Call for Papers

51ST INTERNATIONAL CONFERENCE AND EXPO ON ADVANCED CERAMICS AND COMPOSITES (ICACC 2027)

The American Ceramic Society
ceramics.org







JAN. 24–29, 2027

HILTON DAYTONA BEACH OCEANFRONT RESORT, DAYTONA BEACH, FL, USA

ceramics.org/icacc2027

Abstracts due on September 1, 2026

ceramics.org/icacc2027

Welcome

We would like to warmly welcome you to the 51st International Conference and Exposition on Advanced Ceramics and Composites (ICACC 2027) in Daytona Beach, Florida. Since its inception in 1977, this prestigious conference has been organized by the Engineering Ceramics Division (ECD) of the American Ceramic Society (ACerS). Over the years, the conference has experienced significant growth in interest and participation from researchers, educators, technology developers, manufacturers, and end-users worldwide.

The 51st ICACC provides a platform for state-of-the-art presentations and information exchange on cutting-edge ceramic and composite technologies. The technical program of ICACC 2027 consists of nineteen Symposia, six Focused Sessions, one Special Focused Session on Entrepreneurship and Commercialization and the 16th Global Young Investigator Forum on Sustainability.

Symposium 8 is dedicated to the memory of Professor Hisayuki Suematsu, a pioneering researcher in advanced ceramics and a long-standing contributor to ICACC and the ECD, whose contributions and legacy continue to inspire the field. The well-established nineteen symposia at this conference include mechanical behaviour and performance of advanced ceramics and composites; advanced ceramic coatings for structural, environmental, and functional uses; solid oxide cell materials and technologies; thermoelectric and thermionic energy conversion and integrated thermal management; next-generation bioceramics and biocomposites; advanced materials and technologies for rechargeable energy storage; functional nanomaterials and thin films for sustainable energy, environmental, and biomedical applications; advanced processing and manufacturing technologies for structural and multifunctional ceramic systems; porous ceramic materials and their novel applications; integrated computational-experimental and data-driven modeling and design; innovative root-technology production routes; nanolayered carbides, nitrides, borides, and related materials; advanced ceramics and composites for nuclear fission and fusion systems; crystalline materials for electrical, optical, and medical applications; additive manufacturing and 3D printing of ceramics; geopolymers and inorganic polymer-derived ceramics; advanced ceramic materials and processing for photonics and energy; ultra high temperature ceramics; and molecular-level processing and chemical engineering of functional materials.

In addition to the core symposia, the technical program will include six Focused Sessions on emerging technologies: bioinspiration, green manufacturing, and emerging frontiers in advanced materials; ceramics for low-carbon and carbon-negative technologies; smart powder processing of multifunctional ceramics and catalyst materials; ceramic/carbon reinforced polymers; advanced processing pathways for multi-stream critical-materials recovery and reuse; and sustainable design and manufacturing of advanced ceramics for space applications.

The 16th Global Young Investigator Forum aims to bring together students, young professionals, and early-career faculty from around the world to showcase their research and promote scientific discussions that identify and tackle emerging global challenges. The Special Focused Session on Entrepreneurship and Commercialization explores the essential skills and attributes that define successful materials engineers and scientists in today's dynamic landscape, fostering job creation, innovation, and career development and offering unparalleled opportunities for growth and impact.

Like last year, poster presenters have the opportunity to present a two-minute summary of their research. Over 50 presenters have taken advantage of this new opportunity at the end of a daily session.

The ICACC Exposition will be held on Tuesday and Wednesday evenings at the adjacent Ocean Center, providing a platform for attendees to connect with business partners and explore new business opportunities, view new materials, processing and characterization tools, and products. The poster session will be held in conjunction with the Exposition.

The ECD Executive Committee, ICACC Programming Committee, and volunteer organizers, together with The American Ceramic Society, would like to thank you for joining us for this stimulating and beneficial experience.

Finally, I would like to express our gratitude to our industrial sponsors as well as to many other partners and exhibitors.



Yuki Nakashima
National Institute of Advanced Industrial Science and Technology
Program Chair, ICACC 2027

SCHEDULE OF EVENTS

SUNDAY, JANUARY 24, 2027

Conference Registration	2 – 7 p.m.
Speaker Ready Room	2 – 7 p.m.
Welcome Reception	5:30 – 7 p.m.

MONDAY, JANUARY 25, 2027

Conference Registration	7 a.m. – 6 p.m.
Speaker Ready Room	8 a.m. – 4 p.m.
Opening Awards Ceremony & Plenary Session	8:30 a.m. – Noon
Coffee Break	10:10 – 10:40 a.m.
Lunch on Own	Noon - 1:30 p.m.
Concurrent Technical Sessions	1:30 – 6:10 p.m.
Coffee Break	3 – 3:20 p.m.

TUESDAY, JANUARY 26, 2027

Conference Registration	7:30 a.m. – 6 p.m.
Speaker Ready Room	8 a.m. – 4 p.m.
Concurrent Technical Sessions	8:30 a.m. – Noon
Coffee Break	10 – 10:20 a.m.
Exhibitor Set-up	Noon – 4 p.m.
Lunch On Own	Noon – 1:20 p.m.
Concurrent Technical Sessions	1:30 – 5:30 p.m.
Coffee Break	3 – 3:20 p.m.
Poster Session Set-up	3 – 4:30 p.m.
Exhibits & Poster Session Including Reception	5 – 8 p.m.

HILTON DAYTONA BEACH OCEANFRONT RESORT

ATTENDEE BOOKING LINK:
https://www.hilton.com/en/attend-my-event/dabdhhf-acrs27-ed7f1719-ab94-48b4-a3ad-f86fd471246/
Hilton Daytona Beach Oceanfront Resort
Address: 100 N Atlantic Ave, Daytona Beach, FL 32118
Phone: (386) 254-8200

Standard Room Rate: $199 a night plus tax for single/double occupancy

Government Room Rate: Prevailing government per diem

Student Rate: $179 a night plus tax for single/double occupancy; must show student ID upon check-in

Cut-off date: January 2, 2027

ABSTRACT SUBMISSION INSTRUCTIONS

Visit icacc2027.abstractcentral.com to submit your abstract via the Abstract Central website.

Abstract title plus text total character limit (including spaces) is 1,500 characters.

If you have questions, please contact Karen McCurdy at kmccurdy@ceramics.org

WEDNESDAY, JANUARY 27, 2027

Conference Registration	7:30 a.m. – 5:30 p.m.
Speaker Ready Room	8 a.m. – 4 p.m.
Concurrent Technical Sessions	8:30 a.m. – Noon
Lunch On Own	Noon – 1:20 p.m.
Concurrent Technical Sessions	1:30 – 5:30 p.m.
Coffee Break	3 – 3:20 p.m.
Poster Session Set-up	3 – 4:30 p.m.
Exhibits & Poster Session Including Reception	5 – 7:30 p.m.

THURSDAY, JANUARY 28, 2027

Conference Registration	7:30 a.m. – 5:30 p.m.
Speaker Ready Room	8 a.m. – 4 p.m.
Concurrent Technical Sessions	8:30 a.m. – Noon
Lunch On Own	Noon – 1:20 p.m.
Concurrent Technical Sessions	1:30 – 5:30 p.m.
Coffee Break	3 – 3:20 p.m.
Last Night Reception	5:30 – 7 p.m.

FRIDAY, JANUARY 29, 2027

Conference Registration	8 a.m. – Noon
Concurrent Technical Sessions	8:30 – 11:40 a.m.
Coffee Break	10 – 10:20 a.m.

ACERS ENGINEERING CERAMICS DIVISION LEADERSHIP

Chair:
Amjad Almansour | NASA Glenn Research Center, USA

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Federico Smeacetto | Politecnico di Torino, Italy

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Member Engagement Subcommittee Representative
Federico Smeacetto | Politecnico di Torino, Italy

Panel of Fellows representative (2024-2027)
Dileep Singh | Argonne National Laboratory, USA

REGISTRATION INFO

Please note that pricing will increase significantly after the early-bird period closes. To take advantage of the lower rate, we encourage you to register before the deadline of December 31, 2026, as we are unable to extend early-bird pricing beyond that date.

Registering early also helps our organizing team plan more effectively and ensures a smoother experience for everyone. The standard rate reflects the additional time and resources required to accommodate late registrations.

	Through December 31, 2026	After December 31, 2026
Full conference registration+*	$920	$1,120
Registration (with ACerS member discount)+	$745	$945
Registration plus ACerS membership renewal+	$895	$1,095
ACerS Emeritus/Senior/ Associate Member+	$655	$855
One-Day conference registration+	$780	$980
One-Day conference registration (with ACerS member discount)+	$605	$805
Student registration (graduate and undergraduate)+	$280	$330
Student registration (with member discount Graduate and Doctoral Student Member or Material Advantage)+	$230	$280
Student registration with Graduate and Doctoral Student membership renewal+	$260	$310
Guest networking add-on (access to three receptions with paid attendee)	$225	$225
Exhibit Pass Only***	$25	$25

+ In-person registration includes coffee breaks and four networking sessions (Sunday, Tues, Weds, Thurs)
* Receives 1 year ACerS and ECD division membership
***Pass to attend exhibit only Contact customer service at customerservice@ceramics.org

CANCELLATION POLICY

Full refund upon request, less a $50 processing fee, if registration is cancelled on or before December 24, 2026. If registration is cancelled between December 25, 2026 and January 23, 2027 a 50% refund is sent. No refunds are offered after the start of the conference.

