CALL FOR PAPERS

ABSTRACTS DUE SEPTEMBER 1, 2021

46TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

JANUARY 23 – 28, 2022

ceramics.org/icacc2022

The American Ceramic Society
www.ceramics.org

Engineering Ceramics Division
The American Ceramic Society

Organized by the Engineering Ceramics Division of The American Ceramic Society

HILTON DAYTONA BEACH RESORT AND OCEAN CENTER | DAYTONA BEACH, FL, USA

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INTRODUCTION

Dear Colleagues,

We are pleased to announce that the 46th International Conference & Exposition on Advanced Ceramics & Composites (ICACC) will be held Jan. 23–28, 2022, in Daytona Beach, Fla. It is a great honor to chair this conference, which has a long and illustrious history of being the preeminent international meeting on advanced structural and functional ceramics, composites, and other emerging ceramic materials and technologies.

Engineering Ceramics Division (ECD) of the American Ceramic Society has organized this esteemed event since 1977. In 2016, the conference celebrated its 40th anniversary, showing its longevity and instrumental role in the global advancement of ceramics and composites. Because of the attractiveness of the presentations describing innovative results and also participants with deep insights, more than 50% of the participants came from abroad in recent years—making ICACC a truly global materials science conference.

In 2022, the 46th ICACC will celebrate the future of ceramics and composites by featuring the innovative work and technological advancements at the forefront of the field. The technical program will continue to reflect the growth and success of ICACC by featuring 18 symposia, five focused sessions, one special focused session, the 11th Global Young Investigator Forum, and one honorary 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 the current trends in the research, development, engineering, and application of advanced ceramics. The core symposia at this conference are:

- Mechanical Behavior and Performance of Ceramics & Composites
- Advanced Ceramic Coatings
- Solid Oxide Fuel Cells
- Armor Ceramics
- Bioceramics
- Advanced Materials and Technologies for Rechargeable Energy Storage
- Functional Nanostructured Materials and Nanocomposites
- Advanced Processing & Manufacturing Technologies
- Porous Ceramics
- Modeling and design of ceramics and composites
- 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
- Processing for Photonics and Energy
- Ceramic Materials for Photonics and Energy
- Ultra-High Temperature Ceramics

In addition to the core symposia, the technical program will include five focused sessions on emerging technologies: Bioinspired Processing of Advanced Materials; Materials for Thermoelectrics; Molecular-level Processing and Chemical Engineering of Functional Materials; Ceramic/Carbon Reinforced Polymers; and Current Challenges in Microstructural Evolution. Building upon the successful interactions and excitement generated in the first ten years, the 11th Global Young Investigator Forum (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 and showcase some of the recent developments in entrepreneurship and commercialization in the field of ceramics science and engineering. In addition, an International Symposium, **Emergent Materials and Sustainable Manufacturing Technologies in a Global Landscape**, will be held in honor of Dr. Tatsuki Ohji to recognize his long term and outstanding contributions to science and technology of advanced ceramic materials and technologies and promoting global collaborations.

Details of the symposia and focused sessions are listed in the Call for Papers. The ECD Executive Committee and volunteer organizers sincerely hope you will join us at ICACC 2022 for a stimulating and enjoyable conference

We look forward to seeing you in Daytona Beach, Florida, in January, 2022!

Palani Balaya
Program Chair, ICACC 2022
National University of Singapore
mpepb@nus.edu.sg

ACERS ENGINEERING CERAMICS DIVISION LEADERSHIP

- Trustee: **Michael Halbig**, NASA Glenn Research Center, USA, michael.c.halbig@nasa.gov
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- Counselor: **Surojit Gupta**, University of North Dakota, Grand Forks, USA, surojit.gupta@engr.und.edu

TENTATIVE SCHEDULE OF EVENTS

Sunday, January 23, 2022

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 24, 2022

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 25, 2022

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 26, 2022

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 27, 2022

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 28, 2022

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

ABSTRACT SUBMISSION INSTRUCTIONS

- Visit **www.ceramics.org/icacc2022** 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.

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/icacc2022 or reserve by telephone, mention The American Ceramic Society to obtain the special rate.

Room rates are effective until January 1, 2022 and are based on availability.

TECHNICAL SYMPOSIA

S1: MECHANICAL BEHAVIOR AND PERFORMANCE OF CERAMICS & 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, the development of novel methods to advance and accelerate computationally driven materials characterization and validate structure/property relationship models is needed to improve the 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 Session Topics

– 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 & equipment
– Environmental effects, thermomechanical performance and tribology
– Manufacturing and testing of joined and integrated components and structures
– Small-scale testing and in situ characterization using X-rays & neutrons
– Novel computational approaches to enhance performance and characterization
– Fracture mechanics, failure analysis and fractography

Symposium Organizers

- Jonathan Salem, NASA Glenn Research Center, USA
- Dietmar Koch, University of Augsburg, Germany
- Dileep Singh, Argonne National Laboratory, USA
- 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, Airforce Research Laboratory, USA
- Andrew Wereszcak, Oak Ridge National Laboratory, USA
- Kevin Strong, Sandia National Laboratory

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- **Dietmar Koch**: dietmar.koch@mrm.uni-augsburg.de
- **Amjad Almansour**: amjad.s.almansour@nasa.gov

