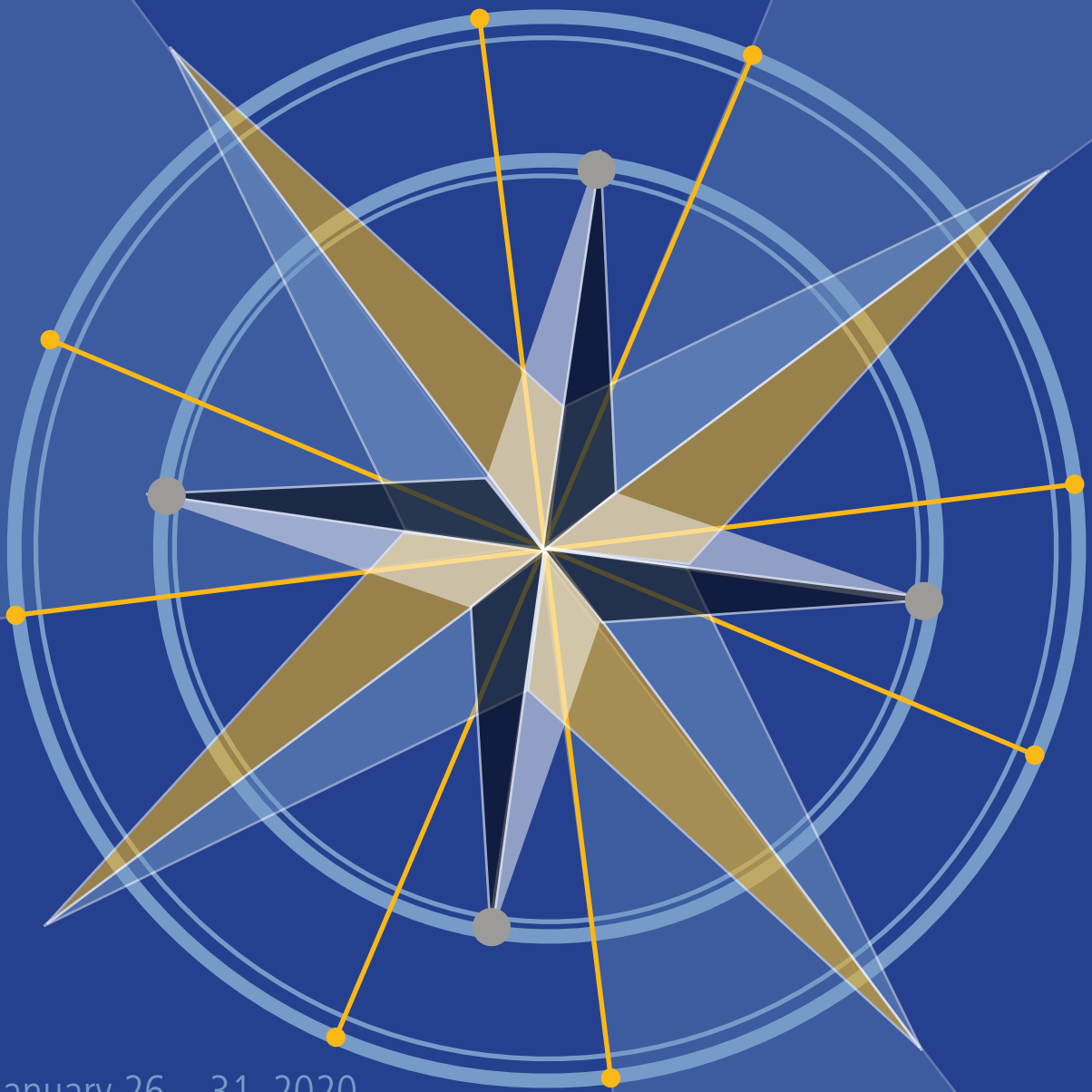
44TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

CALL FOR PAPERS

ABSTRACTS DUE
JULY 29, 2019



January 26 – 31, 2020
HILTON DAYTONA BEACH
RESORT AND OCEAN CENTER
Daytona Beach, Florida, USA
ceramics.org/icacc2020

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

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Daytona Beach, Florida, USA

Introduction

We are pleased to announce that the 44th International Conference & Exposition on Advanced Ceramics & Composites (ICACC) will be held from Jan 26–31, 2020, 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 Ceramic Society, the Engineering Ceramics Division (ECD) has organized this esteemed event since 1977. Due to the high quality of technical presentations and unique networking opportunities, ICACC has achieved tremendous worldwide interest and has attracted active participation from ceramic researchers and developers from the global technical community, thanks to the dedication and support of our membership. In 2020, the 44th ICACC will celebrate the future of ceramics and composites by featuring the innovative work and technological advancements at the forefront of the field.

This year, the technical program continues to reflect the growth and success of ICACC by featuring 18 symposia, five focused sessions, one special focused session, the 4th Pacific Rim Engineering Ceramics Summit, and the 9th Global Young Investigator Forum. These technical sessions, consisting of both oral and poster presentations, will provide an open forum for scientists, researchers, and engineers from around the world to present and exchange findings on recent advances on various aspects related to ceramic science and technology. The 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 Energy Conversion and Rechargeable Energy Storage, Functional Nanostructured Materials and Nanocomposites, Advanced Processing & 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, and 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, Image-Based Characterization and Modelling of Ceramics, Chemically Processing of Functional Materials, Green Technologies and Joining of Ceramics, and Materials for Thermoelectrics. Building upon the successful interactions and excitement generated in the first eight years, the 9th Global Young Investigator Forum (GYIF) will again be organized and facilitated by a group of early career researchers. In addition, a special focused session on diversity, entrepreneurship, and commercialization will be organized to recognize the ECD Jubilee Global Diversity Award recipients, 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.

