# CALL FOR PAPERS

ABSTRACTS DUE
JULY 25, 2018

## 43RD INTERNATIONAL CONFERENCE AND EXPOSITION ON

# ADVANCED CERAMICS AND COMPOSITES

## JANUARY 27 – FEBRUARY 1, 2019

Hilton Daytona Beach Resort and Ocean Center
Daytona Beach, Florida, USA


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

ceramics.org/icacc2019

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## Introduction

It is an honor to chair the 43rd International Conference & Exposition on Advanced Ceramics & Composites (ICACC), which will be held from Jan. 27 – Feb. 1, 2018, in Daytona Beach, Fla. This conference has a strong history of being one of the best international meetings on advanced structural and functional ceramics, composites, and other emerging ceramic materials and technologies.

On behalf of the American Ceramics Society, the Engineering Ceramics Division (ECD) has organized this esteemed event since 1977. Due to the high quality of presentations and subsequent networking opportunities, this event has achieved tremendous growth and worldwide interest, and active participation from ceramic researchers and developers from national and global technical communities. This conference plays a key role in advancement of ceramics and composites.

This year, the technical program will consist of 17 symposia, four focused sessions, one special focused session, the Fulrath symposium, and the 8th 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 in the 43rd ICACC is the international 40th Anniversary Richard M. Fulrath Award Symposium on "Frontiers of Ceramics for Sustainable Society." The Richard M. Fulrath award was started in 1978 to promote technical and personal friendships between Japanese and American professional ceramic engineers/scientists and encourage understanding among the diverse cultures surrounding the Pacific Rim.

Sustainable Nuclear Energy and Fusion Energy, and Crystalline Materials for Electrical, Optical and Medical Applications, Additive Manufacturing and 3D Printing Technologies, Geopolymers, and Photonics and Energy.

In addition to the core symposia, the technical program will inclue four focused sessions on emerging technologies: Bioinspired processing of advanced materials, tomography and microscopy based modeling of ceramics and green technologies, and joining of ceramics. Building upon the successful interactions and excitement generated in the first seven years, the 8th Global Young Investigator Forum (GYIF) will again be organized and facilitated by a group of our young researchers. In addition, a Special Focused Session on Diversity, Entrepreneurship, and Commercialization is being organized for the first time. The Jubilee Global Diversity Awardees, where exceptional early- to mid-career women and/or underrepresented minorities (based on race, ethnicity, nationality, and/or geographic location) in the area of ceramic science and engineering will be recognized, and invited to present their contributions and showcase some of the recent developments in entrepreneurship and commercialization in the field of ceramics science and engineering.

The ECD executive committee and volunteer organizers sincerely hope you will join us at ICACC 2019 for a stimulating and enjoyable conference.

**We look forward to seeing you in Daytona Beach, Florida in January 2019!**

**Surojit Gupta**
Program Chair, ICACC 2019
Department of Mechanical Engineering
University of North Dakota
E-mail: surojit.gupta@engr.und.edu

## ACerS Engineering Ceramics Division Leadership

- Trustee: **Tatsuki Ohji**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; t-ohji@aist.go.jp
- Chair: **Jingyang Wang**, Institute of Metal Research, China; jywang@imr.ac.cn
- Chair-elect: **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; manabu-fukushima@aist.go.jp
- Vice chair/Treasurer: **Surojit Gupta**, University of North Dakota, USA; surojit.gupta@engr.und.edu
- Secretary: **Valerie Wiesner**, NASA Glenn Research Center; USA valerie.l.wiesner@nasa.gov

## Tentative Schedule of Events

| | |
|---|---|
| **Sunday, January 27, 2019** | |
| Conference registration | 2 – 7 p.m. |
| Welcome reception at Hilton | 5:30 – 7 p.m. |
| **Monday, January 28, 2019** | |
| Conference registration | 7 a.m. – 6 p.m. |
| Opening awards ceremony and plenary session | 8:30 a.m. – Noon |
| Companion coffee | 9 – 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 p.m. |
| **Tuesday, January 29, 2019** | |
| Conference registration | 7:30 a.m. – 6 p.m. |
| Concurrent technical sessions | 8:30 a.m. – Noon |
| Lunch on own | Noon – 1:20 p.m. |
| Concurrent technical sessions | 1:30 – 6 p.m. |
| Exhibits and poster session A, including reception | 5 – 8 p.m. |
| **Wednesday, January 30, 2019** | |
| 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 p.m. |
| Exhibits and poster session B, including reception | 5 – 7:30 p.m. |
| **Thursday, January 31, 2019** | |
| Conference registration | 7:30 a.m. – 6 p.m. |
| Concurrent technical sessions | 8:30 a.m. – Noon |
| Lunch on own | Noon – 1:20 p.m. |
| Concurrent technical sessions | 1:30 – 5 p.m. |
| **Friday – February 1, 2019** | |
| Conference registration | 8 a.m. – Noon |
| Concurrent technical sessions | 8:30 a.m. – Noon |

## Abstract Submission Instructions

- Visit **www.ceramics.org/icacc2019** 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.