Contact customer service at 1-614-890-4700 or customerservice@ceramics.org

CHILDCARE GRANT APPLICATION

The **Engineering Ceramics Division (ECD)** is offering Childcare Grants for those attending the 51st International Conference and Expo on Advanced Ceramics and Composites (ICACC 2027) held from January 24 – January 29, 2027, in Daytona Beach, Florida.

Grants of up to $400 will be given to selected registered meeting attendees who are bringing one or more young children to the conference or who incur extra expenses in leaving them at home (i.e., added hours of daycare or babysitting services).

Applicants must be registered for ICACC'27 to submit a grant application. Please note that only one grant per household will be given. Should the number of requests exceed available funding, preference will be given to applicants who demonstrate need and apply earlier in the process.

Allowable expenses include:

- Daycare expenses during meeting week (off-site at meeting*)
- Extra daycare expenses at home incurred because the primary caregiver was attending the meeting (e.g., overtime at a daycare center, cost of a sitter, etc.). A signed statement by caregiver, including the total amount paid per day, is required.
- Expenses incurred in bringing a babysitter or family member acting as caregiver to the meeting to care for the child.

Not allowable: Meeting attendee's mileage and travel expenses to and from ICACC'27 or tickets to local museums, amusement parks, etc.

Application Guidelines

- Grant applications are due by **November 25, 2026.**
- Applicant must be registered for the meeting when submitting the application.
- Upon approval of applications, recipients will be notified (on or before January 23, 2027). Approved recipients will be required to submit a list of expenses and scans of receipts showing the extra expenses incurred, no later than **February 12, 2027.** Please allow up to 6-8 weeks to receive your reimbursement.

Any questions or concerns can be sent to Vicki Evans at vevans@ceramics.org.

***Please note:** *There will be no ACerS-sponsored childcare services on-site at ICACC'27. ACerS does not sanction or recommend childcare providers and does not assume responsibility or liability for childcare services of any sort. It is the responsibility of the parent or guardian to thoroughly investigate all childcare providers.*

ICACC 2027 Child Care Grant Selection Committee:

Amjad Almansour
Hui-Suk Yun
Katalin Balázsi

Scan the QR Code to Apply

Deadline: November 25, 2026

STUDENT REGISTRATION SUPPORT PROGRAM

The **ICACC 2027 Student Registration Support Program** will support the attendance of students to the ICACC 2027, on January 24 – 29, 2027. The aim of the Student Support Program is to develop and foster cooperation among students from all over the world. Funding for the program has been provided by our generous meeting sponsors.

Awardees may receive registration support in an amount up to the full amount of the registration fee.

Eligibility: Any student (high school, undergrad, graduate) who is giving an oral or poster presentation at the ICACC 2027 Meeting is eligible to apply.

Deadline: The deadline to apply is November 25, 2026.

ICACC 2027 Global Member Engagement Grant Committee:

Dong (Lilly) Liu
Hyun-Sik Kim







Scan the QR Code to Apply

SPECIAL EVENTS

ICACC 2027 will offer a number of special events to not only encourage invaluable networking opportunities with colleagues, but also provide you memorable conference and networking experience. ICACC 2027 registration includes four evening receptions with food and drink provided, as well as two coffee breaks per day, and an additional evening reception for students and young professionals.

Welcome Reception

Network with colleagues at the reception and enjoy food, drink and live entertainment at the kick-off event.

ACerS Student and Young Professional Networking Mixer

Join fellow students and young professionals for food and drink at the student and young professionals networking event.

Shot Glass Contest

Organized by ACerS President's Council of Student Advisors (PCSA), test your skills with this design contest! Competing teams of four will be given 15 pipe cleaners to build a protective device for their shot glass provided by SCHOTT. Then, the glasses will be dropped from increasing heights until the breaking threshold is reached. The glass with the highest successful drop distance wins!

Last Night Reception with Contest

Recap the week's excitement with your colleagues and friends. Join in the trivia contest to win and some great prizes!

Expo and Poster Session

Visit with vendors from the ceramic and glass industry and check out scientific posters!

Poster Session Preview

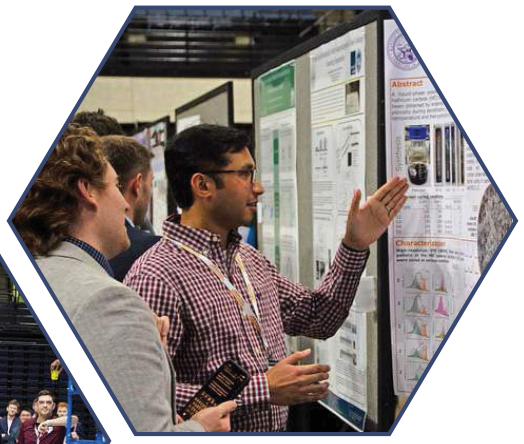
At ICACC 2027, posters presenters will have the opportunity to make a two-minute "Poster Preview Pitch" in front of their colleagues at the end of their respective technical session each day, in addition to presenting their poster in the two-day poster session. This is optional and poster authors can indicate their interest in participation when submitting their abstract in Scholar One.

NOTE TO PRESENTERS

Important Information

It is unavoidable that some symposia and presentations will be scheduled for the last day of the conference. Please refrain from making flight reservations or travel arrangements until your presentation has been scheduled. If you are unable to present on your assigned day, ACerS cannot guarantee we will be able to reschedule your presentation. Special request for specific presentation times and dates are discouraged.

Due to the costs associated with hosting a professional scientific conference, ACerS does not offer complimentary or discounted registration for this meeting. All attendees, to include our invited speakers and students, are expected to register for the event through our registration system at the appropriate rate. All student attendees will be asked to show a valid student ID to retrieve their badges on site.







MECHANICAL BEHAVIOR AND PERFORMANCE OF ADVANCED CERAMICS & COMPOSITES

Advanced structural ceramics, cermets and ceramic matrix composites (CMCs) are enabling materials for applications in various industries such as energy generation and storage (e.g. concentrated solar power, nuclear, combustion, batteries), extreme environment, space, transportation, medicine, microelectronics, and optical systems. High mechanical reliability is a key issue for their ultimate use in short- to very long-term applications. Identification and quantification of failure mechanisms such as fracture, creep, fatigue and/or irreversible deformation are necessary, and correlation with structure, processing, and exposure to severe service conditions is essential. Extreme environments and challenging applications have necessitated new approaches for sustainable manufacturing and characterization of ceramic materials. The development of novel methods to advance and accelerate computationally driven materials characterization and validate structure/property relationship and multiscale models is needed to improve predictions of material behavior, lower costs, consider sustainability and perform life cycle assessment. This symposium solicits abstracts related to a range of topics ranging from the mechanical behavior of ceramics and composites to their correlations with processing, component performance and reliability.

Proposed Session Topics

- Mechanical characterization of ceramics and composites, techniques & equipment
- Small-scale testing and in-situ characterization using electrons, photons & neutrons
- Fracture mechanics, failure analysis and fractography
- Environmental effects, thermo-mechanical creep, fatigue performance and tribology
- Design, reliability and life prediction modeling of materials, devices and components
- Novel computational approaches to enhance performance and characterization
- Processing - microstructure - mechanical properties correlation
- Role of fibers, matrices, coatings, and interfaces in mechanical behavior
- Additively manufactured, functionally graded materials and multilayer ceramic systems
- Manufacturing and testing of joined and integrated components and structures
- Ceramics for aerospace and other transport applications
- Ceramics for energy generation, turbines, and environmental applications
- Ceramics for concentrated solar-thermal power and industrial process heat
- Correlation of resource efficient processing of ceramics and CMCs with their performance

Symposium Organizers

- Amjad Almansour, NASA Glenn Research Center, USA
- Dong (Lilly) Liu, University of Oxford, UK
- Monica Ferraris, Politecnico di Torino, Italy
- Gerard Vignoles, University of Bordeaux, France
- Dileep Singh, Argonne National Laboratory, USA
- Dietmar Koch, University of Augsburg, Germany
- Bob Zhou, GE Aerospace, USA
- Raul Bermejo, Montanuniversitaet Leoben, Austria
- Kamala Raghavan, U.S. Department of Energy, USA
- Arne Rüdinger, Fraunhofer ISC/HTL Bayreuth, Germany
- Fredric Laurin, Onera, France
- Cesar Foschini, Sao State University, Brazil

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ADVANCED CERAMIC COATINGS FOR STRUCTURAL, ENVIRONMENTAL, AND FUNCTIONAL APPLICATIONS

High-performance ceramic coating systems are key to current and future technologies. Ceramic coatings extend lifetime or even enable operation of engineering materials in harsh environments. Advanced gas turbine engine components made of ceramic matrix composites, intermetallics, or superalloys promise higher energy efficiency due to increasing operation temperatures. Advanced thermal and environmental barrier coatings (T/EBC) are key to protect components against the synergistic attack of heat, combustion atmosphere, and inorganic, CMAS-type aerosols. Ceramic coatings are crucial for oxidation protection of non-oxide, ultra-high temperature ceramics and composites to be used in reusable spacecraft or hypersonic vehicles. Protection of metal components against oxidation, corrosion, erosion, and wear by innovative ceramic coatings is also a central building block for many other technologies. Functional ceramic coatings are essential for many renewable energy applications.

The symposium covers processing, microstructure, performance, and durability of advanced ceramic coatings. Research and development on new materials, innovative processing technologies, advanced characterization methods, and modeling are particularly emphasized. Material scientists and engineers from around the world are invited to present and discuss cutting-edge ceramic coating science and engineering.

