ceramics.org/gfmat-2-and-bio-4

ABSTRACT DEADLINE: JANUARY 14, 2019

2nd Global Forum on Advanced Materials and Technologies for Sustainable Development (GFMAT-2)

4th International Conference on Innovations in Biomaterials, Biomanufacturing, and Biotechnologies (Bio-4)

JULY 21 – 26, 2019

Toronto Marriott Downtown Eaton Centre Hotel, Toronto, Canada

Organized by ACerS

The American Ceramic Society
www.ceramics.org

Bio-4 is organized by ACerS and its Bioceramics Division and endorsed by:

Society For Biomaterials

BMES Biomedical Engineering Society

IAOC International Academy of Ceramic Implantology

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ORGANIZING CHAIRS

Tatsuki Ohji
General Chair
AIST, Japan

Jingyang Wang
GFMAT-2 Lead Chair
Institute of Metal Research, China

Palani Balaya
GFMAT-2 Co-chair
NUS, Singapore

Dietmar Koch
GFMAT-2 Co-chair
DLR, Germany

Kiyoshi Shimamura
GFMAT-2 Co-chair
NIMS, Japan

Roger Narayan
Bio-4 Lead Chair
Chair-elect ACerS Bioceramics Division
NC State University, USA

Markus Reiterer
Bio-4 Co-chair
Medtronic Inc., USA

Alessandro Alan Porporati
Bio-4 Co-chair
CeramTec GmbH, Germany

Thomas Webster
Bio-4 Co-chair
Northeastern University, USA

JULY 21 – 26, 2019

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INTRODUCTION

The American Ceramic Society (ACerS) is organizing and hosting the 2nd Global Forum on Advanced Materials and Technologies for Sustainable Development (GFMAT-2) and the 4th International Conference on Innovations in Biomaterials, Biomanufacturing and Biotechnologies (Bio-4), in Toronto, Canada, July 21 – 26, 2019.

GFMAT-2, whose 1st meeting was held also in Toronto, Canada, (2016) in conjunction with HTCMC9, will address various key issues, challenges and opportunities in a wide variety of advanced materials and technologies that are critically needed for a sustainable societal development.

Following successful meetings held in Raleigh, North Carolina (2012), Columbus, Ohio (2014), and Chicago, Illinois (2016), the ACerS Bioceramics Division is helping to organize Bio-4. The meeting will focus on developing cutting-edge technologies into marketable products through collaboration among researchers, professionals and manufacturers.

The emphasis of these concurrent meetings will lie on recent societal challenges in the new millennium including, but not being limited to, health, energy, and environmental aspects. In addition, novel materials design paradigms are needed for fabricating materials with multifunctional applications, which can bring game changing solutions to some of the problems facing society. This event aims to bring together researchers and scientists in different fields from around the globe to discuss new approaches to addressing these challenges, and to provide a platform for intensive exchange of ideas, knowledge, and network building.

We invite you to take advantage of this opportunity to visit the great city of Toronto and actively participate in this event. We are quite hopeful that this event will provide an excellent forum for interaction and friendship with participants from various continents to discuss latest trends in the application of advanced materials and technologies for sustainable societal development.

Events planned in addition to multiple technical sessions include a young professionals forum, tabletop exhibits, and poster sessions. We welcome your participation in one or both of these meetings, and we invite researchers, manufacturers, suppliers, and medical professionals to submit abstracts before the deadline.

HOTEL INFORMATION

Toronto Marriott Downtown Eaton Centre Hotel
525 Bay St. Toronto, Ontario, Canada
1-416-597-9200

Group rate from **$229 CAD + taxes** (currently 16%) based upon availability. The cut off is on or before **June 18, 2019**.

ABSTRACT SUBMISSION INSTRUCTIONS

Visit http://ceramics.org/gfmat-2-and-bio-4 to review the session topics and select the "Submit Abstract" hyperlink to be directed to the abstract website. If you have questions, please contact Marilyn Stoltz at mstoltz@ceramics.org or 614-794-5868. Abstract title and text character limit (including spaces) is 1,500 characters.

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2nd Global Forum on Advanced Materials and Technologies for Sustainable Development (GFMAT-2)

The global population growth and tremendous economic development has brought us to the crossroads of long term sustainability and risk of irreversible changes in the ecosystem. Sustainability has become an integral component of research for the 21st century. The key motivating factors are: Rapid urbanization, population growth, and aging population; the large amount of waste yearly disposed to landfill; the global depletion of natural resources and environment (fossil fuels, minerals, water and energy scarcity); declining infrastructure; the emergency of carbon dioxide emissions; and climate change.

For instance, the development of new biomarkers for reliable detection of diseases at early stages, molecular imaging, targeting and therapy are crucial for a healthy society, while the development of more efficient energy conversion technologies, fuel cells and batteries are an essential step facing the increasing demand for energy supply. Energy efficient and eco-friendly technologies and systems are critically needed for further growth and sustainable development. Consequently, recent research trends globally cover the search for alternative and reusable energies, for fast and reliable medical diagnostic and therapeutic methods, and for new functional materials—as well as new (greener, more efficient) synthesis approaches—that exhibit unique properties allowing for their implementation in health, energy, and environment related applications.

G1: POWDER PROCESSING INNOVATION AND TECHNOLOGIES FOR ADVANCED MATERIALS AND SUSTAINABLE DEVELOPMENT

Slight differences in powder processing can significantly influence material microstructure and properties. Consequently, understanding and control of powder processing techniques are critical to the design and fabrication of high-performance, reliable advanced materials and composites. Additionally, innovations in powder processing and characterization technologies are critical to develop advanced materials and composites with optimized functionality, including advanced materials for sustainable development.

In this symposium, materials and process scientists and engineers with interdisciplinary expertise in powder processing and characterization technologies will discuss powder processing control and innovative powder technologies, including powder synthesis and dispersion; particle design (molding and sintering); and innovative characterization or analytical techniques for advanced ceramics, ceramic composites, and advanced materials for sustainable development.

Proposed session topics

- Particle and powder design and synthesis
- Fabrication of composite particles and particle coating technology
- Particle dispersion control in liquid or polymers
- Novel shaping, forming, and sintering technology, including additive manufacturing
- Nanostructure and microstructure control
- Composite or porous structure control
- Low-cost and energy-saving processing of advanced ceramics and ceramic composites, including smart recycling of materials for sustainable development
- Advanced characterization and analytical techniques for powder processing and materials

Organizers

- **Makio Naito**, Joining and Welding Research Institute (JWRI), Osaka University, Japan; m-naito@jwri.osaka-u.ac.jp
- **Junichi Tatami,** Yokohama National University, Japan; tatami-junichi-xv@ynu.ac.jp
- Masayoshi Fuji, Nagoya Institute of Technology, Japan
- Yuji Hotta, National Institute of Advanced Industrial Science and Technology, Japan
- Toshihiro Ishikawa, Tokyo University of Science, Yamaguchi, Japan
- Norifumi Isu, LIXILCorp., Japan
- Jian Luo, University of California, USA
- Sanjay Mathur, University of Cologne, Germany
- Yoshio Sakka, National Institute for Materials Science, Japan
- Taeseup Song, Hanyang University, Korea
- Jingxian Zhang, Shanghai Institute of Ceramics, China

G2: NOVEL, GREEN, AND STRATEGIC PROCESSING AND MANUFACTURING TECHNOLOGIES

The properties and performance of materials largely depend on their processing and manufacturing routes. Recently developed new processing and manufacturing technologies of ceramic materials and systems give us unique properties which cannot be achieved from the conventional routes. On the other hand, we should take into account at least two critical issues in making materials and products. One is that the technologies are "green" or environmentally benign so as to avoid generation of elements and compounds hazardous to the human health and environments and to protect the global environment by preserving energy during the fabrication. The other is that they are "strategic" or using no or less quantity of rare natural resources for stable production. Keeping these aspects in view, the aim of this symposium is to discuss advances in processing and manufacturing technologies for a wide variety of ceramic materials.

