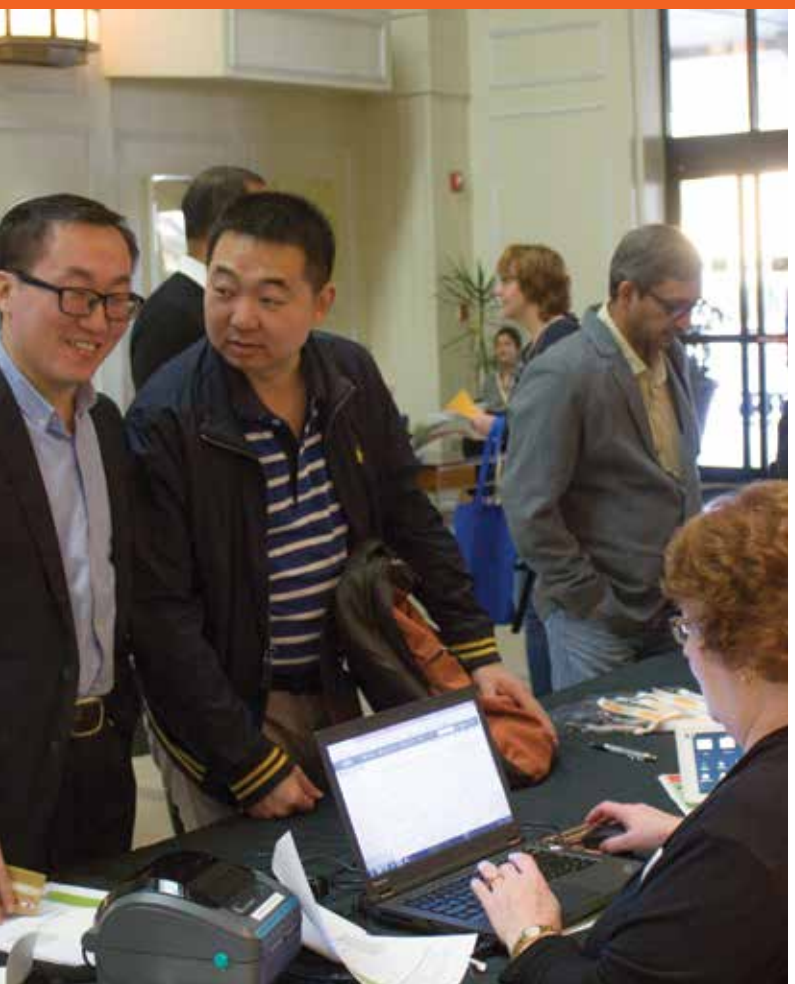


OFFICIAL NEWS SOURCES

AMERICAN CERAMIC SOCIETY bulletin
emerging ceramics & glass technology

CeramicTechToday
FROM THE AMERICAN CERAMIC SOCIETY

ELECTRONICS DIVISION PROGAM



S1. Complex oxide and chalcogenide semiconductors: Research and applications

Many technologies that power the information age are based on covalent semiconductors. Despite this success, harnessing phenomena, such as magnetism, superconductivity, metal–insulator transitions, ferroelectricity (and coupled combinations thereof) for future applications require a thorough understanding of electronic materials with varying degrees of ionicity. This symposium broadly discusses the status and the outlook for research and applications of emerging complex oxide and chalcogenide materials, with a specific emphasis on the common challenges and opportunities in the fields of complex oxides and chalcogenide semiconductors. The symposium covers studies from theory, materials synthesis, characterization, devices, and applications.

Proposed session topics

- Theoretical methods
- Synthesis and characterization techniques
- Low-dimensional systems
- Physical and chemical properties
- Emerging materials

Symposium organizers

– **Jayakanth Ravichandran**, University of Southern California, USA; jayakanr@usc.edu
– Bharat Jalan, University of Minnesota, USA
– Rafael Jaramillo, Massachusetts Institute of Technology, USA
– Anderson Janotti, University of Delaware, USA
– Yuval Golan, Ben Gurion University of the Negev, Israel
– Ryan Comes, Auburn University, USA

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S2. Energy applications of electronic and ferroic ceramics: Synthesis, characterization, and theory

The growing use of ferroic ceramics in energy applications has led to increasing activity worldwide in their synthesis, theory, computation, and characterization. The many degrees of freedom and coupling of order parameters in ferroic systems present new opportunities in caloric materials, including electrocalorics, magnetocalorics, and elastocalorics. In ferroelectric materials, for example, electrothermal properties of ceramics are enabled by phase transformations, domain phenomena, and exotic polarization/magnetization/strain configurations in ferroelectric/magnetic/multiferroic systems, such as formation of skyrmions and vortex patterns. Furthermore, the application of multiferroics in caloric applications includes the development of combined caloric properties depending on electrical and magnetic phenomena. Generally, mechanical energy harvesting photovoltaic and photoferroelectric properties enable applications in novel environments.