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 ICACC20 for a stimulating and enjoyable conference.

We look forward to seeing you in Daytona Beach, Florida, in January 2020!

Valerie Wiesner
Program chair, ICACC 2020
NASA Glenn Research Center
E-mail: valerie.l.wiesner@nasa.gov

ACerS Engineering Ceramics Division leadership

- Trustee: **Michael Halbig**, NASA Glenn Research Center, USA, michael.c.halbig@nasa.gov
- Chair: **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology (AIST), Japan, manabu-fukushima@aist.go.jp
- Chair-elect: **Surojit Gupta**, University of North Dakota, Grand Forks, USA, surojit.gupta@engr.und.edu
- Vice chair/Treasurer: **Valerie Wiesner**, NASA Glenn Research Center, USA, valerie.l.wiesner@nasa.gov
- Secretary: **Hisayuki Suematsu**, Nagaoka University of Technology, Japan, suematsu@nagaokaut.ac.jp
- Counselors: **Andrew L. Gyekenyesi**, Ohio Aerospace Institute, NASA-Glenn Research Center, USA, Andrew.L.Gyekenyesi@grc.nasa.gov

  Jinyang Wang, Institute of Metals Research, China, jywang@imr.ac.cn
- Parliamentarian: **Dileep Singh**, Argonne National laboratory, USA dsingh@anl.gov

Tentative Schedule of Events

Sunday, January 26, 2020

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

Monday, January 27, 2020

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

Tuesday, January 28, 2020

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

Wednesday, January 29, 2020

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

Thursday, January 30, 2020

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

Friday – January 31, 2020

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

Abstract Submission Instructions

- Visit **www.ceramics.org/icacc2020** to review session topics.
- Select "Submit Abstract" to be directed to the Abstract Central website.

Abstract title and text character limit (including spaces) is 1,500 characters. If you have questions, please contact **Marilyn Stoltz** at mstoltz@ceramics.org or +1 614-794-5868.

ceramics.org/icacc2020

Hilton Daytona Beach Resort

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

Rates: One to four occupants: $180 USD
US government employee: Prevailing rate

Mention The American Ceramic Society to obtain the special rate.

Room rates are effective until December 20, 2019 and are based on availability.

44TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

TECHNICAL SYMPOSIA

S1: MECHANICAL BEHAVIOR AND PERFORMANCE OF CERAMICS AND COMPOSITES

Structural ceramics and composites have applications in areas including energy generation, 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. 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

– Fibers, matrices, coatings, and interfaces
– Processing–microstructure–mechanical properties correlation
– Manufacturing of composite structures for gas turbine applications
– Fracture mechanics of ceramics and composites
– Failure analysis
– *In situ* characterization using x-rays and neutrons
– Small-scale testing and applications
– Mechanics, characterization techniques, and equipment
– Testing of joined and integrated components and structures
– Tribological performance of ceramics and composites
– Ceramics for energy generation and environmental applications
– Functionally graded materials and multilayer systems with multifunctional properties
– Environmental effects and thermo-mechanical performance
– Design, reliability, and life prediction modeling of devices and components

Symposium organizers

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

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

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

A dedicated session on environmental barrier coatings for ceramic matrix composites will be held in memory of our late colleague Dr. Dongming Zhu (NASA GRC).

Proposed session topics

– Thermal and environmental barrier coatings for CMC, intermetallics, and alloys
– CMAS-type degradation of T/EBC: Fundamentals, modeling, and mitigation strategies
– Oxide and 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

Symposium organizers

- **Peter Mechnich**, German Aerospace Center (DLR), Germany; peter.mechnich@dlr.de
- **Douglas E. Wolfe**, The Pennsylvania State University, USA; dew125@arl.psu.edu
- 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
- 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
- Soumendra N. Basu, Boston University, USA
- Rodney W. Trice, Purdue University, USA
- Uwe Schulz, German Aerospace Center (DLR), Germany
- Kaylan Wessels, Pratt and Whitney, USA
- Yiguang Wang, Northwestern Polytechnical University, China
- Satoshi Kitaoka, Japan Fine Ceramics Center, Japan

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S3: 17TH 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 an excellent platform for academia and industry to present and to discuss novel solutions for materials, components design, mechanical robustness, durability, system layouts and exchange their experience in application of SOCs in different areas. The goal of symposium is not only exchange of latest results by experienced and young scientists but also extensive discussion of unsolved problems and on development directions.

Proposed session topics

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

Symposium organizers

- **Mihails Kusnezoff,** Fraunhofer IKTS, Germany; mihails.kusnezoff@ikts.fraunhofer.de
- **Narottam P. Bansal**, NASA Glenn Research Center, USA; Narottam.P.Bansal@nasa.gov
- Tatsumi Ishihara, Kyushu University, Japan
- Federico Smeacetto, Politecnico di Torino, Italy
- Jeffrey W. Stevenson, Pacific Northwest National Laboratory, USA
- 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 and Technology, South Korea
- Prabhakar Singh, University of Connecticut, USA
- Sebastian Molin, Gdansk University of Technology, Poland

S4: ARMOR CERAMICS—CHALLENGES AND NEW DEVELOPMENTS

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

This symposium is an opportunity for attendees from industry, academia, and government organizations to meet and participate in open discussions on relevant fundamental and applied research that supports the advancement of our knowledge and understanding of the processing-structure-properties-performance relationships for ceramic and glass materials.

