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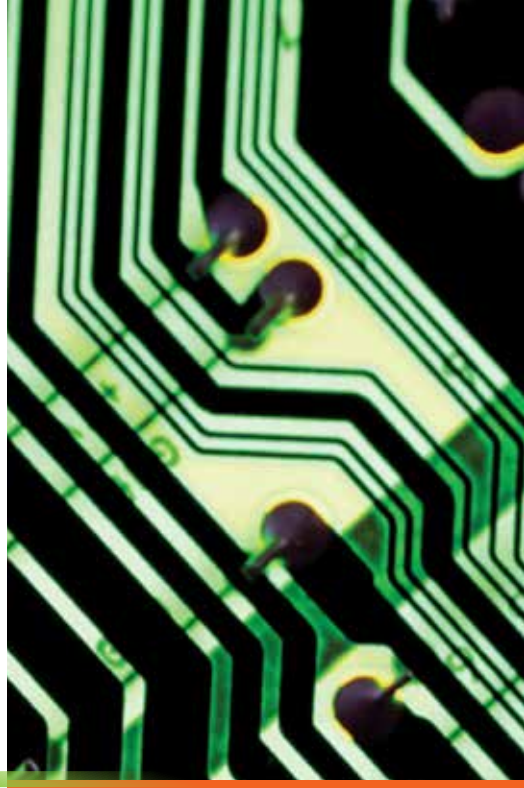
ELECTRONIC MATERIALS AND APPLICATIONS 2017



call for papers

Abstracts due by September 7, 2016

JANUARY 18 – 20, 2017

ORLANDO, FLA. USA

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ELECTRONIC MATERIALS AND APPLICATIONS 2017

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JANUARY 18-20, 2017 | DOUBLETREE BY HILTON | ORLANDO, FLA. USA

INTRODUCTION

Electronic Materials and Applications 2017 is an international conference focused on electroceramic materials and their applications in electronic, electromechanical, magnetic, dielectric, and optical components, devices and systems. Jointly programmed by the Electronics Division and Basic Science Division of The American Ceramic Society, EMA 2017 will take place at the DoubleTree by Hilton Orlando at Sea World® January 18–20, 2017.

EMA 2017 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 2017 features symposia focused on optoelectronic, magnetoelectronic, and photonic ceramics; thermal energy conversion; multifunctional nanocomposites; superconductors; ion-conducting ceramics; and materials for millimeter wave applications. Other symposia emphasize broader themes covering processing, microstructure evolution, and integration; effects of surfaces and interfaces on processing, transport, and properties; mesoscale phenomena; 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, 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 Failure: The Greatest Teacher. New this year, 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!

ABSTRACT SUBMISSION INSTRUCTIONS

Visit **www.ceramics.org/ema2017** to review session topics. Select "Submit Abstract" to access 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 614-794-5868.

OFFICIAL NEWS SOURCES

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Northwestern University

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Neil Alford
Associate provost and professor of physical electronics and thin film materials
Imperial College London

SYMPOSIA

S1. Advanced Electronic Materials: Processing, Structures, Properties, and Applications

This symposium brings together materials and engineering researchers from academia and industry to present the latest advances in electronic materials, including synthesis/processing and characterization of dielectric, piezoelectric, pyroelectric and ferroelectric materials 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, energy storage, energy harvesting, actuators, sensors, and tunable microwave devices. Other topics of interest include nanoscale domain phenomena, defect chemistry, structure-property relationships, electrocaloric behavior, and electric field induced phase transitions.

Proposed Sessions

- Advanced electronic materials, including ferroelectric, piezoelectric, dielectric, electrostrictive, pyroelectric, electrocaloric, and flexoelectric materials
- Materials design, new materials and structures, and their emerging applications
- Characterization of materials, crystal structure, phase transitions, as well as electrical, mechanical, electromechanical, and other functional properties
- Energy storage, conversion, and harvesting materials and device structures
- Lead-free piezoelectrics
- Reliability of electronic materials and devices

Symposium Organizers

Shujun Zhang, University of Wollongong, Australia; shujun@uow.edu.au
Xiaoli Tan, Iowa State University
Kyle Webber, Technische Universität Darmstadt, Germany
Satoshi Wada, University of Yamanashi, Japan
Rudeger (Derek) Wilke, Sandia National Laboratories

