

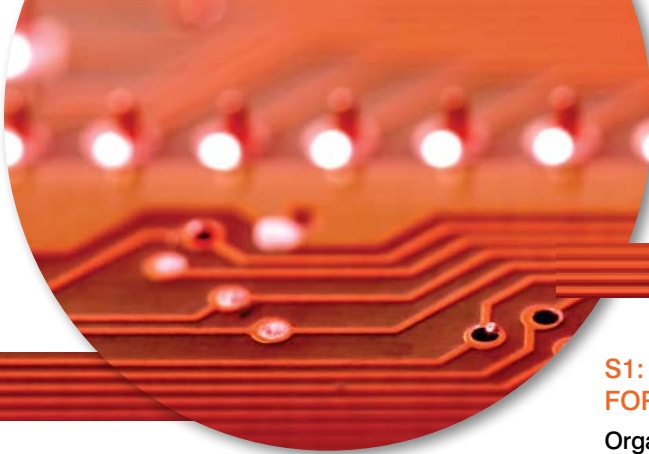
# **ELECTRONIC MATERIALS AND APPLICATIONS 2010**

**January 20-22, 2010**

Royal Plaza in The Walt Disney® World Resort  
Lake Buena Vista, FL, USA

## **Call For Papers!**

Abstract Due: July 27, 2009



Paul Clem



Jacob L. Jones



Amit Goyal

## INTRODUCTION

Welcome to Electronic Materials and Applications 2010, the first in a series of annual international meetings to be held each January in Florida. EMA 2010 will be held January 20-23, 2010 at the Royal Plaza in The Walt Disney® World Resort, Lake Buena Vista, Florida, and is jointly programmed by the Electronics Division and Basic Science Division of The American Ceramic Society.

The focus of EMA 2010 is on **electronic ceramics for energy storage and conversion applications and the enabling fundamental science issues**. The technical program will include invited lectures, contributed papers, poster presentations, roundtables on emerging topics, and participation of the President's Council of Student Advisors (PCSA), the Society's student-led group.

With increased investment in renewable energy, "smart grid" technologies and innovative hybrid & all-electric transportation development, electrical ceramics are positioned as key enabling technologies. Additionally, there is growing interest in energy harvesting, integrated sensors, and advanced functional microelectronics in which integrated electrical ceramics support key elements. This meeting aims to present the latest state of the art in applications of these materials, the fundamental science of materials processing, and advanced methods for materials integration. The programming includes a **mix of industrial, university and federal laboratory participants**.

We are excited about the future of this field and the opportunities that the meeting will enable. For many years, we have enjoyed a high degree of interconnectedness and intimacy in this field. We hope that EMA 2010 will continue to foster this atmosphere and facilitate these relationships. Please join us in Lake Buena Vista, Florida for this unique experience.

### 2010 Organizing Committee

Paul Clem, Electronics Division  
Jacob L. Jones, Basic Science Div.  
Amit Goyal, Electronics Division

## S1: ADVANCES IN CERAMIC PROCESSING, FORMING, AND SHAPING

**Organizers:** Wolfgang M. Sigmund, University of Florida; Juan C. Nino, University of Florida; Kristen Brosnan, General Electric Global Research Center; Edward M. Sabolsky, West Virginia University

**Point of Contact:** Wolfgang M. Sigmund, University of Florida  
225 Rhines Hall, P.O. Box 116400; Gainesville, FL 32611-6400  
Phone: +1 (352) 846-3343  
Email: wsigm@mse.ufl.edu

**Description:** Considerable scientific challenges remain for understanding fundamental aspects of ceramic processing technologies to meet demands in electronic applications. This symposium will focus on the advancement of understanding ceramic processing science, forming and shaping. Every aspect of processing science will be covered, from nanopowders to recent advances in sintering. Applications of electronic ceramics include actuators, solid oxide fuel cells, thermoelectrics, energy storage and conversion, sensors, power electronics and microwave dielectrics.