Contributed papers addressing the following general symposium topics are welcomed:

– Terminal ballistic behavior: depth-of-penetration, dwell and penetration, in-situ/real-time and post-test characterization, mechanisms, size-scale effects, modeling, new techniques

– Synthesis and processing: ceramics, glasses, glass-ceramics, new materials, thermodynamics and kinetics, new methods including field-effects and additive manufacturing, monolithic and composites including CMCs and laminates, functionally-graded, toughened, damage-tolerant, multi-scale structures, materials-by-design, conventional and novel, powder synthesis and processing, green body forming, densification, surface modification, planar and curved shapes with/without topological features, scale-up

– Materials characterization: chemistry, phases, structure, defects, flaws and flaw statistics, bulk, surface, microscopy, spectroscopy, combined methods, non-destructive, residual stress, reactivity, wear and erosion, new techniques

– Quasi-static and dynamic behavior: mechanical properties, low and high-rate, high-pressure, large deformation, shear, multi-stress state, shock, fracture, fragmentation, damage, inelastic deformation mechanisms, phase transformations and transitions, in-situ probing, small-scale, size-scale effects, reactivity, macro, new techniques

– Materials and process modeling: material, system, analytical, computational, continuum, atomistic, multi-scale, thermodynamics, mechanics, phenomenological, physically-based, microstructural, damage, inelastic deformation mechanisms, phase transformations and transitions, fracture, fragmentation, impact, penetration, residual stress, homogeneous and heterogeneous deformation, failure, size-scale effects, novel numerical techniques, new materials

– Bonding of materials: surface chemistry and structure, surface treatments, bond material characteristics and properties, bond theory, bonded interface

processing, interface characteristics and properties, bond durability, residual stress, modeling

In addition, part of this symposium is devoted to special focus topics with invited speakers. These topics will be (1) fundamental terminal ballistic behavior, (2) processing science which support the development of hierarchically structured ceramic bodies, and (3) development of processing-structure-properties-performance relationships for both opaque and transparent materials. Presentations on theoretical and/or experimental aspects of these topics are welcomed.

For those interested in participating, but uncertain whether their work fits within the theme of this symposium, please contact the symposium organizers listed below.

Symposium organizers

- **Jerry LaSalvia**, CCDC ARL, USA; jerry.c.lasalvia.civ@mail.mil
- **Jeffrey Swab**, CCDC ARL, USA; jeffrey.j.swab.civ@mail.mil
- Brady Aydelotte, CCDC ARL, USA
- Michael Bakas, ARO, USA
- Kristopher Behler, CCDC ARL, USA
- Victoria Blair, CCDC ARL, USA
- Peter Brown, DSTL, UK
- Richard Haber, Rutgers University, USA
- Christopher Marvel, Lehigh University, USA
- Patrik Lundberg, FOI, SE
- Ghatu Subhash, University of Florida, USA
- Andrew Wereszczak, ORNL, 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 session topics

– Porous bioceramics (jointly with Symposium 9)
– 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 (jointly with Symposium 7)
– Magnetic nanoceramics for biomedical applications
– Light-emitting nanoceramics for bioimaging, sensing, and therapy
– Ceramic biosensors

Symposium organizers

- **Roger Narayan**, University of North Carolina, USA; roger_narayan@unc.edu
- **Bikramjit Basu**, Indian Institute of Science, India; bikram.iisc@gmail.com
- Markus Reiterer, Medtronic, Inc., USA
- Ilaria Cacciotti, Università degli Studi Niccolò Cusano, Italy
- Marta Cerruti, McGill University, Canada
- Enrico Bernardo, Università di Padova, Italy
- Eva Hemmer, 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

The significant increases in demand of world energy consumption as well as clean and efficient energy resources have prompted the imperative searches of new materials and technologies. The technologies aiming for clean energy generation with zero-emission will require advances in materials development for 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 chemistry are key factors to extend the life, enhance the safety, and lower the cost of rechargeable batteries that are regarded as the most efficient energy storage systems for portable electronics, renewable energy storage, smart grid, and transportation applications. A deeper understanding of the battery materials/property relationship, electrode/electrolyte interface phenomena, and cell failure mechanisms is critically needed to face these challenges. The search for advanced high capacity electrode materials and the implementation of the very challenging lithium sulfur, lithium-air, and sodium-air batteries will be necessary to overcome the energy density shortfall in currently commercial batteries.

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

Proposed session topics

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

Symposium organizers

- **Palani Balaya**, National University of Singapore, Singapore; mpepb@nus.edu.sg
- **Mickael Dollé**, University of Montrael, Canada; mickael.dolle@umontreal.ca
- **Olivier Guillon**, Forschungszentrum Jülich, Germany; o.guillon@fz-juelich.de
- Ilias Belharouak, Oak Ridge National Laboratory, USA
- Fei Chen, Wuhan University of Technology, China
- XiangXin Guo, Qingdao University, China
- Wei Lai, Michigan State University, USA
- Valerie Pralong, CNRS CRISMAT, France
- Naoaki Yabuuchi, Yokohama National University, Japan

S7: 14TH 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 and innovative thin film techniques (e.g., ALD, PECVD)
– Industrial production and application of nanomaterials and coatings
– Carbon nanostructures, 2D materials, and metal chalcogenides
– Computational methods in the design of tailored nanostructured materials
– Interfacial materials and multi-material heterostructures and nanocomposites

