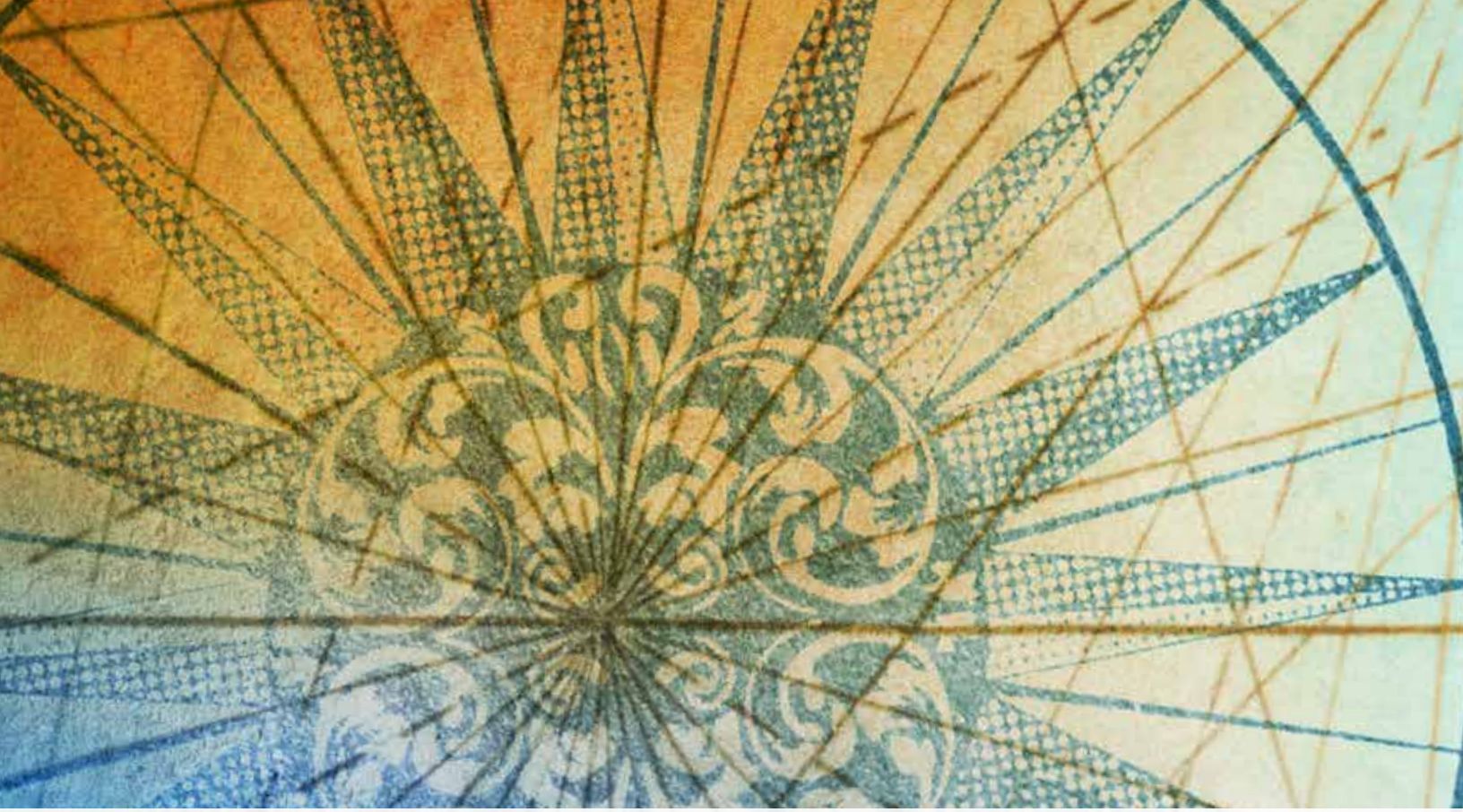

45TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

CALL FOR ABSTRACTS

DUE SEPTEMBER 1, 2020

JANUARY 24–29, 2021 | 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/icacc2021

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INTRODUCTION

Dear colleagues,

We are pleased to announce that the 45th International Conference & Exposition on Advanced Ceramics & Composites (ICACC) will be held Jan 24–29, 2021, in Daytona Beach, Florida. It is a great honor to chair this conference, which has a strong history of being the preeminent international meeting 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. In 2016, this conference celebrated its 40th anniversary in playing an instrumental role in the advancement of ceramics and composites. Because of the attractiveness of not only the presentations of innovative results but also participants with deep insights, more than 50% of the participants have come from abroad in recent years. ICACC now becomes an annual world conference on materials science. In 2021, ICACC will celebrate the future of ceramics and composites by featuring innovative work and technological advancements at the forefront of the field.

This year the technical program will reflect the growth and success of ICACC by featuring 18 symposia, five focused sessions, one special focused session, the 10th Global Young Investigator Forum (GYIF), and one honorable symposium. 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 technical program reflects critical areas of interest within ceramics and advanced composites, with a particular emphasis on current trends in research, development, engineering, and application of advanced ceramics. The core symposia at this conference are:

- 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
- Advanced MAX/MXene Phases
- Ceramics and Composites for Nuclear Energy Fission and Fusion Energy Systems
- Crystalline Materials for Electrical, Optical, and Medical Applications
- Additive Manufacturing and 3D Printing Technologies
- Geopolymers, Photonics, and Energy
- Materials for Extreme Environments

In addition to the core symposia, the technical program will include five focused sessions on emerging technologies: Bio-Inspired Processing of Advanced Materials; Materials for Thermoelectrics; Molecular-level Processing and Chemical Engineering of Functional Materials; and Ceramic/Carbon Reinforced Polymers and Fractography of Ceramics. Building upon successful interactions and excitement generated in the first eight years, the GYIF will again be organized and facilitated by a group of early career researchers. The **Special Focused Session on Diversity, Entrepreneurship, and Commercialization** will be organized to recognize the ECD Jubilee Global Diversity Awardees along with other invited speakers who will present their contributions on recent developments in entrepreneurship and commercialization in the field of ceramic science and engineering. In addition, an international symposium, **Emergent Materials and Sustainable Manufacturing Technologies in a Global Landscape**, will be held to honor Tatsuki Ohji to thank him for his hard work and efforts in leading the Society.