### Proposed Session Topics:

- Powder processing science
- Electrohydrodynamic processing
- Nanostructured ceramics
- Ceramic composites
- Novel casting technologies
- Thin film/microelectronic processing
- Macroporous ceramics
- Net-shape ceramic processing
- Advances in sintering

## S2: SYMPOSIUM ON ADVANCED DIELECTRIC, PIEZOELECTRIC, AND FERROIC MATERIALS, AND EMERGING FIELDS IN ELECTRONICS

**Organizers:** Amit Goyal, Oak Ridge National Laboratory; Shashank Priya, Virginia Polytechnic Institute and State University; Dwight Viehland, Virginia Polytechnic Institute and State University; Sahn Nahm, Korea University; Pam A. Thomas, University of Warwick

**Point of Contact:** Amit Goyal, Oak Ridge National Laboratory  
P.O. Box 2008; MS 6116; Oak Ridge, TN 37831-6116  
Phone: +1 (865) 574-1587  
Email: goyala@ornl.gov

**Description:** This symposium will bring together researchers from academia and industry to present the latest advances in synthesis, modeling, and characterization of dielectric, piezoelectric, ferroelectric, and multiferroic materials. These materials have a tremendous impact on a variety of civilian and defense applications including tunable microwave devices, sonar transducers, memories, MEMS devices, high energy density capacitors, piezoelectric composites, energy harvesting, actuators, and sensors. Recent work on bridging phases in relaxor

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# Electronic Materials and Applications 2010

based perovskites, multiferroic heterostructures, lead-free piezoelectrics, composite thin films, flexoelectric effect, and fundamental materials science including computational and analytical modeling will be discussed. Other topics of interest include nanoscale domain phenomena, ferroelectric thin films, structure-property relationships, magnetoelectric composite structures, and electric field induced phase phenomena.

## Proposed Session Topics:

- Electromechanical phenomena of piezoelectric composites, actuators, sensors and motors
- Lead-free piezoelectrics
- Integrated multi-layers and interface structures
- Microwave dielectrics, metamaterials, and frequency tunable devices
- Nanoscale phenomena in dielectric, ferroelectric and piezoelectric materials
- Perovskite dielectric, mott insulators, ferroelectric, and piezoelectric materials
- Novel properties such as flexoelectric effect
- Multiferroic oxides, heterostructures, and thin films

## S3: NANO PHENOMENA AND INTERFACIAL/SURFACE EFFECTS IN ELECTRONIC CERAMICS

**Organizers:** Quanxi Jia, Los Alamos National Laboratory; Jacob L. Jones, University of Florida; Geoff Brennecke, Sandia National Laboratories; Brian Gorman, Colorado School of Mines; Amit Goyal, Oak Ridge National Laboratory; David Norton, University of Florida

**Point of Contact:** Quanxi Jia, Los Alamos National Laboratory  
MPA-STC, MS K763; Los Alamos, New Mexico 87545  
Phone: +1 (505) 667-2716  
Email: qxjia@lanl.gov

**Description:** Intentional control or manipulation of interfaces in electronic ceramics from atomic-, nano-, and/or micro-scales provides the possibility to design and fabricate materials with multifunctionalities or emergent behaviors unavailable in the bulk. Interfacing different materials for novel electronic devices has become the subject of

many theoretical and experimental studies recently and is enabling a new design paradigm to produce novel functionalities that cannot be obtained in individual constituents. Experimental results have shown such functionalities in various electronic ceramics including ferroelectric, ferromagnetic, piezoelectric, multiferroic, electro-optic, and superconducting materials, to list a few. However, the sensitivity of processing, chemical stoichiometry, strain, and lattice distortions on the physical properties of the materials has also created enormous challenges to this community. This symposium will provide a forum for academic, industrial, and national laboratory researchers to present and discuss the latest advances and fundamental research in the area of interfacial effects on the structural and physical properties of electronic ceramics. Novel approaches to composite materials, strain induced enhancement of functionalities, nanostructuring, characterization of material properties and physical responses at the interface will be also emphasized.