This symposium brings together scientists working broadly in the field of energy applications of ferroic ceramics. Key directions include modeling domain phenomena in phase transformations, spanning mesoscopic/atomistic/continuum level modeling; ferroic oxide synthesis, including nanocomposite, multilayer, nanoscale, and mesoscale materials; novel techniques related to characterization of materials and measurement of properties; and systems-level analysis of ferroic materials in energy applications. Invited speakers address these four aspects and high-temperature applications (chemical and structural stability), the design of photovoltaic/pyroelectric/piezoelectric devices, and potential applications related to integrated circuits.

Proposed session topics

- Processing
- Characterization
- Systems and devices
- Theory/modeling

Symposium organizers

– **Paul G. Evans**, University of Wisconsin-Madison, USA; pgevans@wisc.edu
– S. Pamir Alpay, University of Connecticut, USA
– Brahim Dkhil, CentraleSupélec/CNRS, France
– Daniel Schreiber, U.S. Army Research Laboratory, USA
– Quanxi Jia, State University of New York at Buffalo, USA

S3. Multiscale structure–property relationships and advanced characterization of functional ceramics

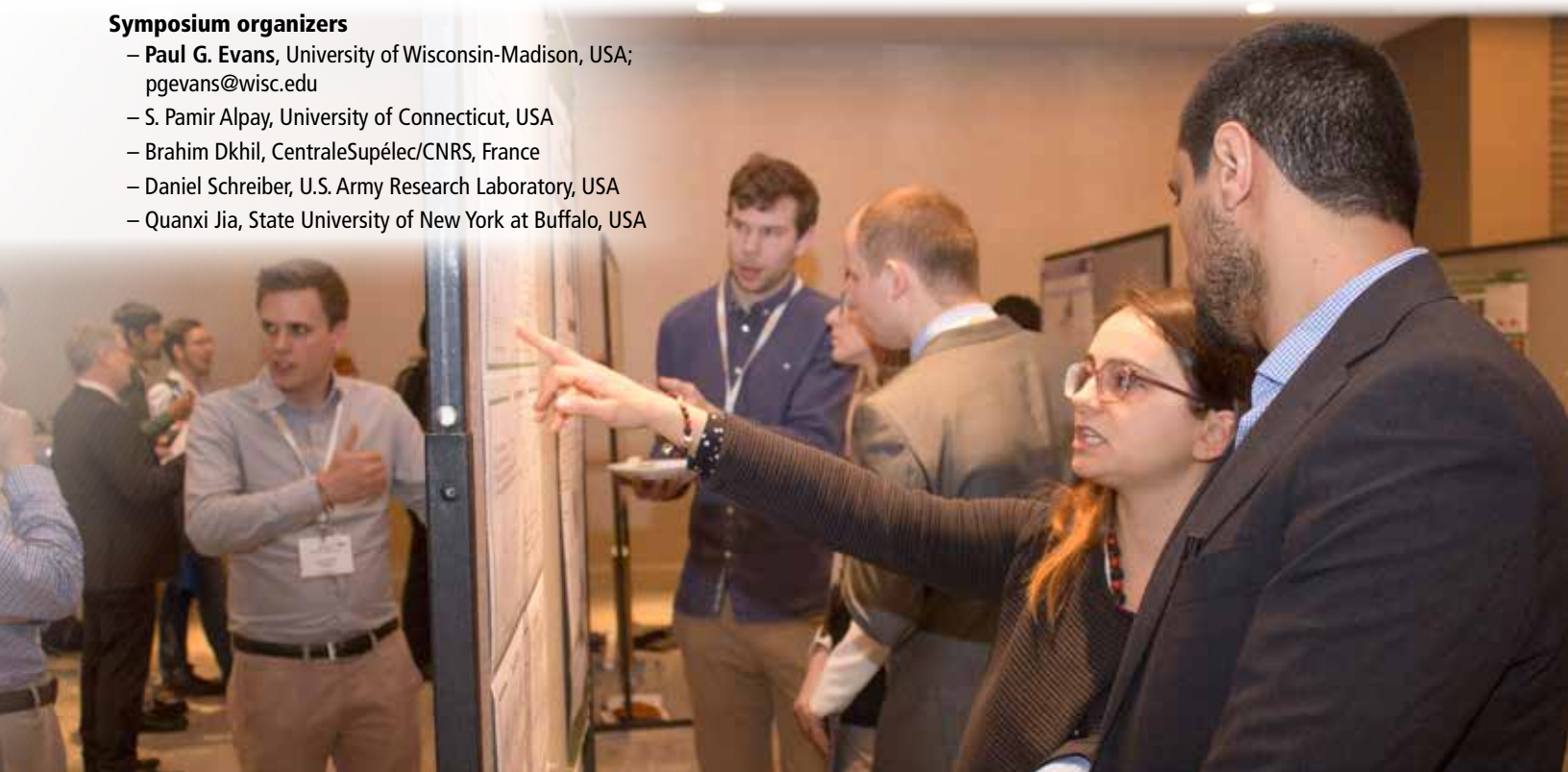
Materials characterization and modeling has evolved rapidly to address questions of structure–property relationships in multiple dimensions (2-D, 3-D, and beyond) and multiple scales (spatially and temporally) using multiple modalities (light, electron, X-ray, neutrons, etc.). However, a conscious effort is required to ensure the accomplishment of a comprehensive model for materials behavior based on the structural features present across all length and time scales. In particular, novel characterization approaches are required for materials whose atomic structures are neither truly random nor exhibit a perfect long range order. This symposium focuses on multiscale structure–property relationships in functional ceramics and the state-of-the-art imaging, analysis, characterization, and computational tools at hand to advance understanding in this area. Among the functional ceramics, featured materials that exhibit a particular necessity for a multiscale approach, namely those with an imperfect long-range order, are featured.