Proposed session topics

- Green manufacturing processes with lower environmental burden
- Energy efficient processing
- Microwave-or microwave assisted processing, SPS
- Education and learning in sustainable materials processing
- Materials recycling for ceramic manufacturing
- Alternatives for rare metals and materials
- Room/low-temperature synthesis
- Aqueous synthesis and processing, colloidal processing
- Advanced composite manufacturing technologies, hybrid processes

Organizers

- **Tatsuki Ohji**, National Institute of Advanced Industrial Science and Technology (AIST); Japan, t-ohji@aist.go.jp
- **Mrityunjay Singh**, Ohio Aerospace Institute, USA; mrityunjaysingh@oai.org
- Theresa Davey, Tohoku University, Japan
- Zhengyi Fu, Wuhan University of Technology, China
- Surojit Gupta, University of North Dakota, USA
- Lalit Sharma, CSIR-Central Glass & Ceramic Research Institute, India
- Richard D. Sisson, Jr., Worcester Polytechnic Institute, USA
- Tohru S. Suzuki, National Institute for Materials Science (NIMS), Japan

G3: 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, worldwide experts in the different topics will be invited to introduce their most recent activities. The session assures a wide overview of the state-of-the-art issues on crystalline materials.

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

Organizers

- **Kiyoshi Shimamura,** National Institute for Materials Science, Japan; SHIMAMURA.Kiyoshi@nims.go.jp
- Noboru Ichinose, Waseda University, Japan
- Nerine J. Cherepy, Lawrence Livermore National Laboratory, USA
- Victoria Blair, U.S. Army Research Laboratory, USA
- Yoshihiko Imanaka, Fujitsu Laboratories Ltd., Japan
- Joanna McKittrick, University of California San Diego, USA
- Takayuki Yanagida, Nara Institute of Science and Technology, Japan
- Yiquan Wu, Alfred University, USA
- Inka Manek-Honninger, Bordeaux University, France

G4: POROUS CERAMICS FOR ADVANCED APPLICATIONS THROUGH INNOVATIVE PROCESSING

Porous ceramics with various pore scales have been widely utilized in numerous engineering applications. This symposium seeks engineers, researchers, and scientists in the area of porous ceramics, carbon, and glass to share recent advances in innovative processing routes, characterizations, properties, fluid dynamics, simulation and modeling. Porous components are prepared with wide range of pore size from nano to millimeters, controlled pore volume fraction and tailored pore configurations such as textured or random morphologies, interconnected or closed microstructures, sandwich structured ceramic matrix composites and hierarchical porosities. They are based on various morphologies: monolithic structures with controlled pore size, foams, syntactic foams, honeycombs, fibrous, bio-inspired, membranes, aero-gels and additive manufacturing. Engineering applications can include biomedical applications, energy-related technologies, environmental protection and lightweight structural components. This symposium will be the ideal showcase for groups involved in the processing and applications of porous materials from design to application. In addition, research advancement and trends in next-generation porous materials, design, fabrication and characterization will be included.

Proposed session topics

- Processing route and synthesis of porous ceramics
- Chemical processing of functional porous materials
- Shape forming, joining and morphology of porous ceramics
- Additive manufacturing of porous ceramics
- Porous biomaterials (joint with Bio-4)
- Micro- or meso-porous ceramics and hierarchical porosities
- Innovative characterization tools, design, simulation and modeling of porous ceramics
- Mechanical and thermal properties of porous ceramics
- Characterization and behavior of porous ceramics
- Functional properties

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2nd Global Forum on Advanced Materials and Technologies for Sustainable Development (GFMAT-2)

Organizers

- **Manabu Fukushima,** National Institute of Advanced Industrial Science and Technology (AIST), Japan; manabu-fukushima@aist.go.jp
- **Young-Wook Kim**, University of Seoul, South Korea; ywkim@uos.ac.kr
- Paolo Colombo, Università di Padova, Italy
- Samuel Bernard, European Institute of Membranes, France
- Tobias Fey, Universität Erlangen-Nürnberg, Germany
- Alberto Ortona, University of Applied Sciences and Arts of Southern Switzerland, Switzerland
- Kay Teraoka, National Institute of Advanced Industrial Science and Technology (AIST), Japan
- Jian-feng Yang, Xi'an Jiaotong University, China
- Kouichi Yasuda, Tokyo Institute of Technology, Japan

G5: ADVANCED FUNCTIONAL MATERIALS, DEVICES, AND SYSTEMS FOR ENVIRONMENTAL CONSERVATION, POLLUTION CONTROL AND CRITICAL MATERIALS

With the rise of science and technology, there is a growing trend toward the expanding importance of ceramic materials that are resistant to heat, chemically stable, and also have a wide variety of functions. However, simply seeking for new functions is now considered routine, and it has been demanded to develop safe and secure ceramic materials for the next generation, considering the pursuit of environmental conservation and development. This symposium covers a variety of topics for the realization of novel and environment-conscious ceramic materials. The aim is to discuss advanced functional ceramic materials such as environmental catalysts for emission control, semiconductors and porous materials such as chemical sensors, optical materials, for example mercury-free lamps (LEDs), environmentally friendly pigments and sunscreens free of toxic elements, and recovery and recycling of rare metals, critical materials, etc.

Proposed session topics

- Ion-conducting ceramics
- Volatile organic compounds (VOCs) and CO abatement
- Low-temperature methane oxidation
- Diesel particulate filters
- Automotive ceramic sensors
- Semiconductor materials for *p-n* junction diode
- Porous materials
- Phosphors and optical ceramics for light emitting diodes
- Advanced process control system for recycling
- Environmentally friendly pigments
- Sunscreen materials
- Recovery and recycling of rare metals
- Critical materials

Organizers

- **Nobuhito Imanaka**, Osaka University, Japan; imanaka@chem.eng.osaka-u.ac.jp
- Taek-Soo Kim, Korea Institute of Industrial Technology, Korea
- Kazuyoshi Ogasawara, Kwansei Gakuin University, Japan
- Satoshi Wada, University of Yamanashi, Japan
- Hiroshi Masumoto, Tohoku University, Japan
- Shu Yin, Tohoku University, Japan
- Shinji Tamura, Osaka University, Japan

G6: MULTIFUNCTIONAL COATINGS FOR SUSTAINABLE ENERGY AND ENVIRONMENTAL APPLICATIONS

This symposium will provide an open forum for material scientists and engineers to discuss recent advances in coating sciences and technologies reflecting theoretical and manufacturing issues, microstructure and property characterization, harsh environment resistance and lifetime prediction. Innovative coating deposition techniques and surface modification processes are particularly emphasized to realize surfaces with enhanced structural and environmental properties and/or novel multi-functionality; thereby enabling them to meet present requirements and future challenges for more efficient, reliable, economical, and clean applications that serve the technological needs of our society. Of interest are coating materials systems and their processing based on oxide and non-oxide ceramics; new carbons; metal-ceramic, organic-ceramic and nano-composites; and hybrid and graded structures. Special focus will be placed on advanced ceramic coatings and components for aerospace, automotive and energy applications.