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

High-performance ceramic coating systems extend lifetime and enable operation of engineered materials in harsh environments. Advanced gas turbine engine components made of ceramic matrix composites, intermetallics, or superalloys promise higher energy efficiency due to increasing operation temperatures. Advanced thermal and environmental barrier coatings are mandatory to protect components against the synergistic attack of heat, combustion atmosphere, and inorganic, CMAS-type aerosols. Oxidation protection is a key issue for ultrahigh-temperature ceramics and composites used in reusable spacecraft or hypersonic vehicles. Protection of structural materials against oxidation, corrosion, erosion, and wear by innovative ceramic coatings is also a key technology for many industrial applications. Functional ceramic coatings are essential for many renewable energy applications. The symposium addresses processing, microstructure, performance, and durability of advanced 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 Session Topics

– Thermal and environmental barrier coatings for CMC, intermetallics, and alloys
– CMAS-type degradation of T/EBC: Fundamentals, modeling, and mitigation strategies
– Ceramic coatings for protection against oxidation, corrosion, erosion, and wear
– Ceramic coatings for renewable energy applications
– Processing of ceramic coatings (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
- Douglas E. Wolfe, The Pennsylvania State University, USA
- Jie Zhang, Institute of Metal Research, CAS, China

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- Bryan Harder, 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
- Robert Vaßen, Forschungszentrum Jülich, Germany
- Kang N. Lee, NASA Glenn Research Center, USA
- Satoshi Kitaoka, Japan Fine Ceramics Center, Japan
- Byung-Koog Jang, Kyushu Universtiy, 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

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S3: 19TH 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 serious consideration of stack operating window, operating environment, contaminants sources / level, and customer specifications to realize competitive solutions. This symposium provides a platform for academia and industry to present and discuss novel solutions for materials, components design, mechanical robustness, durability, and system layouts and to exchange their experience in application of SOCs in different areas.

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 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
- High-temperature electrolysis: steam, steam and CO2, chemical process engineering using SOEC
- System design and demonstration

Symposium Organizers

- Mihails Kusnezoff, Fraunhofer IKTS, Germany
- Narottam P. Bansal, NASA Glenn Research Center, USA
- Federico Smeacetto, Politecnico di Torino, Italy
- John Hardy, Pacific Northwest National Laboratory, USA
- Tatsumi Ishihara, Kyushu University, Japan
- Sebastian Molin, Gdansk University of Technology, Poland
- Ruey-Yi Lee, Institute of Nuclear Energy Research, Taiwan
- Vincenzo Esposito, DTU Energy Conversion and Storage, Denmark
- Julie Mougin, CEA, France
- Scott A. Barnett, Northwestern University, USA
- Tae Ho Shin, Korea Institute of Ceramic Engineering & Technology, South Korea
- Henrik Lund Frandsen, DTU Energy Conversion and Storage, Denmark
- Prabhakar Singh, University of Connecticut, USA

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- **Narottam P. Bansal**: Narottam.P.Bansal@nasa.gov
- **Federico Smeacetto**: federico.smeacetto@polito.it

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 multiscale structure on the fundamental damage and deformation mechanisms that govern strength and penetration resistance is limited, especially under dynamic loading conditions, which has hindered development of advanced materials through traditional, advanced, and emerging materials-by-design approaches. This symposium is an opportunity for attendees to openly discuss new developments in basic and applied research on the various aspects of processing/structure/properties/performance relationships for armor ceramic and glass materials. In addition to the proposed session topics, sessions with invited speakers on the following focus topics will be held: materials in extreme dynamic environments (MEDE), projectile/ceramic interactions, processing/design of hierarchically structured bodies, diamond-based and superhard materials development, and advances in transparent ceramics and glasses. Contributing presentations addressing either proposed session topics or focus topics are welcome.

Proposed Session Topics

– Fundamental terminal ballistic behavior
– Ceramic and glass science and engineering
– Traditional and advance 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

Symposium Organizers:

- Jerry LaSalvia, CCDC ARL, USA
- Jeffrey Swab, CCDC ARL, USA
- Michael Bakas, ARO, USA
- Kristopher Behler, CCDC ARL, USA
- Anthony DiGiovanni, CCDC ARL, USA
- Richard Haber, Rutgers University, USA
- Nicholas Ku, CCDC ARL, USA
- Patrik Lundberg, FOI, SE
- Neil Middleton, DSTL, UK
- Ghatu Subhash, University of Florida, USA
- Andrew Wereszczak, ORNL, USA

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- **Jeffrey Swab**: jeffrey.j.swab.civ@mail.mil

S5: NEXT-GENERATION BIOCERAMICS AND BIOCOMPOSITES

The last few decades 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 also are being adopted to develop bioinspired materials and inorganic-organic hybrids. The advent of nanotechnology and additive manufacturing 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, biosynthetic, 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
- Katalin Balazsi, Center for Energy Research, Hungary
- Hui-Suk Yun, Korea Institute of Materials Science, Korea
- Cristina Balagna, Politecnico di Torino, Italy
- Bikramjit Basu, Indian Institute of Science, India
- Ilaria Cacciotti, Università degli Studi Niccolò Cusano, Italy
- Marta Cerruti, McGill University, Canada
- Enrico Bernardo, Università di Padova, Italy
- Eva Hemmer, University of Ottawa, Canada
- Chikara Ohtsuki, Nagoya University, Japan
- Akiyoshi Osaka, Okayama University, Japan
- Kohei Soga, Tokyo University of Science, Japan
- Enrica Verné, Politecnico di Torino, Italy

