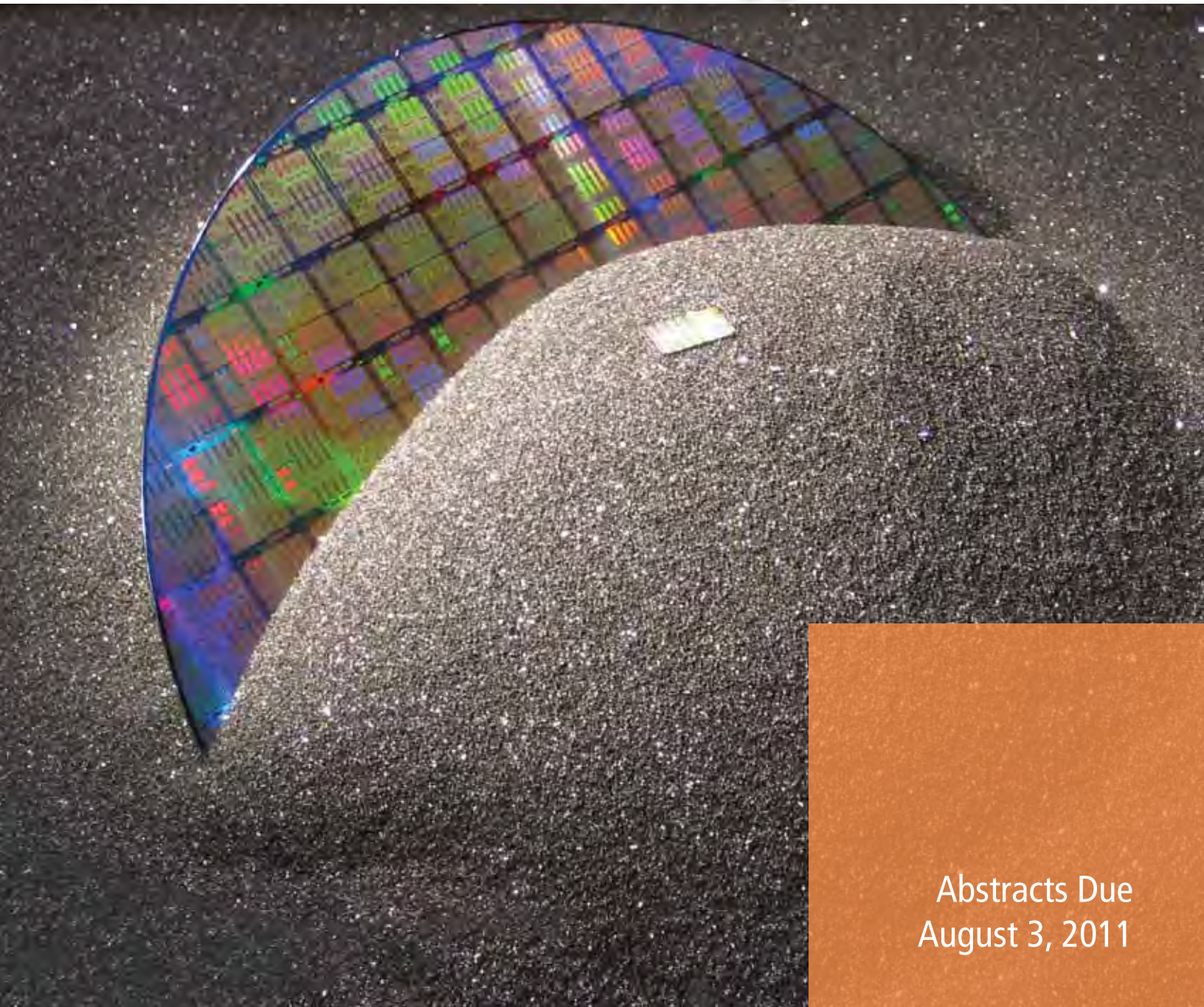


www.ceramics.org/ema2012

Electronic Materials and Applications 2012



Abstracts Due
August 3, 2011

Electronic Materials and Applications 2012

DoubleTree by Hilton Orlando at Sea World®
Orlando, Florida, USA

INTRODUCTION

Electronic Materials and Applications 2012, jointly programmed by the Electronics Division and Basic Science Division of The American Ceramic Society, is the third in a series of annual international meetings. EMA 2012 will be held January 18-20, 2012 at the DoubleTree by Hilton Orlando at Sea World®.

The focus of the 2012 meeting is on electronic materials for energy generation, conversion and storage applications. The meeting will bring together leaders and experts in the field of electronic materials to discuss fundamental science and technological issues. We would like to address the materials-related challenges in a broad spectrum of energy generation, conversion and storage devices. 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.



Goyal

With increased investment in renewable energy, "smart grid" technologies, all-electric vehicles and innovative hybrid transportation development, electrical ceramics are positioned as the key enabler of technologies. In addition, there is growing interest in energy harvesting, integrated sensors, bio-inspired vehicles and systems, and advanced functional microelectronics, where integrated electrical ceramics and composites will play a key role. EMA 2012 aims to provide the current 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.