Symposium organizers

- **Yakup Gönüllü**, SCHOTT AG, Germany; Yakup.Goenuellue@schott.com
- **Sanjay Mathur**, University of Cologne, Germany; sanjay.mathur@uni-koeln.de
- Muhammet Toprak, KTH, Sweden
- Alberto Vomiero, Lulea University, Sweden
- Silke Christiansen, Helmholtz-Zentrum Berlin, Germany
- Gunnar Westin, Uppsala University, Sweden
- Ausrine Bartasyte, University of Besancon, France
- Thomas Fischer, University of Cologne, Germany
- Daniel Chua, National University of Singapore, Singapore
- Yasuhiro Tachibana, RMIT, Australia

S8: 14TH INTERNATIONAL SYMPOSIUM ON ADVANCED PROCESSING AND MANUFACTURING TECHNOLOGIES FOR STRUCTURAL AND MULTIFUNCTIONAL MATERIALS AND SYSTEMS (APMT14)

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

Proposed session topics

– Novel forming/sintering technologies, near-net shaping
– Rapid prototyping, patterning, templates, and self-assembly
– Advanced composite manufacturing technologies, hybrid processes
– Microwave processing, SPS, 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

Symposium organizers

- **Zhengyi Fu**, Wuhan University of Technology, China; zyfu@whut.edu.cn
- **Hisayuki Suematsu**, Nagaoka University of Technology, Japan; suematsu@nagaokaut.ac.jp
- **Tatsuki Ohji**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; t-ohji@aist.go.jp
- Enrico Bernardo, University of Padova, Italy
- Surojit Gupta, University of North Dakota, USA
- Hyung Sun Kim, Inha University, Korea
- Haixue Yan, Queen Mary, University of London
- Jerzy Lis, AGH University of Science and Technology, Poland
- Eugene Medvedovski, Endurance Technologies Inc., Canada

- Lisa Rueschhoff, Purdue University, USA
- Richard D. Sisson, Jr., Worcester Polytechnic Institute, USA
- Tohru S. Suzuki, National Institute for Materials Science (NIMS), Japan
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Weimin Wang, Wuhan University of Technology, China
- Yiquan Wu, Alfred University, USA

S9: POROUS CERAMICS: NOVEL DEVELOPMENTS AND APPLICATIONS

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

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

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

Proposed session topics

– Innovations in processing methods and synthesis of porous ceramics
– Structure and properties of porous ceramics
– Novel characterization tools of porous structures
– Mechanical behavior of porous ceramics
– 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

- **Paolo Colombo**, University of Padova, Italy; paolo.colombo@unipd.it
- **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; manabu-fukushima@aist.go.jp
- **Tobias Fey**, University of Erlangen-Nuremberg, Germany; tobias.fey@fau.de
- Farid Akhtar, Lulea University of Technology, Sweden
- Samuel Bernard, Institut de Recherche sur les Céramiques de Limoges, France
- Jacob George, Corning, USA
- Aleksander Gurlo, Technical University Berlin, Germany
- Oleksandr Kravchenko, Old Dominion University, USA
- Miki Inada, Kyushu University, Japan
- C.D. Madhusoodana, Ceramic Technological Institute Bharat Heavy Electricals Ltd., India
- Jian-feng Yang, Xi'an Jiaotong University, China

S10: MODELING, GENOME, INFORMATICS, AND MACHINE LEARNING

Recent progress in computational materials science has significantly enhanced the efficiency with which the understanding of fundamental phenomena, the improvement of materials performance, the optimization of processing, the discovery of new materials, and the design of structural components can be achieved. This symposium will focus on the high-throughput design, modeling, genome, informatics, and machine learning 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 thermo-structure, integrated materials computational engineering, prediction of the structure and properties of crystals, glasses and defects, modeling materials behavior under extreme/harsh environments, application of novel simulation methods for materials processing and performance, simulation of novel ceramics for functional applications, and the modeling of surfaces, interfaces and grain boundaries at multiple scales.

Proposed session topics

– Ceramic genome and big data
– Informatics and machine learning in accelerated ceramic technology development and applications
– Multi-scale modeling approaches for materials processing and performance
– Integrated materials computational engineering
– Modeling materials behavior under extreme/harsh environments (ultra high temperature, radiation, environmental damages, and severe mechanical load and stresses)
– Prediction of the crystal structure and properties of new ceramics
– Modeling defects and amorphous matter
– Modeling of surfaces, interfaces, and grain boundaries at multiple scales

Symposium organizers

- **Jingyang Wang**, Institute of Metal Research, Chinese Academy of Sciences, China; jywang@imr.ac.cn
- Hyung-Tae Kim, Korean Institute of Ceramic Engineering and Technology, Korea
- Jian Luo, University of California, San Diego, USA
- Katsuyuki Matsunaga, Nagoya University, Japan
- Sergei Manzhos, National University of Singapore, Singapore
- Paul Rulis, University of Missouri-Kansas City, USA
- Hans J. Seifert, Karlsruhe Institute of Technology, Germany
- Sean Smith, The University of New South Wales, Australia
- Valentino Cooper, Oak Ridge National Laboratory, USA
- 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 do not frequently appear outward. However, they are very important fundamentally and greatly influence material performance. As the functions of products become more complex and robust, the importance of these production root technologies is concurrently growing. Production root technologies have an inherent interdisciplinary nature, inevitably including a broad spectrum of skills from starting materials all the way up to component manufacturing and module integration. As demand increases for sustainable energy, especially by employing novel materials, composites and/or functional (e.g., energy scavenging, storage and saving) techniques, the interdisciplinary approach plays even a greater role. Therefore, this symposium is designed to provide an opportunity for the world's leading scientists and engineers from many fields to exchange ideas and to build new collaborations in the fields of production root technologies. Many successful stories and noteworthy examples of transforming dangerous, dirty, and difficult (3 D) aspects of production root technologies into automatic, clean and easy (ACE) form will also be recognized and shared.