Proposed session topics

- Thermal and environmental coatings
- Coatings to resist chemical, wear, erosion, corrosion and tribological loadings
- Advanced coatings for extreme environments
- Functionally graded coatings
- Smart and multifunctional thin films and coatings: Self-cleaning, antimicrobial, antismog, catalytic, electrically/magnetically/optically stimuli-responsive, etc.
- Advances in coating processing methods
- Advanced characterization techniques, properties and non-destructive testing
- Interface phenomena, adhesion and functional coating properties
- Substrate materials, substrate treatments; post-deposition treatment
- Modeling, simulation and database development for life time prediction of coatings

Organizers

- **Jun Akedo**, AIST, Japan; akedo-j@aist.go.jp
- **Hagen Klemm**, Fraunhofer Institute Ceramic Technologies and Systems, IKTS, Germany; hagen.klemm@ikts.fraunhofer.de
- Satoshi Kitaoka, JFCC, Japan
- Seiji Kuroda, NIMS, Japan
- Sanjay Sampath, Stony Brook University, USA
- Tatsuki Ohji, AIST, Japan
- Kentaro Shinoda, AIST, Japan
- Tetsuo Tsuchiya, AIST, Japan
- Robert Vaßen, Forschungszentrum Jülich GmbH, Germany

G7: CERAMICS MODELING, GENOME AND INFORMATICS

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

Proposed session topics

- Ceramic genome
- Big data and informatics in accelerated ceramic technology development and applications
- Multiscale modeling approaches for materials processing and performance
- Integrated materials computational engineering
- 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

Organizers

- **Jingyang Wang**, Institute of Metal Research, Chinese Academy of Sciences, China; jywang@imr.ac.cn
- **Gerard Vignoles**, University of Bordeaux, France; vinhola@lcts.u-bordeaux.fr
- **William J. Weber**, The University of Tennessee, USA; wjweber@utk.edu
- Wai-Yim Ching, University of Missouri-Kansas City, USA
- Valentino Cooper, Oak Ridge National Laboratory, USA
- 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
- Bin Liu, Shanghai University, China
- Masato Yoshiya, Osaka University, Japan
- Qingfeng Zeng, Northwestern Polytechnical University, China

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G8: ADVANCED BATTERIES AND SUPERCAPACITORS FOR ENERGY STORAGE APPLICATIONS

Batteries and supercapacitors are two important energy storage devices. Batteries store electrical energy by conversion into chemical energy while supercapacitors store energy at electrode/electrolyte interface. There are several concepts available for batteries and supercapacitors, representing multi-billion dollar industries. The state-of-the-art battery and supercapacitor systems are not able to meet the requirements for energy-efficient use in transportation, grid and commercial technologies. Both storage technologies seek new concepts in materials design to overcome their current limitations of performance, cycle life and safety. More critical insights are required in terms of advanced material compositions and structures including surface/interfacial reactions to produce next-generation electrode materials enabling higher energy densities, higher power densities, ultra-safety and longer cycle life of batteries and supercapacitors. This symposium will explore novel energy storage advanced materials and technologies that are critical in making the current energy storage technologies more effective in the near future. Sessions will focus discussion on fundamental, modeling, mechanisms, materials design, screening, electrode architectures, diagnostics, materials characterization and electrode/electrolyte interface characterization of the following energy storage devices.

Proposed session topics

- Lithium-ion batteries
- Sodium-ion batteries
- Magnesium batteries
- Lithium-air batteries
- Lithium-sulfur batteries
- Redox flow batteries
- All-solid-state batteries
- High temperature batteries
- Supercapacitors
- Li-ion capacitors

Organizers

- **Palani Balaya**, National University of Singapore, Singapore; mpepb@nus.edu.sg
- **Michael Dolle**, Université de Montréal, Canada; mickael.dolle@umontreal.ca
- Dany Carlier-Larregaray, ICMCB-CNRS, Bordeaux, France
- Robert Dominko, National Institute of Chemistry, Slovenia
- Xiangxin Guo, Shanghai Institute of Ceramics, China
- Akitoshi Hayashi, Osaka Prefecture University, Japan
- Partha P. Mukherjee, Purdue University, USA
- Neeraj Sharma, University of New South Wales, Australia
- Naoaki Yabuuchi, Tokyo Denki University, Japan

G9: INNOVATIVE PROCESSING OF METAL OXIDE NANOSTRUCTURES, HETEROSTRUCTURES AND COMPOSITE MATERIALS FOR ENERGY STORAGE AND PRODUCTION

This symposium will focus on the functional and multifunctional inorganic materials and techniques that offer advanced processing, improved properties, and low-cost/low-temperature synthesis, with a strong focus on the recent innovation in nanotechnological approaches and the assessment of their industrial impact. In particular, special emphasis will be given to novel synthesis approaches, functionalization, processing, and characterization of nanoparticles, nanowires, nanoscopic films and their heterostructures. Application of nanostructures in catalysis, energy and sensing applications, nanocomposites in structural lightweight materials, nanostructured coatings for photovoltaic, biomedical and optical applications will form the major scientific thrust areas. It will provide an international forum for the presentation of technological advances in innovative processing and device applications of new materials to meet the challenges of sustainable energy and environment technologies.

Proposed session topics

- Processing of functional nanomaterials: Electrospinning, plasma-assisted chemical vapor deposition, atomic layer deposition and microwave-enhanced synthesis, sol-gel, and chemical solution techniques
- Synthesis, functionalization, and assembly of nanomaterials
- Interfacial materials and multi-material heterostructures and nanocomposites
- One and two dimensional materials and heterostructures for energy harvesting and storage
- Perovskite-based photovoltaic cells
- Piezoelectric nanostructures for self-powered systems
- Nanodevices: Fabrication and large-scale integration
- Nanomaterials for renewable fuels and energy generation
- Nanomaterials for photocatalysis and solar hydrogen production

Organizers

- **Sanjay Mathur**, University of Cologne, Germany; mathurs@uni-koeln.de
- Tohru Sekino, Osaka University, Japan
- KwangHo Kim, Busan National University, Korea
- Silke Christiansen, Helmholtz Zentrum Berlin, Germany
- Ausrine Bartasyte, Université Franche-Comté, France
- Hidehiro Kamiya, Tokyo University of Agriculture & Technology, Japan
- Gunnar Westin, Uppsala University, Sweden
- Alberto Vomiero, Lulea University, Sweden
- Thomas Fischer, University of Cologne, Germany
- Sven Barth, Technical University Vienna, Austria

G10. CERAMICS FOR SUSTAINABLE INFRASTRUCTURE: GEOPOLYMERS, ALKALI ACTIVATED MATERIALS AND SUSTAINABLE COMPOSITES

Geopolymer is an inorganic aluminosilicate polymer made from high shearing a powder and liquid into a low viscosity paste which can set under ambient conditions into a solid amorphous ceramic. It is composed of calcined, amorphous aluminosilicate clay powder such as kaolinite, and "water glass" or sodium, potassium or another Group I metal metasilicate. Geopolymer has a composition centered at $M_2O{\cdot}Al_2O_3{\cdot}4SiO_2\ xH_2O$ where x varies between 7-12 depending on particle size and specific surface area of the aluminosilicate source. While cements are based on a calcium silicate hydrate (CSH) binder phase, alkali activated, cementitious materials can also be made from waste products such as Class F fly ash and amorphous ground granulated blast furnace slag which is a source of aluminum, silicon and calcium as well as other impurities. When alkali hydroxide and alkali silicate liquids can be mixed with these starting powders, they produce a solid material which is a mixture of CSH (e.g. 55 wt%) and a minor amount of geopolymer (15%), as determined by NMR of selectively leached components of the product phase. Such composites can have significantly superior mechanical properties compared to OPC, as well as improved chemical durability depending on their geopolymer content.

Proposed session topics

– Synthesis, processing, microstructure
– Characterization and composition
– Durability
– Mechanical and thermal properties
– Composites
– Infrastructure and construction materials
– Other indigenous resource materials
– Other inorganic analogues

Organizers

- **Waltraud M. Kriven**, University of Illinois at Urbana-Champaign, USA; kriven@illinois.edu
- Ghassan Al-Chaar, US Army Construction Engineering Research Laboratory (CERL); USA
- Gregor Gluth, BAM Federal Institute for Materials Research and Testing, Germany
- Dechang Jia, Harbin Institute of Technology, China

G11: SMART PROCESSING AND PRODUCTION ROOT TECHNOLOGY FOR HYBRID MATERIALS

Research fields related to innovative manufacturing technologies such as "Smart Processing", "IOT", "Industry 4.0" are expanding. Even in the field of ceramics, such advanced manufacturing is an important research topic. "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. 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 "Smart Processing" and "Production Root Technologies".