Details of the symposia and focused sessions are listed in the Call for Abstracts. The ECD Executive Committee and volunteer organizers sincerely hope you will join us at ICACC 2021 for a stimulating and enjoyable conference.

We look forward to seeing you in Daytona Beach, Florida, in January 2021!

Hisayuki Suematsu
Program Chair, ICACC 2021
Nagaoka University of Technology
suematsu@nagaokaut.ac.jp

ACERS ENGINEERING CERAMICS DIVISION LEADERSHIP

- Trustee: **Michael Halbig**, NASA Glenn Research Center, USA, michael.c.halbig@nasa.gov
- Chair: **Surojit Gupta**, University of North Dakota, USA, surojit.gupta@engr.und.edu
- Chair-elect: **Valerie Wiesner**, NASA Langley Research Center, USA, valerie.l.wiesner@nasa.gov
- Vice chair/Treasurer: **Hisayuki Suematsu**, Nagaoka University of Technology, Japan, suematsu@nagaokaut.ac.jp
- Secretary: **Palani Balaya**, National University of Singapore, Singapore, mpepb@nus.edu.sg

EMERGENT MATERIALS AND SUSTAINABLE MANUFACTURING TECHNOLOGIES IN A GLOBAL LANDSCAPE: INTERNATIONAL SYMPOSIUM IN HONOR OF TATSUKI OHJI

As the increasing global population drives to meet basic necessities and improve standards of living, demand for energy, healthcare, housing, transportation, and industrial products is also rapidly growing. However, higher demand and production in all these areas lead to a dramatic increase in the overall consumption of resources and pollution rates, leading to climate change that creates risk of irreversible changes in the ecosystem. New technologies and innovative solutions are required to address these needs. This symposium will focus on the critical role of emergent materials and sustainable manufacturing technologies to address various societal challenges. It will cover a wide range of topics and identify key challenges and opportunities for various emerging materials and innovative manufacturing technologies in a global landscape.

The symposium will honor Tatsuki Ohji, National Institute of Advanced Industrial Science and Technology, Japan, and recognize his long-term and outstanding contributions to science and technology of advanced ceramic materials and technologies, and for promoting and developing human networks and collaborations among the materials community worldwide. The technical program will cover, but not be limited to:

- Global resource management for sustainable development
- Innovative strategies for sustainable and self-sufficient solutions
- Emergent materials and technologies
- Hybrid and multifunctional systems
- Materials for sustainable energy and environmental systems
- Technologies for human health and societal welfare
- Emerging materials and technologies for AI, IoTs, and big data
- Technologies for solving global water challenges
- Knowledge management, education, mentoring, and collaboration

A number of experts from around the world will be invited to make presentations in their specific areas of interest and highlight specific contributions they have made to better the lives of people and sustainable societal development.

Organizers

- **Mrityunjay Singh**, Ohio Aerospace Institute, USA msingh@globalats.org
- **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology, Japan, manabu-fukushima@aist.go.jp
- Jingyang Wang, IMR-Shenyang National Laboratory for Materials Science, China
- Kiyoshi Shimamura, National Institute of Materials Science, Japan
- Alexander Michaelis, Fraunhofer IKTS, Germany
- Young-Wook Kim, University of Seoul, Korea
- Sanjay Mathur, University of Cologne, Germany
- Dileep Singh, Argonne National Laboratory, USA
- Monica Ferraris, Politecnico di Torino, Italy
- Zhengyi Fu, Wuhan University of Technology, China

ABSTRACT SUBMISSION INSTRUCTIONS

- Visit **www.ceramics.org/icacc2021** to review session topics.
- Select "Submit Abstract" to be directed to the Abstract Central website.

Abstract title plus text total 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.

45TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

HILTON DAYTONA BEACH RESORT

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

Rates: One to four occupants: $185 USD
US government employee: Prevailing rate

Make reservations online under Hotel and Travel link at ceramics.org/icacc2021 or reserve by telephone, mention The American Ceramic Society to obtain the special rate.

Room rates are effective until January 1, 2021 and are based on availability.

TENTATIVE SCHEDULE OF EVENTS

Sunday, January 24, 2021

Conference registration	2 – 7 p.m.
Member and publication center	2 – 7 p.m.
Speaker ready room	2 – 7 p.m.
Welcome reception	5:30 – 7 p.m.

Monday, January 25, 2021

Conference registration	7 a.m. – 6 p.m.
Member and publication center	7 a.m. – 6 p.m.
Speaker ready room	8 a.m. – 4 p.m.
Opening awards ceremony & plenary session	8:30 a.m. – Noon
Companion coffee	9 – 10:30 a.m.
Coffee break	10:10 – 10:40 a.m.
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 6:10 p.m.
Coffee break	3 – 3:20 p.m.

Tuesday, January 26, 2021

Conference registration	7:30 a.m. – 6 p.m.
Member and publication center	7:30 a.m. – 6 p.m.
Speaker ready room	8 a.m. – 4 p.m.
Concurrent technical sessions	8:30 a.m. – Noon
Coffee break	10 – 10:20 a.m.
Exhibitor set-up	Noon – 4 p.m.
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 5:30 p.m.
Coffee break	3 – 3:20 p.m.
Poster session A set-up	3 – 4:30 p.m.
Exhibits & poster session A, including reception	5 – 8 p.m.

Wednesday, January 27, 2021

Conference registration	7:30 a.m. – 5:30 p.m.
Member and publication center	7:30 a.m. – 5:30 p.m.
Speaker ready room	8 a.m. – 4 p.m.
Concurrent technical sessions	8:30 a.m. – Noon
Coffee break	10 – 10:20 a.m.
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 6 p.m.
Coffee break	3 – 3:20 p.m.
Poster session B set-up	3 – 4:30 p.m.
Exhibits & poster session B, including reception	5 – 7:30 p.m.

