CALL FOR PAPERS

Abstracts due on July 28, 2017

42ND INTERNATIONAL CONFERENCE AND EXPOSITION ON

ADVANCED CERAMICS AND COMPOSITES

JANUARY 21-26, 2018

Hilton Daytona Beach Resort and Ocean Center

Daytona Beach, Florida, USA

ceramics.org/icacc2018

Organized by the Engineering Ceramics Division of The American Ceramic Society

The American Ceramic Society
www.ceramics.org

Engineering Ceramics Division
The American Ceramic Society

JANUARY 21-26, 2018 | Hilton Daytona Beach Resort and Ocean Center | Daytona Beach, Florida, USA

42ND INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

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  dsingh@anl.gov

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INTRODUCTION

The 42nd International Conference & Exposition on Advanced Ceramics & Composites (ICACC) continues the strong tradition as the leading international meeting on advanced structural and functional ceramics, composites, and other emerging ceramic materials and technologies. The meeting will be held from January 21–26, 2018 in Daytona Beach. Since its inception in 1977, this prestigious conference has been organized by the Engineering Ceramics Division of the American Ceramic Society. It has experienced tremendous growth, worldwide interest, and active participation from ceramic researchers and developers from the national and global technical community. This conference reached a milestone in 2016 celebrating its 40-year journey of playing a key role in the advancement of ceramics and composites.

The technical program consists of seventeen symposia, three focused sessions, honorary symposium, and 7th Global Young Investigator Forum. These technical sessions, consisting of both oral and poster presentations, will provide an open forum for scientists, researchers, and engineers from around the world to present and exchange findings on recent advances on various aspects related to ceramic science and technology. The key event of the 42nd ICACC is an international symposium entitled "***Advancing frontiers of ceramics for sustainable societal development.***" This symposium honors Dr. Mrityunjay Singh for his long-term and innumerable outstanding contributions to the science and technology of advanced ceramic materials and technologies, his tireless efforts in mentoring students and young professionals, and for promoting and developing networks and collaborations among the materials community worldwide.

The technical program encompasses diverse areas of ceramics and advanced composites, with particular attention to topics that address the current trends in the research, development, engineering, and application of advanced ceramics. The core symposia at this conference include mechanical behavior and performance of ceramics and composites, advanced ceramic coatings, solid oxide fuel cells, armor ceramics, bioceramics, advanced materials and technologies for energy conversion and rechargeable energy storage, functional nanostructured materials and nanocomposites, advanced processing and manufacturing technologies, porous ceramics, virtual material design, industrial root technologies, materials for extreme environments, ceramics for sustainable nuclear energy and fusion energy, crystalline materials for electrical, optical, and medical applications, additive manufacturing, and 3-D printing technologies. Due to its success as a focused session, the topics of geopolymers, photonics, and energy have been promoted to core symposia.

In addition to the core symposia, the technical program will include three focused sessions on emerging technologies: bio-inspired processing of advanced materials, tomography and microscopy based modeling of ceramics, and chemical processing of functional materials. Building upon the successful interactions and excitement generated in the first six years, the 7th Global Young Investigator Forum (GYIF) will again be organized and facilitated by a group of our young researchers.

The ECD Executive Committee and volunteer organizers sincerely hope you will join us at ICACC'18 for a stimulating and enjoyable conference.

We look forward to seeing you in Daytona Beach, Florida, in January, 2018!

Manabu Fukushima
Program chair, ICACC 2018
National Institute of Advanced Industrial Science and Technology (AIST),
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Tentative Schedule of Events

Sunday, January 21, 2018

Conference registration	2:00 – 7:00 p.m.
Welcome reception at Hilton	5:30 – 7:00 p.m.

Monday, January 22, 2018

Conference registration	7:00 a.m. – 6:00 p.m.
Opening awards ceremony and plenary session	8:30 a.m. – Noon
Companion coffee	9:00 – 10:30 a.m.
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 5:30. p.m.
Young Professional Network, GGRN, student mixer	7:30 – 9:00 p.m.

Tuesday, January 23, 2018

Conference registration	7:30 a.m. – 6:00 p.m.
Concurrent technical sessions	8:30 a.m. – Noon
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 6:00 p.m.
Exhibits and poster session A, including reception	5:00 – 8:00 p.m.

Wednesday, January 24, 2018

Conference registration	7:30 a.m. – 5:30 p.m.
Concurrent technical sessions	8:30 a.m. – Noon
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 5:00 p.m.
Exhibits and poster session B, including reception	5:00 – 7:30 p.m.

Thursday, January 25, 2018

Conference registration	7:30 a.m. – 6:00 p.m.
Concurrent technical sessions	8:30 a.m. – Noon
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 5:00 p.m.

Friday – January 26, 2018

Conference registration	8:00 a.m. – Noon
Concurrent technical sessions	8:30 a.m. – Noon

Abstract Submission Instructions

- Visit **www.ceramics.org/icacc2018** 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.

Hilton Daytona Beach Resort

100 North Atlantic Ave., Daytona Beach, FL 32118
Phone: 1-386-254-8200

Rates: One to four occupants: $170
Students: $140
US government employee: Prevailing rate

Mention The American Ceramic Society to obtain the special rate.

Room rates are effective until December 16, 2017 and are based on availability.

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42ND INTERNATIONAL CONFERENCE AND EXPOSITION ON

ADVANCED CERAMICS AND COMPOSITES

Technical Symposia

S1: Mechanical behavior and performance of ceramics and composites

Structural ceramics and composites have applications in areas including energy generation, environment, space, transportation, and microelectronics. Long-term mechanical reliability is a key issue in their ultimate use for a specific application. Correlations between processing and service conditions/environment, to failure of ceramics by fracture, fatigue, or deformation are key aspects. Extreme environments and challenging applications of ceramic materials have necessitated new approaches for characterization. This symposium solicits abstracts related to the diverse aspects of mechanical behavior of ceramics and composites and their correlations to processing and component performance and reliability.

Proposed session topics

- Processing – microstructure – mechanical properties correlation
- Ceramics and composites for energy generation and environment
- Functionally graded materials and multilayer systems with multi-functional properties
- Mechanics, characterization techniques, and equipment
- Design, reliability, and life prediction modeling of devices and components
- Small-scale testing and applications
- Fiber, matrices, coatings, and interfaces
- Environmental effects and thermomechanical performance
- In situ characterization using X-rays and neutrons
- Testing of joined and integrated components and structures
- Failure analysis
- Mechanical applications of transparent ceramics
- Manufacturing of composite structures for gas turbine applications
- Tribological performance of ceramics and composites

Symposium organizers

- **Dileep Singh**, Argonne National Laboratory, USA; dsingh@anl.gov
- **Jonathan A. Salem**, NASA Glenn Research Center, USA; jonathan.a.salem@nasa.gov
- **Dietmar Koch**, German Aerospace Center, Germany; dietmar.koch@dlr.de
- Emmanuel Maillet, General Electric Company, USA
- Shaoming Dong, Shanghai Institute of Ceramics, China
- Warren Oden, Hysitron, Inc., USA
- Toshihiro Ishikawa, Tokyo University of Science, Yamaguchi, Japan
- Monica Ferraris, Politecnico di Torino, Italy
- Walter Krenkel, Unversity of Bayreuth, Germany
- Rajesh Kumar, United Technologies Research Center, USA
- Andrew Wereszcak, Oak Ridge National Laboratory, USA
- Raul Bermejo, Montanuniversitaet Leoben, Austria

S2: Advanced ceramic coatings for structural, environmental, and functional applications

The growing demand for advanced materials to be used in extreme environments is the key driver for the development of protective ceramic coatings. In next generation turbine engines new lightweight structural materials such as ceramic matrix composites and intermetallics as well as advanced superalloys promise higher energy efficiency due to increasing operation temperatures. However, the synergistic attack of heat, combustion atmosphere, and CMAS-type contamination strongly affects the lifetime of the materials. Consequently, the development of new, high-performance protective coating systems minimizing thermochemical degradation of such advanced materials and components is a highly relevant R&D topic. Furthermore, protection of structural materials against oxidation, corrosion, erosion, and wear remains a key challenge in many industrial applications. The symposium addresses processing, microstructure, performance, and durability of advanced ceramic coating systems. Advanced and new coating compositions, innovative processing, advanced characterization, and thermodynamic modeling are particularly emphasized. Material scientists and engineers from around the world are invited to present and discuss their recent advances in ceramic coating sciences and technologies.