S2. Advanced Processing for Electronic and Electrochemical Systems: Crystals, Films and Devices

This symposium will bring together researchers from academia, government laboratories, and industry to discuss the synthesis science, integration challenges and resulting properties of advanced materials for electronic or electrochemically functional systems. Advances in mechanisms of material preparation and integration that lead to new materials discovery, new property opportunities, increased reliability, new form factors, and extensions to performance limits are of particular interest. Topics of interest include: 1) Advances in thin film, thick film, single crystal, or 2-D material synthesis, particularly those that access challenging processing windows, stabilize new phases, or create structures far from equilibrium; 2) Advances in understanding of unusual or unexpected electronic or electrochemical properties enabled by these non-equilibrium structures 3) Advances in in situ monitoring technologies that probe the structure, mechanisms, or kinetics of materials growth; 4) Advances in materials integration including designing interfaces between dissimilar materials, assembly of multi-component nanostructures, or fabrication of sophisticated device platforms.

Proposed Sessions

- Refined synthesis routes to enable and advance properties
- Controlling phase assemblage in crystals, films, and nano-layers
- Accessing and stabilizing non-equilibrium phases and nanostructures
- Managing growth with volatile species
- Using synthesis science to regulate point defects
- Theory and modeling to enhance and inform synthesis
- In situ thin film characterization to guide materials synthesis
- Interface engineering for novel properties or improved stability
- Novel substrates and electrodes
- Synthesis under extreme conditions: pressure, fields, or temperature

Symposium Organizers

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

S3. Ceramic Photonic Materials and Applications

This symposium focuses on an emerging field of ceramic based-photonic materials including but not limited to optoelectronics, transparent ceramics, photonic crystals and structures, and plasmonic materials. In the field of optoelectronic technology, transparent electronics is an emerging field concentrated on producing invisible electronic circuits and optoelectronic devices for a wide range of applications. The lack of integrated light sources is considered to be one of the main obstacles preventing the integration of silicon photonics. Therefore, the development of an efficient silicon-based on-chip light source is an important goal for advancing integrated silicon photonics. In addition, polycrystalline transparent ceramics are considered to have significant potential as a unique and versatile alternative to current optical glass and single-crystal materials for scintillators, solid-state lasers, nonlinear optics, and other optoelectronic components. The symposium is aimed at providing a forum for researchers, students, and entrepreneurs to present and discuss their recent scientific results on a wide variety of topics related to the science and engineering issues associated with ceramic photonic materials and devices.

Proposed Sessions

- Optoelectronic materials
- Nanoelectronic materials and processing
- Ceramic laser materials
- Functional transparent materials
- Optofunctional crystal materials
- Ceramic based plasmonic materials
- Ceramic based photonic materials
- Inorganic scintillation detectors
- Modeling and theory-based computation

Symposium Organizers

Yiquan Wu, Alfred University; wuy@alfred.edu
Haiyan Wang, Texas A&M University
Changzhi Gu, Institute of Physics, Chinese Academy of Sciences, China
Liangbi Su, Shanghai Institute of Ceramics, Chinese Academy of Sciences, China
Akio Ikesue, World-lab Corp, Japan

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SYMPOSIA

S4. Computational Design of Electronic Materials

Given pressing requirements for new high-performance electronic materials to meet important application needs, computational methods are required to understand unusual phenomena and to design new classes of materials. Computationally exploring the properties of novel materials has the potential to mitigate costs, risks and time involved in preparation and testing of potentially useful materials, and 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 current state-of-the-art (and future outlook) within various types of materials modeling and incorporated experiments and materials informatics efforts, aimed primarily at electronic ceramic materials.

Proposed Sessions

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

Symposium Organizers

Mina Yoon, Center for Nanophase Materials Science, Oak Ridge National Laboratory; myoon@ornl.gov

Ghanshyam Pilania, Los Alamos National Laboratory

Chul Hong Park, Pusan National University, Korea

Emmanouil Kioupakis, University of Michigan

Lan Li, Boise State University

S5. Energy Sustainable Optoelectronics and Magneto-electronics

This symposium focuses on recent progress on optoelectronic and magnetoeletronic materials for sustainable energy applications. Efficient transformation and utilization of energy serve as cornerstones for societal energy sustainability. The overarching goal of this symposium is to provide a platform for discussing transdisciplinary materials research for realizing an energy sustainable future, intersecting the fields of electronic, optical, and magnetic materials, devices and systems. The specific topics of interest include photovoltaics, electro-optics, power electronics, and energy-efficient magnetoelectronics. Centered on these topics, materials of interest include halide perovskites, ferroelectric materials, photoferroelectric materials, magnetoelectric and multiferroic materials, wide band gap carbides and nitrides, IV and III-V thin film compounds. Reports of progresses on theory/computation, materials development/properties, device fabrication/characterization and system-level design are highly encouraged.