## Proposed Session Topics:

- Atomic-, nano-, and micro-scale engineering of electronic ceramics
- Interfacial/surface effects on the physical properties of ferroelectric, piezoelectric, ferromagnetic, multiferroic, electro-optic, and superconducting materials
- Nano phenomena in ferroelectric, piezoelectric, ferromagnetic, magnetoelectric, electro-optic, and superconducting films
- Processing related issues for functional metal-oxide films
- Strain related issues
- Interfacial/surface structure and its relation to epitaxial behavior
- Probing and characterizing the interfaces
- Quantification of atomic structure and stoichiometry at oxide interface/surface
- Theory and modeling of interface/surface

## ABSTRACT SUBMISSION

Visit the meeting website at [www.ceramics.org/ema2010](http://www.ceramics.org/ema2010) to review the session topics and select the "Submit Abstract" hyperlink to be directed to the Abstract Central website. Follow the prompts to create an account and submit your abstract online.

Please note that your member login and password will not work on this website. You will need to set up a new account login and password for the Abstract Central website. If you have questions, please contact Marilyn Stoltz at [mstoltz@ceramics.org](mailto:mstoltz@ceramics.org) or 614-794-5868.

### ELECTRONICS DIVISION OFFICERS

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Secretary: Scott Misture  
Programming Chairs (2010):  
Jacob L. Jones and Olivia Graeve



#### S4: SYMPOSIUM ON ENERGY HARVESTING AND SENSORS FOR STRUCTURAL HEALTH MONITORING

**Organizers:** Shashank Priya, Virginia Tech; Dan Inman, CEHMS, Virginia Tech; Paul Clem, Sandia National Laboratories; Roop Mahajan, Institute for Critical Technology and Applied Science, Virginia Tech; Thomas Daue, Smart Material Corp., Sarasota, FL, USA; Michelle Bell, Radiant Technologies, Inc.

**Point of Contact:** Shashank Priya  
Center for Energy Harvesting Materials and Systems (CEHMS),  
310 Durham Hall, Virginia Tech., Blacksburg, VA 24061  
Phone: +1 (540) 231-0745  
Email: spriya@vt.edu

**Description:** Vast reductions in the size and power consumption of CMOS circuitry have led to focused research efforts on small and efficient power sources. Much of the current emphasis has been on developing on-site generators that transform an available environmental energy (light, kinetic, and thermal gradient) into electrical energy. This symposium will review past developments, current challenges and future goals in the field of energy harvesting and its application to structural health monitoring. Presentations in the symposium will concentrate on these topics: Energy Harvesting (piezoelectric, inductive, photovoltaic, electrets, radioactive and thermoelectric), and Structural Health Monitoring.

##### Proposed Session Topics:

- Theory and modeling
- Vibration energy harvesting – transducer design and fabrication, bulk harvesters, MEMS systems
- Light and thermal gradient energy harvesting, ceramics in solar cells
- Multimodal techniques and implementation
- Integration with wireless sensor networks
- Materials for energy harvesting – piezoelectric, electrets, photovoltaic, polymers, radioactive, thermoelectric, electrostatic
- Energy harvesting circuits and control systems
- Structural health monitoring

#### S5: FUNCTIONAL CERAMICS FOR ENERGY STORAGE & CONVERSION

**Organizers:** Wolfgang M. Sigmund, University of Florida; Chris Ablett, Sandia National Laboratories; Y. Shirley Meng, University of Florida

**Point of Contact:** Wolfgang M. Sigmund, University of Florida  
225 Rhines Hall, P.O. Box 116400; Gainesville, FL 32611-6400  
Phone: +1 (352) 846-3343  
Email: wsigm@mse.ufl.edu

**Description:** The performance of current energy conversion & storage technologies falls short of requirements for using electrical energy efficiently in transportation, commercial and residential applications. Ceramic materials have always played a critical role in energy conversion and storage, and they are facing greater challenges today to meet higher performance demand. Key materials science and engineering issues underpinning the performance of the energy storage systems such as batteries and capacitors include crystal

and electronic structures of electrode materials, phase stability and phase transformation during electrochemical processes, ionic diffusion in the bulk of solid and at the solid/liquid interfaces. Similar problems are of importance in fuel cells and photovoltaics. This symposium will provide a forum for academic, industrial, and national laboratory researchers to present and discuss the latest advances and fundamental research in the area of functional ceramic materials for energy storage and conversion systems including batteries (primary and secondary) of different chemistries (Li-ion Mg-ion, NiMH etc.), supercapacitors and hybrids. Advances in computational/modeling aspects will also be emphasized.