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S6: ADVANCED MATERIALS AND TECHNOLOGIES FOR RECHARGEABLE ENERGY STORAGE

The significant increases in demand of world energy consumption as well as clean and efficient energy resources prompted the imperative searches of new materials and technologies. The intermittent nature of the renewable power generation technologies will require new solutions for 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 materials and technologies for energy storage, improvements in materials design, electrodes architecture, electrolytes, separators, and cell chemistries. These factors are key to extending the life, enhance the safety, and lower the cost of rechargeable batteries, which 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, solid electrolytes, and the implementation of the very challenging all-solid-state batteries, lithium batteries, lithium-sulfur, metal-air batteries, beyond lithium technologies including sodium batteries, Mg/Ca/Al-based batteries will be necessary to overcome the energy density shortfall and safety issues in currently 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 Session Topics

- 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-sulphur 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

Symposium Organizers

- Palani Balaya, National University of Singapore, Singapore
- Olivier Guillon, Forschungszentrum Jülich, Germany
- Naoaki Yabuuchi, Yokohama National University, Japan
- Valerie Pralong, CNRS CRISMAT, France
- Mickael Dollé, Université de Montréal, Canada
- Yasutoshi Iriyama, Nagoya University, Japan
- Ilias Belharouak, Oak Ridge National Laboratory, USA
- XiangXin Guo, Qingdao University, China
- Do Kyung Kim, Korea Advanced Institute of Science and Technology, Korea

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S7: 16TH 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 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 & innovative thin film techniques (e.g., ALD, PECVD)
- Industrial production and application of nanomaterials & coatings
- Carbon nanostructures, 2D materials and metal chalcogenides
- Computational methods in the design of tailored nanostructured materials
- Interfacial materials and multi-material heterostructures & nanocomposites

Symposium Organizers

- Sanjay Mathur, University of Cologne, Germany
- 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
- Kwang Ho Kim, Busan National University, Korea
- Wenbin Cao, University of Science and Technology, Beijing, China

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- **Sanjay Mathur**: Sanjay.mathur@uni-koeln.de

S8: 16TH INTERNATIONAL SYMPOSIUM ON ADVANCED PROCESSING AND MANUFACTURING TECHNOLOGIES FOR STRUCTURAL AND MULTIFUNCTIONAL MATERIALS AND SYSTEMS (APMT16)

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 processing and fabrication techniques of ceramic materials and systems give us unique properties that cannot be achieved using 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 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 covered as well.

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, flash sintering
– Advanced powder synthesis and processing
– Aqueous synthesis, colloidal processing, bioinspired 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

Symposium Organizers

- Young-Wook Kim, University of Seoul, Republic of Korea
- Hisayuki Suematsu, Nagaoka University of Technology, Japan
- Tatsuki Ohji, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Valentina Casalegno, Politecnico di Torino, Italy
- 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, Republic of Korea
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Manuel Belmonte, Institute of Ceramics and Glass (ICV-CSIC), Spain
- You Zhou, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Kyu Hyoung Lee, Yonsei University, Republic of Korea
- Csaba Balazsi, Centre for Energy Research, Hungary
- Jochen Schilm, Fraunhofer-Institut für Keramische Technologien und Systeme IKTS

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- **Tatsuki Ohji**: t-ohji@aist.go.jp
- **Valentina Casalegno**: valentina.casalegno@polito.it

S9: POROUS CERAMICS: NOVEL DEVELOPMENTS AND APPLICATIONS

Porous materials are used in many applications, including but not limited to thermal insulation, catalysts, catalyst supports, filters, adsorbers, and sensors. This symposium will 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 be textured to have random porosity or hierarchical porosity and can be based on various pore architectures, such as foams, honeycombs, fiber networks, bioinspired 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 & synthesis of porous ceramics
– Structure and properties of porous ceramics
– Novel characterization tools of porous structures
– Software tools for characterization
– Machine learning (ML) and artificial intelligence (AI) for porous ceramics
– 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 applications
– Porous ceramics for energy applications
– Porous ceramics for biological applications
– Porous ceramics for functional applications
– Porous ceramics for water filtration

Symposium Organizers

- Manabu Fukushima, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Tobias Fey, University of Erlangen-Nuremberg, Germany
- Paolo Colombo, University of Padova, Italy
- Samuel Bernard, Institut de Recherche sur les Céramiques de Limoges, France
- Miki Inada, Kyushu University, Japan
- Oleksandr Kravchenko, Old Dominion University, USA
- C.D. Madhusoodana, Ceramic Technological Institute Bharat Heavy Electricals Ltd., India

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S10: MODELING AND DESIGN OF CERAMICS AND COMPOSITES

Recent progress in computational materials science 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 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 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, informatics, and machine learning for new innovative materials and thermostructure, 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

– High-throughput design and characterization
– Informatics and machine learning
– Multiscale 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