Proposed Session Topics

- Thermal and environmental barrier coatings for CMC, intermetallics, and alloys
- CMAS-type degradation of T/EBC: Fundamentals, modeling, and mitigation strategies
- Ceramic coatings for protection against oxidation, corrosion, erosion, and wear
- Ceramic coatings for renewable energy applications
- Processing of ceramic coatings (thermal spraying, PVD, CVD, aerosol deposition, polymer-, powder deposition and sintering)
- Microstructure-property relationships
- Advanced destructive and non-destructive characterization methods
- Modeling and simulation
- New coating materials- MAX phases, high-entropy phases, etc.

Symposium Organizers

- Peter Mechnich, German Aerospace Center, Germany
- Douglas E. Wolfe, The Pennsylvania State University, USA
- Jie Zhang, Institute of Metal Research, Chinese Academy of Sciences, China
- Ravisankar Naraparaju, German Aerospace Center, Germany
- Nadia Rohbeck, Pratt and Whitney, USA
- Elizabeth Opila, University of Virginia, USA
- Eric H. Jordan, University of Connecticut, USA
- Bryan Harder, NASA Glenn Research Center, USA
- Kuiying Chen, National Research Council - Ottawa, Canada
- Robert Vaßen, Forschungszentrum Jülich, Germany
- Julin Wan, GE Global Research, USA
- Satoshi Kitaoka, Japan Fine Ceramics Center, Japan
- David Poerschke, University of Minnesota, USA
- Ping Xiao, University of Manchester, UK

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24TH INTERNATIONAL SYMPOSIUM ON SOLID OXIDE CELLS (SOC): MATERIALS, SCIENCE AND TECHNOLOGY

Solid oxide cells (SOCs) are at a pivotal transition from laboratory development to industrial-scale deployment, driven by rapidly growing demand for power generation, hydrogen, and synthetic fuels. Solid Oxide Cells operated as fuel cell offer unique opportunity for clean and efficient power generation and by operating them as electrolysis cell provides highly energy efficient pathways to hydrogen (steam electrolysis) and syngas (co-electrolysis). Durable electrochemical energy conversion in SOC is only possible by proper material choice and processing, cells stacking technologies and stack module design. Recent commercial agreements for data center power and megawatt-scale electrolysis demonstrations mark a new era for SOC technology. Application of SOC in scalable systems for power, heat, hydrogen and synthetic gas generation requires serious consideration of the stack operating window, operating environment, contaminants sources/level and customer specifications to realize competitive solutions. Emerging AI/ML-enabled approaches for manufacturing optimization, process control, in-line monitoring, digital twins, quality assurance, and predictive diagnostics are also gaining increasing interest for accelerating SOC scale-up and deployment.

This symposium provides an excellent platform for academia and industry to present and 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 the symposium is not only the exchange of recent results by experienced and young scientists but also extensive discussion of unsolved problems and development directions. Contributions from both established and early-career researchers working at the intersection of materials science, electrochemistry, and data-driven engineering are particularly welcome.

Proposed Session Topics

- Electrolytes and ionic conductors: oxygen ion, proton and mixed conductors; conduction mechanisms and material development
- Electrode materials and interfaces: electrode processes, defect chemistry, microstructural engineering, surface and interfacial reactions, poisoning, degradation mechanisms, accelerated testing and characterization, exsolution, nanostructured infiltration
- Interconnects, seals and joining technologies: ceramic/metallic interconnects; sealing and brazing technologies; materials development, coatings, interactions, and reliability
- Advanced In-Situ/Operando Characterization: AI-enhanced imaging, multi-modal operando sensing, and high-temperature XRD
- Cell and stack design, processing, and fabrication: novel manufacturing methods: additive manufacturing, thin-film and roll-to-roll processing for cells, stacks, reformers, burners and other system components
- AI-Driven Materials Discovery & Informatics: Autonomous Research Laboratories (ARLs), generative AI for materials design, high-throughput experimental (HTE) data management, and digital twins
- AI/ML-Assisted Manufacturing & Operations: Process optimization, in-line monitoring, quality control, surrogate modeling, digital twins, and predictive maintenance
- High-Availability Power for AI & Data Centers: Ultra-fast dynamic response, direct-DC power architectures, thermal management, reliability physics, and prognostics
- Sustainability, Circularity, and Supply Chain Resilience: Critical mineral reduction, end-of-life recycling, and Life Cycle Assessment (LCA)
- Mechanical and thermomechanical properties: mechanical integrity and durability of materials and components under high-temperature operation, thermal and redox cycles
- Modeling and simulation: electrochemical performance, thermomechanical stresses and degradation modeling; simulation of temperature distribution, stress, and current distribution in cells, stacks, and systems, multi-scale and physics-based approaches
- High-temperature electrolysis, Power-to-X, and e-fuel production: steam and CO_2 electrolysis, co-electrolysis of H_2O and CO_2, syngas/e-fuel production, e-ammonia, purity of inlet and outlet streams and their purification, carbon cap-

ture and utilization (CCU), thermochemical coupling with industrial and nuclear heat sources, system integration and chemical process engineering
- Reversible solid oxide cells and energy storage: bidirectional operation, round-trip efficiency, coupling with renewable energy sources, grid balancing, and seasonal energy storage
- System integration, commercial deployment, and emerging applications: system architecture, dynamic operation, techno-economic analysis, field data and fleet operation experience, degradation management in deployed systems, and applications including data centers, industrial decarbonization, and marine power

Symposium Organizers

- Xingbo Liu (Lead Organizer), West Virginia University, USA
- Mihails Kusnezoff, Fraunhofer Institute for Ceramic Technologies and Systems, Germany
- Federico Smeacetto, Politecnico di Torino, Italy
- Tae Ho Shin, Korea Institute of Ceramic Engineering & Technology, Republic of Korea
- Scott A. Barnett, Northwestern University, USA
- John Hardy, Pacific Northwest National Laboratory, USA
- Henrik Lund Frandsen, DTU Energy Conversion and Storage, Denmark
- Prabhakar Singh, University of Connecticut, USA
- Sebastian Molin, Gdansk University of Technology, Poland
- Julie Mougin, French Alternative Energies and Atomic Energy Commission, France
- Vincenzo Esposito, DTU Energy Conversion and Storage, Denmark
- Chien-Kuo Liu, National Atomic Research Institute, Taiwan
- Tatsumi Ishihara, Kyushu University, Japan
- Toshiaki Matsui, Kyoto University, Japan
- Aline Leon, European Institute for Energy Research, Germany
- Luca Mastropasqua, University of Wisconsin-Madison, USA
- Jong Hoon Joo, Gwangju Institute of Science Technology, Republic of Korea

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ADVANCED MATERIALS FOR THERMOELECTRIC AND THERMIONIC ENERGY CONVERSION, AND INTEGRATED THERMAL MANAGEMENT

Thermoelectric power generation relies on a thermally induced electrical current in an all-solid-state device. Thermionic energy conversion similarly utilizes a temperature gradient to generate electrical power, although materials research and device applications remain less mature compared to thermoelectrics. In addition to energy conversion, materials that enable integrated control of heat transport are increasingly critical for high-power and micro electronics, energy systems, and extreme environments. In these technologies, performance depends on the transport of charge carriers and lattice vibrations within the materials.

Broader applications of thermoelectric and thermionic devices together with integrated thermal management strategies are expected as new materials systems, improved processing strategies, and deeper understanding of transport phenomena continue to emerge. Advances in materials design, band structure engineering, phonon transport modulation, microstructure control, and device integration are essential to achieving higher performance and operational stability.

Computational approaches, including first-principles calculations, high-throughput screening, and data-driven methodologies, provide powerful tools to guide the discovery and optimization of materials for thermoelectric, thermionic, and thermal management applications.

This symposium aims to bring together researchers across materials systems and disciplines to discuss recent progress and future directions in thermoelectric and thermionic energy conversion with integrated thermal management.

Proposed Session Topics

- Materials development for thermoelectric and thermionic energy conversion for power generation and cooling with integrated heat-flow control
- Emerging thermoelectric and thermionic materials across intermetallic, chalcogenide, oxide, organic, and hybrid systems
- Organic thermoelectric materials and organic–inorganic hybrid architectures
- Flexible, low-dimensional, and mechanically compliant thermoelectric materials and devices
- Porous, hierarchical, and nanostructured thermoelectric/thermionic materials
- Electronic and phononic band structure engineering, nanostructure design, superlattices, and 2D materials
- Transport phenomena in thermoelectric and thermionic materials, including experimental and theoretical approaches to coupled electrical and thermal transport
- Structure–property relationships, thermodynamics, and solid-state defect chemistry
- Stability, mechanical behavior, and performance under operating conditions
- Electrical and thermal contact phenomena and interface effects in thermoelectric/thermionic systems and integrated heat-transfer interfaces
- First-principles design, density functional theory, and computational approaches for materials discovery
- Data-driven methodologies, machine learning, and high-throughput screening for materials optimization
- High thermal conductivity ceramics and composites for integrated heat spreading and dissipation
- Phonon engineering for controlled heat conduction or thermal insulation
- Processing strategies and microstructure control in thermoelectric materials for coupled energy conversion and heat management
- Device fabrication, module design, and system integration
- Miniaturized, integrated, and application-oriented thermoelectric devices with embedded thermal management functionalities
- System-level applications in power generation, sensing, and integrated thermal regulation in electronic and energy systems

Symposium Organizers

- Hyun-Sik Kim, University of Seoul, Republic of Korea
- Michitaka Ohtaki, Kyushu University, Japan
- Eleonora Isotta, Max Planck Institute for Sustainable Materials, Germany
- Armin Feldhoff, Leibniz University Hannover, Germany
- Sunmi Shin, National University of Singapore, Singapore
- Takayoshi Katase, Institute of Science Tokyo, Japan
- Mona Zebarjadi, University of Virginia, USA
- Umut Aydemir, Koç University, Türkiye
- Hugo Bouteiller, Oak Ridge National Laboratory, USA
- Min-Wook Oh, Hanbat National University, Republic of Korea
- Takao Mori, National Institute for Materials Science, Japan
- Bed Poudel, The Pennsylvania State University, USA
- G. Jeffrey Snyder, Northwestern University, USA
- George Nolas, University of South Florida, USA

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NEXT GENERATION BIOCERAMICS AND BIOCOMPOSITES

Bioceramics and biocomposites are rapidly evolving from conventional implant materials into multifunctional platforms for regenerative medicine, implantable devices and advanced biomedical applications. Recent progress in composition design, ion functionalization, nanostructuring and hybridization with polymers and biomolecules is enabling materials with enhanced bioactivity, controlled degradation, antimicrobial and antiviral performance, drug delivery capability, and improved tissue integration.