Proposed session topics

- Imaging and analytical techniques
- Multiscale structure–property relationships in electroceramics
- Disorder–property relationships

Symposium organizers

– **David W. McComb**, Ohio State University,USA; mccomb.29@osu.edu
– **Abhijit Pramanick**, City University of Hong Kong, Hong Kong; apramani@cityu.edu.hk
– **Julian Walker**, Pennsylvania State University, USA; jxw512@psu.edu
– John E Daniels, University of New South Wales, Australia
– Arno Merkle, Carl Zeiss Microscopy, USA
– Hugh Simons, Technical University of Denmark, Denmark



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S4. Agile design of electronic materials: Aligned computational and experimental approaches

Computational and experimental approaches are required to understand unusual phenomena and to design new classes of materials, because of the pressing requirements for new high-performance electronic materials to meet important application needs. 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 brings together materials scientists and engineers to discuss the current state-of-the-art (and future outlook) methods within various types of materials modeling, experiments, and materials informatics-driven efforts, aimed primarily at electronic materials.

Proposed session topics

- Materials by design: computational/experimental emerging strategies for searching, designing, and discovering new electronic materials
- High-throughput data generation and screening via first principles and other computations and experimental approaches
- Novel phenomena at interfaces and heterostructures: interface driven functional materials and synthesis challenges
- Theoretical challenges and development to accurate description of defects and interface properties
- Low-dimensional systems (quantum dots, nanowires, graphene, and related systems)
- Electronic and/or thermal transport in electronic materials and low-dimensional structures
- Modeling at various (and across) scales (first principles, force fields, phase field, etc.) and computational tool and method development

Symposium organizers

– **Mina Yoon**, Oak Ridge National Laboratory, USA; myoon@ornl.gov
– Venkatesh Botu, Corning Incorporated, USA
– Lan Li, Boise State University, USA
– Scott Retterer, Oak Ridge National Laboratory, USA

S5. Ion-conducting ceramics

Ion-conducting ceramics are expected to be vital components of an increasingly demanding global energy future. New technologies ranging from clean energy production to electrical energy storage and chemical separations will require the development of robust, highly functional ion conducting ceramics. This symposium brings together researchers 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 length scales (atomic to macroscopic), address cation and anion conductors, and consider a variety of ion-conducting materials relevant to a diverse application space. This symposium welcomes relevant presentations and contributions from experimental work, theory and modeling, and advanced characterization of these technologically interesting and important materials.

Proposed session topics

- Novel ion-conducting materials
- Influences of ceramic processing on ion conduction
- Cation-conducting ceramics for energy storage
- Oxygen conductors
- Membranes for chemical separations
- Computational studies in ion-transport ceramics
- Mechanisms for ion transport

Symposium organizers

– **Hui (Claire) Xiong**, Boise State University, USA; clairexiong@boisestate.edu
– Fanglin (Frank) Chen, University of South Carolina, USA
– Jeff Sakamoto, University of Michigan, USA
– Erik Spoerke, Sandia National Laboratories, USA
– Jing Xu, Iowa State University, USA

S6. Electronics materials for 5G telecommunications applications

Currently, there is a worldwide race to implement millimeter-wave (mmWave) technologies for fifth 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, loss control, transport enhancement, and physical models. In this symposium, we initiate a discussion among worldwide experts to identify how ceramics can help. Presentations and discussions are expected to address technical challenges and insights across a wide range of topics, including materials-by-design and proof-of-concept device development relevant to a diverse application space. The broader impacts of this symposium will facilitate innovations in mmWave technology.