Thursday, January 28, 2021

Conference registration	7:30 a.m. – 5:30 p.m.
Member and publication center	7:30 a.m. – 5:30 p.m.
Speaker ready room	8 a.m. – 4 p.m.
Concurrent technical sessions	8:30 a.m. – Noon
Coffee break	10 – 10:20 a.m.
Lunch on own	Noon – 1:20 p.m.
Concurrent technical sessions	1:30 – 5:30 p.m.
Coffee break	3 – 3:20 p.m.
Last night reception	5:30 – 6:30 p.m.

Friday, January 29, 2021

Conference registration	8 a.m. – Noon
Concurrent technical sessions	8:30 – 11:40 a.m.
Coffee break	10 – 10:20 a.m.

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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 manufacturing and characterization. Furthermore, development of novel methods to advance and accelerate computationally driven materials characterization and validate structure/property relationship models is needed to improve predictability of material behavior and lower costs. This symposium solicits abstracts related to the diverse aspects of mechanical behavior of ceramics and composites and their correlations with processing and component performance and reliability.

Proposed sessions

– Processing – microstructure – mechanical properties correlation
– Fibers, matrices, coatings, and interfaces
– Ceramics for energy generation, turbines, and environmental applications
– Design, reliability, and life prediction modeling of devices and components
– Functionally graded materials and multilayer ceramic systems
– Mechanical characterization of ceramics and composites, techniques, and equipment
– Environmental effects, thermo-mechanical performance, and tribology
– Manufacturing and testing of joined and integrated components and structures
– Small-scale testing and in situ characterization using X-rays and neutrons
– Novel computational approaches to enhance performance and characterization
– Fracture mechanics, failure analysis, and fractography

Organizers

- **Jonathan 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
- Raul Bermejo, Montanuniversitaet Leoben, Austria
- Amjad Almansour, NASA Glenn Research Center, USA
- Monica Ferraris, Politecnico di Torino, Italy
- Walter Krenkel, University of Bayreuth, Germany
- Emmanuel Maillet, General Electric Company, USA
- T. Ishikawa, Tokyo University of Science, Yamaguchi, Japan
- Emmanuel Boakye, Air Force Research Laboratory, USA
- Andrew Wereszczak, Oak Ridge National Laboratory, USA
- Kevin Strong, Sandia National Laboratory, USA

S2: ADVANCED CERAMIC COATINGS FOR STRUCTURAL, ENVIRONMENTAL, AND FUNCTIONAL APPLICATIONS

Advanced ceramic coatings extend lifetime and enable operation of engineering materials in harsh environments. Therefore, research and development in the field of high-performance ceramic coating systems minimizing degradation of materials and components is key to future technologies. Advanced gas turbine engine components made of ceramic matrix composites, intermetallics, or superalloys, promise higher energy 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 of application. Functional ceramic coatings are widely used in electronics and solar power generation. The symposium addresses processing, microstructure, performance, and durability of ceramic coatings. New materials, innovative processing technologies, advanced characterization methods, and thermodynamic modeling are particularly emphasized. Material scientists and engineers from around the world are invited to present and discuss cutting-edge ceramic coating science and technology.

Proposed sessions

– Thermal and environmental barrier coatings for CMCs, intermetallics, and alloys
– CMAS-type degradation of T/EBC: fundamentals, modeling, and mitigation strategies
– Oxide and non-oxide 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 non-destructive characterization methods
– Modeling and simulation

Organizers

- **Peter Mechnich**, German Aerospace Center (DLR), Germany peter.mechnich@dlr.de
- **Douglas E. Wolfe,** Pennsylvania State University, USA, dew125@arl.psu.edu
- Bryan Harder, NASA Glenn Research Center, USA
- Eugene Medvedovski, Endurance Technologies Inc., Canada
- Elizabeth Opila, University of Virginia, USA
- Eric H. Jordan, University of Connecticut, USA
- Robert Vaßen, Forschungszentrum Jülich, Germany
- Kang N. Lee, NASA Glenn Research Center, USA
- Satoshi Kitaoka, Japan Fine Ceramics Center, Japan
- Byung-Koog Jang, Kyushu University, Japan
- David Poerschke, University of Minnesota, USA
- Ping Xiao, University of Manchester, UK
- Julin Wan, GE Global Research, USA
- Yutaka Kagawa, University of Tokyo, Japan
- Rodney W. Trice, Purdue University, USA
- Uwe Schulz, German Aerospace Center (DLR), Germany
- Kaylan Wessels, Pratt and Whitney, USA

S3: 18TH 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 SOCs is only possible by proper material choice and processing, cell stacking technology, and stack module design. Application of SOCs in scalable systems for power, heat, hydrogen, and synthetic gas generation needs serious 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 discuss novel solutions for materials, components design, mechanical robustness, durability, and system layouts; and share their experience in application of SOCs in different areas. In addition, the symposium will include an extensive discussion of unsolved problems and development directions.

Proposed sessions

- 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 sealing 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

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
- John Hardy, Pacific Northwest National Laboratory, USA
- Julie Mougin, CEA, France
- Ruey-Yi Lee, Institute of Nuclear Energy Research, Taiwan
- Vincenzo Esposito, DTU Energy Conversion, Denmark
- Scott A. Barnett, Northwestern University, USA
- Tae Ho Shin, Korea Institute of Ceramic Engineering & Technology, South Korea
- Prabhakar Singh, University of Connecticut, USA
- Sebastian Molin, Gdansk University of Technology, Poland

CALL FOR ABSTRACTS

DUE SEPTEMBER 1, 2020

S4: ARMOR CERAMICS – CHALLENGES AND NEW DEVELOPMENTS

Ceramic and glass materials demonstrate significantly higher ballistic efficiencies than homogeneous metals when properly combined with other materials. Consequently, lightweight ceramic and glass armor technologies have been developed for protection against a wide variety of threats. However, our knowledge and understanding on the effects of ceramic composition and multi-scale structure on the fundamental damage and deformation mechanisms that govern strength and penetration resistance has been limited, especially under dynamic loading conditions. This has hindered development of advanced materials through traditional, advanced, and materials-by-design approaches. This symposium is an opportunity for attendees from industry, academia, and government organizations to openly discuss new developments in basic and applied research on various aspects of the processing/structure/properties/performance relationships for armor ceramic and glass materials. In addition to the proposed sessions, sessions with invited speakers on the following focus topics will be held: projectile/ceramic interactions; processing/design of hierarchically structured bodies; diamond-based composites development, and advances in transparent ceramics and glasses. Contributing presentations addressing either proposed or focus sessions are welcome.