At the same time, additive manufacturing, biomimetic processing and bioinspired design are expanding opportunities for patient-specific, hierarchical and responsive systems. This symposium will bring together researchers from academia, national laboratories, industry and clinical practice to discuss emerging trends, translational challenges and future directions in next-generation bioceramics and biocomposites.

Proposed Session Topics

- Bioactive, resorbable, porous and hierarchical bioceramics and biocomposites for hard and soft tissue regeneration (joint with Symposium 9)
- Osteoimmunomodulatory, pro-angiogenic and therapeutic ion-doped bioceramics for tissue repair, infection control and age-related bone regeneration
- Additive manufacturing, injectable/self-setting systems and patient-specific scaffold design
- Hybrid ceramic-polymer, ceramic-hydrogel and inorganic-organic composites with tunable mechanical, biological and degradation properties
- Mesoporous, nanostructured and self-assembled bioceramics and composites with antimicrobial, antiviral and drug delivery properties
- Surface engineering, coatings and interfacial design for implants, medical devices and biosensing applications
- Smart, stimuli-responsive, biomimetic, electroactive, piezoelectric and conductive bioceramics
- Light-emitting, magnetic and sensing bioceramics for diagnostics, stimulation and theranostic applications
- In vitro and in vivo biocompatibility, biomineralization, tissue-material interactions and clinically relevant validation models
- Sustainable, eco-friendly and clinically translatable bioceramics and biocomposites, including scale-up and reproducibility challenges

Symposium Organizers

- Cristina Balagna, Politecnico di Torino, Italy
- Katalin Balazsi, Center for Energy Research, Hungary
- Hui-Suk Yun, Korea Institute of Materials Science, Republic of Korea
- Sungho Lee, National Institute of Advanced Industrial Science and Technology, Japan
- Eva Hemmer, University of Ottawa, Canada
- Akiyoshi Osaka, Okayama University, Japan
- Antonia Ressler, Tampere University, Finland
- Ashutosh Kumar Dubey, Indian Institute of Technology, Varanasi, India

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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 intermittent nature of renewable power generation technologies will require new solutions for efficient and reliable energy storage. This symposium will focus on advanced engineering ceramics and technologies that could help the global community to achieve the stated goals. It will explore state-of-the-art materials and technologies for energy storage, improvements in materials design, electrodes architecture, electrolytes, separators and cell chemistries. These are key factors to extend the life, enhance the safety, and lower the cost of rechargeable batteries, which are regarded as the most efficient energy storage systems for portable electronics, renewable energy storage, smart grid, and transportation applications. A deeper understanding of the battery materials/property relationship, electrode/ electrolyte interface phenomena, and cell failure mechanisms is critically needed to face these challenges. The search for advanced high-capacity electrode materials, solid electrolytes and the implementation of the very challenging all-solid-state batteries, lithium batteries, lithium-sulfur, metal-air batteries, beyond lithium technologies including sodium batteries, Mg/Ca/Al-based batteries will be necessary to overcome the energy density shortfall and safety issues in currently commercial batteries.

This symposium will focus on crystal chemistry, structural analysis, materials processing, powder metallurgy, sintering, transport properties, structural and mechanical characterization, new testing methods, cost/performance and reliability issues, commercialization, market prospects and recyclability related to batteries and supercapacitors. Artificial intelligence (AI) offers opportunities to accelerate certain complex developments. Presentations on the integration of AI tools for accelerated discovery of new materials, prediction of device aging, improving safety or reliability, and other optimizations are also expected.

Proposed Session Topics

- Solid electrolytes for batteries
- All-solid-state batteries
- Advanced anode and cathode materials for lithium and sodium batteries
- Materials design, screening, and electrode architectures for lithium and sodium batteries
- Diagnostics and materials characterization for lithium and sodium batteries
- Electrode/electrolyte interface characterization for lithium and sodium batteries
- Applications focused lithium and sodium batteries
- Lithium-sulfur battery technology
- Potassium batteries, magnesium batteries and calcium batteries
- Materials of capacitive energy storage (super-capacitors)
- Recycling of battery materials
- Stationary rechargeable batteries for grid, solar, and wind technologies
- Machine learning and AI tools

Symposium Organizers

- Palani Balaya, National University of Singapore, Singapore
- Naoaki Yabuuchi, Yokohama National University, Japan
- Valerie Pralong, CNRS CRISMAT, France
- Mali Balasubramanian, Oak Ridge National Laboratory, USA
- Prabeer Barpanda, Indian Institute of Science, India
- Donald Dornbusch, NASA Glenn Research Center, USA
- Dong-Hwa Seo, Korea Advanced Institute of Science and Engineering, Republic of Korea
- Wan Si Tang, Underwriters Laboratories Research Institute, USA
- B. Reeja Jayan, Carnegie Mellon University, USA
- Shih-Kang Lin, National Cheng Kung University, Taiwan
- Pinar Kaya, Aalen University of Applied Sciences, Germany
- Masashi Kotobuki, Ming Chi University of Technology, Taiwan

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21ST INTERNATIONAL SYMPOSIUM ON FUNCTIONAL NANOMATERIALS AND THIN FILMS FOR SUSTAINABLE ENERGY, ENVIRONMENTAL AND BIOMEDICAL 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 materials, 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, 2D materials and nanoscopic films, fundamentally new properties, and energy-efficient materials synthesis. Functional surfaces fabricated using emerging processing techniques such as jet printing, 3D printing, etc. are also within the scope of the symposium. Applications of nanostructures in photocatalysis, energy, sensing, and biomedical applications that combine advanced processing with conceptual advancements will form the major thrust areas. Contributions related to energy applications such as photovoltaics (perovskite materials), photothermal materials, radiative cooling, batteries, fuel cells, thermoelectric materials, water splitting, and carbon 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, storage and catalysis
- Nanomaterials for sensing, batteries and water-splitting applications
- Nanomaterials for thermoelectrics, photocatalysis, electrocatalysis, and solar hydrogen
- Nanotoxicity, bio-imaging, drug-delivery and tissue engineering with tailored nano-bioconjugates
- Transition metal chalcogenides, carbonaceous nanostructures, 2D materials
- Photonic nanostructures for thermal radiation control
- Nanomaterials for solar-reflective and IR-emissive coatings
- Smart thermal regulation surfaces
- Perovskite and emerging photovoltaic nanomaterials
- Nanomaterials for fuel cells and carbon conversion
- Functional coatings and innovative thin film techniques
- Interfacial materials and multi-material heterostructures & nanocomposites
- Computational methods in the design of tailored nanostructured materials
- Industrial production and application of nanomaterials & coatings

Symposium Organizers

- Muhammet S. Toprak, KTH Royal Institute of Technology, Sweden
- Sanjay Mathur, University of Cologne, Germany
- Sedat Ballikaya, Istanbul University, Turkey
- Andreas Lichtenberg, University of Cologne, Germany
- Andreu Cabot, Catalonia Institute for Energy Research, Spain
- Ender Suvaci, Eskisehir University, Turkey
- Elisa Moretti, University of Venice, Italy
- Shikhar Krishn Jha, Rochester Institute of Technology, USA
- Theodora Kyratsi, University of Cyprus, Cyprus
- Ji-Hyun Jang, Ulsan National Institute of Science and Technology, Republic of Korea
- Ayan Roy Chaudhuri, Indian Institute of Technology Kharagpur, India

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21ST INTERNATIONAL SYMPOSIUM ON ADVANCED PROCESSING AND MANUFACTURING TECHNOLOGIES FOR STRUCTURAL AND MULTIFUNCTIONAL MATERIALS AND SYSTEMS

In Memory of Professor Hisayuki Suematsu

Structural and multifunctional materials development is essential for advancing engineering frontiers in energy, environmental technologies, healthcare, defense, nuclear systems, aerospace, and more. The performance of these advanced materials is largely dependent on the processing and manufacturing techniques employed. A thorough understanding of forming and sintering behavior is critical for achieving tailored microstructures, enhancing material properties, and fabricating complex geometries. The objective of this international symposium is to discuss recent progress in technology development for processing and fabricating advanced structural and multifunctional material systems. The symposium will cover innovations in processing technologies as well as state of the art understanding of processing–microstructure–property–performance relationships. Topics will encompass a broad spectrum of advanced materials, including non-oxide and oxide structural ceramics, fiber reinforced and particulate composites, functionally graded materials, and multifunctional materials, along with their components and devices. Eco friendly and cost-effective processing approaches, as well as joining and degradation behavior, will also be addressed.