Proposed session topics

- 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
– Chris Long, National Institute of Standards and Technology, USA
– Geoff Brennecka, Colorado School of Mines, USA

STUDENT AWARDS AND COMPETITION

The Electronics Division will continue an established tradition of strongly supporting undergraduate and graduate student participation at the EAM 2018 Conference. Six awards with cash prizes will be given at EAM 2018 for best student presentations and posters.

S7. Mesoscale phenomena in ceramic materials

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 any multiscale level approach to materials design, modeling, growth, and characterization. Furthermore, such phenomena are interesting in their own right, because many materials systems exhibit intriguing behavior with nontrivial dependence on shape, size, and geometry that is yet to be understood completely. Specifically, in complex oxides, this may include interactions among elastic, polar, and magnetic parameters as well as chemical reactions and diffusion. Simple fundamental examples include the influence of the shape of ferroelectric nanostructure on its domain configuration, fine-tuning the optical response of core–shell nanoparticles, and processes of phase separation in multicomponent systems. This symposium brings together experts to discuss the current state-of-the-art (and future directions) in theoretical modeling, synthesis, characterization, and processing of mesoscopic ceramic structures, with a primary focus on the influence of shape, size, geometry, and strength of the involved interactions on the system properties and functional behavior.

Proposed session topics

- Synthesis, characterization, and processing
- Chemistry and physics on mesoscale
- Microstructures and nanostructures
- Multiscale modeling of mesoscopic phenomena
- Device applications based on electronic and other functionalities

Symposium organizers

– **Edward Gorzkowski**, Naval Research Laboratory, USA; edward.gorzkowski@nrl.navy.mil
– Serge M. Nakhmanson, University of Connecticut, USA
– Olle Heinonen, Argonne National Laboratory,USA
– Paul Evans, University of Wisconsin, USA

S8. Multifunctional nanocomposites

This symposium provides a platform to present and discuss recent advances in the growth, characterization, design, property prediction, and study of functional properties/device applications in oxide thin-film heterostructures and nanocomposites. The goal is to create an international and interdisciplinary forum for scientists and researchers to exchange ideas and to foster collaboration. Topics include the theoretical understanding, design, and prediction of material properties using first-principles-based methods; the synthesis of oxide thin films, multilayers, and vertically aligned nanocomposites; structure, defect, and interface characterization and their relationship to material properties; and device fabrication and integration strategies with existing technologies for energy harvesting, memories, actuators, sensors, optical, electronic, and optoelectronic applications. Specific properties of interest are magnetic, electronic, ionic, and photonic responses.

Proposed session topics

- Synthesis and growth of multifunctional oxide thin films and nanocomposites, including heterostructures, layered compounds, superlattices, and vertically aligned nanocomposites
- The influence of growth, stoichiometry, doping, strain, and microstructure on the properties of nanostructured oxide thin films and vertically aligned nanocomposites
- Microstructures and defects characterization
- Strain, microstructures, and functionality tuning in vertically aligned nanocomposites
- Novel phenomena resulting from structural distortions, charge redistribution, and spin and orbital order rearrangement in the proximity of oxide interface
- Theory, modeling, and first-principles calculations of complex oxide thin films, heterostructures, and superlattices
- Functionalities, including ferroelectric, dielectric, magnetic, magnetoelectric, and photonic properties as well as electronic transport characteristics of single-phase and nanocomposite oxide thin films
- Device fabrication of oxide thin films and nanocomposites for energy harvesting, memories, actuators, sensors, optical, electronic, and optoelectronic applications
- Advanced characterizations of interfacial phenomena

Symposium organizers

– **Aiping Chen,** Center for Integrated Nanotechnologies (CINT), Los Alamos National Laboratory, USA; apchen@lanl.gov
– Hyoungjeen Jeen, Pusan National University, Korea
– James Rondinelli, Northwestern University, USA
– Judith L. MacManus-Driscoll, University of Cambridge, U.K.
– Roman Engel-Herbert, Pennsylvania State University, USA
– Junwoo Son, Pohang University of Science and Technology, Korea

S9. Substitution and sustainability in functional materials and devices

Research on functional materials and devices is rapidly evolving, and it underpins many aspects of modern life, such as energy storage devices, antennas, multicomponent sensors and actuators, and smart materials. This symposium addresses the scientific and technological demands of attaining sustainable, environmentally benign, and economically viable functional materials and devices. It deals with the design, fabrication, and optimization of thermoelectrics; electrocalorics; fuels cells; solar cells; and dielectrics. It is designed to be of interest to industrialists, solid-state physicists, solid-state chemists, and materials scientists interested in the design, fabrication, and utilization of functional materials. It also provides the perspective of industry concerning the critical sustainability and substitution issues that it perceives as paramount during the next 5–10 years.