Proposed sessions

– Fundamental terminal ballistic behavior
– Ceramic and glass science and engineering
– Traditional and advanced ceramics synthesis and processing
– Additive manufacturing
– Microstructure development and advanced characterization methods
– Quasi-static and dynamic mechanical behavior
– Underlying mechanisms for ballistic/mechanical behavior and microstructural evolution
– Constitutive model development
– Process model development
– Bonding/joining

Organizers

- **Jerry LaSalvia**, CCDC Army Research Laboratory, USA jerry.c.lasalvia.civ@mail.mil
- **Jeffrey Swab**, CCDC Army Research Laboratory, USA jeffrey.j.swab.civ@mail.mil
- Michael Bakas, Army Research Office, USA
- Kristopher Behler, CCDC Army Research Laboratory, USA
- Anthony DiGiovanni, CCDC Army Research Laboratory, USA
- Richard Haber, Rutgers University, USA
- Nicholas Ku, CCDC Army Research Laboratory, USA
- Patrik Lundberg, Swedish Defence Research Agency, Sweden
- Neil Middleton, Defence Science and Technology Laboratory, UK
- 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 bio-inspired 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 sessions

– Porous bioceramics (joint with S9)
– Additive manufacturing of bioceramics
– Biomineralization and tissue-material interactions
– Bioactive and resorbable ceramics
– Bio-inspired, 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 S7)
– Magnetic nanoceramics for biomedical applications
– Light-emitting nanoceramics for bioimaging, sensing, and therapy
– Ceramic biosensors

Organizers

- **Roger Narayan**, University of North Carolina, USA, roger_narayan@unc.edu
- **Bikramjit Basu**, Indian Institute of Science, India, bikram.iisc@gmail.com
- **Cristina Balagna**, Politecnico di Torino, Italy, cristina.balagna@polito.it
- 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, University of Ottawa, 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 RECHARGEABLE ENERGY STORAGE

Significant increases in world energy consumption and demand for clean and efficient energy resources have prompted the imperative searches of new materials and technologies. The intermittent nature of renewable power generation technologies will require new solutions for efficient and reliable energy storage. This symposium will focus on advanced engineering ceramics and technologies that could help the global community achieve its stated goals. It will explore state-of-the-art materials and technologies for energy storage, improvements in materials design, electrodes architecture, electrolytes, separators, and cell chemistry, which are key factors to extend life, enhance safety, and lower cost of rechargeable batteries regarded as the most efficient energy storage systems for portable electronics, renewable energy storage, smart grid, and transportation applications. A deeper understanding of battery materials, property relationships, electrode/electrolyte interface phenomena, and cell failure mechanisms is critically needed to face these challenges. The search for advanced high capacity electrode materials, solid electrolytes, and implementation of very challenging all-solid-state batteries, lithium batteries, lithium-sulfur batteries, metal-air batteries, and beyond lithium technologies including sodium batteries and Mg/Ca/Al-based batteries will be necessary to overcome the energy density shortfall and safety issues in current commercial batteries. The symposium will focus on crystal chemistry, structural analysis, materials processing, powder metallurgy, sintering, transport properties, structural and mechanical characterization, new testing methods, cost/performance and reliability issues, commercialization, market prospects, and recyclability related to batteries and supercapacitors.

Proposed sessions

– Solid electrolytes for batteries
– All-solid-state batteries
– 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-sulfur battery technology
– Sodium batteries, potassium batteries, magnesium batteries, and calcium batteries
– Materials of capacitive energy storage (super-capacitors)
– Recycling of battery materials
– Stationary rechargeable batteries for grid, solar, and wind technologies

Organizers

- **Palani Balaya**, National University of Singapore, Singapore mpepb@nus.edu.sg
- **Olivier Guillon**, Forschungszentrum Jülich, Germany o.guillon@fz-juelich.de
- Ilias Belharouak, Oak Ridge National Laboratory, USA
- XiangXin Guo, Qingdao University, China
- Yasutoshi Iriyama, Nagoya University, Japan
- Do Kyung Kim, Korea Advanced Institute of Science and Technology, Korea
- Wei Lai, Michigan State University, USA
- Vilas G. Pol, Purdue University, USA
- Valerie Pralong, CNRS CRISMAT, France
- Naoaki Yabuuchi, Yokohama National University, Japan

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S7: 15TH 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 bio-medical 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 large-scale production and integration of functional and structural nanomaterials are highly desired.

Proposed sessions

- Synthesis, functionalization, and assembly of inorganic and hybrid nanostructures
- Nanomaterials for energy conversion, 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

Organizers

- **Sanjay Mathur**, University of Cologne, Germany sanjay.mathur@uni-koeln.de
- Muhammet Toprak, Stockholm University, Sweden
- Shashank Mishra, University of Lyon, France
- Thomas Fischer, University of Cologne, Germany
- Hidehiro Kamiya, University of Agriculture and Technology, Japan
- Silke Christiansen, Helmholtz-Zentrum Berlin, Germany
- Sedat Ballikaya, Istanbul Technical University, Turkey
- Gunnar Westin, Uppsala University, Sweden
- Flavio de Souza, Universidade Federal do ABC, Brazil
- Daniel Chua, National University of Singapore, Singapore
- Yasuhiro Tachibana, RMIT, Australia

S8: 15TH INTERNATIONAL SYMPOSIUM ON ADVANCED PROCESSING AND MANUFACTURING TECHNOLOGIES FOR STRUCTURAL AND MULTIFUNCTIONAL MATERIALS AND SYSTEMS (APMT15)

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 conventional routes. This international symposium will discuss global advances in research and development of advanced processing and manufacturing technologies for a wide variety of non-oxide and oxide-based structural ceramics, fiber-reinforced and particulate composites, 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 sessions

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

Organizers

- **Young-Wook Kim**, University of Seoul, South Korea, ywkim@uos.ac.kr
- **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
- Weimin Wang, Wuhan University of Technology, China
- Enrico Bernardo, University of Padova, Italy
- Surojit Gupta, University of North Dakota, USA
- Eugene Medvedovski, Endurance Technologies Inc., Canada
- Tohru S. Suzuki, National Institute for Materials Science (NIMS), Japan
- Yiquan Wu, Alfred University, USA
- Chang-Jun Bae, Korea Institute of Materials Science, South Korea
- Valentina Casalegno, Politecnico di Torino, Italy
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Manuel Belmonte, Institute of Ceramics and Glass (ICV-CSIC), Spain
- Kyu Hyoung Lee, Yonsei University, South Korea
- Csaba Balazsi, Hungarian Academy of Sciences, Hungary

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 brings 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 be based on various pore architectures, such as foams, honeycombs, fiber networks, and bio-inspired structures.