This year's symposium is dedicated to the memory of Professor Hisayuki Suematsu, an eminent materials scientist whose sudden passing on December 29, 2025, has deeply affected the global ceramics and materials community. Professor Suematsu was a visionary leader in advanced ceramics, a devoted contributor to the Engineering Ceramics Division (ECD) and The American Ceramic Society (ACerS), and a long-standing pillar of this symposium series. His pioneering research, generous mentorship, and unwavering commitment to international collaboration have left a lasting impact on our field.

Proposed Session Topics

- Novel forming/sintering technologies, near-net shaping
- Rapid prototyping, 3D printing, patterning, templates and self-assembly
- Advanced ceramics manufacturing technologies hybrid processes
- Microwave processing, flash sintering, high pressure assisted sintering, SPS
- Polymer-based processing
- Design-oriented manufacturing and processing
- Joining, integration, machining, degradation and refurbishment technologies
- Green manufacturing, global environmental issues and standards

Symposium Organizers

- Do Thi Mai Dung, Nagaoka University of Technology, Japan
- B V Manoj Kumar, Indian Institute of Technology, Roorkee, India
- Reeja Jayan, Carnegie Mellon University, USA
- Tatsuki Ohji, YNU/NITech/AIST, Japan
- Young-Wook Kim, WORLDEX Industry & Trading Co., Ltd., Republic of Korea
- Enrico Bernardo, University of Padova, Italy
- Surojit Gupta, University of North Dakota, USA
- Csaba Balazsi, HUN-REN Centre for Energy Research, Hungary
- Wei Ji, Wuhan University of Technology, China
- Hyun Sik Kim, University of Seoul, Republic of Korea
- Tohru Suzuki, National Institute for Materials Science, Japan

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POROUS CERAMICS: NOVEL DEVELOPMENTS AND APPLICATIONS

Porous materials are essential components in many applications including, but not limited to, thermal insulation, catalysts, catalyst supports, filters, adsorbers, sensors, and lightweight components. This symposium aims to bring together the scientific community to share recent advances in the formation, characterization, properties, and modeling of porous ceramic, carbon, glass, and glass-ceramic components for diverse applications. These materials contain pore sizes from nanometers to millimeters, can have textured to random or hierarchical porosity, and are based on various pore architectures such as foams, honeycombs, fiber networks, and bio-inspired structures. They can be produced using a variety of fabrication approaches, from direct foaming to replication of a porous scaffold, from the use of sacrificial fillers to additive manufacturing. Because of these properties, porous materials are widely used in environmental, energy, biomedical, and other advanced applications. This symposium will be the ideal showcase for the research activities of the many groups involved in the development and use of porous materials, including but not limited to ceramics, chemistry, mechanics, fluid dynamics, modeling and simulation, and applications engineering.

Proposed Session Topics

- Innovations in processing methods & synthesis of porous ceramics
- Structure and properties (mechanical, thermal, etc.) of porous ceramics
- Novel characterization tools and software for porous structures
- Computational techniques, machine learning (ML) and artificial intelligence (AI) for porous ceramics
- Hierarchical, micro-porous, and meso-porous ceramics and gas separation ceramic membranes
- Engineered porous architectures enabled by additive manufacturing technologies
- Porous ceramics for environmental, energy, biomedical and functional applications

Symposium Organizers

- Tobias Fey, Friedrich-Alexander University of Erlangen-Nürnberg, Germany
- Paolo Colombo, University of Padova, Italy
- Samuel Bernard, Institute of Research for Ceramics-CNRS, France
- Jian-feng Yang, Xi'an Jiaotong University, China
- NV Ravikumar, Indian Institutes of Technology, Madras, India
- Eliandra de Sousa Triches, Federal University of São Paulo, Brazil
- Manabu Fukushima, National Institute of Advanced Industrial Science and Technology, Japan

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INTEGRATED COMPUTATIONAL-EXPERIMENTAL AND DATA-DRIVEN MODELING AND DESIGN OF ADVANCED CERAMICS AND COMPOSITES

Recent advances in computational materials science coupled with artificial intelligence (AI), machine learning (ML), and materials informatics approaches have significantly enhanced our understanding of fundamental phenomena in material behavior. These advances have contributed to improvement in materials performance, as well as discovery and the design of new materials and structures. Increasingly, the integration of computational modeling, data-driven approaches, and advanced experimental characterization is enabling accelerated materials discovery and the predictive design of next-generation ceramic and composite systems.

This symposium solicits research on state-of-the-art physics-based, chemistry-aware, and data-driven modeling, advanced computational techniques, and modern machine learning architectures for a range of analysis, characterization, design of ceramics and composites with tailored properties. Approaches spanning computational research and experimental measurements across length and time scales are encouraged. Examples include, but are not limited to, ML-assisted novel microstructure/composite material design, generative and inverse materials design, establishing structure-property relationships in complex material microstructures, multiscale modeling through ML-driven coupling between scales, and AI-augmented experimental design and characterization. Additional topics of interest include high-throughput simulations and experiments, digital twins of materials systems, uncertainty quantification in predictive materials modeling and characterization, computational surrogate models for (multiphysics) behavioral predictions, and data-driven electromagnetic, thermal, chemical, frictional and mechanical response models. Of particular interest is also microstructure characterization, microstructure informatics, and image-based modeling, enabling the development of physically informed materials design strategies. A broader perspective is also encouraged, including research related to ceramic genome initiatives, virtual materials design platforms, novel strategies for materials processing-structure-performance relationships in advanced ceramics and composites for structural and functional applications. Contributions addressing modeling of surfaces, interfaces and grain boundaries across multiple scales in ceramics and composites are also encouraged.

The symposium aims to bring together researchers working at the intersection of materials science, computational modeling, AI and advanced experimental characterization, providing a platform for discussion of emerging approaches for accelerated design and predictive understanding of ceramics and their composites.

Proposed Session Topics

- Materials informatics, artificial intelligence (AI), and machine learning for ceramics and composites
- AI-enabled discovery, design, processing (including additive manufacturing), and characterization of ceramic and com-posite materials
- Modeling of processing-structure-property relationships in advanced ceramics and composites
- High-throughput materials discovery, design and characterization
- Physics-informed machine learning for materials modeling, simulation and characterization
- Microstructure informatics, microstructure engineering, and image-based materials modeling
- Digital twins and predictive modeling for ceramics and composites
- Physics- and data-driven modeling of additively manufactured (3D printed) ceramics and composites
- (Multi)functional ceramics and composites (e.g. batteries, fuel cells and piezoceramics)- multiphysics modeling, characterization and design
- Multiphysics materials behavior and degradation of ceramics, coatings and composites under extreme environments (thermal, mechanical, chemical and radiation)
- Modeling fracture and damage mechanics of ceramics and composites across scales
- Modeling of surfaces, interfaces, defects, heterogeneities, and grain boundaries at multiple scales
- Modeling friction, wear, and tribology in ceramics and composites
- Sensing/actuating materials modeling and smart ceramic systems

Symposium Organizers

- Gerard L. Vignoles, University of Bordeaux, France
- Sathiskumar Anusuya Ponnusami, Queen Mary University of London, UK
- Jingyang Wang, Liaoning Academy of Materials, China
- Ghatu Subhash, University of Florida, USA
- Arezoo Emdadi, Missouri State University, USA
- Joaquin Garcia Suarez, École Polytechnique Fédérale de Lausanne, Switzerland
- Vignesh Kannan, École Polytechnique, France
- Peter Kroll, University of Texas at Arlington, USA
- Jian Luo, University of California, San Diego, USA
- Yixiu Luo, Institute of Metal Research, Chinese Academy of Sciences, China
- Sergei Manzhos, Tokyo Institute of Technology, Japan
- Bin Liu, Shanghai University, China
- Katsuyuki Matsunaga, Nagoya University, Japan
- Paul Rulis, University of Missouri-Kansas City, USA
- Yan Li, Dartmouth College, USA

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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 fundamentally very important and greatly influence material or module 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 inherently interdisciplinary nature, inevitably encompassing a broad spectrum of skills, ranging from fundamental materials to component manufacturing and module integration. As demand increases for sustainable energy and semiconductor processes, especially by employing relevant materials, composites and/or functional techniques, the interdisciplinary approach plays an even 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.

Proposed Session Topics

- Fundamental materials: Mining, particles, bulk, and functional materials and precursors
- Innovative manufacturing processes for recycling, sustainable energy, or the semiconductor industry
- Future-oriented techniques for coating, forming, and shaping materials
- Emerging intelligent technologies based on AI or IoT for enhancing product performance

Symposium Organizers

- Chisung Ahn, Korea Institute of Industrial Technology, Republic of Korea
- Sungwook Mhin, Dongguk University, Republic of Korea
- Ayahisa Okawa, Tohoku University, Japan
- Son Thanh Nguyen, National Institute of Technology, Japan
- Kyoung Il Moon, Korea Institute of Industrial Technology, Republic of Korea
- Hyuksu Han, Sungkyunkwan University, Republic of Korea
- Yuya Takimoto, Nagaoka University of Technology, Japan

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LAYERED AND LOW-DIMENSIONAL CARBIDES, NITRIDES, BORIDES, AND RELATED MATERIALS

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

Rather recently, it was shown that it is possible to selectively etch certain atomic layers out of the crystal structure and to separate nanolaminated blocks of these transition metal compounds to form 2D solids (MXenes, MBenes). Despite their relatively short history, MXenes (the 2D phases resulting from the removal of A layers from the corresponding MAX phases) have attracted major interest due to their unique properties, such as excellent electrical conductivity, surface functionality, and tunability.