Proposed session topics

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

Symposium organizers

- **Sungwook Mhin**, Korea Institute of Industrial Technology, Korea; hyeleci@kitech.re.kr
- **Tadachika Nakayama**, Nagaoka University of Technology, Japan; nky15@vos.nagaokaut.ac.jp
- Sung Duk Kim, Korea Institute of Industrial Technology, Korea
- Jacob L. Jones, North Carolina State University, USA
- 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
- Kyoung Il Moon, Korea Institute of Industrial Technology, Korea
- Hyuksu Han, Hongik University, Korea

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. They have unusual and unique properties. For example, MAX phases are hexagonal materials with an inherent nanolayered structure which provides a unique combination of metal-like and ceramic-like properties: machinability, good electrical and thermal conductivity, high thermal shock resistance, good oxidation resistance, and stiffness at high temperature, which opens a way to diverse potential applications. Recently, it was shown that it is possible selectively etch atomic metal layers out of the structure to separate each nanolaminates block of the transition metal compounds and form 2D solids. Despite their relatively short history, MXenes (the 2D phase after removing A layers from MAX phases) have attracted scientists' attentions due to their attractive properties such as their excellent electronic conductivity and surface functionality and tunability. The symposium will focus on designing, processing, structure-property relationships, thermal, electrical, optoelectronic, solid lubrication, and mechanical properties, oxidation resistance, stability, and applications of these novel nanolaminates compounds in their 2D and 3D forms. In addition, exploratory research on related ternary chemistry is also invited.

Proposed session topics

– 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

Symposium organizers

- **Surojit Gupta**, University of North Dakota, USA; surojit.gupta@engr.und.edu
- **Miladin Radovic**, Texas AandM University, USA; mradovic@tamu.edu
- Konstantza Lambrinou, SCK · CEN, Belgium
- Jochen M. Schneider, Uppsala University, Sweden
- Jie Zhang, Institute of Metal Research, Chinese Academy of Sciences, China
- Thierry Cabioch, Université de Poitiers, France
- Babak Anasori, Drexel University, USA
- Sylvain Dubois , Université de Poitiers, France
- Per Eklund, Linköping University, Sweden
- Johanna Rosen, Linköping University, Sweden
- Jesus Gonzalez, RWTH Aachen University, Germany

44TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

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 ever increasingly harsh environment of a nuclear reactor core. This international symposium aims to bring together scientists and engineers to discuss opportunities and needs for key enabling materials for application in nuclear energy systems. This will include the most current up-to-date and state-of-the-art science and technology, ranging from materials design and development, processing, and performance under relevant nuclear environments. Also, included will be discussions on prospects and perspectives related to commercial development, and qualification and licensing requirements. The symposium is co-sponsored by ACerS Nuclear and Environmental Technology Division.

Proposed session topics

– Material technologies for enhanced accident tolerance LWR fuels and core
– Ceramic fuel materials, technologies, and characterization; TRISO fuels
– Graphite and carbon materials for nuclear applications
– Chemical compatibility and corrosion
– Novel ceramics and composites for nuclear systems
– Joining and coating 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

- **Phil Edmondson**, Oak Ridge National Laboratory, USA; edmondsonpd@ornl.gov
- **Takaaki Koyanagi**, Oak Ridge National Laboratory, USA; koyanagit@ornl.gov
- Cory Trivelpiece, Savannah River National Laboratory, USA
- Kyle Brinkman, Clemson University, USA
- Kevin Fox, Savannah River National Laboratory, USA
- Monica Ferraris, Politecnico di Torino, Italy
- Weon-Ju Kim, Korea Atomic Energy Research Institute, Korea
- Tatsuya Hinoki, Kyoto University, Japan
- Cédric Sauder, CEA, France

S14: CRYSTALLINE MATERIALS FOR ELECTRICAL, OPTICAL, AND MEDICAL APPLICATIONS

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

Proposed session topics

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

Symposium organizers

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

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 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 electrode with large surface area could also be developed. Large scale structural components for aerospace and other high temperature applications can be fabricated with internal cooling path networks formed without casting molds. Thanks to additive manufacturing, it is now 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 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 will also be discussed.

Proposed session topics

– Laminated object manufacturing/green tape stacking
– Selective laser melting/sintering (SLM/SLS)
– Fused deposition modeling (FDM)
– Binder jetting and powder bed fusion processes
– 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

Symposium organizers

- **Soshu Kirihara**, Osaka University, Japan; kirihara@jwri.osaka-u.ac.jp
- **Mrityunjay Singh**, Ohio Aerospace Institute, USA; mrityunjaysingh@oai.org
- **Michael Halbig**, NASA Glenn Research Center, USA; michael.c.halbig@nasa.gov
- Hui-Suk Yun, KIMS, Korea
- Martin Schwentenwein, Lithoz GmbH, Austria
- Alberto Ortona, SUPSI, Switzerland
- Giorgia Franchin, Università di Padova, Italy
- Tyrone Jones, Army Research Laboratory, USA
- Tobias A. Schaedler, HRL Laboratories LLC, USA
- Arnaldo Moreno Berto, ITC, Spain

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, 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 SiAlONs, which can be further demonstrated.