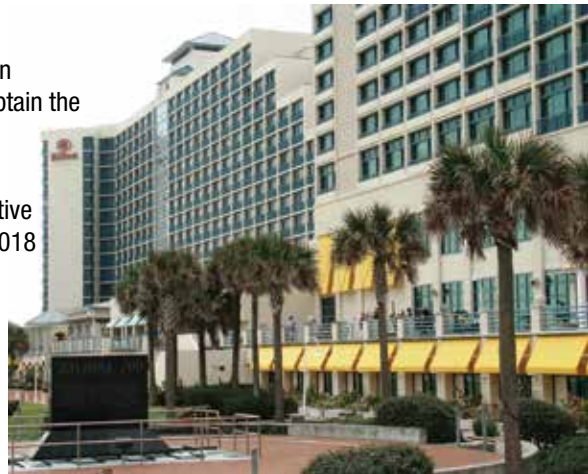
## Hilton Daytona Beach Resort

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

**Rates:** One to four occupants: $TBD
Students: $TBD
US government employee: Prevailing rate

Mention The American Ceramic Society to obtain the special rate.

Room rates are effective until December 16, 2018 and are based on availability.



# Technical Symposia

## S1: MECHANICAL BEHAVIOR AND PERFORMANCE OF CERAMICS AND COMPOSITES

Structural ceramics and composites have applications in areas including energy generation, the environment, space, transportation, medicine, optical systems and microelectronics. Long-term mechanical reliability is a key issue for their ultimate use in specific applications. Correlations between processing and service conditions/environment that lead to failure of ceramics by fracture, fatigue, or deformation are essential. 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 environmental applications
– 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
– Fibers, matrices, coatings, and interfaces
– Environmental effects and thermo-mechanical 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

- **Jonathan A. Salem**, NASA Glenn Research Center, USA; jonathan.a.salem@nasa.gov
- **Dileep Singh**, Argonne National Laboratory, USA; dsingh@anl.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
- T. Ishikawa, Tokyo University of Science, 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

Advanced ceramic coatings extend lifetime or even enable operation of engineering materials in harsh environments. Consequently, the continuous research and development of new, high-performance protective coating systems minimizing degradation of materials and components is highly relevant. Advanced gas turbine engine components made of ceramic matrix composites, intermetallics, or superalloys promise higher efficiency due to increasing operation temperatures. However, the synergistic attack of heat, combustion atmosphere, and inorganic, CMAS-type aerosols is strongly affecting lifetime. Oxidation protection is a key issue for ultra-high temperature ceramics and composites used in reusable spacecraft or hypersonic vehicles. Furthermore, protection of metals against oxidation, corrosion, erosion, and wear by innovative ceramic coatings is also a key technology for many industrial fields such as mining or waste treatment. Functional ceramic thin films are used in electronics and solar power generation. The symposium addresses processing, microstructure, performance, and durability of advanced ceramic coating systems. Advanced and new coating compositions, innovative processing technologies, advanced characterization methods, and thermodynamic modeling are particularly emphasized.

### Proposed session topics

– Thermal and environmental barrier coatings for CMC, intermetallics, and alloys
– CMAS-type degradation of T/EBC: Fundamentals, modeling, and mitigation strategies
– Oxide and nonoxide coatings against oxidation, corrosion, erosion, and wear
– Multifunctional and smart coating systems
– Processing (thermal spraying, PVD, CVD, aerosol deposition, sintering)
– Microstructure – properties relationships
– Advanced destructive and nondestructive characterization methods
– Modeling and simulation

### 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
- 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

# CALL FOR PAPERS

ABSTRACTS DUE JULY 25, 2018

## S3: 16TH INTERNATIONAL SYMPOSIUM ON SOLID OXIDE CELLS (SOC): MATERIALS, SCIENCE AND TECHNOLOGY

Solid oxide cells (SOCs) offer great potential for clean and efficient power generation from a wide variety of fuels ranging from hydrocarbons to renewables and for highly efficient conversion of electricity to hydrogen or synthesis gas via electrolysis. Durable electrochemical energy conversion in SOC is only possible by proper material choice and processing, cells stacking technology and stack module design. Application of SOC in scalable systems for power, heat, hydrogen and synthetic gas generation needs consideration of stack operating window, operating environment, contaminants sources / level and customer specifications to realize competitive solutions. This symposium provides an excellent platform for academia and industry to present and to discuss novel solutions for materials, components design, mechanical robustness, durability, system layouts and exchange their experience in application of SOCs in different areas. The goal of symposium is not only the exchange of the latest results by experienced and young scientists, but also extensive discussion of unsolved problems and on development directions.

### Proposed session topics

- Electrolytes: Oxygen ion, proton and mixed conductors; conduction mechanisms
- Electrode materials and microstructural engineering: Electrode processes, defect chemistry, characterization, accelerated testing and lifetime prediction
- Ceramic and metallic interconnects: Materials development and properties, coatings, accelerated testing and lifetime prediction
- Sealing technology: Material development and characterization, designs and approaches, interactions with sealed materials
- Novel processing and design for cells, stacks, reformers, burners and other system components
- Mechanical and thermomechanical properties of materials and components up to high temperatures
- Surface and interfacial reactions: Electrochemical transport and electrode poisoning, catalytic degradation, carbon fouling
- Simulation: Electrode performance and degradation, distribution of temperature, current density and mechanical stresses in cells and stacks, system layout, stationary and dynamic system operation, etc.
- High temperature electrolysis: Steam, steam and $CO_2$, chemical process engineering utilizing SOEC
- System design and demonstration

### Symposium organizers

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

## 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. Not surprisingly, lightweight armor technologies based on ceramic and glass materials have been developed providing 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 to 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 session topics

- Terminal ballistic behavior: Depth-of-penetration, dwell and penetration, in-situ/real-time and post-test characterization, mechanisms, size-scale effects, modeling, and new techniques
- Synthesis and processing: Ceramics, glasses, glass-ceramics, new materials, new methods including field-effects and additive manufacturing, monolithic and composites including CMCs 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, and 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, and 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, and new techniques
- Materials and process modeling: Material, system, analytical, computational, continuum, atomistic, multi-scale, 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, and 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, and modeling

In addition, part of this symposium is devoted to special focus topics with invited speakers. For ICACC 2019, these topics will be: Fundamental terminal ballistic behavior (e.g. dwell, penetration, and governing mechanisms), and the role of material interfaces on strength and toughness. Papers related to these topics are welcomed.