Sabolsky

We are excited about the future of this field and the opportunities that this meeting will enable for academia, industry and federal agencies. For many years, we have enjoyed a high degree of interconnectedness and intimacy in this field. We believe this meeting will continue to foster this atmosphere and facilitate these relationships. Please join us in Orlando for this unique experience.



Tidrow

The 2012 Organizing Committee:

Amit Goyal, Electronics Division
Edward M. Sabolsky, Basic Science Division
Steven C. Tidrow, Electronics Division

TECHNICAL PROGRAM CO-SPONSOR



ORGANIZATION

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HOTEL INFORMATION

DoubleTree by Hilton Orlando at Sea World®

10100 International Drive, Orlando, FL 32821

Phone: +1 (407) 352-1100 | 800-327-0363

Fax: +1 (407) 352-2632

Rate: Single/double/triple/quad-\$149.00
Government-current prevailing rate

S1: NEW FRONTIERS IN ELECTRONIC CERAMIC STRUCTURES, ADVANCED ELECTRONIC MATERIAL DEVICES AND CIRCUIT INTEGRATION

This symposium will bring together researchers from academia and industry to present the latest advances in synthesis, modeling, simulations, structures and characterization in the field of new ceramic structures, advanced electronic materials integrations, and miniaturization. These topic areas open new frontiers in higher level integration advances, prognosis and designing of new electronic materials for special high professional devices and applications.

Proposed Session Topics:

- Advances in electronic devices and circuit integrations
- Future in electronic ceramics miniaturization
- Fractals in ceramics structure
- Voronoi cell models and applications
- Intergranular contact surfaces and electronic properties
- Intergranular capacitors and future electronic ceramics integration
- Advanced electronic materials in green technologies
- Electronics properties prognosis and designing in function of synthesis-structure-properties relation

Organizers: Vojislav V. Mitic, Serbian Academy of Science and Arts and Univ. of Nis; Amar Bhalla, Univ. of Texas at San Antonio; J. J. (Jack) Mecholsky, Univ. of Florida; Martha L. Mecartney, Univ. of California, Irvine; Ljubisa Kocic, Univ. of Nis; Hirokazu Chazono, Taiyo Yuden Co.; Eugene Medvedovski, Umicore Thin Film Products; Vladimir Pavlovic, Serbian Academy of Science and Arts; Guorong Li, Shanghai Institute of Ceramics; Linan An, Univ. of Central Florida

Points of Contact

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ABSTRACT SUBMISSION INSTRUCTIONS

Visit www.ceramics.org/ema2012 to review the session topics and select the "Submit Abstract" hyperlink to be directed to the Abstract Central website. If you have questions, please contact Marilyn Stoltz at mstoltz@ceramics.org or 614-794-5868.

S2: ADVANCED DIELECTRIC, PIEZOELECTRIC AND FERROIC MATERIALS, AND EMERGING MATERIALS IN ELECTRONICS

This symposium brings 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-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
- Ultrasonic transducers

Organizers: Sahn Nahm, Korea Univ.; Jurgen Rödel, Technische Universität Darmstadt; Shashank Priya, Virginia Polytechnic Institute and State Univ.; Pam A. Thomas, Univ. of Warwick; Steven C. Tidrow, Univ. of Texas Pan American

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S3: SYMPOSIUM ON THIN FILM INTEGRATION AND PROCESSING SCIENCE

This symposium will bring together researchers from academia, government labs and industry to focus on the profound role of processing and integration science on structure-property relations in thin ceramic and epitaxial films. Of interest for this symposium are advances in thin film processes that enable integration with non-traditional substrates, processing methods that facilitate epitaxy, and tailoring processing methods to achieve bulk-like responses under limited thermal budgets. Specific materials systems discussed are intentionally broad in an effort to bridge communities (e.g. ferroelectrics to transparent conductors) for highest impact and knowledge sharing. Topics of interest include integration of oxides with polymers, advanced substrate preparation methods, utilizing and controlling strain to enhance properties, and achieving bulk-like properties in thin films.

Proposed Session Topics:

- Novel substrate materials
- Low temperature processing
- Strain engineering for enhanced performance
- Controlling epitaxial growth morphology
- Controlling phase assemblage
- In-situ characterization

Organizers: Jon Ihlefeld, Sandia National Labs; Brady Gibbons, Oregon State Univ.; Jon-Paul Maria, North Carolina State Univ.

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S4: ADVANCED ENERGY STORAGE MATERIALS AND SYSTEMS: LITHIUM AND BEYOND

This symposium brings together researchers from academia and industry to present the latest advances in electrical energy storage materials and storage systems, ranging from current state of the art lithium-ion batteries, lithium air and sulfur chemistries, all solid-state batteries, novel electrolytes and large scale redox flow batteries. Special focus will be on novel electrode architectures (including 3D concepts) and new materials systems having potential for alternate charge storage mechanism, such as multi-electron red-ox species, conversion and displacement-based reactions (beyond intercalation). Recent developments and issues in solid electrolytes and their successful integration and compatibility with lithium metal anodes for solid-state device architecture will be covered. Other topics of interest include multiscale/multiphysics based modeling approach to predict structure-property correlation, 3D transport and performance prediction.