##### Proposed Session Topics:

- Advanced cathode materials for rechargeable batteries
- New anode materials for rechargeable batteries
- Materials for supercapacitors
- Primary and secondary batteries
- New nano structures for energy storage and conversion
- Solid state ionic materials/electrolytes

#### S6: CERAMIC MATERIALS FOR POWER ELECTRONICS (WIDE-BAND GAP INTEGRATION, HIGH POWER CAPACITORS)

**Organizers:** Jon Ihlefeld, Sandia National Laboratories; Paul Clem, Sandia National Laboratories

**Point of Contact:** Jon Ihlefeld, Sandia National Laboratories  
P.O. Box 5800; M.S. 1069, Albuquerque, NM 87185-1069  
Phone: +1 (505) 844-3162  
Email: jihlefe@sandia.gov

**Description:** Efficient power electronics are in increasingly high demand to support electrical grid, transportation, and renewable power handling. Electronic ceramics and their integration with traditional semiconductor power devices have the potential to play a large role in this growing field. In particular, integration of ferroelectrics with wide bandgap semiconductors is an active and promising field of research. In addition, high energy density capacitors based on ceramics or polymer/ceramic nanoparticle composites show potential for significant increases in energy density for multiple applications in transportation and power electronics. This symposium will provide a forum for academic, industrial, and national laboratory researchers to present and discuss the latest advances and fundamental research in the area of bulk, thick film, thin film and nanoparticle electronic ceramics for power electronic applications.

##### Proposed Session Topics:

- Wide bandgap semiconductor integration
- High energy density capacitors

# Electronic Materials and Applications 2010

## S7: EMERGING TOPICS IN ELECTROMAGNETIC CERAMICS

**Organizers:** Paul Clem, Sandia National Laboratories

**Point of Contact:** Paul Clem, Sandia National Laboratories  
P.O. Box 5800, MS 1349; Albuquerque, NM 87185-1069  
Phone: +1 (505) 272-7624  
Email: pgclem@sandia.gov

**Description:** The ability to develop artificially engineered dielectric materials has enabled a number of new phenomena attractive for communications, optics, and sensing. Among these are microwave dielectrics for RF/microwave applications, ferrites, tunable dielectrics, and a broad class of "Metamaterials" including artificially structured dielectrics, doubly negative materials (negative  $\epsilon$ , negative  $\mu$ , and negative refractive index), and artificial electromagnetics with unique  $\epsilon$ - $\mu$  character. Ceramic materials play unique roles in these systems, and are of particular interest for low loss properties and tunable behavior. This symposium is a forum for emerging electromagnetic phenomena, engineered materials design, structure-property relationships, and system performance in these highly engineered artificial electromagnetic structures.

### Proposed Session Topics:

- Metamaterials (visible to RF)
- Artificial electromagnetic structures (e.g. resonators, engineered substrates)
- Microwave dielectrics
- Magnetic ceramics including ferrites (high frequency applications; visible to RF)
- Tunable dielectrics
- Integration of materials for engineered electromagnetic systems
- Structure-property relations of engineered electromagnetic materials

## S8: THE FUTURE OF ELECTRONIC CERAMICS: A NEW INVESTIGATOR SYMPOSIUM

**Organizers:** Victoria Knox, Laura Burka, Jacob L. Jones, University of Florida; Geoff Brennecka, Sandia National Laboratories

**Point of Contact:** Victoria Knox, PCSA, Alfred University, Alfred, NY  
Email: VLK7@alfred.edu

**Description:** Excellent student research is being conducted at universities in the United States and throughout the international community. However, there are few conferences or workshops where such research activities are highlighted. The New Investigator symposium will showcase both undergraduate and graduate research in the area of electronic materials and their applications. This symposium will also encourage innovation, collaboration, professional development, and continued involvement of students in The American Ceramic Society and throughout the ceramics community.