Symposium 12 focuses on the design, processing, composition-structure-property relationships, thermal, electrical, optoelectronic, solid-lubrication and mechanical properties, stability, oxidation/corrosion resistance, radiation tolerance, as well as envisaged potential applications of these unique nanolaminated compounds in their 2D and 3D forms. In addition, exploratory research on further expanding the chemistry of these ternary compounds, such as high-entropy systems and next-generation ternary borides, is also invited.

Proposed Session Topics

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

Symposium Organizers

- Surojit Gupta, University of North Dakota, USA
- Miladin Radovic, Texas A&M University, USA
- Babak Anasori, Purdue University, USA
- Konstantina Lambrinou, University of Huddersfield, Huddersfield
- Jochen M. Schneider, RWTH Aachen University, Germany
- Thierry Cabioch, Université de Poitiers, France
- Sylvain Dubois, Université de Poitiers, France
- Per Eklund, Uppsala University, Sweden
- Johanna Rosen, Linköping University, Sweden
- Chenxu Wang, Peking University, China

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ADVANCED CERAMICS AND COMPOSITES FOR NUCLEAR FISSION AND FUSION ENERGY SYSTEMS

The 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 environments of a nuclear reactor core. This international symposium will bring together scientists and engineers to discuss opportunities and needs in key enabling materials for application in nuclear energy systems. This will include the most up-to-date science and state-of-the-art technologies, ranging from materials design and development to processing and performance under relevant nuclear environments. Also included will be discussions on prospects and perspectives related to commercial development, qualification, and licensing requirements.

Proposed Session Topics

- Material technologies for core structures of light water reactors and advanced reactors
- Ceramic fuel materials, technologies, and characterization
- Graphite and carbon materials for nuclear applications
- High temperature ceramics for space reactors
- New materials and containment for neutron moderators, reflectors, and shielding
- Processing and characterization of novel ceramics and composites for nuclear systems
- Structural and function materials for nuclear fusion: ceramic breeders, corrosion barriers, and advanced plasma-facing materials
- Joining, coating, and assembly technologies for reactor components
- Chemical compatibility and corrosion
- 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, design methodology, and material qualification

Symposium Organizers

- Takaaki Koyanagi, Oak Ridge National Laboratory, USA
- Dong (Lilly) Liu, University of Oxford, UK
- Monica Ferraris, Politecnico di Torino, Italy
- Tatsuya Hinoki, Kyoto University, Japan
- Samuel Humphry-Baker, Imperial College London, UK
- Ian McCue, Northwestern University, USA
- Gyanender Singh, Idaho National Laboratory, USA
- David Sprouster, Stony Brook University, USA
- Gustavo Costa, NASA Glenn Research Center, USA
- Andrew Nelson, Oak Ridge National Laboratory, USA
- Steve Zinkle, University of Tennessee, USA
- Lance Snead, Stony Brook University, USA
- Yutai Katoh, Oak Ridge National Laboratory, USA
- Charmayne Lonergan, Missouri University of Science and Technology, USA
- Dileep Singh, Argonne National Laboratory, USA

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CRYSTALLINE MATERIALS FOR ELECTRICAL, OPTICAL AND MEDICAL APPLICATIONS

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

Proposed Session Topics

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

Symposium Organizers

- Kiyoshi Shimamura, National Institute for Materials Science, Japan
- Kenji Toda, Niigata University, Japan
- Betul Akkopru-Akgun, The Pennsylvania State University, USA
- Takayuki Yanagida, Nara Institute of Science and Technology, Japan
- Mariya Zhuravleva, University of Tennessee, USA
- Romain Gaume, University of Central Florida, USA
- Hiroaki Furuse, National Institute for Materials Science, Japan
- Philippe Veber, West University of Timișoara, Romania
- Tetsuo Tsuchiya, National Institute of Advanced Industrial Science and Technology, Japan
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11TH INTERNATIONAL SYMPOSIUM ON ADDITIVE MANUFACTURING AND 3D PRINTING TECHNOLOGIES

Additive manufacturing (AM) 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 with multifunctionality, rapid prototyping, and distributed digital manufacturing. In this approach, three-dimensional models are designed and created according to theoretical concepts using computer software, and two-dimensional cross sections are created by slicing operations automatically. In direct writing processes, paste materials with ceramic/metal particles dispersed in binder system are fused from nozzles moving freely in three dimensions to create composite structures. In laser-based approaches, high resolution laser beams are scanned on a spread ceramic powder bed with or without resin binders to form solid planes of two-dimensional cross sections. Various functional components of dielectric lattices to control electromagnetic waves, 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. Utilizing smart additive manufacturing, it is possible to design for function and not for manufacturing. However, each technique needs special design adjustments to boost products' efficiency and multi-functionality. This symposium focuses on superiority of design, efficient processing, and perspicuous evaluations in additive manufacturing and 3D printing processes. In addition, various topics related to starting materials, characterization tools, NDE and in-situ monitoring of processes, qualification and certification, cost, and applications will also be discussed.

A special session is planned to focus on characterization and qualifications of ceramic feedstocks. The goal is to bring together researchers, industry practitioners, and standards developers to address the state-of-the-art in feedstock characterization and identify pathways toward qualified materials for ceramic AM.

Proposed Session Topics

- Feedstocks for additive manufacturing (special session)
- Design with/for additive manufacturing
- Materials and process characterization tools
- Laminated object manufacturing/green tape stacking
- Powder bed fusion/selective laser melting and sintering
- Material extrusion/fused deposition modeling
- Binder jetting processes
- Vat photopolymerization/stereolithography
- Direct writing/ink jet printing technologies
- Multi-material and hybrid printing techniques
- AM of particulate and fiber reinforced composites
- Qualification, certification, standards, and property database
- Applications of AM materials and components

Symposium Organizers

- Soshu Kirihara, Osaka University, Japan
- Michael Halbig, NASA Glenn Research Center, USA
- Mrityunjay Singh, Ohio Aerospace Institute, USA
- Hui-Suk Yun, Korea Institute of Materials Science, Republic of Korea
- Russell Maier, National Institute of Standards and Technology, USA
- Majid Minary, University of Texas, USA
- Alberto Ortona, Scuola universitaria professionale della Svizzera italiana, Switzerland
- Andrew Allen, National Institute of Standards and Technology, USA
- Martin Schwentenwein, Lithoz GmbH, Austria
- Yan Li, Dartmouth College, USA
- Fiona Sprirret, Osaka University, Japan
- Michael Stuer, Swiss Federal Laboratories for Materials Science and Technology, Switzerland
- Lynnora Grant, University of North Carolina at Charlotte, USA
- Wenchao (Mark) Du, Argonne National Laboratory, USA

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GEOPOLYMERS, INORGANIC POLYMER-DERIVED CERAMICS AND SUSTAINABLE CONSTRUCTION MATERIALS

Refractory inorganic polymers can be made at ambient temperatures and pressures from a powder and a liquid to form a paste of low viscosity. These materials, called “geopolymers”, include alkali metakaolin-based, aluminosilicates; alumino-silicate phosphates; potassium magnesium phosphates; alternative geopolymer compositions, other silicate geopolymers. The use of biological materials as starting compounds or as reinforcements in composites demonstrates the eco-friendly and sustainable nature of these materials. The alkali-based, aluminosilicate geopolymer “glue” is refractory up to 900°C, after which it converts to a ceramic, or a ceramic plus glass. Novel potential applications of such composites include: infra-structure and construction materials; porous geopolymers for water purification by heavy metal ion removal; geopolymer derived nano-zeolites for CO_2 sequestration; porous geopolymers for thermal insulation; structural ceramic composites containing ceramic, metal, organic or biological reinforcements; fire and corrosion resistant coatings; nuclear radiation shielding geopolymer composites; amorphous, self-healed geopolymer composites; geothermal well casing liners. The nanoparticulate nature of geopolymers also provides a low energy, processing route to ultra-refractory ceramic powders or versatile forming methods based on transient, organic alkali, charge-balanced geopolymer, and 4-D printing, taking advantage of geopolymer thixotropy.

Proposed Session Topics

- Synthesis, processing microstructure
- Mechanical properties, thermal shock resistance
- Alkali-based geopolymers
- Acid-based phosphate geopolymers
- Other inorganic geopolymer analogues
- Geopolymer-derived processing routes
- Nuclear radiation shielding
- Sustainable construction materials
- Use of waste materials to make geopolymers
- Water purification, CO_2 sequestration
- Novel applications

Symposium Organizers

- Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA
- Ralph Davidovits, Geopolymer Institute, France
- Cristina Leonelli, University of Modena and Reggio Emilia, Italy
- Sylvie Rossignol, University of Limoges, France
- Ana Trindade, University of São Paulo, Brazil
- Patrick F. Keane, Adelaide University, Australia

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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, multi-ferroic materials, catalysis, water treatments 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

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

Symposium Organizers

- Elisa Moretti, University of Venice, Italy
- Federico Rosei, University of Trieste, Italy
- Nicola Pinna, Humbolt University, Germany
- Alberto Vomiero, Luleå University of Technology, Sweden
- Yasuhiro Tachibana, RMIT University, Australia
- Adam Duong, University of Picardy, France

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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 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 the discovery, design, processing, and processing-microstructure-property relationships, as well as the thermal and mechanical properties, oxidation resistance, machining, joining, and thermal/chemical stability of UHTCs and UHTC composites, from both fundamental and application-oriented perspectives. Dr. Inna Talmy was an ACerS Fellow and internationally recognized expert in the field who recently passed away. A special session is planned this year to celebrate her legacy. This session will include invited presentations and is open to contributions from those whose research and professional development were impacted by her in some way.