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

Proposed sessions

– 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
– Micro-porous and meso-porous ceramics
– Ceramic membranes
– Ceramics with hierarchical porosity
– Engineered porous architectures enabled by additive manufacturing technologies
– Porous ceramics for environmental, energy, biological, and functional applications
– Porous ceramics for water filtration

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S10: MODELING AND DESIGN OF CERAMICS AND COMPOSITES

Recent progress in computational materials science has significantly enhanced the efficiency with which understanding of fundamental phenomena, improvement of materials performance, optimization of processing, discovery of new materials, and design of structural components can be achieved. This symposium will focus on high-throughput design and characterization, informatics and machine learning, and modeling of ceramics and composites with different approaches in both computational research and experimental measurements across the length and time scales to further optimize their behavior and facilitate design of new ceramics and composites with tailored properties. A broader perspective is desired, including interest related to ceramic genome, virtual materials design, informatics, and machine learning for new innovative materials and thermo-structure, integrated materials, computational engineering, prediction of 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 modeling of surfaces, interfaces, and grain boundaries at multiple scales.

Proposed sessions

– High-throughput design and characterization
– Informatics and machine learning
– Multi-scale modeling of processing, microstructure, and performance
– Modeling of structure and property of ceramics and composites
– Modeling defects and amorphous matter
– Modeling of surfaces, interfaces, and grain boundaries at multiple scales

Organizers

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- Gerard L. Vignoles, University of Bordeaux, France
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S11: ADVANCED MATERIALS AND INNOVATIVE PROCESSING IDEAS FOR PRODUCTION ROOT TECHNOLOGIES

"Production root technologies" refer to a collection of six production technologies that include 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 fundamentally very important and greatly influence material performance. As functions of products become more complex and robust, importance of these production root technologies concurrently grows.

Production root technologies have an inherent interdisciplinary nature, inevitably including a broad spectrum of skills from starting materials to component manufacturing and module integration. As demand increases for sustainable energy, especially by employing novel materials, composites and functional (e.g., energy scavenging, storage, and saving) techniques, the interdisciplinary approach plays an even greater role. Therefore, this symposium will 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 dangerous, dirty, and difficult (3D) aspects of production root technologies into automatic, clean, and easy (ACE) form will also be recognized and shared.

Proposed sessions

– 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

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- Kouichi Yasuda, Tokyo Institute of Technology, Japan
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S12: ON THE DESIGN OF NANO-LAMINATED TERNARY TRANSITION METAL CARBIDES/NITRIDES (MAX PHASES) AND BORIDES (MAB PHASES), AND THEIR 2D COUNTERPARTS (MXENES, MBENES)

MAX and MAB phases are thermodynamically stable nanolaminates of early transition metals carbides, nitrides, and borides. For example, MAX phases are hexagonal materials with an inherent layering at nanoscale. This structure is responsible for a unique combination of metal and ceramic-like properties. Some of them are machinability, good electrical and thermal conductivity, high thermal shock resistance, stable oxidation scale formation, and rigidity at high temperature, which can have diverse potential applications.

It was recently shown that it is possible to selectively etch atomic metal layers out of a structure to separate each nanolaminates block of transition metal compounds to form 2D solids. Despite their relatively short history, MXenes (the 2D phase after removing A layers from MAX phases) have attracted attention of scientists due to their attractive properties such as excellent electronic conductivity, surface functionality, and tunability, among others.

The symposium will focus on designing, processing, structure-property relationships, thermal, electrical, optoelectronic, solid lubrication, mechanical properties, oxidation resistance, stability, and applications of these novel nanolaminates compounds in their 2D and 3D forms. In addition, exploratory research on related ternary chemistry is also invited.

Proposed sessions

– 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
– Nuclear applications of MAX phases

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- Sylvain Dubois, Université de Poitiers, France
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- Johanna Rosen, Linköping University, Sweden
- Jesus Gonzalez, RWTH Aachen University, Germany

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 are strongly correlated to development and application of advanced materials capable of withstanding the ever increasingly harsh environment of a nuclear reactor core. This international symposium brings 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. Also included will be discussions on prospects and perspectives related to commercial development, qualification, and licensing requirements. The symposium is co-sponsored by ACerS Energy Materials and Systems Division.

Proposed sessions

– 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
– High temperature ceramics for nuclear thermal propulsion
– 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
– Advanced characterization techniques and methods
– Fuel, cladding, assembly, and core evolutions and performance modeling
– Test methods, codes and standards, and design methodology

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- Tatsuya Hinoki, Kyoto University, Japan
- Dong Liu, University of Bristol, UK
- Caen Ang, University of Tennessee, Knoxville, USA

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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 technological development of industrialized materials. For this purpose, worldwide experts in different topics will be invited to introduce their most recent activities. The broad scope of the session ensures a wide overview of state-of-the-art issues on crystalline materials to stimulate interdisciplinary discussions and collaborations in a wide range of fields.

Proposed sessions

– Semiconductors for LED/LD, power devices, sensors
– 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

Organizers

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S15: 4TH 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 a 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, bio-materials components for medical applications, and ceramics electrodes with large surface areas 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. Thanks to additive manufacturing, it is possible to design for function and not for manufacturing, nonetheless each technique needs special design adjustments to boost products' efficiency. This symposium focuses on superiority of design, efficient processing, and perspicuous evaluations in additive manufacturing and 3D printing processes. In addition, various topics related to starting materials, characterization tools, NDE, and in situ monitoring of processes, qualification and certification, cost, and applications will also be discussed.