Proposed session topics

- Energy-efficient and less hazardous materials processing
- Rare-earth- and/or lead-free replacement of functional materials
- Life-cycle assessment of functional materials and devices
- Energy materials
- Novel materials, architectures, and devices by design

Symposium organizers

– **Ian M Reaney**, University of Sheffield, U.K.; i.m.reaney@sheffield.ac.uk
– Ruzhong Zuo, Hefei University of Technology, China
– David P Cann, Oregon State University, USA
– Derek C Sinclair, University of Sheffield, U.K

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S10. Synthesis and processing science of thin films and single crystals—The details of engineering structure–property relationships

This symposium focuses on the details of synthesis science and instrumentation that advance material preparation and integration and underpin the avenues for materials discovery, new property opportunities, and extensions to performance limits. The topic is motivated by the research community's recognition that as exciting new materials are predicted and imagined, making them requires a companion of equally new and scientifically exciting synthesis tools and synthesis-monitoring techniques.

To promote an atmosphere of interactive discussion, the organizers encourage research groups to submit multiple abstracts from junior and senior members and present them in succession. The intent is for the senior member to establish the context of the challenges and opportunities and subsequent talk(s) from junior colleagues to focus on the specifics of advanced synthesis.

Proposed session topics

- Advances in thin-film, single-crystal, and 2-D layer synthesis, particularly those that access challenging processing windows and stabilize new and potentially metastable phases
- Advances in substrate design that extend thermal, chemical, and mechanical stability and provide new opportunities for epitaxy
- Synthesis methods monitored by in situ probes to better understand crystal growth
- Hybrid deposition methods that bridge PVDand CVD
- Synthesis assisted or improved by energetic impingement of ionic and electronic species
- Synthesis far from equilibrium
- Layer-by-layer methods

Symposium organizers

– **Elizabeth A. Paisley**, Sandia National Laboratories, USA; eapaisl@sandia.gov
– Jon-Paul Maria, North Carolina State University, USA
– Paul Clem, Sandia National Laboratories, USA
– Mark. D. Losego, Georgia Institute of Technology, USA
– Ronald Polcawich, U.S. Army Research Laboratory, USA

S11. Superconducting materials and applications

Recently, significant progress has been made worldwide in the application and fundamental understanding of low- and high-temperature superconductors (HTSs). For example, HTS (such as cuprates) wires and tapes are in commercial production, advances continue to be made in fabrication and application of MgB_2, and discovery of iron-based superconductors has sparked an intense search for new superconductors with high transition temperatures. This symposium covers recent developments in the processing of superconducting materials, improvements in flux-pinning via structural and defect optimization, exploration of new superconductors, progress in understanding unconventional superconductivity, and new issues for the field. The development and status of applications and the associated materials science and other issues also will be addressed.

Proposed session topics

- New superconducting materials and phenomena
- Characterization of structural, magnetic, and superconducting properties
- Issues related to the fabrication of lowcost and highperformance second-generation coated conductors
- Applications and related material issues, including wire properties

Symposium organizers

– **Gang Wang**, Institute of Physics, Chinese Academy of Sciences, China; gangwang@iphy.ac.cn
– Haiyan Wang, Purdue University, USA
– Tim Haugan, U.S. Air Force Research Laboratory, USA
– Charles Rong, U.S. Army Research Laboratory, USA

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S12. Thermal transport and storage 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). In terms of thermal transport, thermal conductivity and diffusivity must be optimized for device performance according to the type of device. Consequently, a fundamental understanding of the thermal transport properties, heat storage characteristics, and thermoelectronic 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 phonon transport, phonon storage, and phonon–electron interactions in solids, nanosystems, and across interfaces. This symposium also encourages contributions on technological aspects of the use and control of thermal energy (e.g., refrigeration) as well as developments in characterization systems and measurement standardizations. This symposium aims to increase interactions between the thermal sciences and electronic materials communities, whom often work independently of one another. This forum enables discussions about the interdependencies between defect chemistry, thermal conductivity, property optimization, caloric effects, interface engineering, heat exchange, and related applications.