Proposed session topics

- Thermal and environmental barrier coatings for next generation turbine engines
- CMAS-type degradation of T/EBC: Fundamentals, modeling, and mitigation strategies
- Ceramic coatings for protection against oxidation, corrosion, erosion, and wear
- Multifunctional and smart coating systems
- Advanced coating processing technologies
- Advanced characterization, testing, and computational methods

Symposium organizers

- **Peter Mechnich**, German Aerospace Center (DLR), Germany; peter.mechnich@dlr.de
- **Douglas E. Wolfe**, The Pennsylvania State University, USA; dew125@arl.psu.edu
- Dongming Zhu, NASA Glenn Research Center, USA
- Eugene Medvedovski, Endurance Technologies Inc., Canada
- Elizabeth Opila, University of Virginia, USA
- Eric H. Jordan, The University of Connecticut, USA
- Bryan Harder, NASA Glenn Research Center, USA

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- Robert Vaßen, Forschungszentrum Jülich, Germany
- Kang N. Lee, NASA Glenn Research Center, USA
- Byung-Koog Jang, National Institute for Materials Science (NIMS), Japan
- David Poerschke, University of California, Santa Barbara, USA
- Ping Xiao, University of Manchester, UK
- Marie-Hélène Vidal-Sétif, ONERA, France
- Yutaka Kagawa, University of Tokyo, Japan
- Soumendra N. Basu, Boston University, USA
- Rodney W. Trice, Purdue University, USA
- Federico Cernuschi, Ricerca sul Sistema Energetico, Italy
- Uwe Schulz, German Aerospace Center, Germany
- Yiguang Wang, Northwestern Polytechnical University, China
- Satoshi Kitaoka, Japan Fine Ceramics Center, Japan

S3: 15th international symposium on solid oxide fuel cells (SOFC): Materials, science and technology

Solid oxide fuel cells (SOFC) offer potential for clean and efficient power generation from a wide variety of fuels ranging from hydrocarbons to renewables and coal derived fuels. Advanced systems configurations are currently being developed for applications in centralized and distributed stationary generation using SOFCs. Considerable progress has been made in SOFC based systems for automotive auxiliary power generation as well as in man portable and unmanned operation. With demonstrated advantages of high electrical efficiency, lower emissions (greenhouse gas, SOx, NOx, VOC and particulate matters) and ease of products configurability, major focus of interest continues to be on systems research and development, products engineering, and cost effective manufacturing under the sponsorship of government agencies and private industries. Although significant progress has been made in the areas of cell and stack materials, component fabrication, stack and systems simulation and design, fuel processing, and systems operation on a wide variety of liquid and gaseous hydrocarbons, technology development continues towards the identification of bulk and interfacial modifications for performance enhancement, understanding of aging phenomena, accelerated testing, and minimization of degradation, as well as cost reduction at both materials and process levels. Significant challenges still exist in the areas of durability enhancement, stacking cells, fracture mechanics of ceramic components, thermal management, and BOP component development at both sub-kWe and large multi-kWe levels.

Electrochemical energy conversion in solid oxide cell is reversible allowing power generation and fuel production. An essential goal of the modern energy supply is the transition from fossil to renewable energy sources like wind and sun. A disadvantage of these sustainable sources is their fluctuating nature. This necessitates the development of appropriate technologies for the storage of excess energy. High-temperature electrolysis can solve this problem providing highest efficiency for generation of chemicals and products from excessive power. In electrolysis, the regenerative energy is directly converted into hydrogen, and/or a synthesis gas which can be further processed into any fuel. The production of methane, synthetic oils, or diesel, in particular, provides promising synergies. So, it will be possible to couple electricity grid, natural gas grid, and chemicals production. For this reason the research on solid oxide electrolysis is important an task which helps to understand the opportunities and limitations of this new technology for future energy systems.

Proposed session topics

- Electrolytes; oxygen ion, proton and mixed conductors; conduction mechanisms
- Electrode materials and microstructural engineering; electrode processes, defect chemistry, analytical techniques
- Ceramic and metallic interconnects; degradation mechanisms, coatings, accelerated testing, and life prediction
- Sealing materials, designs and approaches; compatibility and interactions
- Novel processing and design of cell and stack materials
- Mechanical and thermal properties, electrochemical performance and stability
- Electrical and structural reliability
- Surface and interfacial reactions; materials transport and electrode poisoning; catalytic degradation, carbon fouling
- Degradation modeling and computational simulation of cells and stacks
- High temperature electrolysis: steam, steam and CO_2, chemical process engineering utilizing SOEC
- Fuel processing; reforming using supported/unsupported catalysts; carbon and sulfur fouling, gas separation membranes
- System design and demonstration
- Applications: Centralized and distributed generation, CHP and µ-CHP, Hydrogen production, portable and unmanned operations

Symposium organizers

- **Narottam P. Bansal**, NASA Glenn Research Center, USA; narottam.p.bansal@nasa.gov
- **Mihails Kusnezoff**, Fraunhofer IKTS, Germany; mihails.kusnezoff@ikts.fraunhofer.de
- Vincenzo Esposito, DTU Energy Conversion, Denmark
- Tatsumi Ishihara, Kyushu University, Japan
- Ruey-Yi Lee, Institute of Nuclear Energy Research, Taiwan
- Nguyen Q. Minh, University of California San Diego, USA
- Prabhakar Singh, University of Connecticut, USA
- Federico Smeacetto, Politecnico di Torino, Italy
- Jeffry W. Stevenson, Pacific Northwest National Laboratory, USA
- Scott A. Barnett, Northwestern University, USA

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S4: Armor ceramics—challenges and new developments

When properly combined with other materials, ceramic and glass materials can exhibit ballistic penetration resistances significantly higher than monolithic metallic materials. Therefore, it is not surprising that lightweight armor technologies, based on ceramic and glass materials, have been developed that provide levels of protection against a wide array of ballistic threats. Despite this reality, current knowledge and understanding are limited with respect to the effects of a ceramic body's physical, chemical, structural, and mechanical characteristics on its local and global response to dynamic contact loading conditions that are characterized by locally large transient stresses, deformations, and temperatures. The deficiency in our understanding of processing–structure–properties–performance relationships has been a hindrance to the development of new materials through conventional and advanced processes, as well as materials-by-design strategies.

This symposium is an opportunity for attendees from industry, academia, and government organizations to meet and participate in open discussions on relevant fundamental and applied research that supports the advancement of knowledge and understanding of the processing—structure–properties–performance relationships for ceramic and glass materials. Proposed symposium topics are listed below. In addition, special sessions on (1) fundamental terminal ballistic behavior, (2) ultrahard and superhard ceramics based on B-C-N-O chemistries, and (3) novel concepts and methods for improving properties by engineering ceramic structure at the atomic, nano, micro, meso, and macro length scales are planned. Contributing papers addressing the general symposium topics and/or the special session topics are welcomed. For those interested in participating, but uncertain whether their work fits within the theme of this symposium, please contact the symposium organizers listed below.