Proposed sessions

– Laminated object manufacturing/green tape stacking
– Selective laser melting/sintering (SLM/SLS)
– Fused deposition modeling (FDM)
– Binder jetting and powder bed fusion processes
– Vat photopolymerization/stereolithography
– Direct writing and ink jet printing technologies
– Multi-material and hybrid printing techniques
– Materials and process characterization tools
– Qualification, certification, standards, and property database
– Design with/for additive manufacturing
– Applications of AM materials and components

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- Tobias A. Schaedler, HRL Laboratories LLC, USA
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- Rebecca Dylla-Spears, Lawrence Livermore National Laboratory, USA
- Cho-Pei Jiang, National Taipei University of Technology, Taiwan

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" (which convert to single phase ceramics upon heating), 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, organic or biological reinforcements; liquid and water purification; porous materials for CO_2 sequestration; and bio and medical applications. The nanoparticulate nature of geopolymers also provides a low energy processing route to ultra-refractory ceramic powders such as SiC, Si_3N_4 and SiAlON, which can be further demonstrated.

Proposed sessions

– Synthesis, processing microstructure
– Mechanical properties, thermal shock resistance
– Composites
– Medical applications
– Phosphates and other inorganic analogues
– Novel applications
– Geopolymer-derived processing routes
– Conversion to ceramics
– 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

Organizers

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S17: ADVANCED CERAMIC MATERIALS AND PROCESSING FOR PHOTONICS AND ENERGY

In the past few years, significant progress has been reported on the synthesis, structural, physical, and chemical characterization of ceramic nanostructures that exhibit size-dependent properties 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, multi-ferroic 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 development of new functional devices integrating bottom-up and top-down technologies will be also considered.

Proposed sessions

– Multi-functional 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

Organizers

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S18: ULTRA-HIGH TEMPERATURE CERAMICS

Ultra-high temperature ceramics (UHTCs) are materials of interest for use in extreme environments that are beyond the capabilities of other materials. Some proposed applications for UHTCs include scramjet engine components, leading edges, and thermal protection systems for hypersonic vehicles, plasma-facing materials in nuclear fusion reactors, solar power concentrators, fuel forms in nuclear fission reactors, and others. Challenges exist for UHTCs and limit near-term use that include thermal/chemical stability in extreme environments, the ability to be formed into complex shapes, thermal shock resistance, irradiation resistance, and damage tolerance. For such extreme environment applications, advances in understanding of structure-property relations and performance are needed. This symposium will focus on design, processing, structure-property relationships, thermal and mechanical properties, oxidation resistance, machining, joining, and thermal/chemical stability of UHTCs and UHTC composites, both from fundamental and application-oriented perspectives.

Proposed sessions

– Novel processing methods for bulk, coatings, thin films, fibers, and composites
– Precursors for powders, coatings, and matrix or fibers of composites
– Processing-microstructure-property relationships of existing or new systems
– Bulk ceramics, thin films, coatings, fibers, and composites
– Entropy stabilized compositionally complex UHTCs
– Characterization methods and lifetime assessment
– Methods for improving damage tolerance, oxidation behavior, and thermal shock resistance
– Response in extreme environments (irradiation, ultra-high temperature, etc.)
– Simulation and theory for predicting stability or behavior under extreme environments

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FS1: BIO-INSPIRED, GREEN PROCESSING, AND RELATED TECHNOLOGIES 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. In addition to bio-inspired material, green processing and related technologies exhibit flexibility for materials design to impart various functionalities for diverse applications, including energy and environment. The session will provide 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 and green processing of advanced materials. A particular emphasis will be placed on fundamental issues related to advancing our understanding and utilization of processes inspired by nature to develop materials with new functionalities and structures, current progress and challenges, and future directions in green processing and related technologies.

Proposed sessions

– Bio-inspired 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 bio-inspired materials
– Environmental applications of bio-inspired materials
– Characterizations of bio-inspired materials
– Nature-inspired materials for energy storage, conversion, and production
– Green processing for energy conversion and storage materials and systems
– Green processing of functional materials
– Green technology for environmental sustainability
– Future direction of bio-inspired materials, green processing, and technologies

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- Henry A. Colorado, Universidad de Antioquia UdeA, Colombia

FS2: MATERIALS FOR THERMOELECTRICS

Thermoelectric power generation and sensor technology rely on a thermally-induced electrical current in an all solid state device. In principle, the same kind of device can be used to electrically induce a thermal current and thus enable coolers or heaters. In both operational modes, the useful power and the power conversion efficiency depend on transport of charge carriers (electrons or holes) and propagation of lattice vibrations (phonons) in the thermoelectric materials involved. Broader applications of thermoelectric devices can be expected if new materials can be developed and assembled to meet requirements reliably under a number of environments and duty loads. Deeper insight into mechanisms by novel theoretical concepts and advanced manufacturing methods is needed to realize unique thermoelectric materials and devices, which exhibit far greater figure of merit and high power factor than are currently available. Computational sciences also afford researchers tools and methods to guide in the design, performance, and evaluation of non-traditional thermoelectric materials and devices.

The focus of this session is to convene leading global field experts to engage in ceramic technology-centered dialogues to address critical issues in development of thermoelectric energy conversion devices. Researchers and scientists in thermoelectrics and related fields are invited to participate in this focused session.