Proposed session topics

– 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

Symposium organizers

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

S17: ADVANCED CERAMIC MATERIALS AND PROCESSING FOR PHOTONICS AND ENERGY

In the past few years significant progress has been reported on the synthesis and structural, physical and chemical characterization of ceramic nanostructures that exhibit size-dependent properties and on novel glass-based materials for optical lasers and amplifiers. Nanomaterials have been widely studied and are leading to fundamental new discoveries as well as applications in photovoltaics, optical sources, electroceramics, multiferroic materials, catalysis, and solar hydrogen.
This symposium focuses on all ceramic materials with application potential as functional materials, with particular consideration given to the capability to tailor and control material properties via surface and structural modifications. The session also includes novel optical glass-based and glass-ceramic materials with new functionalities, new emission wavelengths, and with an overview toward integration with other classes of materials (polymers, metals). New nanotechnology tools and technological procedures for the development of new functional devices integrating bottom-up and top-down technologies will be also considered.

Proposed session topics

– Multifunctional materials
– Advanced and nanostructured materials for photonics, electronics and sensing
– Advanced and nanostructured materials for photovoltaics and solar fuels
– Advanced glass-based and glass-ceramic materials for laser sources and non-linear applications

Symposium organizers

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

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, which 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 stability of UHTCs and UHTC composites, both from fundamental and application-oriented perspectives.

Proposed session topics

– New materials and 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
– High entropy 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

Symposium organizers

- **William G. Fahrenholtz**, Missouri University of Science and Technology, USA; billf@mst.edu
- 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
- Bai Cui, University of Nebraska-Lincoln, USA
- Ji Zou, Wuhan University of Technology, China
- Lisa Rueschhoff, Air Force Research Laboratory, USA
- Emanuel Ionescu, Technical University Darmstadt, Germany

FOCUSED SESSION 1: BIO-INSPIRED PROCESSING OF ADVANCED MATERIALS

A bio-inspired material is any material that exhibits a structure or function that imitates some aspect of a material or process found in nature. The study of bio-inspired materials is a technical means for people to learn from nature, in order to develop new materials and structures with novel functionalities. The symposium is aimed at providing a forum for researchers, students, and entrepreneurs to present and discuss their recent scientific results on a wide variety of topics related to science and engineering issues associated with bio-inspired processing of advanced materials. A particular emphasis will be placed on the fundamental issues related to advancing our understanding and utilization of processes inspired by nature to develop materials with new functionalities and structures.

Proposed session topics

– Bio-inspired processing of ceramics
– 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

Symposium organizers

- **Joaquin Ramirez-Rico**, University of Seville, Spain; jrr@us.es
- **Florian Bouville**, Imperial College London, UK; f.bouville@imperial.ac.uk
- Francois Barthelat, McGill University, Canada
- Esther Garcia-Tuñon, University of Liverpool, UK
- Denis Gebauer, Leibniz University of Hannover, Germany
- Steven Naleway, University of Utah, USA
- Eduardo Saiz, Imperial College London, UK
- Simone Sprio, Institute of Science and Technology for Ceramics-ISTEC, Italy
- Pablo Zavattieri, Purdue University, USA

FOCUSED SESSION 2: Image-Based Characterization and Modelling of Ceramics by Non-Destructive Examination Techniques

Image-based characterization techniques as such SEM, light microscopy, TEM, and FIB-tomography as well as Micro-tomography have gained an increase in resolution and speed in the past ten years, which make them suitable for microstructural characterization on micro- and nanometer-length scale. Techniques such as µCT, FIB/TEM-tomography, SEM/AFM/ultrasonic microscopy, as well as Digital Image Correlation (DIC), acoustic emission, high energy X-ray synchrotron, and high-performance computing enables an insight 3D view from materials to inspect or detect relative local microstructural changes and damage characteristics. A correlation and synchronization between the sensitivity of these several types of NDE-techniques will close the length scale gap. Thus, physical properties are highly affected by microstructure features (inhomogeneity like porosity, grain borders, inclusions) their size, dimension, shape, and orientation have to be taken into account. Providing microstructure-based models derived from mentioned characterization tools for modelling and simulation will lead to a detailed real structure length scale dependant modelling. Representative volume and volume of interest (VOI) are of particular importance to link model and experiment for verification.

Proposed session topics

– Influence of inhomogeneity on mechanical, chemical, electrical, and thermal properties and the estimations
– Characterization NDE technologies for defect extraction, shape calculation, grain orientation, and void distribution by 3D-model data acquisition
– Analysis of sintering and solidification based on image-based models
– Verification of model by experiment and vice versa

– Optimized microstructures designed and simulated by topographies
– Strain characterization by digital image correlation technique
– Length scale depending modelling based on evaluated structural data

Symposium organizers

- **Tobias Fey**, Friedrich-Alexander-University Erlangen-Nürnberg, Germany; tobias.fey@fau.de
- You Zhou, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Satoshi Tanaka, Nagaoka University of Technology, Japan
- Alisa Stratulat, ZEISS Research Microscopy Solutions, USA