Proposed session topics

- Terminal ballistic behavior: depth-of-penetration, dwell and penetration, in situ/real-time and post-test characterization, mechanisms, size–scale effects, modeling, new techniques
- Synthesis and processing: ceramics, glasses, glass-ceramics, new materials, new methods including field-effects and additive manufacturing, monolithic and composites including CMC's and laminates, toughened, damage-tolerant, multiscale structures, materials-by-design, conventional and novel powders, green body forming, densification, surface modification, planar and curved shapes with/without topological features, scale-up
- Materials characterization: chemistry, phases, structure, defects, flaws and flaw statistics, bulk, surface, microscopy, spectroscopy, combined methods, non-destructive, residual stress, reactivity, wear and erosion, new techniques
- Quasi-static and dynamic behavior: mechanical properties, low and high-rate, high-pressure, large deformation, shear, multi-stress state, shock, fracture, fragmentation, damage, inelastic deformation mechanisms, phase transformations and transitions, in situ probing, small-scale, size–scale effects, reactivity, macro, new techniques
- Materials and process modeling: material, system, analytical, computational, continuum, atomistic, multiscale, thermodynamics, mechanics, phenomenological, physically-based, microstructural, damage, inelastic deformation mechanisms, phase transformations and transitions, fracture, fragmentation, impact, penetration, residual stress, homogeneous and heterogeneous deformation, failure, size–scale effects, novel numerical techniques, new materials
- Bonding of materials: surface chemistry and structure, surface treatments, bond material characteristics and properties, bond theory, bonded interface processing, interface characteristics and properties, bond durability, residual stress, modeling

Symposium organizers

- **Jerry LaSalvia**, ARL, USA; jerry.c.lasalvia.civ@mail.mil
- **Jeffrey Swab**, ARL, USA; jeffrey.j.swab.civ@mail.mil
- Kristopher Behler, ARL, USA
- Sikhanda Satapathy, USA
- Brady Aydelotte, USA
- David Stepp, ARO, USA
- Andrew Wereszczak, ORNL, USA
- Victoria Blair, ARL, USA
- Michael Golt, ARL, USA
- Ghatu Subhash, UFL, USA
- Peter Brown, The Defence Science and Technology Laboratory, UK

S5: Next generation bioceramics and biocomposites

Novel bioceramic materials are being developed that will provide improvements in the diagnosis and treatment of medical and dental conditions. In addition, the development and use of nanostructured materials, bio-inspired materials, biomimetic materials, and inorganic-organic structures has generated considerable scientific interest. This symposium will allow for discussion among the many groups involved in the development and use of bioceramics, including ceramic researchers, medical device manufacturers, and clinicians.

Proposed session topics

- Porous bioceramics (joint with Symposium 9)
- Advanced processing of bioceramics
- Bio-synthetic interfaces
- Biomineralization and tissue-material interactions
- Bioactive and resorbable ceramics
- Bio-inspired and biomimetic ceramics
- Self-assembled bioceramics
- Ceramics for drug and gene delivery
- Antibacterial surfaces

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- In vitro and in vivo characterization of bioceramics
- Mechanical properties of bioceramics
- Medical and dental applications of bioceramics
- Nanostructured bioceramics (joint with Symposium 7)
- Magnetic nanoceramics for biomedical applications
- Light-emitting nanoceramics for bioimaging, sensing and therapy
- Ceramic biosensors

Symposium organizers

- **Roger Narayan**, University of North Carolina, USA; roger_narayan@unc.edu
- Markus Reiterer, Medtronic, Inc., USA
- Bikramjit Basu, Indian Institute of Science, India
- Ilaria Cacciotti, Università degli Studi Niccolò Cusano, Italy
- Marta Cerruti, McGill University, Canada
- Enrico Bernardo, Università di Padova, Italy
- Eva Hemmer, Institut National de la Recherche Scientifique (INRS), Canada
- Chikara Ohtsuki, Nagoya University, Japan
- Akiyoshi Osaka, Okayama University, Japan
- Tolou Shokuhfar, University of Illinois at Chicago, USA
- Kohei Soga, Tokyo University of Science, Japan
- Enrica Verné, Politecnico di Torino, Italy

S6: Advanced materials and technologies for direct thermal energy conversion and rechargeable energy storage

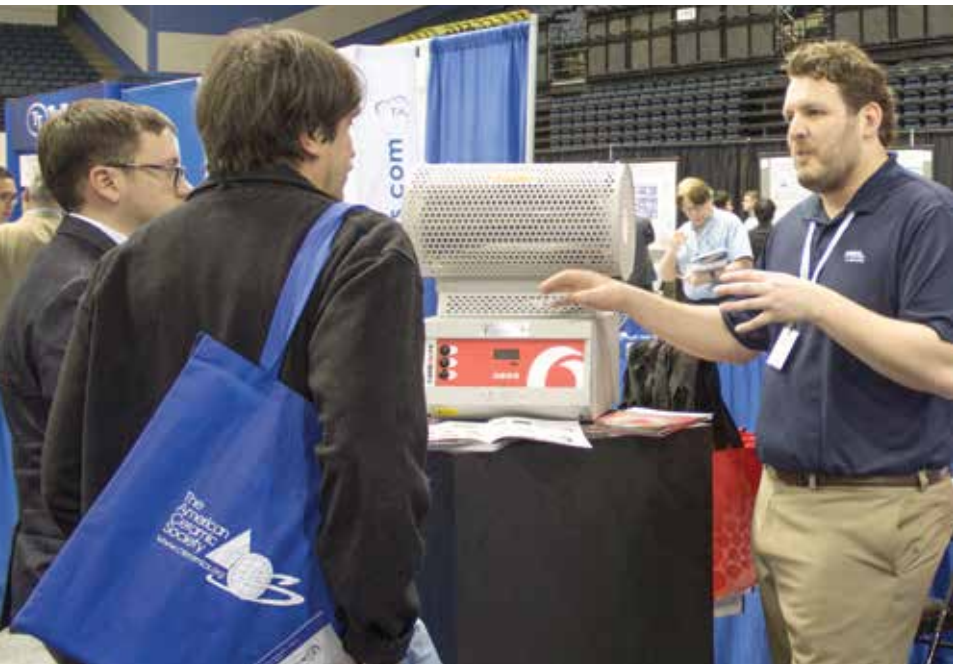
The significant increases in demand of world energy consumption as well as clean and efficient energy resources have prompted the imperative searches of new materials and technologies. The technologies aiming for clean energy generation with zero-emissions will require advances in materials development for electricity generation as well as efficient and reliable energy storage. This symposium focuses on the advanced engineering ceramics and technologies that could help the global community to achieve the stated goals. As for the electric energy generation, sessions will focus on materials for energy harvesting and renewable energy generation. On the other hand, energy storage improvements in materials design, electrodes architecture, electrolytes, separators, and cell chemistry are key factors to extend the life, enhance the safety, and lower the cost of rechargeable batteries that are regarded as the most efficient energy storage systems for portable electronics, renewable energy storage, smart grid, and transportation applications. A deeper understanding of the battery materials/property relationship, electrode/electrolyte interface phenomena, and cell failure mechanisms is critically needed to face these challenges. The search for advanced high capacity electrode materials and the implementation of the very challenging lithium sulfur, lithium-air, and sodium-air batteries will be necessary to overcome the energy density shortfall in currently commercial batteries.