### Symposium organizers

- **Jerry LaSalvia**, U.S. Army Research Laboratory, USA; jerry.c.lasalvia.civ@mail.mil
- **Jeffrey Swab**, U.S. Army Research Laboratory, USA; jeffrey.j.swab.civ@mail.mil
- Brady Aydelotte, U.S. Army Research Laboratory, USA
- Michael Bakas, Army Research Office, USA
- Victoria Blair, U.S. Army Research Laboratory, USA
- Peter Brown, The Defence Science and Technology Laboratory, UK
- Richard Haber, Rutgers University, USA
- Christopher Marvel, Lehigh University, USA
- Ghatu Subhash, University of Florida, USA
- Andrew Wereszczak, Oak Ridge National Laboratory, USA

## S5: NEXT GENERATION BIOCERAMICS AND BIOCOMPOSITES

The last few decades have witnessed significant progress in the use of ceramics for biomedical applications, with anticipated benefits in clinical diagnosis and treatment. In addition to conventional ceramic fabrication technologies, biomimetic processes are also being adopted to develop bioinspired materials and inorganic – organic hybrids. The advent of nanotechnology and additive manufacturing has further increased the spectrum of applications of bioceramics and biocomposites. This symposium will provide a platform to stimulate discussion among active researchers from academia/national labs, medical device manufacturers, entrepreneurs, and clinicians, who are involved in the development and use of bioceramics.

### Proposed session topics

– Porous bioceramics (joint with Symposium 9)
– Additive manufacturing of bioceramics
– Biomineralization and tissue-material interactions
– Bioactive and resorbable ceramics
– Bioinspired, bio-synthetic, and biomimetic ceramics
– Self-assembled bioceramics
– Ceramics for drug and gene delivery
– Ceramics with bacteriostatic and bactericidal properties
– In vitro and in vivo biocompatibility of bioceramics
– Mechanical properties of bioceramics
– Orthopedic 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
- **Bikramjit Basu**, Indian Institute of Science, India; bikram.iisc@gmail.com
- Markus Reiterer, Medtronic, Inc., USA
- 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-emission will require advances in materials development for electricity generation, as well as efficient and reliable energy storage. This symposium will focus on the advanced engineering ceramics and technologies that could help the global community to achieve the stated goals. It will explore state-of-the-art thermoelectric, thermionic and thermophotovoltaic materials and technologies for direct thermal-to-electrical energy conversion. Material and device designs directed to optimize efficiency and cost/performance aspects of direct thermal-to-electrical conversion will be enlightened with emphasis on tailoring electrical, thermal and optical properties to the demand of applications.

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.

The symposium will focus on crystal chemistry, structural analysis, materials processing, powder metallurgy, sintering, transport properties, structural and mechanical characterisation, new testing methods, cost/performance and reliability issues, commercialisation and market prospects related to thermoelectrics and batteries.

### Proposed session topics

– New thermoelectric compounds
– Nanocomposite and nanostructured thermoelectric materials
– Band structure, phonon calculations, modeling and simulation
– Device design, fabrication, integration and testing
– System simulation and demonstration
– Materials for thermionic and thermovoltaic applications
– 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
– Solid electrolytes for batteries
– All-solid-state batteries
– Materials of capacitive energy storage (super-capacitors)
– Stationary rechargeable batteries for grid, solar, and wind technologies

# CALL FOR PAPERS

ABSTRACTS DUE JULY 25, 2018

### Symposium organizers

- **Palani Balaya**, National University of Singapore, Singapore; mpepb@nus.edu.sg
- **Olivier Guillon**, Forschungszentrum Jülich, Germany; o.guillon@fz-juelich.de
- Dany Carlier, Institute of Condensed Matter Chemistry of Bordeaux, France
- Fei Chen, Wuhan University of Technology, China
- Jang Wook Choi, Korea Advanced Institute of Science and Technology, South Korea
- Mickael Dollé, University of Montreal, Canada
- Ryoji Funahashi, National Institute of Advanced Industrial Science and Technology (AIST), Osaka, Japan
- Emmanuel Guilmeau, CNRS CRISMAT, France
- XiangXin Guo, Qingdao University & Shanghai Institute of Ceramics (CAS), China
- Wei Lai, Michigan State University, USA
- Naoaki Yabuuchi, Tokyo Denki University, Japan