Proposed Session Topics

- Celebrating Dr. Inna Talmy: Her research, mentorship, and legacy
- 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
- Compositionally complex UHTCs
- Super-hard 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

- Bai Cui, University of Nebraska-Lincoln, USA
- William G. Fahrenholtz, Missouri University of Science and Technology, USA
- Sea-Hoon Lee, Korea Institute of Materials Science, Republic of Korea
- Frederic Monteverde, National Research Council-Institute of Science and Technology for Ceramics, Italy
- Guo-Jun Zhang, Donghua University, China
- Ji Zou, Wuhan University of Technology, China
- Lisa Rueschhoff, Air Force Research Laboratory, USA
- Lavina Backman, U.S. Naval Research Laboratory, USA
- Simon Middleburgh, Bangor University, UK
- Jon Binner, University of Birmingham, UK
- Theresa Davey, Bangor University, UK
- Scott McCormack, University of California, Berkeley, USA
- Chris Weinberger, Colorado State University, USA

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MOLECULAR-LEVEL PROCESSING AND CHEMICAL ENGINEERING OF FUNCTIONAL MATERIALS

The synthesis of materials from molecular precursors offers a powerful approach for engineering compounds with precisely controlled compositions, crystal structures, and functional properties. Central to this strategy is the deliberate design of suitable precursors and a deep understanding of their transformation pathways - insight essential for advancing rational synthesis and enabling tailored, multifunctional systems. Compared to conventional top-down methods, molecular-level routes offer exceptional atom economy, superior control over chemical and phase purity, and access to unique morphologies and metastable phases. Yet significant challenges remain, most notably the limited mechanistic understanding of molecule-to-material transformations and the restricted availability of suitable precursors.

This symposium brings together materials chemists, ceramists, and engineers pioneering innovative strategies for the synthesis, shaping, and integration of functional materials. Contributions will examine the role of precursor chemistry and solution-based additives across techniques, including sol–gel processing, solvothermal synthesis, electrospinning, microwave-assisted methods, CVD, and ALD. Particular emphasis will be placed on advanced manufacturing approaches such as 3D printing, chemically directed assembly, and post-synthetic modification, alongside emerging characterization methods that enable in-situ diagnostics and fundamental insights into nucleation, growth, and self-assembly.

A key objective is to bridge cutting-edge processing technologies with foundational materials chemistry principles to develop scalable, application-driven synthesis routes. The symposium will also assess the industrial relevance of chemically processed materials with respect to cost-efficiency and process simplicity and will explore the role of molecular precursor strategies in sustainable development - including contributions to circular economy models, waste minimization, and materials recycling.

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 characterization of micro-structure evolution
- New processing methods, 3D-printing, and knowledge-driven processing
- Application of AI and ML in materials design, synthesis, and processing
- Scaled-up production of precursor-derived materials
- Materials integration and device applications
- Micro- and nanomechanical testing

Symposium Organizers

- Samuel Bernard, University of Limoges, France
- Christina Birkel, Arizona State University, USA
- Emanuel Ionescu, Technische Universität Wien, Austria
- Thomas Konegger, Technische Universität Wien, Austria
- Ravi Kumar NV, Indian Institute of Technology, Madras, India
- Sanjay Mathur, University of Cologne, Germany
- Christelle Salameh, University of Montpellier, France
- Gurpreet Singh, Kansas State University, USA

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BIOINSPIRATION, GREEN MANUFACTURING, AND EMERGING FRONTIERS IN ADVANCED MATERIALS

Over billions of years, nature has mastered the art of manufacturing complex, multifunctional materials under ambient conditions with zero waste. As we stand at the intersection of the climate crisis and the Fourth Industrial Revolution, translating these biological blueprints into scalable, sustainable manufacturing paradigms has never been more urgent—or more exciting.

This focused session serves as a premier interdisciplinary forum bridging materials science, biology, mechanical engineering, and data science. We invite researchers, students, and industry pioneers to showcase cutting-edge advancements in bioinspired design, green processing, and next-generation manufacturing technologies. In response to the rapid evolution of this field, this session will place a special emphasis on AI-accelerated discovery, low-carbon footprint synthesis, and the translation of bioinspired concepts from lab to market. Whether you are developing fundamental insights into biological materials, pioneering novel low-temperature processing routes, or scaling sustainable manufacturing processes for real-world applications, this session offers a unique platform to exchange ideas, forge cross-disciplinary collaborations, and engage with a diverse global community spanning academia and industry.

Proposed Session Topics

- Structure, properties, and mechanisms of biological and bioinspired materials
- Aqueous synthesis, colloidal processing, and bottom-up assembly
- Cold sintering and low-temperature, energy-efficient processing technologies
- Physics-informed machine learning, generative AI, and multiscale modeling for materials design
- Bioinspired fabrication techniques, bioprocessing, and biohybrid materials
- Green manufacturing for energy conversion/storage, environmental remediation, and catalysis
- Emerging applications in soft robotics, wearable electronics, biomedical devices, and beyond
- Scalability, circular economy, and industrial pathways for sustainable advanced materials

Symposium Organizers

- Zhaoyong Zou, Wuhan University of Technology, China
- Manoj K Mahapatra, University of Alabama at Birmingham, USA
- Tengteng Tang, University of Virginia, USA
- Zhao Qin, Syracuse University, USA
- Ling Li, University of Pennsylvania, USA
- Wei Zhai, National University of Singapore, Singapore
- Florian Bouville, Imperial College London, UK
- Ziqi Sun, Queensland University of Technology, Australia
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NOVEL CERAMIC MATERIALS AND INTEGRATED APPROACHES FOR INDUSTRIAL DECARBONIZATION

Decarbonizing high-temperature and chemically intensive industries requires new systems and components incorporating ceramic materials that operate under aggressive environments while enabling carbon-managed process routes. This focused session will provide a platform for advances in ceramic membranes, catalysts, sorbents, coatings, reactors, heat-management and heat storage components, innovative solid-state energy production or conversion devices, and integrated process concepts that support industrial decarbonization, zero-emission operation, and carbon-negative pathways. The session is intentionally centered on hard-to-abate process technologies, where ceramics create unique value at the interface between materials, components, and process intensification.

Proposed Session Topics

- Ceramic technologies for hard-to-abate industrial sectors
- Advanced ceramic membranes: Applications and membrane reactors
- Catalytic and multifunctional ceramic systems for carbon-managed processes
- Ceramic components for electrified process heat and energy storage
- Scale-up, durability, and system integration
- System integration and deployment of ceramic process technologies

Symposium Organizers

- Charles Lewinsohn, Rational Solutions, LLC, USA
- Marta Boaro, Universita di Udine, Italy
- Federico Smeacetto, Politecnico di Torino, Italy
- Alexander Michaelis, Fraunhofer Institute for Ceramic Technologies and Systems, Germany
- Takashi Makino, National Institute of Advanced Industrial Science and Technology, Japan

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SMART POWDER PROCESSING OF MULTIFUNCTIONAL CERAMICS AND CATALYST MATERIALS

Powder processing plays a vital role in producing advanced ceramics and functional materials, including catalysts that enable clean energy and sustainability. In catalyst development, precise control over powder synthesis, dispersion, and structural formation enhances efficiency, durability, and reusability. Likewise, innovations in powder processing have a profound influence on material performance in high-technology applications. This session aims to highlight smart strategies and advanced technologies in powder design, particle surface engineering, microstructure optimization, and advanced characterization methods to drive progress in both ceramic and catalytic materials.

Proposed Session Topics

- Microstructural design of powders for ceramics and catalysts
- Particle surface modification, coating, and composite fabrication
- Dispersion and suspension control in liquids and polymers
- Advanced granulation techniques
- Cost-effective and energy-efficient powder processing technologies
- Sustainable material reuse, recycling, and catalyst regeneration
- Design and synthesis of heterogeneous catalysts for energy and environmental applications
- Interface engineering for photocatalytic, thermo-photocatalytic, and electrocatalytic reactions
- Advanced characterization and in-situ analysis for powders and catalytic materials
- Smart powder processing for next-generation catalysts

Symposium Organizers

- Yuki Nakashima, National Institute of Advanced Industrial Science and Technology, Japan
- B.V. Manoj Kumar, Indian Institute of Technology, Roorkee, India
- Taeseup Song, Hanyang University, Republic of Korea
- Junichi Tatami, Yokohama National University, Japan
- Sandan Kumar Sharma, Indian Institute of Technology, Patna, India
- Yiquan Wu, Alfred University, USA
- Kunihiko Kato, Gifu University, Japan

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CERAMIC/CARBON REINFORCED POLYMERS

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

Proposed Session Topics

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

Symposium Organizers

- Satoshi Kobayashi, Tokyo Metropolitan University, Japan
- Takenobu Sakai, Saitama University, Japan
- Toshio Ogasawara, Tokyo University of Agriculture and Technology, Japan
- Shinji Ogihara, Tokyo University of Science, Japan
- Tomohiro Yokozeki, The University of Tokyo, Japan
- Masahito Ueda, Nihon University, Japan
- Sota Oshima, Tokyo University of Agriculture and Technology, Japan
- Mohammad Fikry, Tokyo University of Science, Japan
- Manabu Fukushima, National Institute of Advanced Industrial Science and Technology, Japan

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SUSTAINABLE DESIGN AND MANUFACTURING OF ADVANCED CERAMICS FOR SPACE APPLICATIONS

Advanced materials will enable space exploration and future possible life in outer space, Moon and Mars. Launch vehicles, spacecrafts, satellites, communication systems, and space infrastructures are some examples of space systems that need major improvements and pose new challenges in the field of material science and manufacturing. Advanced ceramics provide high strength-to-weight ratios, good thermal insulation, radiation shielding, and sometimes self-healing capabilities. For space habitation, space sustainability is becoming increasingly relevant, promoting a conscious use of space. All these activities influence environmental, economic, and social aspects. Space is a harsh environment where in-space manufacturing technologies will face microgravity, (non)ionizing radiation, vacuum, thermal cycling and other unique aspects of the space weather. These aspects may assist in producing unique materials and structures.