Proposed session topics

- Thermoelectric materials for energy harvesting
- Materials for thermionic and thermovoltaic applications
- Materials for solar-thermal applications
- Stationary rechargeable batteries for grid, solar, and wind technologies
- Advanced anode and cathode materials for lithium batteries
- Materials design, screening, and electrode architectures for lithium batteries
- Diagnostics and materials characterization for lithium batteries
- Electrode/electrolyte interface characterization for lithium batteries
- Applications focused lithium batteries
- Lithium metal-air and lithium-sulphur battery technologies
- Sodium batteries and beyond lithium batteries
- All-solid-state batteries
- Solid electrolytes for batteries
- Materials of capacitive energy storage (super-capacitors)

Symposium organizers

- **Palani Balaya**, National University of Singapore, Singapore; mpepb@nus.edu.sg
- **Olivier Guillon**, Forschungszentrum Jülich, Germany; o.guillon@fz-juelich.de
- Ryoji Funahashi, National Institute of Advanced Industrial Science and Technology (AIST), Osaka, Japan
- Mickael Dollé, University of Montrael, Canada
- Wei Lai, Michigan State University, USA
- Naoaki Yabuuchi, Tokyo Denki University, Japan
- Valerie Pralong, CNRS CRISMAT, France
- XiangXin Guo, Shangai Institute of Ceramics, China
- Jang Wook Choi, KAIST, South Korea
- Terry Tritt, Clemson University, USA
- Fei Chen, Wuhan University of Technology, China



Exhibition Information

Reserve your booth space today for the premier advanced ceramics and composites event.

This event offers an exceptional opportunity to present your company's latest products, services and technology to a sophisticated audience sharply focused on this market.

Exhibits Open:
Tuesday, January 23, 2018, 5 – 8 p.m.
Wednesday, January 24, 2018, 5 – 7:30 p.m.

Exposition Location: Ocean Center Arena, 101 North Atlantic Avenue, Daytona Beach, FL

Visit ceramics.org/icacc2018 for more details or contact Mona Thiel at mthiel@ceramics.org or at 614-794-5834.

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S7: 12th international symposium on functional nanomaterials and thin films for sustainable energy harvesting, environmental, and health applications

Functional nanomaterials with intrinsically new and tailored properties are key elements for developing sustainable energy solutions. New energy technologies and devices demand functional inorganic and composite materials, and conceptual advancement that combine advanced processing, fundamentally new properties, and energy-efficient materials synthesis will form the focus of this symposium. Particular emphasis will be given to novel synthesis approaches, surface functionalization, and heterostructuring of nanoparticles, nanowires, and nanoscopic films. Application of nanostructures in photocatalysis, energy and sensing applications, nanostructured coatings for photovoltaic, and biomedical applications will form the major thrust areas. Contributions related to energy applications such as perovskite materials, batteries, fuel cells, water splitting, and carbon dioxide conversion as well as transparent conductors and challenges related to the large-scale production and integration of functional and structural nanomaterials are highly desired.

Proposed session topics

- Synthesis, functionalization, and assembly of 1-D, 2-D and 3-D nanostructures
- Inorganic materials and composites for energy harvesting and CO_2 conversion
- Metal oxide nanostructures for chemical and biological sensors
- Functional nanostructures for energy conversion and storage and catalysis
- Nanomaterials for photocatalysis, solar hydrogen, and thermoelectrics
- Nanotoxicity, drug-delivery, and tissue engineering with tailored nanobioconjugates
- Integration of functional metal oxide nanostructures in devices
- Perovskites and other optical materials for light management
- Innovative thin film techniques (e.g., ALD, PECVD)
- Industrial production and application of nanomaterials and coatings
- Carbon nanostructures and 2-D materials
- Computational methods in the design of tailored nanostructured materials

Symposium organizers

- **Sanjay Mathur**, University of Cologne, Germany; sanjay.mathur@uni-koeln.de
- **Yakup Gönüllü**, University of Cologne, Germany; y.goenuellue@uni-koeln.de
- **Gustavo Costa**, NASA Glenn Research Center, USA; gustavo.costa@nasa.gov
- Yoon-Bong Hahn, Chonbuk National University, Korea
- Esko I. Kauppinen, Aalto University, Finland
- Marlies van Bael, Hasselt University, Belgium
- Alberto Vomiero, Luleå University of Technology
- Jih-Jen Wu, National Cheng Kung University, Taiwan
- Shaohua Shen, Xian Jiaotong University, China
- Teresa Andreu, The Catalonia Institute for Energy Research, Spain
- Renata Solarska,University of Warsaw, Poland
- Yang Yang, University of Central Florida, USA
- Chenhu Sun, National Energy Technology Lab, USA
- Roger Narayan, North Carolina State University, USA
- Chung-Li Dong, Tamkang University, Taiwan

S8: 12th international symposium on advanced processing and manufacturing technologies for structural and multifunctional materials and systems (APMT12)

The properties and performance of structural and multifunctional materials largely depend on their processing and manufacturing routes. Manufacturing processes carefully designed with sufficient understanding of forming/sintering behaviors lead to reliable performance of components and products of large size and complex shapes. On the other hand, recently developed new processing and fabrication techniques of ceramic materials and systems give us unique properties which cannot be achieved from the conventional routes. The aim of this international symposium is to discuss global advances in the research and development of advanced processing and manufacturing technologies for a wide variety of fiber reinforced and particulate composites, nonoxide and oxide based structural ceramics, and multifunctional materials, as well as their components and devices. Current advances and state-of-the-art in various eco-friendly processing approaches will be also covered.

Proposed session topics

- Novel forming/sintering technologies, near-net shaping
- Rapid prototyping, patterning, templates, and self assembly
- Advanced composite manufacturing technologies, hybrid processes
- Microwave processing, SPS
- Advanced powder synthesis and processing
- Aqueous synthesis, colloidal processing
- Polymer-based processing
- Design-oriented manufacturing and processing
- Joining, integration, machining, repair, and refurbishment technologies
- Green manufacturing, global environmental issues and standards

Symposium organizers

- **Tatsuki Ohji**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; t-ohji@aist.go.jp
- **Mrityunjay Singh**, Ohio Aerospace Institute, NASA Glenn Research Center, OH, USA; mrityunjay.singh-1@nasa.gov

- **Zhengyi Fu**, Wuhan University of Technology, China; zyfu@whut.edu.cn
- Enrico Bernardo, University of Padova, Italy
- Mirosław Bućko, AGH University of Science and Technology, Poland
- Thomas Graule, Empa, Switzerland
- Surojit Gupta, University of North Dakota, USA
- Young-Wook Kim, University of Seoul, Korea
- Jerzy Lis, AGH University of Science and Technology, Poland
- Eugene Medvedovski, Endurance Technologies Inc., Canada
- Lisa Rueschhoff, Purdue University, USA
- Richard D. Sisson, Jr., Worcester Polytechnic Institute, USA
- Tohru S. Suzuki, National Institute for Materials Science (NIMS), Japan
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Valerie Wiesner, NASA Glenn Research Center, USA

S9: Porous ceramics: Novel developments and applications

Porous materials are utilized in many applications including but not limited to thermal insulation, catalysts, catalyst supports, filters, adsorbers and sensors. This symposium aims to bring together the technical community to share recent advances in the formation, characterization, properties and modeling of porous ceramic, carbon, glass, and glass-ceramic components for any application.

These materials contain pore sizes from nanometers to millimeters, can have textured to random porosity or hierarchical porosity, and are based on various pore architectures, such as foams, honeycombs, fiber networks, bio-inspired structures.

This symposium is the ideal showcase for the research activities of many groups involved in the development and use of porous materials including but not limited to the areas of ceramics, chemistry, mechanics, fluid dynamics, modeling and simulation, and application engineering.