Proposed Sessions

- Photovoltaics
- Electro-optics
- Power electronics
- Emerging microelectronics
- Magnetoelectrics and multiferroics

Symposium Organizers

Jennifer Andrew, University of Florida; jandrew@mse.ufl.edu

Jian Shi, Rensselaer Polytechnic Institute

Jiamian Hu, Pennsylvania State University

John Heron, University of Michigan at Ann Arbor

Xavier Moya, University of Cambridge, UK

S6. Fundamentals to Applications for the Use of Thermal Energy for Power Generation and Refrigeration

Thermal energy has been used in a variety of ways in electrical power generation and refrigeration under both transport and equilibrium conditions. This symposium targets technologies that use thermal energy and the fundamental science that enables such use. Specific technologies of interest include thermoelectrics, thermophotovoltaics, electro-, magneto- and baro-caloric systems, Stirling and thermoacoustic engines. The approaches of interest include novel material development, measurement standardization, bonding, ceramic processing, crystal chemistry, modeling and computational methods, nano-structuring and nanocomposites, devices, and others.

The symposium also aims to include the basic science underlying behavior of such materials including heat transport and heat exchange. Relevant fundamental physics topics include phonon transport and interactions in solids, in nanosystems, and across interfaces. This symposium encourages contributions on topics outside the technologies summarized above that take advantage of thermal energy for power generation and refrigeration. This symposium is a forum for discussing defect chemistry, conductivity, property optimization, caloric effects, interfacial control, heat exchange and applications for novel conversion systems. It aims to increase interaction between communities that normally work separately.

Proposed Sessions

- Theory and applications of thermoelectrics and related phenomena
- Theory and applications of caloric effects and Stirling engines
- Thermophotovoltaics and emerging thermal devices
- Computation methods for material and device optimization
- Fundamental physics of phonon transport and heat exchange
- Materials development, defect structure control and analysis
- Low dimensional materials and crystal chemistry approaches
- Nanocomposites and nanoscale scattering effects

Symposium Organizers

Alp Sehirlioglu, Case Western Reserve University; alp.sehirlioglu@case.edu

David Singh, University of Missouri

Anke Weidenkaff, University of Stuttgart, Germany

Patrick Hopkins, University of Virginia

Karl Sandeman, Brooklyn College of The City University of New York

Brian Donovan, USNA

S7. In situ Experiments of Microstructure Evolution and Properties

Emerging in situ techniques for property and microstructure characterization have shed new light on the mechanisms responsible for fundamental material properties, and microstructural evolution. This symposium will include presentations dealing with experimentation and analysis, kinetics, and mechanisms responsible for microstructural evolution interpreted from in situ studies. The contributions will highlight how in situ techniques have influenced our understanding of mechanisms for materials response at the atomic, nano, and microstructural length scales. In situ techniques highlighted include but are not limited to electron microscopy, photon-based techniques, and scanning probe methods. The goal of the symposium is to highlight the important scientific insights into structural and functional oxides and ceramics gained from in situ techniques.

Proposed Sessions

- Interfacial reactions and processes in complex environments;
- Mechanisms for micro- and nano-structural evolution;
- Knowledge gained from in situ mechanical testing of ceramic-based systems;
- Understanding the dynamic response of functional systems through in situ testing;
- New insights into atomistic processes at high temperatures or in extreme environments.

Symposium Organizers

Wayne D. Kaplan, Technion Israel Institute of Technology, Israel; aplan@technion.ac.il

Shen Dillon, University of Illinois at Urbana Champaign

S8. Interfaces and Surfaces in Energy-Related Ceramic Materials

At the center of existing and emerging energy-related devices such as rechargeable batteries, solid oxide fuel cells, thermoelectric generators, ceramic-based sensors, etc., are the interfacial properties of the interlocked polycrystalline phases. Specifically, interfacial and surfacial properties of ionic ceramics are a result of structure and the associated electrical, mechanical, and thermal properties. The emphasis of this symposium is on presenting the most recent experimental, modeling and simulation efforts that shed light on the structure and properties of surfaces and interfaces and resultant impact on macroscopic properties of ceramic materials.