Symposium Organizers

- Jingyang Wang, Institute of Metal Research, Chinese Academy of Sciences, China
- Valentino Cooper, Oak Ridge National Laboratory, USA
- Hyung-Tae Kim, Korean Institute of Ceramic Engineering and Technology, Korea
- Bin Liu, Shanghai University, China
- Jian Luo, University of California, San Diego, USA
- Katsuyuki Matsunaga, Nagoya University, Japan
- Sergei Manzhos, Institut National de la Recherche Scientifique (INRS), Canada
- Paul Rulis, University of Missouri-Kansas City, USA
- Hans J. Seifert, Karlsruhe Institute of Technology, Germany
- Gerard L. Vignoles, University of Bordeaux, France
- William J. Weber, University of Tennessee, USA
- Haixuan Xu, University of Tennessee, USA

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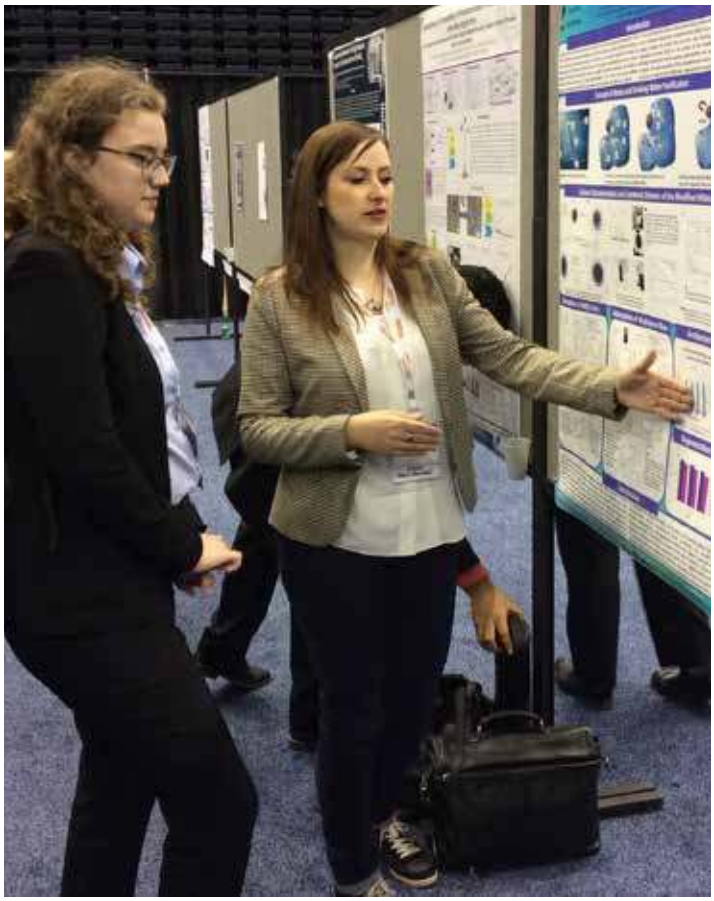

S11: ADVANCED MATERIALS AND INNOVATIVE PROCESSING IDEAS FOR PRODUCTION ROOT TECHNOLOGIES

"Production root technologies" refers to a collection of six production technologies including casting, molding, forming, welding, heat treatment, and surface treatment. Production root technologies involve both materials and process technologies that are hidden behind products and frequently do not appear outward. However, they are fundamentally important 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 an even greater role. Therefore, this symposium is designed to provide an opportunity 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 also will be recognized and shared.

Proposed Session Topics

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

Symposium Organizers

- Kyoung Il Moon, Korea Institute of Industrial Technology, Korea
- Chisung Ahn, Korea Institute of Industrial Technology, Korea
- Tadachika Nakayama, Nagaoka University of Technology
- Giovani Ramirez, Bruker, 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
- Sungwook Mhin, Kyonggi University, Korea
- Hyuksu Han, Konkuk University, Korea

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S12: ON THE DESIGN OF NANOLAMINATED TERNARY TRANSITION METAL CARBIDES/NITRIDES (MAX PHASES) AND BORIDES (MAB PHASES), SOLID SOLUTIONS THEREOF, AND 2D COUNTERPARTS (MXENES, MBENES)

The MAX and MAB phases are thermodynamically stable nanolaminates of early transition metals carbides, nitrides, and borides. The MAX/MAB phases are hexagonal materials with an inherent nanolayered crystal structure that is responsible for an unusual and unique combination of metal-like and ceramic-like properties, such as machinability, good electrical/thermal conductivity, high thermal shock resistance, good oxidation/corrosion resistance, and stiffness at high temperatures. The unique properties of the MAX/MAB phases make them appealing candidate materials for diverse potential industrial applications.

It was shown recently that it is possible to selectively etch atomic metal layers out of the crystal structure and to separate each nanolaminated block of these transition metal compounds to form 2D solids (MXenes, MBenes). Despite their relatively short history, MXenes (the 2D phases resulting from the removal of A layers from the corresponding MAX phases) have attracted attention due to their attractive properties, such as excellent electronic conductivity, surface functionality, and tunability. Symposium 12 focuses on the design; processing; structure-property relationships; thermal, electrical, optoelectronic, solid lubrication and mechanical properties; stability; oxidation/corrosion resistance; radiation tolerance; as well as envisaged potential applications of these unique nanolaminated compounds in their 2D and 3D forms. In addition, exploratory research on further expanding the chemistry of ternary compounds is invited as well.