Proposed session topics

– Integration of ceramics manufacturing process and IT
– Process monitoring and quality improvement
– Starting Materials: Mining, particles, bulk and functional materials and precursors
– Sustainable energy concepts and applications and recycling and reuse processes
– Development of ceramics and its hybrid materials with thermal conduction, electrical insulation, battery, optical properties, solar cell, heat resistance, environmental resistance and biological applications
– Forming and shaping processes for advanced materials
– New concepts and emerging technologies for enhanced product performance

Organizers

- **Tadachika Nakayama**, Nagaoka University of Technology, Japan; nky15@vos.nagaokaut.ac.jp
- **Hyuksu Han**, Korea Institute of Industrial Technology, Korea; hhan@kitech.re.kr
- Sung Duk Kim, Korea Institute of Industrial Technology, Korea
- Jacob L. Jones, North Carolina State University, USA
- Ali Erdemir, Argonne National Laboratory, USA
- Jun Akedo, National Institute of Advanced Industrial Science and Technology, Japan
- Byungkoog Jang, National Institute for Materials Science, Japan
- Kouichi Yasuda, Tokyo Institute of Technology, Japan
- Kyoung Il Moon, Korea Institute of Industrial Technology, Korea
- Sungwook Mhin, Korea Institute of Industrial Technology, Korea

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G12: ADVANCED CERAMICS AND COMPOSITES DERIVED FROM CONDENSED MOLECULAR PHASES FOR ENERGY AND ENVIRONMENTAL APPLICATIONS

The aim of the symposium is to highlight advanced concepts for the synthesis of novel multifunctional ceramics and ceramic composites. Industrial demands on future technologies have created a need for new material properties which exceed far those of materials known today and that can only be produced by controlled synthesis-microstructure-property relations. Furthermore, the increasing miniaturization of components calls for new process technologies allowing reliable production of ceramics at and below a micrometer scale. In particular inorganic-organic hybrid materials as well as amorphous and polycrystalline materials are to be used as material classes and produced by means of cross-linking routes in various states of condensation. In accordance with the so-called "bottom-up" approach, specific inorganic molecules are to be assigned to higher molecular networks and solid-state structures in the form of molecular nanotools by means of condensation and polymerization processes. This method aims at producing ceramics and ceramic composites inaccessible by thermodynamically controlled chemical syntheses. Therefore, the scope of the symposium is the development of solids derived from molecular units via kinetically controlled synthesis processes in the interface between molecular and solid-state chemistry enabling specific adjustments to the resulting microstructure and solid-state properties. The focal point of the symposium is energy and environmental applications of advanced ceramics and composites derived from condensed molecular phases.

Proposed session topics

- Synthesis of condensed molecular phases as precursors for advanced ceramics and composites
- Processing of condensed molecular phases
- Synthesis – processing – microstructure relation
- Characterization and properties of advanced ceramics derived from condensed molecular phases
- Thermodynamics and kinetic phenomena
- Energy and environmental related applications

Organizers

- **Ralf Riedel**, Technische Universität Darmstadt, Germany; riedel@materials.tu-darmstadt.de
- **Paolo Colombo**, Università di Padova, Italy; paolo.colombo@unipd.it
- Samuel Bernard, University of Limoges, France
- Toshihiro Ishikawa, Tokyo University of Science, Japan
- Jie Kong, Northwestern Polytechnical University, China
- Peter Kroll, University of Texas at Arlington, USA
- Rick Laine, University of Michigan, USA
- Gurpreet Singh, Kansas State University, Manhattan, USA
- Gian Domenico Soraru, University of Trento, Italy
- Xiaowei Yin, Northwestern Polytechnical University, China
- Zhaoju Yu, Xiamen University, China

G13: CERAMIC ADDITIVE MANUFACTURING AND INTEGRATION TECHNOLOGIES

Traditional methods for fabricating ceramics and ceramic matrix composites are limited by manufacturability of large parts and complex shapes. In addition, component production can be time consuming and costly. Novel fabrication processes in additive manufacturing, joining, and integration of ceramics and ceramic matrix composites can overcome these limitations. Ceramic integration and additive manufacturing technologies increasingly enable fabrication and utilization of components for high temperature structural applications, including those in energy, environment, transportation, and aerospace. Joining processes allow combination of simpler parts to form large structures or complicated shapes. Integration processes allow incorporation of ceramic and ceramic matrix composite components with metal-based systems. Joining and integration approaches include adhesives, brazing, glass sealing, diffusion bonding, transient liquid phase bonding, and reactive processes.

Additive manufacturing processes allow innovative complex part fabrication, client customization, rapid prototyping, and distributed manufacturing. In additive manufacturing approaches, three dimensional models are designed minutely according to theoretical concepts in computer graphic applications, and two-dimensional cross sections are created by automatic slicing operations. Two-dimensional layers are built up through powder bed processes that use high resolution laser beams or binder jetting to form solid planes, or through layer stacking processes, paste extrusion, fused deposition, and curing of photoreactive resins.

Proposed session topics

- Joining of ceramics and ceramic matrix composites
- Integration of ceramics and ceramic matrix composites to metals
- Nanoscale and microscale joining

– Emerging additive manufacturing technologies
– Selective laser sintering and stereolithography
– Direct writing technologies
– Fused deposition modeling and 3-D printing technologies
– Laminated object manufacturing and powder bed fusion processes
– Mechanical tests of additively manufactured and joined ceramics and ceramic matrix composites
– Design and modeling of additive manufacturing materials and interfaces
– Additive manufacturing-enabled components and their evaluation in relevant operating conditions
– Multi-material systems

Organizers

- **Soshu Kirihara**, Osaka University, Japan; kirihara@jwri.osaka-u.ac.jp
- **Michael C. Halbig**, NASA Glenn Research Center, USA; michael.c.halbig@nasa.gov
- **Monica Ferraris**, Politecnico di Torino, Italy; monica.ferraris@polito.it
- Johannes Homa, Lithos GmbH, Austria
- Miranda Fateri, FH Aachen, Germany
- Cynthia Gomes, BAM Federal Institute for Materials Research and Testing, Germany
- Tatsuya Hinoki, Kyoto University, Japan
- Michael J. Reece, Queen Mary University of London, UK
- Cesar R. Foschini, São Paulo State University, Brazil
- Thomas Weißgärber, Fraunhofer Institute for Manufacturing Technology and Advanced Materials, Dresden, Germany
- Mathieu Brochu, McGill University, Canada

G14: ADVANCED CMCs: PROCESSING, EVALUATION, AND APPLICATIONS

The transition of ceramic matrix composites (CMCs) from laboratory to commercial use in hot sections of turbine engines has just begun. They are allowing significant advances in efficiency, and their use is expected to increase rapidly. Refinements in the performance and manufacturing of current composite systems will be aggressively pursued. There are opportunities for substantial improvements in fibers, matrices, and interface treatments. Improvements in high temperature stability and creep resistance of Si-based fibers, and creep resistance and resistance to volatilization in steam of oxide fibers will be of great benefit. A higher temperature performing ceramic fiber >1480°C may improve the long term performance of CMCs. Additionally chemically resistant interphase chemistries are sought for both types of CMCs. Finally, improvements in matrices are required for improved interlaminar properties, and improved environmental barrier coatings are needed to protect the matrix from steam under oxidizing conditions.

This international symposium will bring together scientists and technologists working on advanced ceramic fibers, interphases, and ceramic matrix composites to discuss and share ideas on advances in the development of ceramic matrix composites and their performance at high temperatures.