FOCUSED SESSION 3: 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 multifunctional 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 multi-component and hybrid (organic-inorganic) materials. Despite the well-known benefits of molecular-level processing of inorganic solids, a major challenge lies in the limited insight into molecule-to-material transformations and the fact that many of the molecular precursors are commercially not available. During this focused session, 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 lie 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 the advancements in materials processing techniques with the existing knowledge-base of materials chemistry will also be a part of this focused session. The industrial potential of chemically processed materials will be analyzed and discussed 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; sanjay.mathur@uni-koeln.de
- Emanuel Ionescu, Technische Universität Darmstadt, Germany
- Shashank Mishra, Universite of Lyon, France
- Maarit Karppinen, Aalto University, Finland
- Thomas Fischer, University of Cologne, Germany
- Gurpreet Singh, Kansas University, USA
- Gunnar Westin, Uppsala University, Sweden
- Claudia Wickleder, Siegen University, Germany
- Ausrine Bartasyte, University of Franche-Comté, France
- Hirokazu Katsui, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Silke Christiansen, Helmholtz Zentrum Berlin, Germany
- K. Byrappa, Adichunchanagiri University, India
- Yoshiyuki Sugahara, Waseda university, Japan

FOCUSED SESSION 4: Green Technologies and Ceramic/Carbon Reinforced Polymers

This focused session will cover the general field of green and sustainable technologies with emphasis on waste derived ceramics, as well as new developments of environmental technologies and ceramic/carbon reinforced polymer composites utilized in 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 and recycled materials. The session of green technologies focuses on the fundamental research regarding waste derived materials science and technologies including solidification/stabilization, combustion, pyrolysis, hydrometallurgy, pyrometallurgy, mechanical processing, and sintering. In the session of ceramic/carbon reinforced polymer, the role of inorganic phases in the composites or in recycled materials 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 focused session 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 technologies, including, but not limited to the areas of ceramics, plastics, their interface chemistry, mechanics, modeling and simulation, and engineering application.

44TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

Proposed session topics

– Innovative processing of ceramics and ceramic/carbon reinforced polymers to minimize energy utilization, recycling, and reduction of processing waste
– Ceramics production from ceramic, plastic, metallic, and natural wastes
– Novel process and characterization technology of fiber, filler, matrix, composites, and their reused or recycled materials
– Mechanical behavior—fracture, fatigue, deformation, and machine processing of ceramic/carbon reinforced polymers and composites and various waste derived materials
– Big data, informatics, computing, simulation, modeling, and theoretical approaches in green technology and ceramic/carbon reinforced polymers and composites recycling
– Environmental, infrastructure, energy, biological, space, transportation, building, and sport applications
– Innovation for integration of ceramics and composites
– Circular economy and climate change associated with ceramic and composite materials

Symposium organizers

- **Manoj K. Mahapatra**, University of Alabama at Birmingham, USA; mkmanoj@uab.edu
- **Satoshi Kobayashi**, Tokyo Metropolitan University, Japan; koba@tmu.ac.jp
- **Henry A. Colorado**, Universidad de Antioquia UdeA, Medellin, Colombia; henry.colorado@udea.edu.co
- **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; manabu-fukushima@aist.go.jp
- Jorge Barcena, Tecnalia Research and Innovation, Spain
- Enrico Bernardo, University of Padova, Italy
- Surojit Gupta, University of North Dakota, USA
- Seiichi Nomura, The University Texas at Arlington, USA
- Marino Quaresimin, University of Padova, Italy
- Takenobu Sakai, Saitama University, Japan
- Federico Smeacetto, Politecnico di Torino, Italy
- Carlos Mauricio F. Vieira, Universidade Estadual do Norte Fluminense, Brazil
- Vladimir Vinogradov, Newcastle University, UK
- Tomohiro Yokozaki, The University of Tokyo

FOCUSED SESSION 5: MATERIALS FOR THERMOELECTRICS

Solid state power conversion devices, such as thermoelectrics and thermionics, depend solely upon the temperature gradients and the semiconductor charge carrier mechanisms for their operation. Thermoelectric devices offer the possibility of high efficiencies and reliability. New materials must be developed that can meet requirements under a number of environments and duty loads. In addition, new theoretical concepts, mechanisms, and manufacturing methods are needed to realize unique composite-based thermoelectric generators which exhibit far greater figures of merit than is now currently available. Computational sciences also afford researchers tools and methods to guide in the design, performance, and evaluation of non-traditional materials such as practical thermoelectric and thermionic 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 the development of thermoelectric energy conversion devices. Researchers/scientists in thermoelectrics and all related fields are invited to participate in this symposium.

Proposed session topics

– Organic thermoelectric materials and hybrid systems.
– Novel theories which separate thermal/electrical transports mechanisms in thermoelectrics
– Thermal stability and mechanical properties of thermoelectric materials
– Physics-based novel interdisciplinary and composite materials with high figures of merit
– Design principles for thermoelectric modules and TEG devices
– Design new thermoelectric and thermionic materials using density functional theory or other first principles computational methods
– Novel processing for thermoelectric materials and devices
– System-level applications of advanced thermoelectric devices and modules
– Solid-state defect chemistry and mechanisms of thermoelectric materials
– Theoretical studies of bulk materials and low-dimensional nanostructures
– Materials for thermionic and thermovoltaic applications

Symposium organizers

- **Jon Goldsby**, NASA Glenn Research Center, USA; jon.c.goldsby@nasa.gov
- Jing-Feng Li, Tsinghua University, China,
- Lidong Chen, Shanghai Institute of Ceramics, China,
- Masakazu Mukaida, AIST, Japan
- Michitaka Ohtaki, Kyushu University, Japan,
- Xinfeng Tang, Wuhan University of Technology, China