Proposed Session Topics

– Design of novel compositions and manufacturing methods
– Methods for improving damage tolerance, oxidation/corrosion and thermal shock resistance
– Novel applications and device fabrication (electrochemical energy storage, biosensors, etc.) of MAX/MAB phases and MXenes/MBenes
– Study of electronic, optical, plasmonic and thermoelectric properties
– Theoretical calculations for designing and predicting the behavior of MAX/MAB phases and MXenes/MBenes
– Nuclear applications of the MAX phases

Symposium Organizers:

- Surojit Gupta, University of North Dakota, USA;
- Miladin Radovic, Texas A&M University, USA;
- Konstantza Lambrinou, SCK · CEN, Belgium;
- Jochen M. Schneider, Uppsala University, Sweden;
- Jie Zhang, Institute of Metal Research, CAS, China;
- Thierry Cabioch, Université de Poitiers, France;
- Sylvain Dubois, Université de Poitiers, France;
- Per Eklund, Linköping University, Sweden;
- Johanna Rosen, Linköping University, Sweden;
- Jesus Gonzalez, RWTH Aachen University, Germany

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ABSTRACTS DUE SEPTEMBER 1, 2021

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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 the development and application of advanced materials capable of withstanding the 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, including the most current, up-to-date, and state-of-the-art science and technologies, 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, and qualification and licensing requirements. The symposium is co-sponsored by the ACerS Energy Materials and Systems 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
- 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

Symposium Organizers

- Takaaki Koyanagi, Oak Ridge National Laboratory, USA
- Kyle Brinkman, Clemson University, USA
- Monica Ferraris, Politecnico di Torino, Italy
- Weon-Ju Kim, Korea Atomic Energy Research Institute, Korea
- Tatsuya Hinoki, Kyoto University, Japan
- Dong Liu, University of Bristol, UK
- Caen Ang, University of Tennessee, Knoxville, USA
- Kelsa Palomares, Analytical Mechanics Associates, 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 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
- Noboru Ichinose, Waseda University, Japan
- Luisa E. Bausá, Autonomous University of Madrid, Spain
- Victoria Blair, U.S. Army Research Laboratory, USA
- Yoshihiko Imanaka, Fujitsu Laboratories Ltd., Japan
- Taylor Shoulders, U.S. Army Research Laboratory, USA
- Kenji Toda, Niigata University, Japan
- Tetsuo Tsuchiya, National Institute of Advanced Industrial Science and Technology, Japan
- Yiquan Wu, Alfred University, USA
- James Wollmershauser, Naval Research Laboratory, USA
- Takayuki Yanagida, Nara Institute of Science and Technology, Japan
- Mariya Zhuravleva, University of Tennessee, USA

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- **Kiyoshi Shimamura:** SHIMAMURA.Kiyoshi@nims.go.jp

S15: 6TH 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 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. 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. Various functional components of dielectric lattices to control electromagnetic waves, biomaterials components for medical applications, and ceramics electrode with large surface area could be developed as well. Large scale structural components for aerospace and other high temperature applications can be fabricated with internal cooling path networks formed without casting molds. Using smart additive manufacturing, it is possible to design for function and not for manufacturing. However, each technique needs special design adjustments to boost products' efficiency and multifunctionality. 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, characterization tools, NDE, and in-situ monitoring of processes, qualification and certification, cost, and applications also will be discussed.

Proposed Session Topics

– Laminated object manufacturing/green tape stacking
– Powder bed fusion/selective laser melting and sintering
– Material extrusion/fused deposition modeling
– Binder jetting processes
– Vat photopolymerization/stereolithography
– Direct writing and ink jet printing technologies
– Multimaterial and hybrid printing techniques
– Design with/for additive manufacturing
– Materials and process characterization tools
– Qualification, certification, standards, and property database
– Applications of AM materials and components

Symposium Organizers

- Soshu Kirihara, Osaka University, Japan
- Mrityunjay Singh, Ohio Aerospace Institute, USA
- Michael Halbig, NASA Glenn Research Center, USA
- Andrew Allan, NIST, USA
- Arnaldo Moreno Berto, ITC, Spain
- Zhangwei Chen, Shenzhen University, China
- Giorgia Franchin, Università di Padova, Italy
- Cho-Pei Jiang, National Taipei University of Technology, Taiwan
- Majid Minary, University of Texas-Dallas, USA
- Alberto Ortona, SUPSI, Switzerland
- Tobias A. Schaedler, HRL Laboratories LLC, USA
- Martin Schwentenwein, Lithoz GmbH, Austria
- Hui-Suk Yun, KIMS, Korea

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- **Michael C. Halbig**: michael.c.halbig@nasa.gov

S16: GEOPOLYMERS, INORGANIC POLYMERS, AND SUSTAINABLE MATERIALS

Refractory inorganic polymers can be made at ambient temperatures and pressures from a powder and a liquid to form a paste of low viscosity. These materials, called geopolymers, include alkali metakaolin-based, aluminosilicates, silico-aluminate phosphates, or stoichiometric "geopolymers" (which convert to single phase ceramics upon heating), as well as other chemically bonded, inorganic compounds. The use of biological materials as starting compounds or as reinforcements in composites demonstrates the eco-friendly and sustainable nature of these materials. The geopolymer "glue" is refractory up to 1,000°C, whereupon it converts to a ceramic or a ceramic plus glass. Novel potential applications of such composites include fire and corrosion resistant coatings, thermal insulation, porous materials, structural ceramic composites containing ceramic, metal, organic or biological reinforcements, nanozeolites for liquid and water purification, and infrastructure and construction materials. The nanoparticulate nature of geopolymers also provides a low energy, processing route to ultra-refractory ceramic powders or versatile forming methods, including 4D printing.