Proposed session topics

- Innovations in processing methods and synthesis of porous ceramics
- Structure and properties of porous ceramics
- Novel characterization tools of porous structures
- Mechanical behavior of porous ceramics
- Microporous and mesoporous ceramics
- Ceramic membranes
- Ceramics with hierarchical porosity
- Engineered porous architectures enabled by additive manufacturing technologies
- Porous ceramics for environmental applications
- Porous ceramics for energy applications
- Porous ceramics for biological applications
- Porous ceramics for functional applications
- Porous ceramics for water filtration

Symposium organizers

- **Paolo Colombo**, University of Padova, Italy; paolo.colombo@unipd.it
- **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; manabu-fukushima@aist.go.jp
- **Tobias Fey**, University of Erlangen-Nuremberg, Germany; tobias.fey@fau.de
- Samuel Bernard, Institut Européen des Membranes, France
- Giorgia Franchin, University of Padova, Italy
- Go Kawamura, Toyohashi University of Technology, Japan
- Fabrice Rossignol, CNRS Limoges, France
- Kurosch Rezwan, University of Bremen, Germany
- Hutha Sarma, Corning Environmental Technologies, USA
- Jian-feng Yang, Xi'an Jiaotong University, China

S10: Virtual materials (computational) design and ceramic genome

Recent progress in computational materials science has significantly enhanced the efficiency with which the understanding of fundamental phenomena, the improvement of materials performance, the optimization of processing, the discovery of new materials, and the design of structural components can be achieved. This symposium will focus on the design, modeling, and simulation of ceramics and composites to further optimize their behavior and facilitate the design of new ceramics and composites with tailored properties. A broader perspective is desired including interest related to ceramic genome, virtual materials design for new innovative materials and thermo structure, integrated materials computational engineering, prediction of the structure and properties of crystals and defects, modeling materials behavior under extreme/harsh environments, application of novel simulation methods for materials processing and performance, simulation of novel ceramics for functional applications, and the modeling of surfaces, interfaces, and grain boundaries at multiple scales.

Proposed session topics

- Ceramic genome
- Integrated materials computational engineering
- Novel simulation methods for materials processing and performance
- Multiscale modeling approaches
- Modeling materials behavior under extreme/harsh environments (ultra high temperature, radiation, environmental damages and severe mechanical load and stresses)
- Model-aided design of thermal insulating and thermo structural materials
- Modeling and design of new innovative ceramics for functional applications
- Prediction of the crystal structure and properties of new ceramics
- Modeling defects and amorphous matter
- Modeling of surfaces, interfaces, and grain boundaries at multiple scales

Symposium organizers

- **Jingyang Wang**, Institute of Metal Research, Chinese Academy of Sciences, China; jywang@imr.ac.cn
- William J. Weber, University of Tennessee, USA
- Gerard L. Vignoles, University of Bordeaux, France
- Paul Rulis, University of Missouri-Kansas City, USA
- Katsuyuki Matsunaga, Nagoya University, Japan
- Hans J. Seifert, Karlsruhe Institute of Technology, Germany
- Jian Luo, University of California, San Diego,
- Sean Smith, The University of New South Wales, Australia
- Haixuan Xu, University of Tennessee, USA

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S11: Advanced materials and innovative processing ideas for production root technologies

"Production Root Technologies" refers to a collection of six production technologies including casting, molding, forming, welding, heat treatment, and surface treatment. Production Root Technologies involve both materials and process technologies that are hidden behind products and do not frequently appear outward. However, they are very important fundamentally and greatly influence material performance. As the functions of products become more complex and robust, the importance of these Production Root Technologies grows concurrently.

Production Root Technologies have an inherent interdisciplinary nature, inevitably including a broad spectrum of skills from starting materials all the way up to component manufacturing and module integration. As demand increases for sustainable energy, especially by employing novel materials, composites and/or functional (e.g., energy scavenging, storage, and saving) techniques, the interdisciplinary approach plays even a greater role. Therefore, this symposium is designed to provide an opportunity for the world's leading scientists and engineers from many fields to exchange ideas and to build new collaborations in the fields of Production Root Technologies. Many successful stories and noteworthy examples of transforming 3 D (dangerous, dirty, and difficult) aspects of Production Root Technologies into ACE (automatic, clean and easy) form will also be recognized and shared.

Proposed session topics

- Starting materials: mining, particles, bulk and functional materials and precursors
- Sustainable energy concepts and applications
- Transitioning fundamentals to industry
- Forming and shaping processes for advanced materials
- Recycling and reuse processes
- Coating processes for low friction and energy solutions
- New concepts and emerging technologies for enhanced product performance
- Industrial root technology based on kitech and gigaku concept

Symposium organizers

- **Sungwook Mhin**, Korea Institute of Industrial Technology, Korea; hyeleci@kitech.re.kr
- **Tadachika Nakayama**, Nagaoka University of Technology, Japan; nky15@vos.nagaokaut.ac.jp
- Sung Duk Kim, Korea Institute of Industrial Technology, Korea
- Jacob L. Jones, North Carolina State University, USA
- Geoff Brennecka, Colorado School of Mines, USA
- Ali Erdemir, Argonne National Laboratory, USA
- Jun Akedo, AIST, Japan
- Byungkoog Jang, NIMS, Japan
- Kouichi Yasuda, Tokyo Institute of Technology, Japan
- Kyoung Il Moon, Korea Institute of Industrial Technology, Korea

S12: Advanced MAX/mxene phases and UHTC materials for extreme and high temperature environment

Track A: Nano-laminated ternary carbides and nitrides (MAX Phases) and 2-D phases (MXenes)

MAX phases (over 70 phases) are thermodynamically stable nanolaminates displaying unusual, and sometimes unique, properties. These phases possess a M*n*+1AX*n* chemistry, where *n* is 1, 2, or 3, M is an early transition metal element, A is an A-group element and X is C or N. MAX phases are hexagonal materials with an inherent nanolayered structure which provides a unique combination of metal-like and ceramic-like properties: machinability, good electrical and thermal conductivity, high thermal shock resistance, good oxidation resistance, stiffness at high temperature which opens a way to diverse potential applications. Recently, it was shown that it is possible to separate each layer of nanolaminates and form 2-D solids, MXenes (attractive electronic, optical, magnetic, plasmonic and thermoelectric properties have also been observed in these 2-D solids). The Track A will focus on designing, processing, structure-property relationships, thermal, electrical, optoelectronic, solid lubrication, and mechanical properties, oxidation resistance, and stability of these novel ternary compounds in their 2-D and 3-D forms.

Track B: Ultrahigh temperature ceramics (UHTCs)

Ultrahigh temperature ceramics (UHTCs) are potential materials for use in extreme environments such as scramjet engine components, leading edges and thermal protection systems for hypersonic vehicles etc. However, their thermal/chemical stability in extreme environments, the ability to be formed into complex shapes/sharp edges, thermal shock resistance, irradiation resistance, and damage tolerance are all critical challenges limiting near-term industrial applications of these materials. For such extreme environment applications, new advances in the understanding of structure-property relations and improved performance are needed. Track B will focus on design, processing, structure-property relationships, thermal and mechanical properties, oxidation resistance, machining and joining, and stability of UHTCs both from fundamental and application-oriented perspectives.