## S7: 13TH 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 solutions for energy, environment and health. Specifically, this symposium will focus on new energy technologies and devices based on inorganic, hybrid and composite materials. Particular emphasis will be given to novel synthesis approaches, surface functionalization, and heterostructuring of nanoparticles, nanowires, and nanoscopic films, fundamentally new properties, and energy efficient materials synthesis. Applications of nanostructures in photocatalysis, photovoltaic, energy, sensing and biomedical applications that combine advanced processing with conceptual advancement 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 inorganic and hybrid nanostructures
– Nanomaterials for energy conversion and storage and catalysis
– Metal oxide nanostructures for sensing, batteries and water-splitting applications
– Nanomaterials for photocatalysis, solar hydrogen, and thermoelectrics
– Nanotoxicity, drug-delivery and tissue engineering with tailored nano-bioconjugates
– Functional coatings on glass and innovative thin film techniques (e.g., ALD, PECVD)
– Industrial production and application of nanomaterials and coatings
– Carbon nanostructures, 2D materials, and metal chalcogenides
– Computational methods in the design of tailored nanostructured materials
– Interfacial materials and multi-material heterostructures and nanocomposites

### Symposium organizers

- **Sanjay Mathur**, University of Cologne, Germany; sanjay.mathur@uni-koeln.de
- **Yakup Gönüllü**, Schott AG, Germany; Yakup.Goenuellue@schott.com
- Hidehiro Kamiya, University of Agriculture and Technology, Japan
- Alberto Vomiero, Lulea University, Sweden
- Silke Christiansen, Helmholtz-Zentrum Berlin, Germany
- Mustafa Ürgen, Istanbul Technical University, Turkey
- Mustafa Toprak, Royal Institute of Technology (KTH), Sweden
- Gunnar Westin, Uppsala University, Sweden
- Wilson Smith, TU Delft, Netherland
- Di Wu, Washington State University, USA
- Ausrine Bartasyte, University of Besancon, France
- Thomas Fischer, University of Cologne, Germany
- Daniel Chua, National University of Singapore, Singapore
- Yasuhiro Tachibana, RMIT, Australia

## SPECIAL FOCUSED SESSION ON DIVERSITY, ENTREPRENEURSHIP, AND COMMERCIALIZATION

One of the critical goals of this special session is to recognize Jubilee Global Diversity Awardees—exceptional early- to mid-career women and/or underrepresented minorities (based on race, ethnicity, nationality and/or geographic location) in the area of ceramic science and engineering who will recognized, and invited to present their contributions. In addition, this session will focus on entrepreneurship and commercialization. As a background, entrepreneurship has become an important tool for job creation. More particularly, entrepreneurial process is a highly rewarding process which revolves around freedom of thoughts, originality, risk-taking and recognizing gaps in the market, proactiveness, and competitive aggressiveness.

### Proposed session topics

– Jubilee Global Diversity Awardees Invited Presentation
– Designing a successful start-up, for example, business strategy, and business idea generation
– Assembling a focused team for a successful venture
– Reallocating different resources for the same, for example human resource management
– Promoting problem-solving, and creative and out-of-the-box thinking.

### Symposium organizers

- **Surojit Gupta**, University of North Dakota, USA; surojit.gupta@engr.und.edu
- Valerie L Wiesner, NASA Glenn Research Center, USA
- Amanda Krause, Lehigh University, USA

## S8: 13TH INTERNATIONAL SYMPOSIUM ON ADVANCED PROCESSING AND MANUFACTURING TECHNOLOGIES FOR STRUCTURAL AND MULTIFUNCTIONAL MATERIALS AND SYSTEMS (APMT13)

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 that 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, non-oxide 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

- **Zhengyi Fu**, Wuhan University of Technology, China; zyfu@whut.edu.cn
- **Hisayuki Suematsu**, Nagaoka University of Technology, Japan; suematsu@nagaokaut.ac.jp
- **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, USA
- 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, Air Force Research Laboratory, OH, 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
- Yiquan Wu, Alfred University, 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 the nanometers to millimeters, and can have textured to random porosity or hierarchical porosity and be based on various pore architectures, such as foams, honeycombs, fiber networks, bio-inspired structures.

This symposium will be 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
- Farid Akhtar, Lulea University of Technology, Sweden
- Samuel Bernard, Institut de Recherche sur les Céramiques de Limoges, France
- Giorgia Franchin, University of Padova, Italy
- Jacob George, Corning, USA
- Aleksander Gurlo, Technical University Berlin, Germany
- Miki Inada, Kyushu University, Japan
- Jian-feng Yang, Xi'an Jiaotong University, China

# CALL FOR PAPERS

ABSTRACTS DUE JULY 25, 2018

## S10: CERAMICS MODELING, GENOME, AND INFORMATICS

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 high-throughput design, modeling, big data and informatics of ceramics and composites with different approaches in both computational research and experimental measurements across the length and time scales so as to further optimize their behavior and facilitate the design of new ceramics and composites with tailored properties. A broader perspective is desired including the interest related to ceramic genome, virtual materials design, big data and informatics for new innovative materials and thermo-structure, integrated materials computational engineering, prediction of the structure and properties of crystals, glasses 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
- Big data and informatics in accelerated ceramic technology development and applications
- 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
- Jian Luo, University of California, San Diego, USA
- Katsuyuki Matsunaga, Nagoya University, Japan
- Sergei Manzhos, National University of Singapore, Singapore
- Paul Rulis, University of Missouri-Kansas City, USA
- Hans J. Seifert, Karlsruhe Institute of Technology, Germany
- Sean Smith, The University of New South Wales, Australia
- Gerard L. Vignoles, University of Bordeaux, France
- William J. Weber, University of Tennessee, USA
- Haixuan Xu, University of Tennessee, USA