Proposed Session Topics

– Synthesis, processing microstructure
– Mechanical properties, thermal shock resistance
– Composites
– Acid-based phosphate geopolymers
– Other inorganic geopolymer analogues
– Geopolymer derived processing routes
– Conversion to ceramics
– Use of waste materials to make geopolymers
– Coatings (fire resistant, acid resistant)
– Waste encapsulation
– Sustainable materials
– Novel applications

Symposium Organizers

- Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA
- Joseph Davidovits, Geopolymer Institute, St. Quentin, France
- Ghassan Al Chaar, US Army Corps of Engineers, ERDC, CERL, USA
- Don Seo, Arizona State University, USA
- Henry A. Colorado, Universidad de Antioquia, Medellin, Colombia

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ABSTRACTS DUE SEPTEMBER 1, 2021

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 considered as well.

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 nonlinear applications

Symposium Organizers

- Alberto Vomiero, Ca' Foscari University of Venice, Italy
- Federico Rosei, INRS, Canada
- Yasuhiro Tachibana, RMIT University, Australia
- David Kisailus, University of California at Riverside, U.S.
- Tohru Sekino, Osaka University, Japan
- Isabella Concina, Luleå University of Technology, Sweden
- Haiguang Zhao, Qingdao University, China
- Francesco Enrichi, National Research Council (CNR), Italy
- Daniele Benetti, INRS, Canada

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- **Federico Rosei**: rosei@emt.inrs.ca

S18: ULTRAHIGH-TEMPERATURE CERAMICS

Ultrahigh-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 of UHTCS that limit near-term use 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 the 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 Session Topics

- Novel processing methods for bulk, coatings, thin films, fibers, and/or 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
- Superhard UHTCs
- Characterization methods and lifetime assessment
- Methods for improving damage tolerance, oxidation behavior, and thermal shock resistance
- Response in extreme environments (e.g., irradiation, ultrahigh-temperature)
- Simulation and theory for predicting stability or behavior under extreme environments

Symposium Organizers

- William G. Fahrenholtz, Missouri University of Science and Technology, USA
- Bai Cui, University of Nebraska-Lincoln, USA
- Sea-Hoon Lee, Korea Institute of Materials Science, Korea
- Frederic Monteverde, National Research Council-Institute of Science and Technology for Ceramics, Italy
- Luc J Vandeperre, Imperial College London, UK
- Guo-Jun Zhang, Donghua University, Shanghai, China
- Carolina Tallon, Virginia Tech, USA
- Ji Zou, Wuhan University of Technology, China
- Lisa Rueschhoff, Air Force Research Laboratory, USA
- Emanuel Ionescu, Technical University Darmstadt, Germany
- Lavina Backman, Naval Research Laboratory, USA

Point of Contact

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- **William G. Fahrenholtz**: billf@mst.edu

FS1: BIOINSPIRED, GREEN PROCESSING, AND RELATED TECHNOLOGIES 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 bioinspired 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 bioinspired material, green processing and related technologies exhibit flexibility for materials design to impart various functionalities for diverse applications including energy and environment. 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 bioinspired and green processing of advanced materials. A particular emphasis will be placed on the fundamental issues related to advancing our understanding and use 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 as well.

Proposed Session Topics

– Bioinspired processing of ceramics
– Advances in bioinspired materials and related applications
– Bottom-up assembly and complex colloids
– Green processing for energy conversion and storage materials and systems
– Green processing of functional materials
– Green technology for environmental sustainability
– Future directions of bioinspired materials, green processing and technologies

Symposium Organizers

- Manoj K Mahapatra, University of Alabama at Birmingham, USA
- Francois Barthelat, McGill University, Canada
- Esther Garcia-Tuñon, University of Liverpool, United Kingdom
- Denis Gebauer, Leibniz University of Hannover, Germany
- Steven Naleway, University of Utah, USA
- Joaquin Ramirez-Rico, University of Seville, Spain
- Eduardo Saiz, Imperial College London, United Kingdom
- Simone Sprio, Institute of Science and Technlogy for Ceramics-ISTEC, Italy
- Pablo Zavattieri, Purdue University, USA
- Henry A. Colorado, Universidad de Antioquia UdeA, Colombia

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FS2: MATERIALS FOR THERMOELECTRICS

Thermoelectric power generation and sensor technology both 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 the 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 higher power factor than those of currently available counterparts. Computational sciences also afford researchers tools and methods to guide in the design, performance, and evaluation of nontraditional thermoelectric materials and devices.