Proposed session topics

Track A :

- Design of novel composites and manufacturing methods
- Methods for improving damage tolerance, oxidation and thermal shock resistance
- Novel applications and device fabrication (capacitors, energy storage, biosensors, etc.) of MAX Phases and MXenes
- Study of electronic, optical, plasmonic, and thermoelectric properties
- Theoretical calculations for designing MAX Phases and MXenes

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Track B :

- New precursors for powders, coatings, and matrix or fibers of composites
- Processing–microstructure–property relationships of existing systems
- Novel processing methods (bulk, coatings, and thin films), characterization methods and lifetime assessment
- Methods for improving damage tolerance, oxidation, and thermal shock resistance
- Structural stability under extreme environments (irradiation, ultrahigh temperature)
- Simulation and theory for predictive material behavior under extreme environments

Symposium organizers

- **Surojit Gupta**, UND, USA; surojit.gupta@engr.und.edu
- **William G. Fahrenholtz**, Missouri S&T, USA; billf@mst.edu
- **Miladin Radovic**, Texas A&M University, USA; mradovic@tamu.edu
- Johanna Rosen, Linköping University, Sweden
- Thierry Cabioch, Université de Poitiers, France
- Qing Huang, Ningbo Institute of Materials Technology & Engineering, China
- Michael Naguib, ORNL, USA
- Babak Anasori, Drexel University, USA
- Jochen Schneider, RWTH Aachen, Germany
- Sylvain Dubois , Université de Poitiers, France
- Per Eklund, Linköping University, Sweden
- Konstantza Lambrinou, SCK· CEN, Belgium
- Yanchun Zhou, Aerospace Research Institute of Material & Processing Technology, China
- Michael Walock, ARL, USA
- Elizabeth Opila, University of Virginia, USA
- Jon Binner, University of Birmingham, UK
- Erica L. Corral, University of Arizona, USA
- Greg Hilmas, Missouri S&T, USA
- Sea-Hoon Lee, KIMS, Korea
- Frederic. Monteverde, ISTEC-CNR, Italy
- Luc J Vandeperre, Imperial College, UK
- Guo-Jun Zhang, Donghua University, Shanghai, China

S13: Advanced ceramics and composites for nuclear fission and fusion energy

Development of advanced materials and their application for safer and sustainable nuclear energy, including future fusion energy systems continues to progress and evolve. This international symposium provides a venue for scientists and engineers to discuss the opportunities and needs for key enabling materials in nuclear energy systems, including the most current and state-of-the-art science and technology ranging from materials design, processing, and properties to their performance in harsh nuclear environments. Also, included will be discussions on prospects and perspectives related to commercial development, and qualification and licensing requirements. The symposium is cosponsored by ACerS Nuclear and Environmental Technology Division.

Proposed session topics

- Material technologies for enhanced accident tolerance LWR fuels and core
- Ceramic fuel materials, technologies, and characterization; TRISO fuels
- Graphite and carbon materials for nuclear applications
- Chemical compatibility and corrosion
- Novel ceramics and composites for nuclear systems
- Joining and coating for reactor components
- Radiation damage, defect production, evolutions, and interactions
- Plasma interactions of ceramics for fusion energy
- Fuel, cladding, assembly, and core evolutions and performance modeling
- Test methods, codes and standards, and design methodology

Symposium organizers

- **Yutai Katoh**, Oak Ridge National Laboratory, USA; katohy@ornl.gov
- **Jake Amoroso**, Savannah River National Laboratory, USA; jake.amoroso@srnl.doe.gov
- Theodore Besmann, University of South Carolina, USA
- Nicholas Brown, Pennsylvania State University, USA
- Christian Deck, General Atomics, USA
- Monica Ferraris, Politecnico di Torino, Italy
- Peter Hosemann, University of California, Berkeley, USA
- Weon-Ju Kim, Korea Atomic Energy Research Institute, Korea
- Takaaki Koyanagi, Oak Ridge National Laboratory, USA
- Konstantza Lambrinou, SCK-CEN, Belgium
- Takashi Nozawa, National Institutes for Quantum and Radiological Science and Technology, Japan
- Lance Snead, Stony Brook University, USA
- Melissa Teague, Sandia National Laboratories, USA

S14: Crystalline materials for electrical, optical and medical applications

This session will provide a forum for the presentation and discussion of recent research and development activities on crystalline materials. The session will cover all aspects, from basic research and material characterization, through physicochemical aspects of growth, synthesis and deposition techniques, to the technological development of industrialized materials. For this purpose, world-wide experts in the different topics will be invited to introduce their most recent activities. The broad scope of the session assures a wide overview of the state-of-the-art issues on crystalline materials, aiming to stimulate interdisciplinary discussions and collaborations in a wide range of fields.

Proposed session topics

- Semiconductors for LED/LD, power device, sensor
- Optical materials for laser, nonlinear optics, optical isolator, phosphor
- Scintillators for X-, gamma- and neutron detection
- Piezo-, ferro- and magneto-electric materials
- Transparent ceramics and nanocrystals
- Phase diagrams, defect chemistry, crystalline quality

Symposium organizers

- **Kiyoshi Shimamura**, National Institute for Materials Science, Japan; SHIMAMURA.Kiyoshi@nims.go.jp
- Noboru Ichinose, Waseda University, Japan
- Nerine J. Cherepy, Lawrence Livermore National Laboratory, USA
- Joanna McKittrick, University of California, San Diego, USA
- Victoria Blair, U.S. Army Research Laboratory, USA
- Mariya Zhuravleva, University of Tennessee, USA
- Yoshihiko Imanaka, Fujitsu Laboratories Ltd., Japan
- Kenji Toda, Niigata University, Japan
- Romain Gaume, University of Central Florida, USA
- Juejun Hu, Massachusetts Institute of Technology, USA
- Takayuki Yanagida, Nara Institute of Science and Technology, Japan

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S15: Additive manufacturing and 3-D printing technologies

Additive manufacturing and 3-D printing are novel fabrication processes of ceramic components with functional structures. The processes allow for innovative complex part fabrication, client customization, rapid prototyping, and distributed manufacturing. Three-dimensional models are designed minutely according to theoretical concepts in computer graphic applications, and two-dimensional cross sections are created by slicing operations automatically. High resolution laser beams are scanned on a spread ceramic powder bed with or without resin binders to form solid planes of two-dimensional cross sections. Through layer stacking, ceramic precursors or components with the three-dimensional models are fabricated rapidly and exactly. In other processes, paste materials with ceramic particles dispersed are fused from nozzles moving freely in three dimensions to create composite precursors. Various functional components of dielectric lattices to control electromagnetic waves, biomaterials components for medical applications and ceramics electrode with large surface area will be newly developed. Large scale structural components for aerospace and other high temperature applications can be fabricated with internal cooling path networks formed without casting molds. This symposium focuses on superiority of design, efficient processing, and perspicuous evaluations in the additive manufacturing and 3-D printing processes.

Proposed session topics

- Selective laser sintering (SLS)
- Stereolithography
- Direct writing technologies
- Fused deposition modeling (FDM)
- Laminated object manufacturing/ green tape stacking
- Ink jet printing technologies
- Powder bed fusion process
- Emerging additive manufacturing technologies

Symposium organizers

- **Soshu Kirihara**, Osaka University, Japan; kirihara@jwri.osaka-u.ac.jp
- **Mrityunjay Singh**, Ohio Aerospace Institute, USA; mrityunjaysingh@oai.org
- **Michael Halbig**, NASA Glenn Research Center, USA; michael.c.halbig@nasa.gov
- Elizabeth Kupp, Pennsylivania State University, USA
- Cesar R. Foschini, Universidae Estadual Paulista, Bauru, Brazil
- Martin Schwentenwein, Lithoz GmbH, Austria
- Miranda Fateri, FH Aachen, Germany
- Andrea Zocca, BAM, Germany
- Lisa Rueschhoff, Purdue University, USA

S16: Geopolymers, inorganic polymers and sustainable materials

Refractory inorganic polymers can be made at ambient temperatures and pressures. These materials include alumino-silicates or "geopolymers," phosphates and other chemically bonded inorganic compounds. The use of waste products such as fly ash or slag, or components derived from biological materials as starting compounds or as reinforcements in composites, demonstrates the eco-friendly and sustainable nature of these materials. Novel potential applications of such composites include fire and corrosion resistant materials, infrastructure and construction materials, thermal insulation, porous materials, structural ceramic composites containing ceramic, metal or biological reinforcements, hydrogen storage, liquid and water purification, and porous materials for CO_2 sequestration.