## 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 is concurrently growing.

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
- Additive/subtractive manufacturing (i.e. 3D printing) for industrial application
- Shaping and forming 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
- Ali Erdemir, Argonne National Laboratory, USA
- Jun Akedo, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Byungkoog Jang, Kyushu University, Japan
- Kouichi Yasuda, Tokyo Institute of Technology, Japan
- Kyoung Il Moon, Korea Institute of Industrial Technology, Korea
- Hyuksu Han, Korea Institute of Industrial Technology, Korea
- Giovanni Ramirez, Bruker, USA

## S12: ADVANCED MAX/MXENE PHASES AND UHTC MATERIALS FOR EXTREME AND HIGH TEMPERATURE ENVIRONMENT

**TRACK A:** Nano-laminated ternary transition metal carbides/nitrides (MAX phases) and borides (MAB phases), and their 2D counterparts (MXenes)

MAX and MAB phases are thermodynamically stable nanolaminates of early transition metals carbides, nitrides, and borides. They have unusual and unique properties, for example, 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 selectively etch atomic metal layers out of the structure to separate each nanolaminate's block of the transition metal compounds and form 2D solids. Despite their relatively short history, MXenes (the 2D phase after removing A layers from MAX phases) have attracted scientists attentions due to their attractive properties such as their excellent electronic conductivity and surface functionality and tunability. Track A will focus on designing, processing, structure-property relationships, thermal, electrical, optoelectronic, solid lubrication, and mechanical properties, oxidation resistance, stability, and applications of these novel nanolaminates compounds in their 2D and 3D forms.

**TRACK B:** Ultra-high-temperature ceramics (UHTCs)

Ultra-high-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 compositions and manufacturing methods
– Methods for improving damage tolerance, oxidation and thermal shock resistance
– Novel applications and device fabrication (electrochemical energy storage, biosensors etc) of MAX/MAB Phases and MXenes.
– Study of electronic, optical, plasmonic, and thermoelectric properties
– Theoretical calculations for designing and predicting behavior of MAX/MAB Phases and MXenes.

#### 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**, University of North Dakota, USA; surojit.gupta@engr.und.edu
- **Miladin Radovic**, Texas A&M University, USA; mradovic@tamu.edu
- **William G. Fahrenholtz**, Missouri S&T, USA; billf@mst.edu
- Konstantza Lambrinou, SCK·CEN, Belgium
- Michael Naguib, Oak Ridge National Laboratory, USA
- Jie Zhang, Institute of Metal Research, Chinese Academy of Sciences, China
- Thierry Cabioch, Université de Poitiers, France
- Babak Anasori, Drexel University, USA
- Sylvain Dubois , Université de Poitiers, France
- Per Eklund, Linköping University, Sweden
- Johanna Rosen, Linköping University, Sweden
- Yanchun Zhou, Aerospace Research Institute of Material & Processing Technology, China
- Sea-Hoon Lee, KIMS, Korea
- Frederic. Monteverde, ISTEC-CNR, Italy
- Luc J Vandeperre, Imperial College, UK
- Guo-Jun Zhang, Donghua University, Shanghai, China
- Carolina Tallon, Virginia Tech, USA

## S13: DEVELOPMENT AND APPLICATIONS OF ADVANCED CERAMICS AND COMPOSITES FOR NUCLEAR FISSION AND FUSION ENERGY SYSTEMS

Future safety and sustainability of nuclear energy systems based on fission and fusion technologies is strongly correlated to the development and application of advanced materials capable of withstanding the ever increasingly harsh environment of a nuclear reactor core. This international symposium aims to bring together scientists and engineers to discuss opportunities and needs for key enabling materials for application in nuclear energy systems. This will include the most current up-to-date and state-of-the-art science and technology, ranging from materials design and development, processing, and performance under relevant nuclear environments. There will also be discussions on prospects and perspectives related to commercial development, and qualification and licensing requirements. The symposium is cosponsored by the 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 technologies for reactor components
– Radiation damage, defect production, evolutions, and interactions
– Plasma surface interactions of ceramics for fusion energy

# CALL FOR PAPERS

ABSTRACTS DUE JULY 25, 2018

– Advanced characterization techniques and methods
– Fuel, cladding, assembly, and core evolutions and performance modeling
– Test methods, codes and standards, and design methodology

### Symposium organizers

- **Phil Edmondson**, Oak Ridge National Laboratory, USA; edmondsonpd@ornl.gov
- **Takaaki Koyanagi**, Oak Ridge National Laboratory, USA; koyanagit@ornl.gov
- Jake Amoroso, Savannah River National Laboratory, USA
- Cory Trivelpiece, Savannah River National Laboratory, USA
- Kyle Brinkman, Clemson University, USA
- Kevin Fox, Savannah River National Laboratory, 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
- Victoria Blair, U.S. Army Research Laboratory, USA
- Yoshihiko Imanaka, Fujitsu Laboratories Ltd., Japan
- Romain Gaume, University of Central Florida, USA
- Takayuki Yanagida, Nara Institute of Science and Technology, Japan
- Yiquan Wu, Alfred University, USA