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

Proposed Session Topics:

– Novel thermoelectric materials with high power factor and/or 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 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 (e.g., thermogenerators), sensor technology, heating and cooling

Symposium Organizers

- Michitaka Ohtaki, Kyushu University, Japan
- Armin Feldhoff, Leibniz University Hannover, Germany
- Sunmi Shin, National University of Singapore, Singapore
- Takao Mori, National Institute for Materials Science (NIMS), Japan

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ABSTRACTS DUE SEPTEMBER 1, 2021

- Mari-Ann Einarsrud, Norwegian University of Science and Technology, Norway
- Daryoosh Vashaee, North Carolina State University, USA
- Fabien Giovanelli, University of Tours, France
- Xiaolin Wang, University of Wollongong, Australia
- Peng Jiang, Dalian Institute of Chemical Physics, CAS, China

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

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 consequently 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, 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 multicomponent 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, 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 laid on materials manufacturing strategies, such as 3D printing and chemically controlled assembly and purpose-driven modification of materials. Nonconventional synthesis and analytical methods enabling in-situ diagnostics and mechanistic insights into nucleation, growth, and self-assembly are in particular focus. Need of new smart chemical processing methods to obtain specific material compositions and that can integrate the advancements in materials processing techniques with the existing knowledge-base of materials chemistry also will 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 Session Topics

- 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

Symposium Organizers:

- Sanjay Mathur, University of Cologne, Germany
- Emanuel Ionescu, Technische Universität Darmstadt, Germany
- Samuel Bernard, University of Limoges, France
- Gurpreet Singh, Kansas University, USA
- Ravi Kumar, IIT Madras, India
- Peter Kroll, University of Texas at Arlington, USA
- Shashank Mishra, University of Lyon, France
- Maarit Karppinen, Aalto University, Finland
- Gunnar Westin, Uppsala University, Sweden
- Ausrine Bartasyte, University of Franche-Comté, France
- Hiromitsu Kozuka, Kansai University, Japan
- 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

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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 aims to bring together the technical community to share recent advances in experimental or simulation approaches for the fabrication, processing, characterization, properties, and modeling of ceramic, ceramic/carbon reinforced polymers. The role of inorganic phases in the composites, in which that can provide various functionalities such as mechanical, thermal, biological, insulation, electric, chemical resistant, and wear properties, composed of fillers or fibers from the nanometers to millimeters, and in textured to random. This symposium will be the ideal showcase for the research activities of many groups involved in the development of ceramic/carbon reinforced polymers and composites, and their recycling technology, including but not limited to

the areas of ceramics, plastics, their interface chemistry, mechanics, modeling and simulation, and engineering application.

Proposed Session Topics:

- 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 multimaterial systems
- Thermoplastics based composites
- Composite recycling technology

Symposium Organizers:

- Satoshi Kobayashi, Tokyo Metropolitan University, Japan
- Manabu Fukushima, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Kenneth Reifsnider, University of Texas Arlington, USA
- Scott W Case, Virginia Polytechnic Institute and State University, USA
- Vladimir Vinogradov, Newcastle University, UK
- Maria Kashtalyan, The University of Aberdeen, UK
- Joung-Man Park, Gyeongsang National University, South Korea
- 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

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FS5: CURRENT CHALLENGES IN MICROSTRUCTURAL EVOLUTION: FROM FUNDAMENTALS TO ENGINEERING APPLICATIONS

The performance of ceramic devices is dominated by the electronic and mechanical properties of interfaces, both internal and external. Thus, the performance is highly dependent on the structure and chemistry of grain boundaries and the structure of the grain boundary network. The atomic structure, bonding configuration, defect distributions, and segregation behavior of these boundaries, and the overall microstructure of the system, can be altered by material processing techniques and critically impact microstructure evolution (sintering, grain growth, and chemical reactions). Developing a fundamental understanding of the effect of processing techniques on modifying interfaces and of the microstructure of ceramic materials is needed to tailor their performance and optimize their applications in device technology.

This symposium explores fundamental research into the interfacial structure and composition as well as microstructure evolution in ceramic materials as it relates to processing techniques. These processing techniques include applied electric fields (FAST), mechanical fields (HP and HIP), atmosphere control. joining techniques, and high-temperature treatments. The focus is on both ceramic-ceramic and ceramic-metal interfaces including composites. In addition to experimental approaches, modelling of microstructure and interfaces at various length scales is needed to extend fundamental understanding and to apply these results to current and future applications.

Proposed session topics

- Interface structure and chemistry
  - » Atomic structure, chemistry, bonding configuration
  - » Defect and segregation behavior
  - » In-situ microscopy evaluation
  - » Chemical reactions
- Microstructure evolution
  - » Sintering, grain growth and grain boundary mobility
  - » Nanocrystalline ceramics
  - » Material properties
- Impact of processing parameters and techniques on microstructure and properties
  - » Mechanical and electric fields (e.g., SPS, FAST, HIP)
  - » Extreme temperatures (e.g., cold sintering, SPS)
  - » Environments (e.g., oxygen, hydrogen)
  - » Joining techniques
  - » Processing–structure–properties relationship (mechanics, oxidation, conductivity, and other functional properties)