Proposed sessions

– Novel thermoelectric materials with high power factor and high figure of merit
– Inorganic thermoelectric materials, organic thermoelectric materials, and organic-inorganic hybrid systems
– Electronic and phononic band structure engineering, nanostructural engineering, superlattice structures, and 2D thermoelectric materials
– Porous thermoelectric materials
– Thermal stability and mechanical properties of thermoelectric materials and reliability of devices
– Electrical and thermal contact resistivity and their interplay with joining of thermoelectric materials
– Thermodynamics and solid-state defect chemistry of thermoelectric materials
– Theoretical and experimental approaches to thermal and electrical transport mechanisms in thermoelectric materials
– Design of new thermoelectric materials using density functional theory or other first principles computational methods
– Innovative processing routes for thermoelectric materials
– Advanced manufacturing technologies for thermoelectric devices and modules
– Miniaturized and integrated thermoelectric devices
– System-level applications of advanced thermoelectric devices and modules in electrical power generation (i.e. thermogenerators), sensor technology, heating, and cooling

Organizers

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FS3: MOLECULAR-LEVEL PROCESSING AND CHEMICAL ENGINEERING OF FUNCTIONAL MATERIALS

Materials synthesis based on use of molecular precursors has been recognized as a powerful way to access compounds with controlled and adjustable compositions, crystal structures, morphologies, and consequently property profiles. Thus, a careful design of suitable molecular precursors as well as extensive knowledge about their (thermal) conversion into desired functional materials are of crucial importance for providing improved rational preparative concepts toward tailor-made multifunctional structures. Molecular synthesis techniques toward 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 unique morphologies and metastable phases.

This focused session unites 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 thermodynamical regimes and are less suited for synthesizing multi-component and hybrid (organic-inorganic) materials.

Despite 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 molecular precursors are not commercially available. During this focused session role of precursor chemistry and additives in solution such as sol-gel, solvothermal, electrospinning, microwave, chemical vapor deposition (CVD) and atomic layer deposition (ALD) techniques will be critically analyzed. Specific emphasis will be placed 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 for new and smart chemical processing methods to obtain specific material compositions that can integrate 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 toward their simplicity, scalability, and cost-effectiveness.

Proposed sessions

– Precursor chemistry—structural and thermal transformations
– Chemically processed nanostructures and on-surface nanochemistry
– Two dimensional materials and their chemical functionalization
– 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

Organizers

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- Hirokazu Katsui, Tohoku University, Japan
- Yoshiyuki Sugahara, Waseda University, Japan
- Dong-Pyo Kim, Pohang University of Science and Technology, South Korea
- Ulrich Wiesner, Cornell University, USA

FS4: CERAMIC/CARBON REINFORCED POLYMERS

This focused session will cover ceramic/carbon reinforced polymer composites used in a wide range of industrial applications including energy, environment, biological, space, transportation, building, and sport. This symposium brings together the technical community to share recent advances in experimental or simulation approaches for fabrication, processing, characterization, properties, and modeling of ceramic and ceramic/carbon reinforced polymers. The role of inorganic phases in composites provides various functionalities such as mechanical, thermal, biological, insulation, electrical, chemical-resistant, and wear properties composed of fillers or fibers from nanometers to millimeters and in textured to random. This session will be the ideal showcase for research activities of many groups involved in development of ceramic/carbon reinforced polymers and composites and their recycling technology, including, but not limited to, areas of ceramics, plastics, their interface chemistry, mechanics, modeling and simulation, and engineering application.

Proposed sessions

– Innovative processing of ceramics and ceramic/carbon reinforced polymers
– Novel process and characterization technology of fiber, filler, matrix, and composites
– Mechanical behavior—fracture, fatigue, deformation, and machine processing of ceramic/carbon reinforced polymers and composites
– Big data, informatics, computing, simulation, modeling, and theoretical approaches in ceramic/carbon reinforced polymers and composites
– Environmental, infrastructure, energy, biological, space, transportation, building, and sport applications
– Innovation for integration of ceramics and composites
– The role of composites in multi-material systems
– Thermoplastics-based composites
– Composite recycling technology

Organizers

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- Toshio Ogasawara, Tokyo University of Agriculture and Technology, Japan
- Shinji Ogihara, Tokyo University of Science, Japan
- Tomohiro Yokozeki, The University of Tokyo, Japan
- Takenobu Sakai, Saitama University, Japan

FS5: FRACTOGRAPHY OF CERAMICS

Fractography is an art that is critical, not only to understand why a component or test specimen failed, but to improve materials and predict the life of structural components. When information from fractography is combined with fracture mechanics, stress analysis, and basic mechanical testing, the art becomes science and the puzzle of an unexpected failure can be solved. This session invites presentations on fractography and failure analysis of brittle materials including glasses and ceramics, with the goal of improving mechanical and functional properties, reliability, and lifetime of structural and functional components.

Proposed sessions

– SEM, TEM, FIB- and micro-tomography
– Advanced techniques used in fractography
– Quantitative fractography and fractal analysis
– Fractography-based failure prediction
– Fractography of service failures
– Environmental and microstructural effects on fractographic features
– New fractographic features and associated terminology
– Glasses, monolithic, and composite ceramics

Organizers

- **George Quinn**, NIST, USA, george.quinn@nist.gov
- **Jonathan Salem**, NASA Glenn Research Center, USA jonathan.a.salem@nasa.gov
- **Kevin Strong**, Sandia National Laboratory, USA, ktstron@sandia.gov
- Jack Mecholsky, University of Florida, USA
- Tobias Fey, Friedrich-Alexander-University Erlangen-Nürnberg, Germany

CALL FOR ABSTRACTS

DUE SEPTEMBER 1, 2020

10TH GLOBAL YOUNG INVESTIGATOR FORUM

The Global Young Investigator Forum brings together young researchers from around the world to facilitate scientific discussions and promote 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 symposium provides a platform for attendees to facilitate global cooperation and networking, discuss current and future challenges in ceramic science and technology, and showcase their research. A poster session section is also planned. In addition to connecting with young researchers, participants will be invited to attend a private luncheon hosted by the president of the American Ceramic Society. The Society will also provide complimentary student registration for a select number of eligible student presenters.

The Global Young Investigator Award laureate will deliver the opening keynote lecture.