Proposed session topics

- Computational methods for material and device optimization
- Fundamental physics of phonon transport and heat exchange
- Materials development, defect structure control, and analysis
- Thermal transport in low-dimensional materials
- Phonon scattering in nanocomposites and nanoscale devices
- Characterization development and standardization of measurements
- Materials for thermal management in extreme environments

Symposium organizers

– **Alp Sehirlioglu**, Case Western Reserve University, USA; axs461@case.edu
– Patrick Hopkins, University of Virginia, USA
– Brian Donovan, U.S. Naval Academy, USA
– Mark Losego, Georgia Institute of Technology, USA

S13. 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 session topics

- Advanced electronic materials, including ferroelectric, piezoelectric, dielectric, electrostrictive, and pyroelectric materials
- Materials design, new materials and structures, and their emerging applications
- Characterization of materials, crystal structure, phase transitions and electrical, mechanical, electromechanical, and other functional properties
- Reliability of electronic materials and devices

Symposium organizers

– **Shujun Zhang**, University of Wollongong, Australia; shujun@uow.edu.au
– Xiaoli Tan, Iowa State University, USA
– Kyle Webber, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany
– Satoshi Wada, University of Yamanashi, Japan
– Rudeger (Derek) Wilke, Sandia National Laboratories, USA

FAILURE: THE GREATEST TEACHER

The vast majority of scientific literature and conference talks report positive results, but there's a lot to be learned from negative results and missteps as well. After the "successful" part of the meeting closes, come hear recognized leaders in the field discuss failure—and perhaps recount some of their most spectacular learning experiences—during a frank and friendly discussion in a relaxed atmosphere. Speakers and audience alike are encouraged to check their egos at the door for this event that has turned into an EAM highlight. If you would like to speak at this symposium, please contact Geoff Brennecka (gbrennec@mines.edu).

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BASIC SCIENCE DIVISION PROGRAM

S1. Computational and data Sciences for 21st century ceramics research

According to the vision of the Materials Genome Initiative (MGI), the integration of modeling and data tools with experiment is the cornerstone of a materials innovation infrastructure for accelerating the discovery of advanced ceramics and materials in general. This symposium invites scientists and engineers to discuss the latest progress of computational modeling and data informatics and their role in advancing ceramics research in the 21st century within the MGI framework. We welcome research talks on the development of a broad range of modeling, data generation, and informatics methodology and their application to the study of structure, processing to functionality of ceramic materials, and beyond. Work with a strong connection to experiment is of particular interest.

Proposed session topics

- High-throughput computing, data mining, and materials informatics
- Theoretical and computational investigation of interfaces in materials: structure; properties; and evolution
- Multiscale modeling of materials for energy storage and conversion
- Ferroelectric, multiferroic, and other functional ceramics
- Modeling of novel materials-processing methods, such as additive manufacturing and colloidal self-assembly

Symposium organizers

– **Ming Tang**, Rice University, USA; mingtang@rice.edu

– **Jeffrey Rickman**, Lehigh University, USA; jmr6@lehigh.edu

S2. Electromagnetic field effects on ceramic processing: Fundamental mechanisms and new applications

Electromagnetic fields can have considerable impact on densification and/or grain growth in ceramics, as manifested during electric-field-assisted sintering, which includes field-assisted sintering, spark plasma sintering, and flash sintering. The fundamental mechanisms of applied electric fields on grain-boundary structures, local defect distributions, space charges, mechanical stresses, and the anisotropy of transport processes are debated in the literature. This symposium seeks to assess and critically discuss the current state of knowledge of this rapidly advancing field. The focus of the presentations is on experimental and computational investigations of fundamental atomic-scale mechanisms and their implications to macroscopic physical properties of as-processed ceramics.

Topical overlap with the symposia on "Computational Studies" and "Microstructural Evolution" are expected and intended.