Proposed Sessions

- Effect of interface structure on ion and electron transport properties
- Electrochemically-driven morphological evolution of interfaces
- Interface degradation mechanisms in battery compounds
- Interface engineering in nanocrystalline thermoelectric materials
- Atomistic and mesoscale modeling of interface structure and properties
- In situ characterization of interface structure and evolution

Symposium Organizers

R. Edwin Garcia, Purdue University; redwing@purdue.edu

Shuo Chen, Rice University

Ming Tang, Rice University

S9. Interfaces in Microstructural Evolution: Structure, Properties, Anisotropy, and Motion

The structure of interfaces plays a key role in the processing and performance of functional ceramics, such as sensors, ferroelectric actuators, dielectrics and ion conductors. Possible influences on processing and microstructure arise due to the boundary structure, local defect redistribution, space charges, mechanical stresses and the anisotropy of transport processes at interfaces. These effects and their interplay with the materials properties need to be understood on a fundamental level in order to optimize a material for a given application.

This symposium covers basic science topics on all aspects of interfaces, microstructure evolution, thermodynamics and their relationship to the materials properties in functional ceramics. The focus is on functional electronic ceramics, but other all classes of materials are considered as well.

Proposed Sessions

- Interface structure and anisotropy
  - -Atomic structure, segregation and stoichiometry
  - -Grain boundary transitions
  - -Mechanisms of interface motion
- Interface properties
  - -Defects and space charge
  - -Diffusion and transport along and across interfaces
  - -Mechanical properties
- Sintering and grain growth
  - -Conventional sintering and field assisted sintering
  - -Grain growth and abnormal grain growth
  - -Effects of nonstoichiometry
  - -Simulation of microstructural evolution
  - -Anisotropy of interfacial energy and motion

Symposium Organizers

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

Michael Hoffmann, Karlsruhe Institute of Technology, Germany

John Blendell, Purdue University

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S10. Interfacial Phenomena in Multifunctional Heterostructures: From Theory to Transport Processes

Physics and chemistry of interfaces between solids has been an intense area of research with both important scientific and technological relevance. This symposium will address the latest and exciting developments in the fundamental research and understanding of interfacial phenomena between multifunctional materials – from theory, synthesis, characterization, thermodynamic and transport property measurements. Some of the typical investigations of interest will include structure-composition-physical property correlations for interfaces and surfaces, correlation effects, and effects of low dimensionality. The material systems of interest range from emerging materials systems such as complex oxides and layered dichalcogenides to conventional metals and semiconducting materials. This symposium will bring together scientists and engineers from academia, national labs and industry to discuss the current status and the future outlook for research into interfaces between multifunctional materials and how this understanding will enable a variety applications ranging from electronics to energy.

Proposed Sessions

- Development of theoretical techniques to understand interfacial phenomena (ionic, covalent, and van der Waals bonded solids)
- Synthesis of heterostructures and superlattices of new materials
- Physical and chemical properties of oxide interfaces
- Heterostructures of van der Waals bonded transition metal dichalcogenides
- Electrical and optical properties of layered chalcogenide heterostructures
- Interface sensitive characterization methods for heterostructures and superlattices

Symposium Organizers

Jayakanth Ravichandran, University of Southern California; jayakanr@usc.edu
Bharat Jalan, University of Minnesota
Dillon Fong, Argonne National Laboratory
Anderson Janotti, University of Delaware
Roger De Souza, RWTH Aachen, Germany

S11. Ion Conducting Ceramics

Ion conducting membranes 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 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 length scales (atomic to macroscopic), address both cation and anion conductors, and consider a variety of ion conducting materials relevant to a diverse application space.