Proposed session topics

- Synthesis, processing microstructure
- Mechanical properties, thermal shock resistance
- Other inorganic analogues
- Composites
- Conversion to ceramics
- Waste encapsulation
- Infrastructure and construction materials
- Coatings (fire resistant, acid resistant)
- Novel applications
- Sustainable materials

Symposium organizers

- **Waltraud M. Kriven**, University of Illinois at Urbana-Champaign, USA; kriven@illinois.edu
- Joseph Davidovits, Geopolymer Institute, St. Quentin, France
- Claus H. Rüscher, Leibniz University of Hannover, Germany
- Sylvie Rossignol, GEMH-ENSCI, Limoges, France
- Iannis Pontikes, Katholieken Universiteit, Leuven, Belgium
- Flavio de Silva, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

S17: Advanced ceramic materials and processing for photonics and energy

In the past few years, significant progress has been reported on the synthesis as well as on the structural, physical and chemical characterization of ceramic nanostructures that exhibit size-dependent properties and on novel glass-based materials for optical lasers and amplifiers. The field of nanomaterials (e.g. nanowires, nanorods, nanotetrapods) has become one of the most active research areas within the nano-science community. Such materials are leading to fundamental new discoveries as well as applications in photovoltaics, optical sources, electroceramics, multiferroic materials, catalysis and solar hydrogen. Optical glasses have been employed in the fabrication of high power fiber lasers with unprecedented performance and for optical waveguide based devices with multiple functionalities.

This session focuses on all ceramic materials with application potentials as

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functional materials, with particular consideration given to the capability to tailor and control material properties via surface and structural modifications. The session also includes novel optical glass-based materials with new functionalities, new emission wavelengths and with an overview toward integration with other classes of materials (polymers, metals). New nanotechnology tools and technological procedures for the development of new functional devices integrating bottom-up and top-down technologies will be also considered.

Proposed session topics

- Multifunctional materials
- Advanced and nanostructured materials for photonics, electronics and sensing
- Advanced and nanostructured materials for photovoltaics and solar fuels
- Advanced glass based materials for laser sources and nonlinear applications

Symposium organizers

- **Alberto Vomiero**, Luleå University of Technology, Sweden; alberto.vomiero@ltu.se
- Federico Rosei, University du Quebec, Canada
- Yasuhiro Tachibana, RMIT University, Australia
- David Kisailus, University of California, Riverside, USA
- Tohru Sekino, Osaka University, Japan
- Guozhong Cao, University of Washington, Seattle, USA

FOCUSED SESSION 1: BIO-INSPIRED PROCESSING OF ADVANCED MATERIALS

A bio-inspired material is any material that exhibits a structure or function that imitates some aspect of a material or process found in nature. The study of bio-inspired materials is a technical means for people to learn from nature, in order to develop new materials and structures with novel functionalities. 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 science and engineering issues associated with bio-inspired processing of advanced materials. A particular emphasis will be placed on the fundamental issues related to advancing our understanding and utilization of processes inspired by nature to develop materials with new functionalities and structures.

Proposed session topics

- Bio-inspired processing of ceramics
- Biomimetic optical and photonic materials
- Bio-inspired materials for medical applications
- Advances in bio-inspired materials
- Mechanical properties of bio-inspired materials
- Environmental applications of bio-inspired materials
- Characterizations of bio-inspired materials
- Nature inspired materials for energy conversion

Symposium organizers

- **Yiquan Wu**, Alfred University, USA; wuy@alfred.edu
- **Di Zhang**, Shanghai Jiaotong University, China; zhangdi@sjtu.edu.cn
- Zhengyi Fu, Wuhan University of Technology, China
- Joachim Bill, University of Stuttgart, Germany
- Eduardo Saiz, Imperial College London, UK
- Tolou Shokuhfar, University of Illinois at Chicago, USA
- Atsushi Hozumi, AIST, Japan
- Joaquin Ramirez-Rico, University of Seville, Spain

FOCUSED SESSION 2: TOMOGRAPHY AND MICROSCOPY BASED MODELING OF CERAMICS

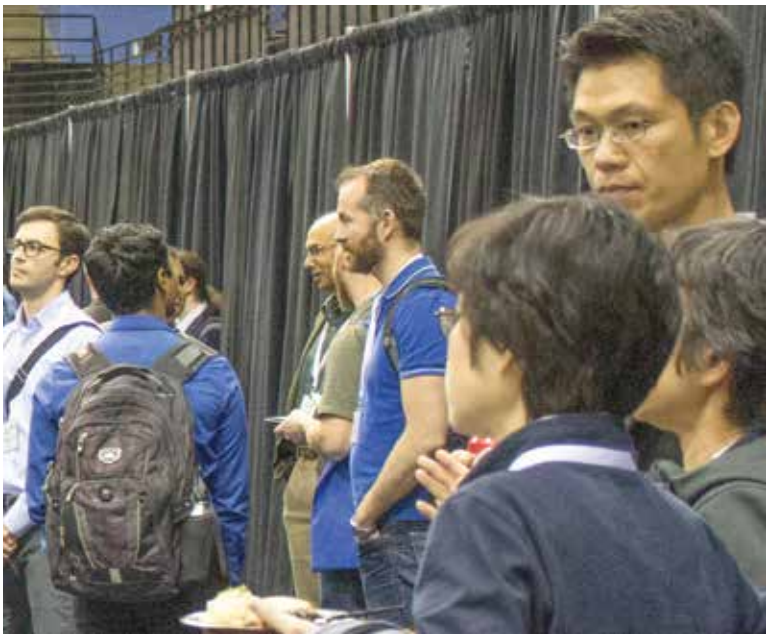
Characterization techniques as tomography and microscopy have gained an increase in resolution and speed in the past ten years which make them suitable for microstructural characterization on micro- and nanometer length scale. Techniques as µCT, TEM-Tomography, SEM/AFM/Ultrasonic microscopy as well as synchrotron and high performance computing enables an insight 3-D view from materials. Thus, physical properties are highly effected by microstructure features (inhomogenities as e.g. porosity, grain borders, inclusions) their size, dimension, shape and orientation have to be taken into account. Providing microstructure based models derived from mentioned characterization tools for modeling and simulation will lead to a detailed real structure length scale depending modeling. Representative volume and volume of interest (VOI) are of particular importance to link model and experiment for verification.

Proposed session topics

- Influence of inhomogeneity on mechanical, chemical, electrical and thermal properties and the estimations
- Characterization technologies for defect extraction, shape calculation, grain orientation and void distribution by 3-D model data acquisition
- Analysis of sintering and solidification based on image based models
- Verification of model by experiment and vice versa
- Optimized microstructures designed and simulated by topographies
- Strain characterization by digital image correlation technique
- Length scale depending modeling based on evaluated structural data

Symposium organizers

- **Tobias Fey**, Friedrich-Alexander-University Erlangen-Nürnberg, Germany; tobias.fey@fau.de
- Yasuo Kogo, Tokyo University of Science, Japan
- You Zhou, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Michael Scheffler, Otto-von-Guericke University, Germany
- Alberto Ortona, SUSPI, Switzerland
- Lorenzo Valdevit, University of California, Irvine, USA



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FOCUSED SESSION 3: CHEMICAL PROCESSING OF FUNCTIONAL MATERIALS: UNDERSTANDING THE CONVERSION OF MOLECULAR STRUCTURES TO SOLID-STATE COMPOUNDS