Proposed session topics

– New developments in high temperature oxide and non-oxide ceramic fibers
– CMCs processing and fabrication methods
– Temperature-dependent mechanical properties
– Extreme environmental effects of fibers and CMCs (oxidation and moisture effects)
– Ceramic matrix composites interphases (oxide and non-oxide interphases)
– Environmental protective coatings
– Ultra-high temperature ceramics matrix composites
– Stress rupture, creep, fatigue, crack growth
– Modeling and damage mechanics
– NDE characterization methods

Organizers

- **Emmanuel E. Boakye**, UES/AFRL Wright-Patterson AFB, USA; emmanuel.boakye.ctr@us.af.mil
- **Dietmar Koch**, German Aerospace Center, Germany; dietmar.koch@dlr.de
- Yutai Katoh, Oak Ridge National Laboratory, USA
- Ronald Kerans, University of Dayton/ AFRL Wright-Patterson AFB, USA
- Kang N Lee, NASA Glenn Research Center, USA
- Shaoming Dong, Shanghai Institute of Ceramics, China
- Xiaowei Yin, Northwestern Polytechnical University, China
- Toshihiro Ishikawa, Tokyo University of Science, Yamaguchi, Japan
- Jacques Lamon, CNRS – LMTENS, France

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JULY 21 – 26, 2019

Toronto Marriott Downtown Eaton Centre Hotel, Toronto, Canada

2nd Global Forum on Advanced Materials and Technologies for Sustainable Development (GFMAT-2)

G15: ADVANCED LUMINESCENT MATERIALS AND THEIR APPLICATIONS

Luminescent materials play an indispensable role in lighting, displays, bioimaging, medical treatments, photovoltaic, sensing, security, and etc. Recent years have witnessed rapid advances and progress in luminescent materials and their broad applications. The aim of this symposium is to bring together leading academic scientists, researchers and students to discuss and share their experimental and theoretical results on all aspects of advanced luminescent materials. The symposium will cover a broad range of topics including but not limited to materials, synthesis, properties, theoretical modeling and applications. We are going to provide a platform for all attendees to exchange ideas and enhance collaborations, and finally to make contributions to the development and applications of advanced luminescent materials.

Proposed session topics

- Phosphors for lighting and displays
- Upconversion materials for bioimaging and therapy
- Luminescent materials for photovoltaic applications
- Quantum dots and nano phosphors
- Bulk luminescent materials (single crystals, ceramics and glasses)
- Synthesis of luminescent materials
- Applications of luminescent materials
- Theoretical modeling of luminescent materials

Organizers

- **Rong-Jun Xie**, Xiamen University, China; rjxie@xmu.edu.cn
- Jun Lin, Changchun Institute of Applied Chemistry, Chinese Academy of Science, China
- Takashi Takeda, National Institute for Materials Science, Japan
- Shyue Ping Ong, University of California San Diego, USA
- Won Bin Im, Chonnam National University, Korea
- Ru-Shi Liu, National Taiwan University, Taiwan

4th International Conference on Innovations in Biomaterials, Biomanufacturing, and Biotechnologies (Bio-4)

This is the fourth in a series of biomaterial meetings organized by The American Ceramic Society that emphasizes collaboration between R&D, medical practitioners, and biomedical materials manufacturers and marketers to better develop emerging technologies into marketable products. Cutting-edge research and product developments related to novel materials for orthopedic, dental, oral, and maxillofacial applications; advanced manufacturing technologies including 3-D printing; nanomedicine; multifunctional biomaterials; point-of-care sensors and diagnostic devices; and more will be featured. In addition, a symposium on Glasses for Healthcare Applications to honor Delbert E. Day is planned.
This robust technical program will provide a forum for scientists, engineers, medical professionals, and industrial researchers to discuss recent advances in the fields of biomaterials, biomanufacturing and biotechnologies.

Bio-4 is organized by ACerS and its Bioceramics Division

Endorsed by

Society For Biomaterials

BMES BIOMEDICAL ENGINEERING SOCIETY

IAOC INTERNATIONAL ACADEMY OF CERAMIC IMPLANTOLOGY

B1. INNOVATIONS IN GLASSES FOR HEALTHCARE APPLICATIONS: A SYMPOSIUM IN HONOR OF DELBERT E. DAY

This symposium, in honor of Delbert E. Day, will cover progress and innovations in the fundamentals, technology and application of glasses in healthcare (bioglasses). In addition to recognizing the enormous contribution of Dr. Day to this area, the symposium will provide a forum for researchers to discuss their work in similar and related topical areas. Covering both melt-derived and sol–gel glasses, session topics include: fundamentals in the design, structure and reactivity of bioglasses; silicate, borate and phosphate bioglasses in the particulate, fibrous and porous solid forms; glass–ceramics and composites; bioglasses as delivery devices for ions and biomolecules in enhancing osteogenesis, angiogenesis and bacterial resistance; biocompatibility phenomena related to bioglasses; and biomedical applications of glasses and glass–ceramics. The symposium will also discuss emerging developments and future potential of bioglasses in healthcare.

Proposed session topics

- Compositional design and structure of bioglasses
- Degradation and reactivity of bioglasses in vitro and in vivo
- Silicate, borate and phosphate bioglasses
- Bioactive glass–ceramics and composites
- Bioglasses as delivery devices for ions and biomolecules
- Biocompatibility phenomena
- Bioactive glasses in wound healing and regenerative medicine
- Medical and dental applications of glasses and glass–ceramics
- Emerging developments and future potential of glasses in healthcare

Organizers

- **Mohamed N. Rahaman**, Missouri University of Science and Technology, and University of Illinois at Chicago, USA; rahaman@mst.edu
- **Richard K. Brow**, Missouri University of Science and Technology, USA; brow@mst.edu

B2. ADVANCED ADDITIVE MANUFACTURING TECHNOLOGIES FOR BIO-APPLICATIONS; MATERIALS, PROCESSES, AND SYSTEMS

Additive manufacturing, also known as 3-D printing, is a process by which a three-dimensional body is built through point, line or planar deposition of material. Recent advancements in additive manufacturing technologies have attracted a lot of attention to their application to a variety of biomedical components and devices, because of the unique capability of fabricating complex or heterogeneous structures and custom-made parts. This symposium intends to address and discuss the latest achievements, trends, issues, challenges, and opportunities on additive manufacturing and related technologies of ceramics and other materials for bio-applications that are critically needed for future medical technologies. We hope this symposium will provide an excellent forum to share ideas and visions on these technologies and grow interaction and friendship among participants from academe and industry over the world.

Proposed session topics

- Materials for ceramic additive manufacturing
- Novel processes for additive manufacturing for bio-applications

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4th International Conference on Innovations in Biomaterials, Biomanufacturing, and Biotechnologies (Bio-4)

– Additive manufacturing systems for ceramics and other materials: stereolithography, fused deposition modeling, powder bed fusion process, inkjet printing, selective laser sintering and emerging additive manufacturing technologies
– Multi-material additive manufacturing technologies
– 3-D printed ceramics devices with bio-applications: orthopedic, maxillofacial, dental, etc.

Organizers

- **Hui-suk Yun**, Korea Institute of Materials Science, Korea; yuni@kims.re.kr
- Moritz Tassilo, Fraunhofer-IKTS, Germany
- Soshu Kirihara, Osaka University, Japan
- Julian R. Jones, Imperial College London, UK
- Richard Gaignon, 3-Dceram, France
- Cho-Pei Jiang, National Formosa University, Taiwan
- Grace Zhang, George Washington University, USA

B3. CLINICAL TRANSLATION OF BIOMATERIALS AND BIOPHYSICAL STIMULATION

In the interdisciplinary field of biomaterials, the phenomenological interaction of a biological cell on a material substrate under normal culture conditions is broadly known and researchers use many approaches to tailor substrate modulus or surface wettability in an effort to enhance cell-material interaction. In this context, a strikingly different approach in the field of Biomaterials Science has recently been proposed to replicate the dynamic physiological microenvironment of native tissues. Using experiments and modeling approaches, the recent research has witnessed a new dimension to the design of biomaterials by developing an integrated approach involving a combination of external physical cues and instructive matrices to guide tissue repair and regeneration. It is expected that this unique research concept of biophysical stimulation will offer an unprecedented enhancement in the performance of existing implant materials in terms of improving the successful integration of the materials with the host tissue in vivo, which has wide applications in orthopedic, cardiovascular and neural tissue regeneration.