In this framework, manufacturing and sustainability of advanced ceramics for space application is a topic of great interest not only for the international scientific community but also for all the space agencies and industrial sectors who are planning to extend human activities beyond Earth. Recently, design, manufacturing and testing of advanced ceramics on Earth and in outer space are the subjects of several research studies. Their possible use in harsh and extreme conditions of space, is opening a new frontier of the in-space manufacturing in different environments, different gravity conditions and possibility of in-situ resource utilization (ISRU) for new habitats potentially on Moon and Mars. This symposium solicits abstracts related to design, manufacturing and testing of novel advanced ceramics for space applications, also considering aspects of space sustainability.

Proposed Session Topics

- Ceramics for space in-situ resource utilization (ISRU)
- Ceramics for space habitats
- Ceramics for space infrastructure
- Ceramics for space power and propulsion systems
- 3D Printed Components for antennas of small satellites
- Structural and thermal ceramics for space applications
- Ceramics for shielding systems
- Ceramics for optics and space instruments
- Sustainable utilization of space resources and recycling

Symposium Organizers

- Loredana Santo, University of Rome Tor Vergata, Italy
- Amjad S Almansour, NASA Glenn Research Center, USA
- Malgorzata Holynska, European Space Research and Technology Centre, Netherlands
- Alamgir Karim, University of Houston, USA
- Giorgia Franchin, University of Padua, Italy

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ADVANCED PROCESSING PATHWAYS FOR MULTI-STREAM CRITICAL MATERIALS RECOVERY AND REUSE

Critical materials recovery is increasingly essential for economic growth and development as supply chains face mounting constraints. Many sustainability innovations for high tech products depend on reliable access to critical materials, which are vital to competitiveness yet vulnerable to supply chain risk, as many are difficult to substitute in batteries, solar panels, wind turbines, and energy efficient lighting, expanding their circular use is central to climate mitigation while meeting societal needs.

Addressing this challenge requires complementary resource circulation loops—from resource saving strategies (life extension, maintenance, repair, and sharing) to resource circulation strategies (reuse, refurbishment, remanufacturing, and recycling). These activities require energy for collection, recovery, and separation; impacts can be reduced by using low carbon energy and designing processes guided by techno-economic analysis (TEA) and life cycle assessment (LCA). Energy efficient and cost-effective processes are critical to improving sustainability outcomes and easing supply chain pressure through recovery and reuse.

Research is advancing innovative disassembly and high precision physical/chemical separations for selective, high yield, energy efficient recovery of valuable materials from complex products. Consumer proximate loops—longevity, repair, and reuse—often deliver the greatest energy and resource savings, underscoring the need for next generation materials, components, and product architectures that enable long service life, repairability, and easy disassembly/regeneration. Promising pathways also include waste valorization and stabilization to create alternative raw materials for functional and structural applications.

This symposium solicits abstracts on upstream (manufacturing-stage) and downstream (end of life) approaches, including recycling routes; disassembly and separation technologies; system designs and enabling infrastructure; and techno economic, environmental, and TEA/LCA based assessments that advance efficient, resilient resource circulation loops.

Proposed Session Topics

- Recovery of critical materials from end-of-life complex products (e-waste, batteries, magnets, etc.)
- Circular economy approaches for inorganic waste and wastewater valorization and stabilization
- Valorization and reuse of construction and demolition (C&D) waste and secondary aggregates
- Polymer/resin design and structural control for selective depolymerization and closed-loop recycling
- Design for circularity: Next-generation products, materials, and joining/fastening concepts
- Advanced powder processing for circular manufacturing and materials reuse
- Materials processing for longevity and repairability
- Data modeling and simulation for material-circulation strategies

Symposium Organizers

- Chiharu Tokoro, Waseda University, Japan
- Beihai Ma, Argonne National Laboratory, USA
- Enrico Bernardo, Università di Padova, Italy
- Motoyuki Iijima, Yokohama National University, Japan
- Anna Schneller, University of Augsburg, Germany
- Yuki Yamaguchi, National Institute of Advanced Industrial Science and Technology, Japan
- Henry Colorado, Universidad de Antioquia, Colombia
- Kenta Iyoki, The University of Tokyo, Japan
- Majda Pavlin, Slovenian National Building and Civil Engineering Institute, Slovenia
- Tohru Suzuki, National Institute for Materials Science, Japan
- Ziqi Sun, Queensland University of Technology, Australia

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SPECIAL FOCUSED SESSION ON ENTREPRENEURSHIP AND COMMERCIALIZATION

This session explores the essential skills and attributes that define successful materials engineers and scientists in today's dynamic landscape. Core competencies such as team building, creativity, communication, and business acumen are increasingly vital for driving innovation and achieving professional excellence. Among these, entrepreneurship and commercialization have emerged as key enablers of job creation, innovation, and career development, offering unparalleled opportunities for growth and impact. A variety of perspectives encompassing insights into the entrepreneurial process, a journey marked by freedom of thought, originality, and calculated risk-taking, are welcomed. Whether scaling up groundbreaking technologies, bridging the gap between research and industry, or fostering a spirit of innovation, the tools and strategies discussed in this session will empower participants to elevate their impact in the field.

Proposed Session Topics

- Designing a successful start-up, for example, building a diverse team, business strategy, and business idea generation
- Assembling a focused team for a successful venture or product development
- Reallocating different resources, for example human resource management
- Promoting problem-solving and creative and out-of-the-box thinking
- Creating saleable products from research results

Symposium Organizers

- Valerie Wiesner, NASA Langley Research Center, USA
- Young-Wook Kim, Worldex Industry & Trading Co., Ltd., Republic of Korea
- Surojit Gupta, University of North Dakota, USA
- Kensuke Hofuku, Kureha Corporation, Japan

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16TH GLOBAL YOUNG INVESTIGATOR FORUM ON SUSTAINABILITY

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

This year's GYIF seeks to promote a theme of Sustainability, a global issue to be addressed by the next generation of leaders and international cooperation. Presentations and posters should discuss how the work may address sustainability needs through various approaches.

Proposed Session Topics

- Sustainable materials development and architectured ceramics: Exploring novel ceramics, composites, functionally graded materials, and architectured ceramic systems with enhanced properties for structural and functional applications
- Thermo-mechanical behavior of ceramics and composites: Understanding mechanical properties, phase transformations, and thermal stability for diverse applications
- Life cycle assessment (LCA) and environmental impact: Evaluating the sustainability of ceramic and composite materials from raw material sourcing to end-of-life strategies
- Efficient manufacturing processes: Strategies for optimizing material usage, reducing energy consumption, and enhancing production efficiency in ceramic and composite processing
- Circular economy and recycling approaches: Innovations in reuse, remanufacturing, and recycling of ceramic and composite materials to minimize waste
- Design and performance of functional ceramics: Advances in piezoelectrics, batteries, energy storage, and energy harvesting materials for next-generation technologies
- Green chemistry and sustainable synthesis methods: Environmentally friendly fabrication techniques for ceramics and composites
- Bioceramics and glass for biomedical applications: Development, characterization, and clinical potential of bioceramics, bioactive glasses, and related materials for tissue engineering, implants, and regenerative medicine
- Computational design, modeling, and artificial intelligence: Multiscale modeling, physics-informed AI, high-throughput simulation, and digital tools for sustainable materials development and manufacturing
- Case studies and industrial applications: Showcasing successful research and practical implementations in ceramic and composite technology
- Career development and collaboration in ceramics research: Career development in science, technology, engineering, mathematics and medicine (STEMM), including building collaborative networks, research projects, as well as supporting different perspectives and promoting sustainability in the field of ceramics

Symposium Organizers

- Minh Chu Ngo, National Institute of Advanced Industrial Science and Technology, Japan
- Dong (Lilly) Liu, University of Oxford, UK
- Meelad Ranaiefar, NASA Glenn Research Center, USA
- Bai Cui, University of Nebraska-Lincoln, USA
- Stefano De la Pierre, Politecnico di Torino, Italy
- Mark Du, Argonne National Laboratory, USA
- Ho Jin Ma, Korea Institute of Materials Science, Korea
- Xiangyu Li, University of Tennessee, USA
- Dustin Gilmer, University of Tennessee, USA
- Sungho Lee, National Institute of Advanced Industrial Science and Technology, Japan
- Ying Chung, National Institute of Advanced Industrial Science and Technology, Japan

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