## S15: 3RD INTERNATIONAL SYMPOSIUM ON ADDITIVE MANUFACTURING AND 3D PRINTING TECHNOLOGIES

Additive manufacturing and 3D printing technologies are globally recognized as novel fabrication processes for advanced materials and components with multifunctional structures. These technologies offer tremendous potential for design innovations and customization, complex part fabrication, rapid prototyping, and distributed digital manufacturing. In this approach, three-dimensional models are designed and created according to theoretical concepts using computer software, and two-dimensional cross sections are created by slicing operations automatically. In laser-based approaches, 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. In direct writing processes, paste materials with ceramic/metal particles dispersed in binder system are fused from nozzles moving freely in three dimensions to create composite structures. Various functional components of dielectric lattices to control electromagnetic waves, biomaterials components for medical applications, and ceramics electrode with large surface area could also be 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 3D printing processes. In addition, various topics related to starting materials, characterziation tools, NDE and in-situ monitoring of processes, qualification and certification, cost, and applications will also be discussed.

### Proposed session topics

– Selective laser melting/sintering (SLM/SLS)
– Stereolithography
– Direct writing and ink jet printing technologies
– Fused deposition modeling (FDM)
– Laminated object manufacturing/ green tape stacking
– Powder bed fusion process
– Materials and process characterization tools
– Qualification, certification, standards, and property database
– Applications of additive manufacturing materials and components

### Symposium organizers (TENTATIVE)

- **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, Pennsylvania State University, USA
- Martin Schwentenwein, Lithoz GmbH, Austria
- Tyrone Jones, Army Research Laboratory, USA
- Hui-suk Yun, KIMS Korea
- Craig E. Smith, NASA Glenn Research Center, USA
- Lisa Rueschhoff, Air Force Research Laboratory, USA
- Andrea Zocca, BAM, Germany
- Miranda Fateri, FH Aachen, Germany

## S16: GEOPOLYMERS, INORGANIC POLYMERS, AND SUSTAINABLE MATERIALS

Refractory inorganic polymers can be made at ambient temperatures and pressures. These materials include alumino-silicates or stoichiometric "geopolymers," alkali activated cements and materials, 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, porous materials for $CO_2$ sequestration. The nanoparticulate nature of geopolymers also provides a low energy processing route to ultra-refractory ceramic powders such as SiC, $Si_3N_4$.

### Proposed session topics

– Synthesis, processing microstructure
– Mechanical properties, thermal shock resistance
– Composites
– Conversion to ceramics
– Phosphates and other inorganic analogues
– Use of waste materials to make geopolymers
– Alkali activated cements and materials
– Infrastructure and construction materials
– Coatings (fire resistant, acid resistant)
– Waste encapsulation
– Sustainable materials
– Novel applications
– Geopolymer derived processing routes

### Symposium organizers

- **Waltraud M. Kriven**, University of Illinois at Urbana-Champaign, USA, kriven@illinois.edu
- Joseph Davidovits, Geopolymer Institute, St. Quentin, France
- Ghassan Al Chaar, US Army Corps of Engineers, USA
- Don Seo, Arizona State University, USA

## S17: ADVANCED CERAMIC MATERIALS AND PROCESSING FOR PHOTONICS AND ENERGY

In the past few years significant progress has been reported on the synthesis and structural, physical and chemical characterization of ceramic nanostructures that exhibit size-dependent properties and on novel glass-based materials for optical lasers and amplifiers. Nanomaterials have been widely studied and are leading to fundamental new discoveries as well as applications in photovoltaics, optical sources, electroceramics, multiferroic materials, catalysis, and solar hydrogen.

This symposium focuses on all ceramic materials with application potential as 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 and glass-ceramic 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 and glass-ceramic materials for laser sources and non-linear applications

### Symposium organizers

- **Alberto Vomiero**, Luleå University of Technology, Sweden; alberto.vomiero@ltu.se
- **Federico Rosei**, INRS, Canada; rosei@emt.inrs.ca
- Yasuhiro Tachibana, RMIT University, Australia
- David Kisailus, University of California at Riverside, USA
- Tohru Sekino, Osaka University, Japan
- Francesco Enrichi, Centro Enrico Fermi, Rome, Italy
- Daniele Benetti, INRS, Canada

# CALL FOR PAPERS

ABSTRACTS DUE JULY 25, 2018

## FOCUSED SESSION 1: BIOINSPIRED PROCESSING OF ADVANCED MATERIALS

A bioinspired 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

– Bioinspired processing of ceramics
– Bottom-up assembly and complex colloids
– Biomimetic optical and photonic materials
– Bio-inspired materials for medical applications
– Advances in bio-inspired materials
– Mechanical properties of bioinspired materials
– Environmental applications of bioinspired materials
– Characterizations of bioinspired materials
– Nature inspired materials for energy storage, conversion and production

### Symposium organizers

- **Joaquin Ramirez-Rico**, University of Seville, Spain; jrr@us.es
- **Ziqi Sun**, The Queensland University of Technology, Australia; ziqi.sun@qut.edu.au
- Simone Sprio, Institute of Science and Technology for Ceramics-ISTEC, Italy
- Florian Bouville, Swiss Federal Institute of Technology Zürich – ETH, Switzerland
- Pablo Zavattieri, Purdue University, USA
- Esther Garcia-Tunon, Materials Innovation and School of Engineering, University of Liverpool, United Kingdom