Designing matter from atomistic to macroscopic scales is a unique attribute of chemical materials technologies. Processing of a large number of compounds with controlled crystal structure, porosity and dimensionality involve a significant chemical interplay, which is rarely considered as a guiding parameter. This focused session intends to conceptually unite the materials chemists with ceramists and materials engineers for developing new concepts and pathways for synthesis, handling and device integration of functional materials. Whereas the conventional top-down methods are preferred due to their simplicity and to some extent predictable nature, they operate mostly in the thermodynamical regimes and are less suited for synthesizing multi-component and hybrid (organic-inorganic) materials. The chemical approaches based on well-defined precursors offer precise control over chemical composition, microstructure, porosity and low processing temperatures that have provided access to vast number of metastable phases with interesting properties and have opened several new application domains. Despite the well-known benefits of molecular-level processing of inorganic solids, a major challenge lies in the limited insight into molecule-to-material transformations and the fact that many of the molecular precursors are commercially not available. This focused session will discuss new transformation mechanisms for converting molecular precursors into functional solid-state structures. Role of precursor chemistry and additives in solution such as sol-gel, solvothermal, electrospinning and microwave and gas phase techniques such as Chemical Vapor Deposition (CVD) and Atomic Layer Deposition (ALD) will be critically analysed. Specific emphasis will be to demonstrate materials manufacturing strategies and chemically controlled assembly and purpose-driven modification of materials. Non-conventional synthesis and analytical methods enabling in-situ diagnostics and mechanistic insights into nucleation, growth and self-assembly can circumvent existing problems. Particular focus will be to elucidate the need of new and smart precursor chemistry to obtain specific material compositions, that can integrate the advancements in materials processing techniques with the existing knowledge-base of materials chemistry. The industrial potential of chemically processed materials will be analyzed and discussed towards their simplicity, scalability and cost-effectiveness.

Proposed session topics

- Precursor chemistry – Structural and thermal characterization
- Figure of Merit studies on precursor to material transformations
- Chemically processed nanostructures – 0D, 1D, 2D and 3D systems
- Solution-phase processing of functional materials
- Molecular precursor approaches for vapor-phase synthesis of materials
- In-situ studies on nucleation and growth of solid-state phases in solution and gas phases
- Surface chemistry on nanostructures
- Scaled-up production of precursor-derived materials
- Materials integration and device applications

Symposium organizers

- **Sanjay Mathur**, University of Cologne, Germany; Sanjay.mathur@uni-koeln.de
- Maarit Karppinen, University of Aalto, Finland
- Se-Hun Kwon, Busan National University
- Aivaras Kareiva, Vilnius University, Lithuania
- Thomas Fischer, University of Cologne, Germany
- Linan An, University of Central Florida, USA
- Edwin Kroke, TU Bergakademie Freiberg, Germany
- Hiromitsu Kozuka, Kansai University, Japan
- Philippe Miele, Ecole Nationale Supérieure de Chimie de Montpellier, France
- Simon Elliott, Tyndall National Institute, Ireland
- Hirokazu Katsui, Tohoku University, Japan

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7TH GLOBAL YOUNG INVESTIGATOR FORUM

The Global Young Investigators forum (GYIF) aims to bring together young researchers from around the world by facilitating scientific discussions to promote the exchange of ideas essential to identifying emerging global challenges at the forefront of ceramic science and engineering research. Young researchers, including students, postdoctoral researchers, young professionals and early career faculty are invited to join this event. The GYIF symposium will help establish global cooperation and networking among young scientists and engineers to approach current and future challenges in ceramic science and technology as well as provide GYIF participants a unique forum at which to showcase their research.

In addition to connecting with young researchers, all GYIF participants will be invited to attend a private luncheon hosted by the president of the American Ceramic Society. The American Ceramic Society will also provide complimentary student registration for a select number of eligible student GYIF presenters. The Global Young Investigator award laureate will deliver the opening keynote lecture. New this year: a poster session section dedicated to the GYIF.

Proposed session topics

- Frontiers in ceramic chemistry and physics: new precursors for functional ceramics, ceramics and catalysis, functional surfaces
- Ceramic hybrid materials and composites for aerospace, armor, biological, and medical applications
- Advanced ceramics and coatings for structural, environmental, and functional applications
- Novel ceramic processing methods and synthesis routes
- Nanocomposites and nanostructured materials
- Computational materials prediction and design
- Novel characterization tools of ceramics and composites
- Applications: ceramic sensors and actuators, energy generation, saving and storage, photo-catalysis, and biomedical applications
- Young researchers' funding, mobility, and networks

Symposium organizers

- **Kathleen Shugart**, UES Inc. at Air Force Research Lab, USA; kathleen.shugart.ctr@us.af.mil
- **Daniele Benetti**, Institut National de la Recherche Scientifique, Canada; daniele.benetti@emt.inrs.ca
- **Manoj K. Mahapatra**, University of Alabama at Birmingham, USA; mkmanoj@uab.edu
- **Giorgia Franchin**, University of Padova, Italy; giorgia.franchin@unipd.it
- Valerie Wiesner, NASA Glenn Research Center, USA
- Eva Hemmer, University of Ottawa, Canada
- Ken'ichiro Kita, National Institute of Advanced Industrial Science and Technology, Japan
- Alex Lee, The Chinese University of Hong Kong, China
- Jie Zhang, Institute of Metal Research, China
- Derek King, UES Inc. at Air Force Research Lab, USA
- Ben Kowalski, NASA Glenn Research Center, USA
- Matt Applby, NASA Glenn Research Center, USA

HONORARY SYMPOSIUM: Advancing frontiers of ceramics for sustainable societal development – International symposium in honor of Dr. Mrityunjay Singh

Global population growth and tremendous economic development has brought us to the crossroads of long-term sustainability and risk of irreversible changes in the ecosystem. Energy efficient and ecofriendly technologies and systems are essentially important for further growth and sustainable development of our society. Because of their unique properties and performances, ceramic materials and components are frequently used as key parts in cutting-edge products and systems that solve these issues in various fields including energies, environments, transportation, electronics, biotechnologies, manufacturing industries, etc. Keeping these aspects in view, the aim of this symposium is to address and discuss the latest issues, challenges, and opportunities in a variety of advanced materials and technologies that are critically needed for sustainable societal development.

This symposium honors of Mrityunjay Singh, Ohio Aerospace Institute, USA, and past president of the American Ceramic Society (2015-16), and recognizes his long-term and outstanding contributions to science and technology of advanced ceramic materials and technologies, as well as his tireless efforts in mentoring students and young professionals, promoting and developing human network and collaborations among the materials community worldwide.

Proposed session topics

- Emerging global trends and innovations in advanced materials and technologies
- Global energy and environmental challenges and role of ceramics
- Ceramics for health and biomedical applications
- Ceramics for clean water and sustainable infrastructure
- Engineered ceramics for sustainable development
- Challenges and prospects for advanced ceramic technologies
- Global resource management for sustainable development
- Innovative strategies and technologies for sustainable and self-sufficient solutions
- Ceramic education, training, and knowledge management

Symposium organizers

- **Tatsuki Ohji**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; t-ohji@aist.go.jp
- Sanjay Mathur, University of Cologne, Germany
- Palani Balaya, National University of Singapore, Singapore
- Monica Ferraris, Politecnico Di Torino – DISAT, Italy
- Jow-Lay Huang, National Cheng Kung University, Taiwan
- Hai-Doo Kim, Korea Institute of Materials Science (KIMS), South Korea
- Hua-Tay Lin, Guangdong University of Technology, China
- Jerzy Lis, AGH University of Science and Technology, Poland
- Alexander Michaelis, Fraunhofer IKTS, Germany
- Reginaldo Muccillo, IPEN, Brazil
- Pavol Sajgalik, Slovak Academy of Sciences, Slovakia
- Lalit Sharma, CSIR-Central Glass & Ceramic Research Institute, India
- Dileep Singh, Argonne National Laboratory, USA
- Richard D. Sisson, Jr., Worcester Polytechnic Institute, USA
- Yu Zhou, Harbin Institute of Technology, China

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