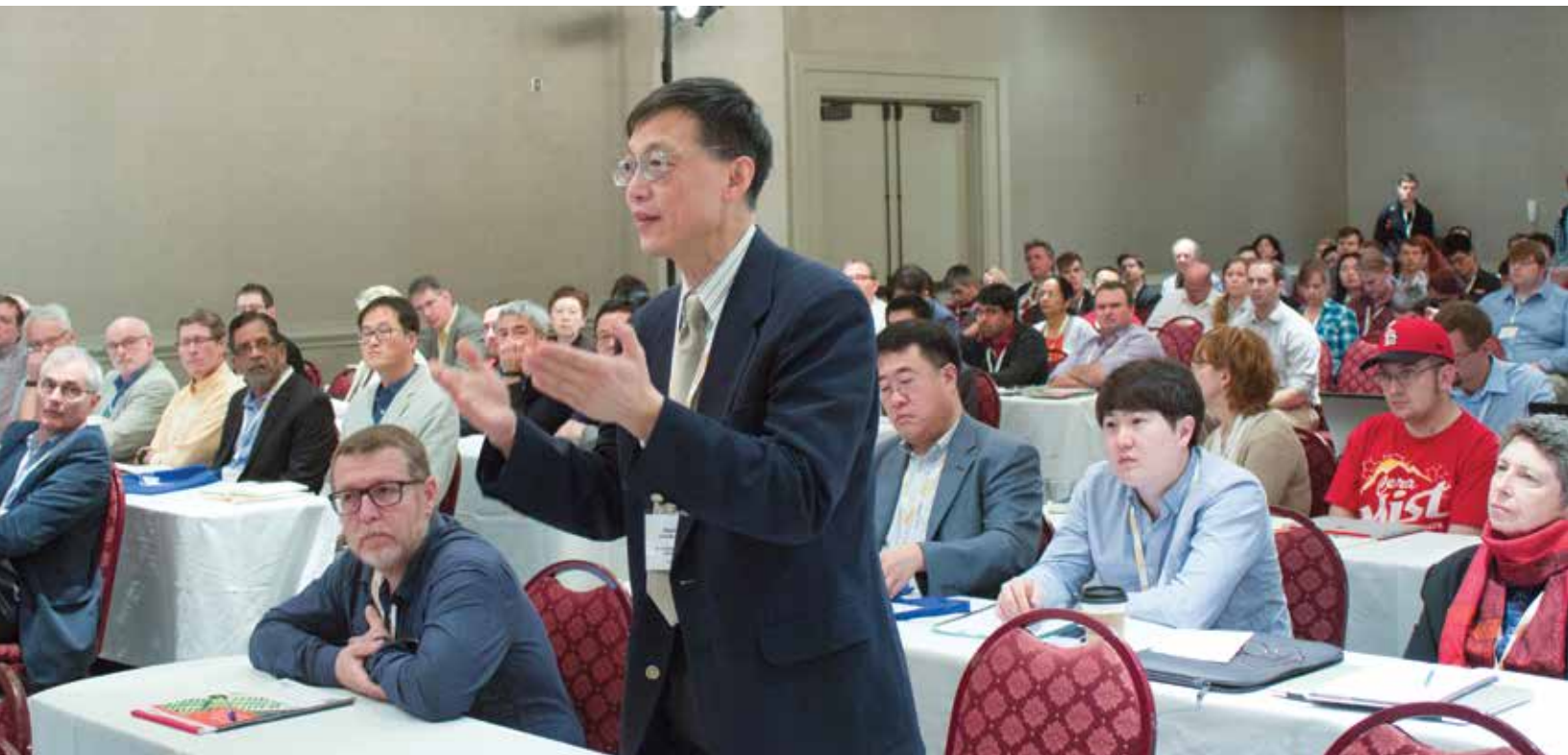
Proposed session topics

- Field effects on grain-boundary configurations
- Enhanced densification versus grain growth
- Flash sintering
- New materials and applications

Symposium organizers

– **Klaus van Benthem**, University of California, Davis, USA; Benthem@ucdavis.edu

– **Martha Mecartney**, University of California, Irvine, USA; martham@uci.edu



S3. Experimental and theoretical insights on interfaces of ceramics

Properties of ceramics depend strongly on the heterophase and homophase interfaces they contain, which can be affected by impurities or dopants. Interfacial complexions can form and undergo transitions when ceramics are heat-treated under various atmospheres. Understanding underlying mechanisms; unraveling interface structure, chemistry, and thermodynamic properties; and predicting interface complexions are keys to interface engineering and to tailoring the properties of ceramics for future applications. The aim of the session is to bring together experts in the field of interface science with a focus on the atomic structure, chemistry and energetics of interfaces, bonding, thermal stability, and other key factors to trigger discussions. This session welcomes experimental or theoretical contributions to interfacial phenomena in various ceramics, ranging from energy applications to biominerals.