Proposed Sessions

- 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

Symposium Organizers

Fanglin (Frank) Chen, University of South Carolina; chenfa@cec.sc.edu
Jon Ihlefeld, Sandia National Laboratories
Jeff Sakamoto, University of Michigan
Erik Spoerke, Sandia National Laboratories
Hui (Claire) Xiong, Boise State University

S12. 5G Materials for the Millimeter Wave Revolution

Right now, 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 pie. 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, and enhancing transport. In this symposium, we kickoff a discussion between worldwide experts from academia, government labs, and industry to 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

- 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; orloff@nist.gov
Jim Booth, National Institute of Standards and Technology
Rick Ubic, Boise State University
Geoff Brennecka, Colorado School of Mines

S13. Mesoscale Phenomena in Ceramic Materials, Nano- and Microstructures

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, since many materials systems exhibit intriguing behavior with nontrivial dependence on shape, size and geometry that is yet to be fully understood. Specifically, in nonmetallic ceramics, such as, e.g., complex oxides, this may include interactions among elastic, polar and magnetic parameters, as well as the effects of layering, composition variation and ionic diffusion. Simple fundamental examples range from the influence of shape of ferroelectric nanostructure on its domain configuration to fine-tuning the optical response of core-shell nanoparticles to processes of phase separation in multi-component systems. This symposium will bring together experts from academia, industry, and national laboratories 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 the strength of the involved interactions on the system properties and functional behavior.

Proposed Sessions

- 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

Serge M. Nakhmanson, Institute of Materials Science; serge.nakhmanson@uconn.edu

Olle Heinonen, Argonne National Laboratory

Edward Gorzkowski, Naval Research Laboratory

S14. Multifunctional Nanocomposites

This symposium provides a platform to present and discuss recent advances in growth, characterization, design, property prediction, and study of functional properties/device applications in oxide thin films and their nanocomposites. The goal is to create an international and interdisciplinary forum for scientists and researchers from industry, academia, and national laboratories 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; 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, electric and photonic responses, as well as electronic and thermal transport phenomena.

Proposed Sessions

- Synthesis and growth of multifunctional oxide thin films and vertically aligned nanocomposites
- The influence of growth, stoichiometry, doping, strain and micro-structure on the properties of nanostructured oxide thin films and vertical aligned nanocomposites
- Microstructures and defects characterization
- Strain, microstructures and functionality tuning in vertical aligned nanocomposites
- Theory, modeling and first principles calculations of complex oxide thin films
- Functionalities including ferroelectric, dielectric, magnetic, magnetoelectric and photonic properties as well as electronic and thermal 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

Symposium Organizers

Aiping Chen, Center for Integrated Nanotechnologies (CINT), Los Alamos National Laboratory; apchen@lanl.gov

James Rondinelli, Northwestern University

Junwoo Son, Pohang University of Science and Technology, Republic of Korea

Judith L. MacManus-Driscoll, University of Cambridge

Roman Engel-Herbert, The Pennsylvania State University

S15. Superconducting Materials and Applications

Significant progress has been made worldwide in application and fundamental understanding of both low- and high-temperature superconductors (HTS) in recent years. For example, HTS (such as cuprates) wires and tapes have been commercially produced; advances continue to be made in fabrication and application of MgB_2; and the discovery of iron-based superconductors has set off an intense search for new superconductors with high transition temperatures. However, challenges remain to increase the overall current carrying ability for applications and to correlate the interplay among structure, magnetism, and superconductivity in these materials on micro-, meso-, and nano-scales for understanding the superconductivity mechanism. This symposium will cover recent developments in the processing of superconducting materials, improved flux-pinning via structural and defect optimization, recent advances in the exploration of new superconductors, and progresses in understanding unconventional superconductivity. The development and status of applications, and the associated materials science and other issues will also be addressed.

Proposed Sessions

- Issues related to the fabrication of low-cost and high-performance second generation coated conductors
- Applications and related material issues including wire properties
- New superconducting materials and phenomena
- Characterization of structural, magnetic, and superconducting properties
- Electronic structure and superconductivity mechanism

Symposium Organizers

Gang Wang, Institute of Physics, Chinese Academy of Sciences, China; gangwang@iphy.ac.cn

Haiyan Wang, Texas A&M University

Tim Haugan, Air Force Research Laboratory

Charles Rong, CIV USARMY RDECOM ARL

S16. Failure: The Greatest Teacher

The vast majority of scientific literature and conference talks report positive results, but there is 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 EMA highlight. In addition to highlighted failures, this year we will also be including contributed vignettes on failure and lessons from experience.

Symposium Organizers

Geoff Brennecka, Colorado School of Mines; geoff.brennecka@mines.edu

Jon-Paul Maria, North Carolina State University

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