Proposed Session Topics:

- New developments in high voltage electrodes, electrolytes and alternative red-ox chemistries
- Novel electrode architecture, assembly and design for advanced batteries
- Interfacial processes and in-situ methods for energy storage materials and devices
- Next generation advanced energy storage devices: lithium-air, lithium-sulfur and all solid-state batteries
- Multiscale and multiphysics based modeling of advanced electrodes and batteries
- Large format energy storage systems including red-ox flow batteries

Organizers: Jagjit Nanda, Oak Ridge National Lab; Yue Qi, General Motors R&D; Sergey Lopatin, Applied Materials; Amit Goyal, Oak Ridge National Lab

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S5: UNCONVENTIONAL THERMOELECTRICS: DEFECT CHEMISTRY, DOPING AND NANOSCALE EFFECTS

In order to be useful, widespread energy scavenging materials, thermoelectrics must be composed of nontoxic and abundant elements, be stable in air to high temperatures, and display simultaneous large thermopower and low thermal conductivity. A wide variety of ceramic science may be applied to control conductivity and to decrease phonon-related thermal transport. Nanostructuring approaches have been adopted in traditional selenide and telluride thermoelectric materials, and are now being extended to novel thermoelectrics. Methods including nanoscale grains, embedded nano-inclusions, interfacial nanocoatings, and lamellar/multilayer structuring have all been utilized for significant thermoelectric property improvements. Similar efforts have recently been proposed for oxide materials, where control of oxygen vacancies, crystal chemistry, and electronically compensating charge carriers have led to ZT values exceeding 0.7. This symposium is a forum for discussing defect chemistry, conductivity, thermal conductivity optimization and applications for novel thermoelectrics.

Proposed Session Topics:

- Theory and applications
- Thermoelectric silicides
- Thermoelectric oxides
- Novel materials
- Low dimensional materials and crystal chemistry approaches
- Nanoscale scattering effects
- Thermophotovoltaics and emerging thermal devices

Organizers: Alp Sehirlioglu, Case Western Reserve Univ.; Jon Ihlefeld, Sandia National Labs; Anke Weidenkaff, EMPA

Point of Contact

Alp Sehirlioglu: 1+(216) 433-6159 | axs461@case.edu



S6: TECHNOLOGIES FOR SUSTAINABILITY AND GREEN MATERIALS PROCESSING

Development of low-carbon, energy-efficient, and environmentally-benign technologies is an emerging issue for economic competitiveness of manufacturing and sustainable energy generation and use. This symposium is a forum for materials issues related to improved materials manufacturing, to new energy efficiency and to energy generation technology development. Improved materials manufacturing, or green processing, includes use of more environmentally-benign and/or lower energy use manufacturing methods, which provide benefits in reduced cost, waste generation, and environmental compliance. Electronic ceramics play an important role in clean energy generation, environmental remediation and energy efficiency technologies. Redox-active materials enable multiple atmospheric effects, including reduction of atmospheric pollution, carbon sequestration, and artificial solarthermal photosynthesis. Electronic ceramics also enable advances in building energy efficiency through moderation of heat gain and loss (electrochromics and photochromics), photovoltaics (transparent conductive oxides), and novel energy storage methods. Topics include development of novel energy and environmental technologies, waste minimization, and advanced process development.

Proposed Session Topics:

- Green manufacturing methods
- Ceramic-based carbon sequestration
- Synthetic photosynthesis
- Carbon-neutral energy generation
- Environmental remediation
- Energy efficiency (transportation, manufacturing, building, lighting)

Organizers: Paul Clem, Sandia National Labs; Edward M. Sabolsky, West Virginia Univ.

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S7: METAMATERIALS AND MICROWAVE MATERIALS

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, tunable magnetics, and a broad class of “Metamaterials” including artificially structured dielectrics, doubly negative materials (negative permittivity, negative permeability, and negative refractive index), and artificial electromagnetics with unique 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)
- Integration of materials for engineered electromagnetic systems
- Structure-property relations of engineered electromagnetic materials
- Tuning and gain in RF and optical composites

Organizers: Paul Clem, Sandia National Labs

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S8: HIGHLIGHTS OF STUDENT RESEARCH IN BASIC SCIENCE AND ELECTRONIC CERAMICS

Student research is being conducted at all universities throughout the United States and the international community. However, there are few conferences or workshops where such research activities are highlighted. This symposium will showcase undergraduate as well as graduate research to encourage innovation and involvement of students throughout the ceramics community.

Proposed Session Topics:

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

Organizers: David Shahin, PCSA Council Chair; Jaime George, PCSA Programming Chair; Geoff Brennecke, Sandia National Labs