### Proposed Session Topics:

- Nanostructured materials, nanocomposites, and interfacial effects
- Novel processing techniques
- Novel characterization approaches
- Dielectric, piezoelectric, ferroelectric and multiferroic materials
- Energy harvesting materials and applications
- Energy storage materials and applications
- Other basic science and applications of electronic ceramics

## HOTEL INFORMATION

Royal Plaza in the Walt Disney® World Resort  
1905 Hotel Plaza Boulevard  
Lake Buena Vista, FL 32830  
<http://www.royalplaza.com/>

Phone – 407-828-2828

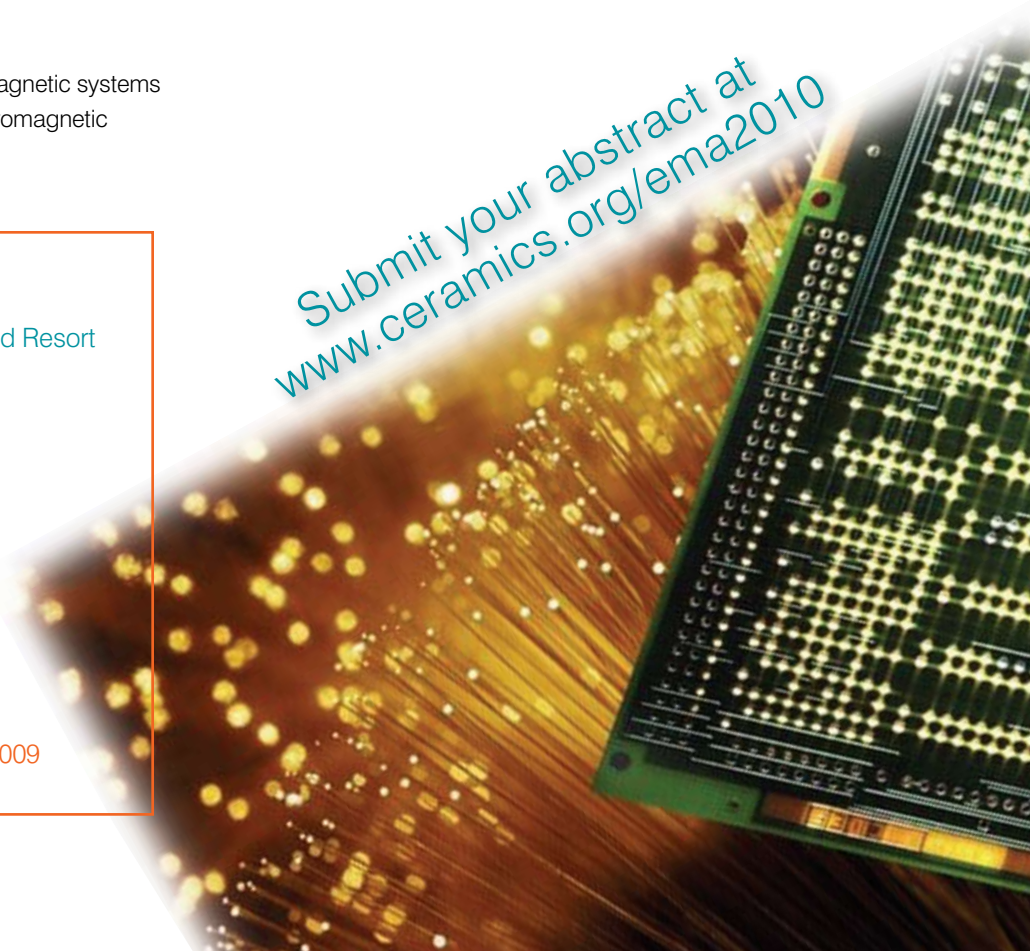
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Submit your abstract at  
[www.ceramics.org/ema2010](http://www.ceramics.org/ema2010)





The American Ceramic Society  
600 N. Cleveland Ave., Suite 210  
Westerville, Ohio 43082 USA

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