Symposium organizers

- Wolfgang Rheinheimer, Jülich Research Center, Germany
- Kristen Brosnan, Superior Technical Ceramics, USA
- John Blendell, Purdue University, USA
- Carol Handwerker, Purdue University, USA
- Gregory Rohrer, Carnegie Mellon University, USA
- Ricardo Castro, UC Davis, USA
- Michael Hoffmann, KIT, Germany
- Yiquan Wu, Alfred University, USA
- Olivier Guillon, Jülich Research Center, Germany
- Gary Messing, Penn State University, USA

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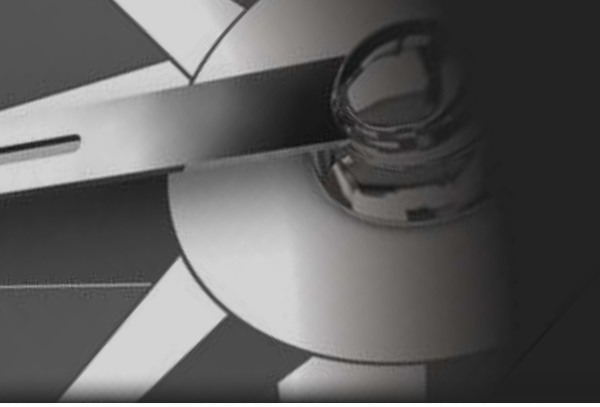

CALL FOR PAPERS

ABSTRACTS DUE SEPTEMBER 1, 2021

11TH GLOBAL YOUNG INVESTIGATOR FORUM

The Global Young Investigators Forum (GYIF) aims to bring together students, postdoctoral researchers, young professionals, and early career faculty from around the world to showcase their research and promote scientific discussions to identify and tackle emerging global challenges at the forefront of ceramic science and engineering research. The GYIF dedicated symposium and poster session are a platform to support networking among young professionals, fostering global cooperation to approach current and future challenges in ceramic science and technology. The Global Young Investigator Award laureate will deliver the opening keynote lecture of the symposium. All GYIF participants will be invited to attend a private luncheon hosted by the president of The American Ceramic Society. The American Ceramic Society also will provide complimentary student registration for a select number of eligible students GYIF presenters.

Proposed Session Topics:

- Novel ceramic processing methods and synthesis routes, including new precursors for functional ceramics
- Additive manufacturing of ceramics and ceramic-based composites
- Advanced ceramics and coatings for structural, environmental and functional applications
- Computational materials prediction and design
- Nondestructive testing (NDT) for investigation of ceramics and composites
- Novel characterization tools of ceramics and composites
- Advanced and nanostructured materials: ceramic sensors and actuators, energy generation, saving and storage, catalysis, functional surfaces, and biomedical applications
- Careers in science, technology, engineering, and mathematics (STEM), including building collaborative networks and research projects, as well as diversity and sustainability in the field of ceramics

Symposium Organizers

- Daniele Benetti, Institut National de la Recherche Scientifique, Canada
- Kaline P. Furlan, Hamburg University of Technology, Germany
- Andrew Rosenberger, US Army Research Laboratory, USA
- Theresa Davey, Tohoku University, Japan
- Yuki Nakashima, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- William Costakis, Air Force Research Labs, USA

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

As the increasing global population drives to meet the basic necessities and improve its standard of living, the demand for energy, healthcare, housing, transportation, and industrial products is growing rapidly as well. 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 emergent materials and sustainable manufacturing technologies in addressing various societal challenges. It will cover wide ranging topics and identify key challenges and opportunities for various emerging materials and innovative manufacturing technologies in a global landscape.

This symposium is being held in honor of Dr. Tatsuki Ohji, National Institute of Advanced Industrial Science and Technology (AIST), Japan, recognizing his long term and outstanding contributions to science and technology of advanced ceramic materials and technologies and promoting and developing human network and collaborations among the materials community worldwide. The technical program will cover, but is not 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 all over 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 support sustainable societal development.

Symposium Organizers

- Mrityunjay Singh, Ohio Aerospace Institute, Cleveland, USA
- Manabu Fukushima, National Institute of Advanced Industrial Science and Technology, Japan
- Jingyang Wang, IMR-Shenyang National Laboratory for Materials Science, China
- Kiyoshi Shimamura, National Institute of Materials Science, Japan
- Alexander Michaelis, Fraunhofer IKTS, Dresden, Germany
- Young-Wook Kim, University of Seoul, Korea
- Sanjay Mathur, University of Cologne, Germany
- Dileep Singh, Argonne National Laboratory, IL
- Monica Ferraris, Politecnico di Torino, Italy
- Zhengyi Fu, Wuhan University of Technology, China

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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 be 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 that 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 startup, 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
- Impact of diversity on ideation and entrepreneurial endeavors
- Creating saleable products from research results
- Methods and tools for fostering and retaining broad diversity in STEM with main focus to ceramic science

Symposium organizer

- Surojit Gupta, University of North Dakota, USA
- Valerie L Wiesner, NASA Glenn Research Center, USA
- Amanda Krause, University of Florida, USA
- Kristin Breder, Saint Gobain Research, USA
- Katalin Balázsi, Institute for Technical Physics and Materials Science, MTA EK, Budapest, Hungary
- Phylis Makurunje, Nuclear Futures Institute, Bangor University, Wales, UK

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