This symposium needs to be of a multi-disciplinary nature with experts on biomaterial development, biology, medicine present to accelerate progress of the biophysical stimulation approach for human healthcare applications.

Proposed session topics

– Cell-material interactions
– Tissue response to biomaterials
– Antimicrobial properties of bioceramics
– Electric field induced tissue regeneration and implant integration
– Magnetic field stimulation against microbial infections
– Bioactive glasses and multiple ion-doping
– Piezoelectric ceramic implants

Organizers

- **Bikramjit Basu**, Indian Institute of Science, Bangalore, India; bikram.iisc@gmail.com
- **Surya K. Mallapragada**, Iowa State University, USA; suryakm@iastate.edu
- Ashutosh K. Dubey, Indian Institute of Technology, India
- Manus Biggs, National University of Ireland, Ireland
- Greeshma Thrivikraman Nair, Oregon Health and Science University, USA

B4. MULTIFUNCTIONAL BIOCERAMICS: CURRENT AND FUTURE THERAPY

Because of their unique properties, bioceramics are widely used in various medical fields. Extensive research efforts are currently underway to better develop surgical implants, scaffolds for cells, and drug delivery to treat various diseases. Multifunctionality, or compatibility of different functions and properties, is one of the most essential subjects in the field of bioceramics. This symposium is designed for researchers, engineers, physicians, industrialists, inventors, veterinarians, and clinicians to discuss the latest findings and advancements and share the idea and vision on this subject. Particular focus will be placed on strategic approaches to optimize and combine novel or conventional techniques, typically related to the following proposed session topics, for realizing multi-functionality as well as maximizing mono-functionality in bioceramics.

Proposed session topics

- Nanoparticles structure and applications
- Bioactive glasses and glass-ceramics
- Injectable bioceramics and composites
- Biointerfaces with ceramics
- Cell delivery and cell material interactions
- Scaffolds for regenerative medicine
- Clinical applications
- 3-D printing of multifunctional medical devices

Organizers

- **Miho Nakamura**, Tokyo Medical and Dental University, Japan; miho.bcr@tmd.ac.jp
- Ahmed El-Ghannam, University of North Carolina at Charlotte; USA
- Hasan Uludag, University of Alberta, Canada (advisory boad)
- Masanori Kikuchi, National Institute for Material Science, Japan
- Aldo Boccaccini, Erlangen University, Germany
- Christine Knabe-Ducheyne, Philipps University, Germany
- Christophe Drouet, University of Toulouse, France
- Anna Tampieri, The Institute of Science and Technology for Ceramics, Italy
- Marcelo Prado, Instituto Militar de Engenharia, Brazil
- Julian Jones, Imperial College London, UK

B5. NANOTECHNOLOGY IN MEDICINE

Nanotechnology has begun to revolutionize medicine in terms of advanced disease prevention, detection, and treatment. This is because nanomaterials possess unique surface energetics to interact with living systems, can penetrate cells and parts of cells, avoid immune system clearance, pass the blood-brain-barrier, are easily functionalized, possess improved properties for detection (such as magnetic or electrical), and so much more. This session will cover how nanomaterials are advancing many areas of medicine including but not limited to cancer, diabetes, cardiovascular diseases, neural diseases, infection, tissue engineering, regenerative medicine, implantable and external sensors, in vitro diagnostic tools, drug delivery, disease prevention strategies, etc.

Proposed session topics

- Nanomedicine strategies for disease prevention, detection, and treatment
- Improved nanomaterials for cancer treatment
- Tissue growth strategies using nanomaterials
- Better nanoparticles for drug delivery
- Implantable and external sensors using nanomaterials

Organizers

- **Thomas J. Webster**, Department of Chemical Engineering, Northeastern University, USA; th.webster@neu.edu
- Yupeng Chang, University of Connecticut, USA
- Erik Taylor, Boston University, USA
- Linlin Sun, Northeastern University, USA

B6. ADVANCE MATERIALS AND DEVICES FOR THE TREATMENT OF BRAIN DISORDERS

The scope of this session is on advance materials and devices with the focus on materials and implantable device development/characterization for the treatment of brain disorders including brain tumors and neurodegenerative diseases. Next generation biomaterials and nanomaterials are expected to revolutionize the future of medicine. This session provides an opportunity for the medical and scientific communities to be exposed to new materials and nanotechnologies that could address one of the most devastating illnesses of the society: Disorders of the brain and neurodegeneration. Researchers and engineers will be able to learn about the clinical and patient needs from the medical community perspectives.

Proposed session topics

- Synthesis and characterization of novel biomaterials to overcome the blood brain barriers
- Nanobiomaterials' applications in neurodegenerative diseases
- Strategies to enhance the amount and concentration of therapeutic compounds in the brain
- Drug-release systems for the treatment of Alzheimer's, Parkinson's diseases, and amyotrophic lateral sclerosis
- Nanomaterials as therapeutic agents for patients with brain tumors
- Surface biofunctionality: The interface between brain implants and living cells and tissues
- Neurotoxicity and metallic particles
- Results of clinical evaluations of biomaterials, implants and devices for the treatment of brain disorders

Organizers

- **Tolou Shokuhfar,** Department of Bioengineering, University of Illinois at Chicago, USA; tolou@uic.edu
- **Reza Shahbazian**, Department of Mechanical Engineering, University of Illinois at Chicago, USA; rsyassar@uic.edu
- **Tahaamin Shokuhfar**, M.D., Northwestern University, Feinberg School of Medicine, Department of Radiology, Section of Neuroradiology, USA; tahaamin.Shokuhfar@northwestern.edu

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4th International Conference on Innovations in Biomaterials, Biomanufacturing, and Biotechnologies (Bio-4)

B7. MATERIALS AND PROCESS CHALLENGES TO UPSCALE FABRICATION OF 3-D TISSUE CONSTRUCTS

The fabrication of 3-D tissue constructs is one of the most exciting fields in cell biology, materials science, biomedical engineering, and automation technology. Huge progress has been made in the last 10 years, but commercial or clinical success stories, where patients have received engineered tissue or organ replacements are rare. Recently, more success has been reported with organ-on-a-chip constructs that are used for drug discovery and testing. There are still technical challenges to overcome, like the integration of vasculature to create "thick" tissues, but other challenges that are more related to manufacturing exist. The availability of standardized, high quality bioinks, good sources and high quantities of cells, and appropriate manufacturing equipment limit the progress. In addition, sensors and systems that help to control cell health and tissue maturation are of great interest. Contributions that focus on manufacturing technologies for tissue and organ fabrication or accelerate clinical application or commercialization are welcome.

Proposed session topics

- Characterization of bioinks and scaffold materials
- Testing of tissue scaffolds
- Bioreactors and other technologies for cell expansion, maturation, and stem cell differentiation
- Sensors for monitoring and controlling cell and tissue maturity and health
- Organs-on-a-chip for drug discovery and testing

Organizer

- **Markus Reiterer**, Medtronic, PLC, USA; markus.w.reiterer@medtronic.com

B8. ADVANTAGES OF CERAMICS IN BIOMEDICAL APPLICATIONS: HAS THE TRANSITION TO METAL-FREE IMPLANTS ALREADY STARTED?