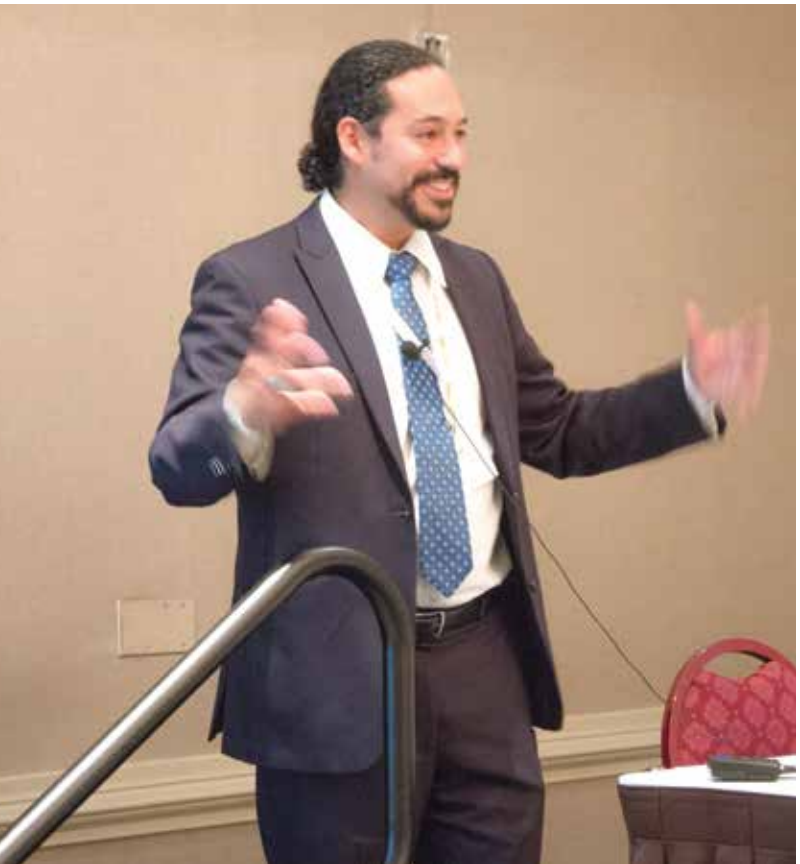
Proposed session topics

- Atomic/ionic and electronic structure of interfaces in ceramic materials
- Interface motion induced by temperature, electrical bias, mechanical stress, or magnetic field
- Interface-dominated structural and functional properties of ceramics
- Methodologies to advance understanding of interfaces

Symposium organizers

– **Christina Scheu**, Max-Planck-Institut für Eisenforschung GmbH (MPIE), Germany; scheu@mpie.de

– **Dominique Chatain**, Aix-Marseille University, CNRS, CINaM, France; chatain@cinam.univ-mrs.fr



S4. Fundamentals of mechanical response

This symposium brings together researchers working on ceramics, glasses, and/or coatings where mechanical behavior is an important attribute of the application and where there is a need to improve basic understanding of mechanical phenomena. A special focus is placed on microscale and nanoscale phenomena in layered and complex systems as well as on the coupling of mechanical behavior to other phenomena, such as ion conduction.

Proposed session topics

- Fracture
- Environmental effects
- Chemoelastic stresses
- Mechanical behavior of hierarchical and layered structures
- Contact damage and tribology
- Small-scale mechanical phenomena

Symposium organizers

– **Ivar Reimanis**, Colorado School of Mines, USA; reimanis@mines.edu

– **Gerhard Dehm**, Max-Planck-Institut für Eisenforschung GmbH, Germany; dehm@mpie.de

S5. Morphology evolution and microstructure characterization

Understanding the development of materials microstructure through experimentation, quantitative characterization, and simulations permits the materials designer to better control desired properties. This symposium focuses on morhpology evolution in polyphase, polycrystalline materials in four focus areas. Topics of particular interest include experimental observations of microstructure evolution, modeling and simulation using continuum and atomistic methods, characterization techniques that aid in identifying structural and chemical effects that control the kinetics of microstructure evolution, and new and novel processes that can be used to synthesize or select technologically important microstructural features. Contributions are welcome from authors who are studying processes in bulk or thin films as well as effects caused by wetting and adsorption on kinetic processes.

Proposed session topics

- Experimental studies of microstructure evolution
- Modeling and simulation of microstructure evolution
- Structural and chemical characterization
- Processing to control microstructure

Symposium organizers

– **Dan Lewis**, Rensselaer Polytechnic Institute, USA; lewisd2@rpi.edu

– **Helen Chan**, Lehigh University, USA; Helen.Chan@lehigh.edu

ceramics.org/eam2018

Abstracts due SEPTEMBER 6, 2017

BASIC SCIENCE DIVISION TUTORIAL

DEFECT CHEMISTRY IN PEROVSKITE CERAMICS AND ITS IMPACT ON MATERIALS PROCESSING AND PROPERTIES

In functional ceramics, the defect chemistry is of outstanding importance for the materials properties. For example, the electric or ion conductivity of ceramics is governed by point defects. But, other effects—ferroelectricity and optical properties—are impacted by defects, and microstructural evolution is closely linked to defect chemistry. However, because many applications of functional ceramics involve polycrystalline materials, a deep understanding of the bulk defect chemistry needs to be extended to the existence of charged interfaces and space charge at interfaces.

This tutorial gives a comprehensive introduction to the defect chemistry of functional ceramics in general and perovskites in particular. The reasons for the existence of charged interfaces and space charge and its interplay with defect chemistry are reviewed. Finally, the impact of these concepts on materials properties and processing is highlighted. The talks illustrate the most important tools in this field and give examples for their application.

Tutorial organizers

– **Wolfgang Rheinheimer**, Karlsruhe Institute of Technology, Germany; Wolfgang.Rheinheimer@kit.edu

– **Rachel Zucker**, University of California, Berkley, USA; rzucker@berkeley.edu

CALL FOR PAPERS Abstracts due SEPTEMBER 6, 2017

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The 2018 meeting has expanded programming and is organized by ACerS Electronics and Basic Science Divisions.

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