4TH PACIFIC RIM ENGINEERING CERAMICS SUMMIT

During the past 50 years, Pacific Rim countries have proudly contributed to groundbreaking research, technology development, and commercialization in the field of engineered and functional ceramics. These important contributions led to the advancement and wide scale utilization of ceramics in energy, aerospace, transportation, healthcare, communication, infrastructure, environmental, and other industrial sectors. In turn, these ceramic technologies and systems led to significant improvements in living standards and quality of life for people across the world.
The International Summit series started in 2011 with the focus being on Pacific Rim countries. The second summit in 2012 focused on EU/US ceramic efforts, while in 2013 it was called the Summit of Americas. The second round for both the Pacific Rim and EU/US summits were held in 2014 and 2015, respectively. The third Pacific Rim summits were held in 2017. In 2020, the 4th Pacific Rim Engineering Ceramics Summit will bring together experts from academia, industry, and government research institutes/laboratories to discuss the current state of the art and various technical challenges in research and development, engineering, manufacturing, and application of ceramic materials. The goal of the summit is to provide a forum for global information exchange concerning the current status and emerging trends in various ceramic technologies in Pacific Rim countries.

The technical program, consisting of invited and contributed presentations, will include the following topics:
– Current trends and future directions for research and technology
– Challenges and opportunities for various ceramic technologies
– Energy and environmental issues and role of ceramics
– Applications of engineering and functional ceramics

– Ceramic education, training, and knowledge management
– Overview of major ceramics efforts in the region

Session organizers

- **Young-Wook Kim**, University of Seoul, Republic of Korea; ywkim@uos.ac.kr
- **Jingyang Wang**, Institute of Metal Research, China; jwang@imr.ac.cn
- **Manabu Fukushima**, National Institute of Advanced Industrial Science and Technology (AIST), Japan; manabu-fukushima@aist.go.jp
- Surojit Gupta, University of North Dakota, USA
- Valerie Wiesner, NASA Glenn Research Center, USA
- Hua-Tay Lin, Guangdong University of Technology, China
- Junichi Tatami, Yohohama National University, Japan
- Juan Paulo Wiff, Air Liquide, Japan
- Prabhakar Singh, Indian Institute of Technology, Banaras, India
- Dechang Jia, Harbin Institute of Technology, China
- In-Hyuck Song, Korea Institute of Materials Science, Republic of Korea
- Miki Inada, Kyushu University, Japan
- Ziqi Sun, Queensland University of Technology, Australia
- Ramesh Singh, University of Malaya, Malaysia

9TH GLOBAL YOUNG INVESTIGATOR FORUM

The Global Young Investigators Forum (GYIF) aims to bring together young researchers from around the world by facilitating scientific discussions to promote the exchange of ideas essential to identifying emerging global challenges at the forefront of ceramic science and engineering research. Young researchers, including students, postdoctoral researchers, young professionals, and early career faculty are invited to join this event. The GYIF symposium provides a platform to help establish global cooperation and networking among young scientists and engineers to approach current and future challenges in ceramic science and technology as well as provide GYIF participants a unique forum at which to showcase their research. A poster session section is also dedicated to the GYIF. In addition to connecting with young researchers, all GYIF participants will be invited to attend a private luncheon hosted by the president of the American Ceramic Society. The American Ceramic Society will also provide complimentary student registration for a select number of eligible student GYIF presenters. The Global Young Investigator Award laureate will deliver the opening keynote lecture.

Proposed session topics

– Frontiers in ceramic 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
– 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

Symposium organizers

- **Daniele Benetti**, Institut National de la Recherche Scientifique, Canada; daniele.benetti@emt.inrs.ca
- **Manoj Mahapatra**, University of Alabama at Birmingham, USA; mkmanoj@uab.edu
- **Giorgia Franchin**, University of Padova, Italy; giorgia.franchin@unipd.it
- **Matthew P. Appleby**, NASA Glenn Research Center, USA; matthew.p.appleby@nasa.gov
- Rebekah Webster, University of Virginia, USA
- Andrew Rosenberger, US Army Research Laboratory, USA
- Wei Ji, Wuhan University of Technology, China

SPECIAL FOCUSED SESSION ON DIVERSITY, ENTREPRENEURSHIP, AND COMMERCIALIZATION

One of the critical goals of this special session is to recognize Jubilee Global Diversity Awardees who are exceptional early- to mid-career professional women and underrepresented minorities (i.e. based on race, ethnicity, nationality, and geographic location) in the area of ceramic science and engineering, and invite them to present their contributions. This session will also focus on entrepreneurship and commercialization. Entrepreneurship has become an important tool for job creation. More particularly, the entrepreneurial process is highly rewarding and revolves around freedom of thought, originality, recognizing gaps in the market, proactiveness, risk-taking, and competitive aggressiveness.

Proposed topics

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

Symposium organizers

- **Surojit Gupta**, University of North Dakota, USA; surojit.gupta@engr.und.edu
- Valerie Wiesner, NASA Glenn Research Center, USA
- Amanda Krause, University of Florida, USA
- Emmanuel Maillet, GE Research, USA
- Thiyagarajan Natarajan, Applied Materials, USA

44TH INTERNATIONAL CONFERENCE AND EXPOSITION ON ADVANCED CERAMICS AND COMPOSITES

CALL FOR PAPERS

ABSTRACTS DUE JULY 29, 2019

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