Proposed sessions

– Frontiers in ceramic chemistry and physics: new precursors for functional ceramics, ceramics and catalysis, functional surfaces
– Advanced ceramics and coatings for structural, environmental, and functional applications
– Novel ceramic processing methods and synthesis routes
– Ceramic additive manufacturing
– Non-destructive testing for investigation of ceramics and composites
– Computational materials prediction and design
– Novel characterization tools of ceramics and composites
– Advanced and nanostructured materials: ceramic sensors and actuators, energy generation, saving and storage, photo-catalysis, and biomedical applications
– Careers in science, technology, engineering, and mathematics (STEM)
– The art of failing: strategies for young or future professionals to overcome difficult periods in their careers

Organizers

- **Daniele Benetti**, Institut National de la Recherche Scientifique, Canada, daniele.benetti@emt.inrs.ca
- **Kaline P. Furlan**, Hamburg University of Technology, Germany kaline.furlan@tuhh.de
- **Andrew Rosenberger**, U.S. Army Research Laboratory, USA arosenberger14@gmail.com
- Theresa Davey, Tohoku University, Japan, theresa@tohoku.ac.jp
- Yuki Nakashima, National Institute of Advanced Industrial Science and Technology, Japan, nakashima-yuki@aist.go.jp
- Rebekah Webster, University of Virginia, USA
- Matthew P. Appleby, NASA Glenn Research Center, USA
- Giorgia Franchin, University of Padova, Italy
- William Costakis, Purdue University, USA

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 underrepresented minorities (based on race, ethnicity, nationality and geographic location) in areas of ceramic science and engineering who will be invited to present their contributions. This session will also focus on entrepreneurship and commercialization. Entrepreneurship has become an important tool for job creation. The entrepreneurial process is highly rewarding and revolves around freedom of thought, originality, risk-taking, recognizing gaps in the market, being proactive, and competitively aggressive. Diverse teams are more successful than monolithic teams in these areas.

Proposed sessions

– Invited presentations from Jubilee Global Diversity Awardees
– Designing a successful start-up, business strategy, and business idea generation
– Assembling a focused team for a successful venture
– Reallocating different resources, (for example, human resource management)
– Promoting problem-solving, creativity, and out-of-the-box thinking
– Impact of diversity in ideation and entrepreneurial endeavors

Organizers

- **Surojit Gupta**, University of North Dakota, USA surojit.gupta@engr.und.edu
- Valerie L Wiesner, NASA Langley Research Center, USA
- Amanda Krause, Lehigh University, USA
- Kristin Breder, Saint-Gobain Research North America, USA
- Indrajit Dutta, Corning Incorporated, USA
- Katalin Balázsi, Institute for Technical Physics and Materials Science, MTA EK, Hungary

JANUARY 24–29, 2021 | HILTON DAYTONA BEACH RESORT AND OCEAN CENTER | DAYTONA BEACH, FLORIDA, USA

45TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

CALL FOR ABSTRACTS

DUE SEPTEMBER 1, 2020

The American Ceramic Society
www.ceramics.org

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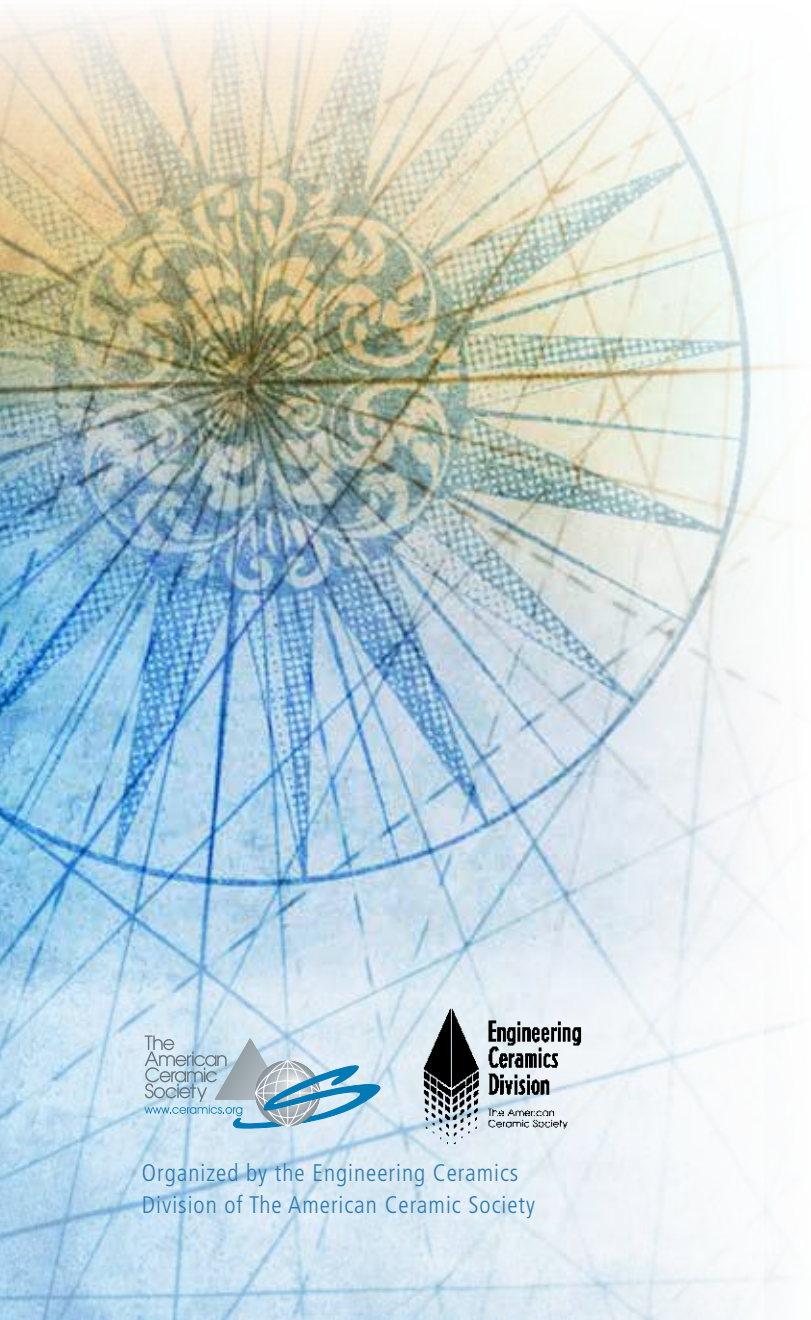

The American Ceramic Society
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Engineering Ceramics Division
The American Ceramic Society

Organized by the Engineering Ceramics Division of The American Ceramic Society

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