Millions of medical devices are implanted every year. Ceramics are applied massively in orthopedic and dental applications such as bearings for joint replacement or screws and crowns for tooth-like restorations. The negligible wear of ceramic bearings and the immunocompatibility of the material are the prerequisites for optimal long-term clinical performance of ceramic devices, and for the fast host bone healing. The outstanding biological properties of ceramics in combination with an accurate surgical handling are showing the best survival in the category. Ceramics offer also significantly better aesthetic outcome in dental field avoiding visible gray lines under the gums or along the tooth ridge, as well as local tissue reaction in metal-sensitized patients.

The session is aimed to address the key challenges for the materials in use, reviewing their clinical performance and how their features can be exploited in novel concept designs, as the metal- and plastic-free implants, which may potentially further improve the outcomes of ceramic devices.

Proposed session topics

- Clinical outcomes of ceramic components
- Host response of advanced bioceramics
- Novel ceramic applications in medicine
- Novel assessment methodologies for the current implants

Organizers

- **Alessandro Alan Porporati**, CeramTec GmbH, Germany; a.porporati@ceramtec.de
- Corrado Piconi, Associate to the Institute for the Science and Technology of Ceramics – National Research Council, Faenza, Italy
- Lia Rimondini, University of Piemonte Orientale "Amedeo Avogadro", Italy
- Giorgio Perino, Hospital of Special Surgery, USA
- Laurent Sedel, CC/Contact, France

B9. ADVANCES IN PRODUCTION METHODS AND HIGH-PERFORMANCE MATERIALS FOR DENTAL, ORAL AND MAXILLOFACIAL APPLICATIONS

The goal of ongoing research and development in novel dental, oral and maxillofacial biomaterials is to achieve superior material properties, biocompatibility and durability over currently used restorative and implantable systems. Development of the next generation state-of-the-art biomaterials requires integrative approaches with measurement capabilities and assurance strategies to characterize physical, chemical and biological properties for short- and long-term predictions of performance. The emergence and integration of 3-D imaging, computer-aided design and manufacturing (CAD-CAM), and additive manufacturing (3-D printing) techniques with new biomaterials has paved the way for the success of improved interventions in dentistry. This session will provide a forum for scientists, engineers, clinical professionals, and industrial researchers to discuss recent technical advances that enable quantitative and predictive in-vitro and in-vivo safety and effectiveness evaluations across the product development cycle targeting clinical translation. Special emphasis will be given to discuss challenges and future directions of sensitive measurement technologies, data-driven frameworks and production techniques that provide critical and clinically relevant insights to improve the design, safety and effectiveness of novel biomaterials in terms of biological performance, shelf-life, clinical usability, bond preservation, load-bearing capacity, durability/service-life, and scale-up manufacturing.

Proposed session topics

- High-performance materials for additive manufacturing of restoration, reconstruction and repair
- Ceramics for 3-D printing of dental devices
- Novel production methods for high-performance materials with increased biological activity
- Smart bioceramics with immediate load bearing capability, drug delivery and osseointegration
- Validation of optimized 3-D printing solutions and high-performance materials in digital dentistry
- Smart expert systems for treatment planning and characterization of tissue-material interfaces and material selection
- Novel methods for design, production and implantation in oral, dental, oral and maxillofacial applications
- Digital imaging and software processing techniques to streamline production of surgical guides, devices and treatment planning
- Testing methods for evaluating translational biomaterials

Organizers

- **Orlando Lopez**, National Institute of Dental and Craniofacial Research, National Institutes of Health, USA; Orlando.lopez@nih.gov
- **Lucy Di-Silvio**, King's College London Dental Institute and King's College London, Guy's Hospital Campus, UK; lucy.di_silvio@kcl.ac.uk

B10. POINT-OF-CARE SENSORS AND DIAGNOSTIC DEVICES

A major issue in addressing global health challenges is the lack of portable, rapid, and low-cost technologies for disease diagnosis and health monitoring. Rapid disease diagnoses are of particular importance in remote or low-income settings in which timely treatment can mitigate infectious disease outbreaks. Additionally, portable devices can also be valuable in remote health monitoring of patients with chronic conditions. In all cases, the biosensors need to be reliable and sufficiently accurate for the intended application. This symposium intends to focus on innovative and emerging point-of-care (POC) sensors and diagnostic devices designed to address these needs. The scope of the symposium covers technologies ranging from non-invasive to implantable biosensors that utilize ceramic and multimaterial composite biosensor platforms. Noninvasive technologies of particular interest to this forum include, but are not limited to, biosensor devices that analyze breath, sweat, or other bodily fluids that can be collected with minimal stress on the patient. Of particular interest for implantable or injectable biosensors are the optimization of longevity and performance while minimizing issues regarding toxicity and biocompatibility. Also of interest are devices that monitor food and water for biological contaminants that could negatively impact human health.

Proposed session topics

- Wearable sensors
- Electrochemical detection of volatile organic biomarkers
- Electrical, mechanical, and optical biosensors
- Microdevices for clinical diagnostics
- Implantable and injectable biosensors
- Role of nanotechnology in biosensing
- Sensors for the detection of biological contaminants in food and water

Organizers

- **Krista Carlson**, Department of Metallurgical Engineering, University of Utah, USA; krista.carlson@utah.edu
- **Pankaj Kumar**, Department of Chemical and Materials Engineering, University of Nevada, USA, Reno

B11. MATERIAL NEEDS FOR MEDICAL DEVICES

In the last two decades tremendous progress has been made in field of bioactive and biomimetic materials and in understanding natural/biologic materials. On the other hand, most of the medical devices that improve people's lives such as pacemakers, cardiac stents, heart valves, and large joint replacements utilize a fairly small set of conventional materials subjected to traditional problems in materials science. Due to the extremely high reliability goals, the complex use conditions, and long implant durations, it is often very difficult accurately predict the product performance. This symposium includes topics covering the control and prediction of fatigue, corrosion, tribology, biostability, and biocompatibility of implants and complex medical devices. Contributions on metals, ceramics, polymers and multi-material systems are welcome.

Organizer

- **Roger Narayan**, North Carolina State University and The University of North Carolina, USA, roger_narayan@unc.edu

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4th International Conference on Innovations in Biomaterials, Biomanufacturing, and Biotechnologies (Bio-4)

B12: ADVANCED BIOCERAMICS AND CLINICAL APPLICATIONS

Bioceramics are a basic biomaterial and is one of the first applied clinical material that still enjoys vigorous development. Contemporary bioceramics, after 50 years' development, have been expanded from traditional nearly bioinert ceramics which are mainly used for restoring the damaged tissue morphology and mechanical functions to bioactive ceramics, biodegradable ceramics, bioceramic coatings and ceramic-based composites. However, through the long-term clinical application, especially with the increasing of aging population and injuries in middle and young people, it has been revealed that the function and life span are difficult to meet the clinical requirements. Because of the contemporary science and technology, especially the advances in medicine and regenerative medicine, bioceramics, like other biomaterials, are undergoing significant changes. It has become the direction and frontier of bioceramic research to develop a new generation of materials which are able to regenerate, reconstruct, or enhance the bio-function of damaged tissue or organ, or can be used in minimally invasive therapy and precise treatment. This symposium focuses on the research progress and development trends of a new generation of bioceramics including the preparation technologies and clinical applications.