## FOCUSED SESSION 2: IMAGE BASED CHARACTERIZATION AND MODELLING OF CERAMICS BY NON-DESTRUCTIVE EXAMINATION TECHNIQUES

Image based characterization techniques as such SEM, light microscopy, TEM and FIB-tomography as well as micro-tomography have gain an increase in resolution and speed in the past 10 years which make them suitable for microstructural characterization on micro- and nanometer length scale. Techniques as µCT, FIB/TEM-Tomography, SEM/AFM/Ultrasonic microscopy as well as digital image correlation, acoustic emission and high energy X-ray synchrotron and high performance computing enables an insight 3D view from materials to inspect or detect relative local microstructural changes and damage characteristics. A correlation and synchronization between the sensitivity of this several types NDE-techniques will close the length scale gap. Thus physical properties are highly effected by microstructure features (inhomogeneity 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 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 NDE technologies for defect extraction, shape calculation, grain orientation and void distribution by 3D-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 modelling based on evaluated structural data

### Symposium organizers

- **Tobias Fey**, Friedrich-Alexander-University Erlangen-Nürnberg, Germany; tobias.fey@fau.de
- You Zhou, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Surojit Gupta, Dept. of Mechanical Engineering, University of North Dakota, USA
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Rousseau Benoît, University of Nantes, France
- Ulf Betke, Otto-von-Guericke University, Germany
- Amjad Almansour, NASA, USA

## FOCUSED SESSION 3: MOLECULAR-LEVEL PROCESSING OF FUNCTIONAL MATERIALS: UNDERSTANDING THE CONVERSION OF MOLECULAR COMPOUNDS TO SOLID-STATE AND HYBRID STRUCTURES

Materials synthesis based on the use of molecular precursors has been recognized as a powerful way to access compounds with controlled and adjustable compositions, crystal structures, morphologies, and property profiles. Thus, a careful design of suitable molecular precursors as well as an extensive knowledge about their (thermal) conversion into desired functional materials are of crucial importance for providing improved rational preparative concepts towards tailor-made (multi)functional structures. Molecular synthesis techniques towards functional materials are highly attractive, as they can be performed with highly efficient atom economy and they allow access to well defined chemical and phase compositions, as well as to unique morphologies and (metastable) phases.

This focused session intends to conceptually unite the materials chemists, ceramists and materials engineers for developing new concepts and pathways for synthesis, net-shaping 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. 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.

During this focused session, the role of precursor chemistry and additives in solution such as sol-gel, solvothermal, electrospinning, microwave, chemical

vapor deposition and atomic layer deposition techniques will be critically analyzed. Specific emphasis will be laid on materials manufacturing strategies such as 3D printing 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 are in particular focus. The need of new and smart chemical processing methods to obtain specific material compositions, that can integrate the advancements in materials processing techniques with the existing knowledge-base of materials chemistry will also be a part of this focused session. 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 transformations
– Chemically processed nanostructures–0D, 1D, 2D and 3D systems
– Solution-processing of nanomaterials for optical, catalytic and sensing applications
– Molecular precursor approaches for vapor-phase synthesis (ALD, CVD) of materials
– In-situ studies on nucleation and growth of solid-state phases in solution and gas phases
– Smart chemistry for functionalization of nanostructures
– Chemical approaches to new processing methods such as 3D printing.
– 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
- Emanuel Ionescu, Technische Universität Darmstadt, Germany
- Shashank Mishra, Universite of Lyon, France
- Maarit Karppinen, Aalto University, Finland
- Thomas Fischer, University of Cologne, Germany
- Gurpreet Singh, Kansas University, USA
- Gunnar Westin, Uppsala University, Sweden
- Claudia Wickleder, Siegen University, Germany
- Ausrine Bartasyte, University of Franche-Comté, France
- Se Hun Kwon, Pusan National University
- Hiromitsu Kozuka, Kansai University, Japan
- Hirokazu Katsui, Tohoku University, Japan
- Philippe Miele, Ecole Nationale Supérieure de Chimie de Montpellier, France

## FOCUSED SESSION 4: GREEN TECHNOLOGIES, AND JOINING OF CERAMICS

### SESSION A: GREEN TECHNOLOGIES

This focused section invites abstracts in the general field of green and sustainable technologies with emphasis on waste derived ceramics as well as new developments of environmental technologies. Of particular interest is the demonstration of experimental or simulation approaches for the fabrication of ceramics and ceramic matrix composites by incorporating previously unutilized waste streams or sources from recycled materials. Session A focuses on the fundamental research regarding waste derived materials science and technologies including solidification/stabilization, combustion, pyrolysis, hydrometallurgy, pyrometallurgy, mechanical processing, sintering. The impact of the green technologies on the economy, climate change, and society is also included.

### SESSION B: JOINING OF CERAMICS

The integration of ceramics and ceramic composites is a challenging task due to its limitation on the use of conventional technologies (mechanical joints, riveting, use of bolts). Progress in materials innovation and advanced manufacturing techniques in the field of ceramics and composites pushes the operational boundaries of existing technologies and new technology development. Joining of various similar and dissimilar components is an integral part for the successful implementation of any technology and engineering structure. The joining components may include metallic, ceramic/glass, and composite parts. Long-term thermochemical stability and thermomechanical integrity of joined areas remain a persistent challenge despite careful materials selection of materials and manufacturing techniques. Session B focuses on the fundamentals of ceramics and composites joining for diverse applications including electronics, aerospace, and energy and environment technologies; the status of the state-of-the art joining technologies and the technical challenges; and the R&D directions for the next-generation joining technologies.