Proposed session topics

- Bioceramics in regenerative medicine
- Bioceramics with functions of pharmacology and tissue regeneration
- Bioceramics coating and its biofunctionalization
- Degradation of bioceramics and its effects on the immune system and regeneration system
- Nano-bioceramics and their nanobiological effects and risks
- Ceramics-based composite biomaterials and its in-situ synthesis technology
- Advanced manufacturing technologies such as 3-D printing of implantable bioceramic devices
- Progress in clinical application of bioceramics

Organizers

- **Xingdong Zhang**, Sichuan University, China; zhangxd@scu.edu.cn
- **Jiang Chang**, Shanghai Institute of Ceramics, Chinese Academy of Sciences, China; jchang@mail.sic.ac.cn
- **Julian R Jones**, Imperial College London, UK, julian.r.jones@imperial.ac.uk

B13: ZIRCONIA BIOCERAMICS IN METAL FREE IMPLANT DENTISTRY

In recent years, bioceramic implants have become an attractive and reliable alternative to titanium (TiO_2) implants. Currently, zirconia (ZrO_2) is the material of choice for the fabrication of zirconia dental implants because it demonstrates superior biomechanical properties compared to other ceramics.

This session presents current evidence-based background information on zirconia as a material for dental implants. Optimized manufacturing processes can now produce fracture-proof zirconia implants with a similar surface topography to micro-rough titanium implants. This session shows that these modern zirconia dental implants can be used as clinically reliable alternatives to titanium implants. Also, session will highlight an effective strategy to improve and develop these zirconia implants.

Proposed session topics

- Zirconia as a metal free alternative in implant dentistry
- Zirconia as an implantable bioceramic
- Clinical outcomes of zirconia implant material
- Optimizing osseointegration and mucointegration of ceramic implants
- Economics of ceramics/ bioceramics implants

Organizers

- **Sammy Noumbissi**, International Academy of Ceramic Implantology, USA; sammy@iaoci.com
- **Saurabh Gupta**, International Academy of Ceramic Implantology, USA; saurabh@iaoci.com
- **Andrea Borgonovo**, University of Milan, Italy; andrea.borgonovo@unimi.it

YOUNG PROFESSIONALS FORUM

Next-Generation Materials for Multifunctional Applications and Sustainable Development, and Concurrent Societal Challenges in the New Millennium

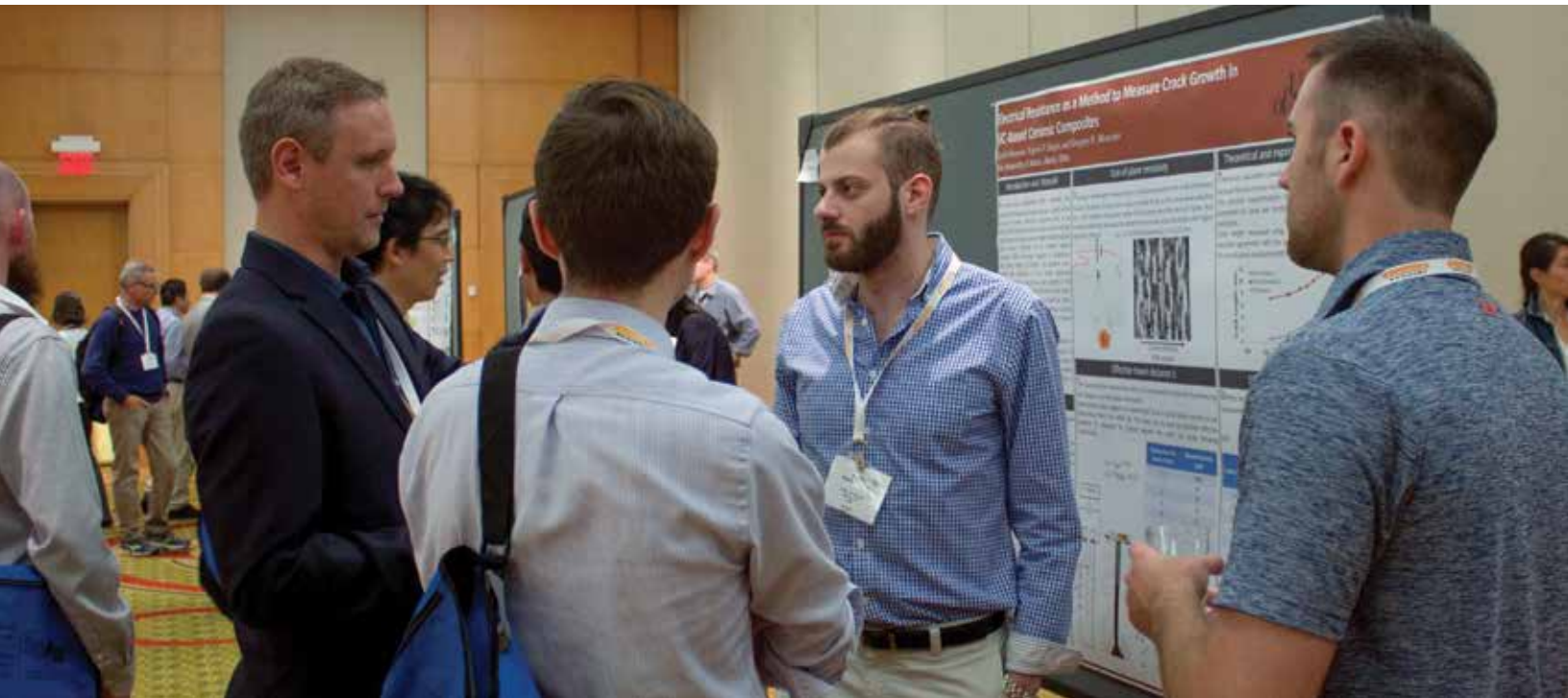
This symposium focuses on recent societal challenges in the new millennium, including—but not limited to—energy, health, and environmental aspects. In addition, novel material design paradigms are needed to fabricate materials with multifunctional applications that can bring solutions to some of today's biggest problems. This symposium aims to bring together young researchers and scientists from around the globe to discuss new approaches and challenges in materials synthesis and to provide a platform for intensive exchange of ideas, knowledge, and networking.

Proposed session topics

- Multifunctional, porous, and catalytic materials
- Sensing materials, including gas, pollutant, and drugs sensors
- Energy: New solar cell materials, fuel cells, batteries, water splitters, and hydrogen generation techniques
- Environment: Sustainable materials, CO_2 capture and storage, and membranes and filters for air treatment
- Health: Diagnostics (imaging, sensing, and assays) and therapies (drug release, light-based photodynamic, and hyperthermic) to theranostics; semiconductor quantum dots, inorganic nanomaterials, carbon-based, and polymers; composites; from synthesis to application approaching assemblies; and biosensors and lab-on-a-chip
- Alternative synthesis approaches for advanced functional materials, including green chemistry, low-temperature, and sustainable use of resources and recycling (quantum dots, nanoparticles, thin films, and one-dimensional structures)
- Innovative manufacturing technologies, including green manufacturing and additive manufacturing
- Technology development and entrepreneurship, from laboratory to industrial scale
- Information and communication technologies, including RF devices, terahertz devices, and MEMS
- Computing, simulation, and theoretical approaches towards new functional materials
- Global Networking — Challenges and Chances for Young Scientists: Accomplished scientists and thinkers are invited to influence the career development of young professionals.
- Young Professional Forum speaking contest
- Poster award

Organizers

- **Surojit Gupta**, University of North Dakota, USA, surojit.gupta@engr.und.edu
- **Eva Hemmer**, University of Ottawa, Canada, ehemmer@uottawa.ca
- Valerie Wiesner, NASA Glenn Research Center, USA
- Akira Miura, Hokkaido University, Japan
- Sahar S Mahshid, University of Toronto, Canada
- Jie Zhang, Institute of Metal Research, Chinese Academy of Sciences, China
- Sankha Banerjee, California State University, Fresno, USA
- Pradeep Menezes, University of Nevada, Reno, USA
- Daniele Benetti, INRS, Canada
- Yuelei Bai, Harbin Institute of Technology, China
- Yongpeng Lei, Central South University, China
- Andy Nieto, Northwestern Polytechnic University, USA
- Jing Liu, University of British Columbia, Canada



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550 Polaris Parkway, Suite 510
Westerville, Ohio 43082 | USA

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Organized by:

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