### Proposed session topics

#### Session A:

– Ceramics derived from various waste streams
– Ceramic raw materials recovery from industrial or food waste.
– Ceramics production from ceramic, plastic, metallic, and natural wastes
– Incorporation of waste in construction and building materials
– High-added-value derived products such as aerospace parts, refractories, coatings, glass.
– Environmental technologies
– Circular economy and climate change associated with ceramics

#### Session B:

– Materials design, types, and processing methods for ceramic joining for ambient and extreme environmental applications (brazing, in-situ joining, new adhesives, etc.).
– Waste derived ceramics for joining technology
– Role of advanced manufacturing on joining of ceramics and composites
– Advances in investigation methods and standards for evaluating joined components
– Self-healing materials for joining of ceramics and composites
– Future directions of materials innovation and joining technology

### Symposium organizers

- **Henry A. Colorado**, Universidad de Antioquia UdeA, Medellín, Colombia; henry.colorado@udea.edu.co
- **Manoj K. Mahapatra**, University of Alabama at Birmingham, USA; mkmanoj@uab.edu
- Surojit Gupta, University of North Dakota, USA
- Enrico Bernardo, University of Padova, Italy
- Jorge Barcena, Parque Científico y Tecnológico de Bizkaia, Spain
- Federico Smeacetto (yet to confirm), Politecnico di Torino, Italy
- Juan C. Nino, University of Florida, Gainesville, USA
- Rajiv Asthana, University of Wisconsin-Stout, USA

# CALL FOR PAPERS

ABSTRACTS DUE JULY 25, 2018

## 40TH ANNIVERSARY RICHARD M. FULRATH AWARD SYMPOSIUM

*"FRONTIERS OF CERAMICS FOR SUSTAINABLE SOCIETY"*

40 years

The Richard M. Fulrath award was started in 1978 to promote technical and personal friendships between Japanese and American professional ceramic engineers/scientists and encourage understanding among the diverse cultures surrounding the Pacific Rim. In its 40-year history, this award has made major contributions in this area. All the Fulrath award winners have made significant contributions to various areas of ceramic science and technology development which is critically needed for a sustainable society. As an increasing global population drives to improve its standard of living, the demand for energy, healthcare, housing, transportation, and industrial products also grows rapidly. However, the higher demand and production in all these areas leads to a dramatic increase in the overall consumption of resources and rate of pollution leading to climate change that creates the risk of irreversible changes in ecosystem. New technologies and innovative solutions are required to address these needs. This symposium will address the critical role of advanced ceramic materials and technologies in solving various societal challenges. The technical program will cover wide ranging topics and identify key challenges and opportunities for various ceramic technologies in creating sustainable development.

– Ceramics for sustainable energy and environmental systems
– Ceramics in medicine and human health
– Ceramics for sustainable transportation and infrastructure
– Advanced Ceramic Technologies in AI, IoTs, and Big Data
– Role of advanced ceramic technologies in solving global water problems
– Global resource management for sustainable development
– Emerging ceramic materials and technologies
– Ceramic education, mentoring, global outreach, and collaborations

All the Fulrath award winners from Japan and USA, over the last four decades, are invited to make invited presentations in their specific areas of interest and highlight specific contributions they have made to better the lives of people and promoted the technical exchange and friendships

### Symposium organizers

- **Michael C. Halbig**, NASA Glenn Research Center, USA; michael.c.halbig@nasa.gov
- **Kiyoshi Shimamura**, National Institute of Materials Science, Japan; michael.c.halbig@nasa.gov
- Mrityunjay Singh, Ohio Aerospace Institute, USA
- M. Naito, Osaka University, Japan
- Elizabeth Dickey, North Carolina State University, USA
- Y. Imanaka, Fujitsu Corporation, Japan
- Tadachika Nakayama, Nagaoka University of Technology, Japan
- Akira Ando, Murata Manufacturing Co., Japan

## 8TH 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 to showcase their research. A poster session section is also dedicated to the GYIF.

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.

### Proposed session topics

– Frontiers in ceramic materials: advances and challenges in novel materials design, synthesis, performance, and reliability
– Ceramic hybrid materials and composites for aerospace, armor, biomedical, electronics, sensors and actuators, energy conversion and storage, photocatalysis, and environmental applications
– Advanced ceramics and coatings for structural, energy, environmental and functional applications
– Nanoceramics and nano-composites
– Computational materials prediction and design
– Novel characterization tools and methods of ceramics and composites
– Art of scientific communication
– Careers in Science, Technology, Engineering and Mathematics (STEM)

### Symposium organizers

- **Manoj K. Mahapatra**, University of Alabama at Birmingham, USA; mkmanoj@uab.edu
- **Giorgia Franchin**, University of Padova, Italy; giorgia.franchin@unipd.it
- **Daniele Benetti**, Institut National de la Recherche Scientifique, Canada; daniele.benetti@emt.inrs.ca
- **Matthew Appleby**, NASA Glenn Research Center, USA; matthew.p.appleby@nasa.gov
- Kathleen Shugart, UES Inc at Air Force Research Lab, USA
- 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

# 43RD INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

**JANUARY 27 – FEBRUARY 1, 2019**

Hilton Daytona Beach Resort and Ocean Center
Daytona Beach, Florida, USA

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ABSTRACTS DUE
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