CALL FOR PAPERS

ABSTRACTS DUE JANUARY 15, 2019

www.ceramics.org/icg2019

JUNE 9–14, 2019 | BOSTON PARK PLAZA HOTEL AND TOWERS | BOSTON, MASSACHUSETTS | USA

25TH INTERNATIONAL CONGRESS ON GLASS (ICG2019)

HOSTED BY ACERS GLASS & OPTICAL MATERIALS DIVISION

100 years

ICG
International Commission on Glass

The American Ceramic Society
www.ceramics.org

25TH International Congress on Glass (ICG2019)

Hosted by ACerS Glass & Optical Materials Division

100 years

June 9–14, 2019 | Boston Park Plaza Hotel and Towers | Boston, Massachusetts | USA

Congress president:

Richard K. Brow

Missouri University of Science & Technology

brow@mst.edu

Program chair:

John C. Mauro

The Pennsylvania State University

jcm426@psu.edu

ceramics.org/icg2019

International Program Committee

Every three years, the International Commission on Glass (ICG) organizes the International Congress on Glass. The 25th International Congress on Glass (ICG2019) will be organized and hosted by The American Ceramic Society (ACerS) in Boston, Mass., USA, June 9-14, 2019.

ICG2019 provides a valuable opportunity for glass scientists and technologists to meet and disseminate information on glass science and technology. Special features of ICG2019 include 43 technical sessions under the topics of Glass Structure and Chemistry; Glass Physics; Glass Technology and Manufacturing; Emerging Applications of Glass; Glass Art; and Glass Education. Other special features include:

- Special recognition of the 100th anniversary of ACerS Glass and Optical Materials Division (GOMD)
- Sessions organized by ICG Technical Committees
- Arun K. Varshneya Festschrift
- Technical, cultural, and historical excursions in and around the Boston area.
- Student career roundtables
- Student poster contest

We anticipate a strong and vibrant program and thank our International Program Committee and session organizers for their hard work and expertise.

We welcome your participation in this important international meeting and look forward to seeing you in Boston.

50 Park Plaza at Arlington Street
Boston, MA 02116-3912
Ph: 617.426.2000

Group name:
The American Ceramic Society

Group rate from **$254** + tax is based on availability. Cut off is on or before **May 8, 2019**.

ABSTRACT SUBMISSION INSTRUCTIONS

Visit **www.ceramics.org/icg2019** to review session topics. Select "Submit Abstract" to access the Abstract Central website. Abstract title and text character limit (including spaces) is 1,500 characters. If you have questions, please contact **Marilyn Stoltz** at **mstoltz@ceramics.org** or 614-794-5868.

Symposia related to ICG Technical Committees are as indicated.

CALL FOR PAPERS ABSTRACTS DUE JANUARY 15, 2019

ceramics.org/icg2019

TECHNICAL PROGRAM

SYMPOSIUM I: GLASS STRUCTURE AND CHEMISTRY

Lead Organizer: **Doris Möncke**, National Hellenic Research Foundation, Greece, dmoencke@eie.gr

Basic aspects of glass structure will be discussed over a range of glass types from conventional oxide to chalcogenide, organic, or metallic glasses. Submissions regarding all aspects of structure-property relationships are welcome, as well as contributions to analytical techniques that help improve understanding of the materials chemistry. Sessions will cover glass chemistry from melt reactions, chemical stability, and the role of the individual elements in governing glass structure and properties.

Session 1: Definition of Network Formers and Network Modifiers (ICG TC03 & TC26)

Daniel Neuville, IPG Photonics Corp., France, neuville@ipgp.fr

Bernard Hehlen, University of Montpellier, France, bernard.hehlen@umontpellier.fr

Glass forming ability is one of the first concepts that glass scientists tried to propose rules based on structural arguments. Since the first concept was introduced by Zachariasen in 1932 based on oxide glasses, the number of glass families has increased to include chalcogenide, metallic, organic, and spin glasses. How does the Zachariasen concept of network formers, network modifiers, and intermediates apply to these other glass systems? In this session, we encourage submission of abstracts that investigate the binding or depolymerizing role of the glass constituents, to motivate discussions between the scientific communities of oxide, chalcogenide, and metallic glasses.

Session 2: Glass and Melt: Macroscopic Properties and Structure of Melt at High Temperature (ICG TC03 & TC26)

Daniel Neuville, IPG Photonics Corp., France, neuville@ipgp.fr

Bernard Hehlen, University of Montpellier, France, bernard.hehlen@umontpellier.fr

The links between a glass and its liquid counterpart are complex but fundamental for the development of new vitreous or crystalline materials. This session seeks presentations on global studies between glass and liquid at high temperature and investigations that will relate the structural or macroscopic properties of the liquid to that of the glass.

Session 3: Metallic Glasses

Yunfeng Shi, Rensselaer Polytechnic Institute, USA, shiy2@rpi.edu

Jian Luo, Corning Inc., USA, luoj2@corning.com

Metallic glasses (MGs) have emerged as one of the most exciting metallic systems in the past two decades, particularly after the discovery of bulk metallic glasses (BMGs). MGs are mostly made up by multiple metallic elements to frustrate crystallization. It is known that MGs exhibits various short-range and medium-range order, with possible anisotropy or heterogeneity. MGs possess many unique material properties that result in a number of commercial applications. This symposium will cover the composition-structure-property relation in MG systems using experimental or theoretical approaches.

Session 4: Chalcogenide Glass Structure and Chemistry

J. David Musgraves, IRradiance Glass, USA, musgraves@irradianceglass.com

Laurent Calvez, University of Rennes, France, laurent.calvez@univ-rennes1.fr

Chalcogenide glasses include sulfur, selenium, or tellurium, rather than oxygen as their glass-forming backbone. The difference in basic structural units gives chalcogenide glasses a host of structure, properties, and chemistry that differ markedly from their oxide counterparts. This session will address all aspects of chalcogenide glass formation, including experimental, modeling, and theoretical development in the understanding of the glass transition and relaxation.

Topics of interest include, but are not limited to: Structural relaxation; viscous flow and fragility; dynamic processes in the glass transition range; dynamic heterogeneities; glass-forming ability; entropy; and landscape approach.

Session 5: Borate Glasses

Efstratios I. Kamitsos, National Hellenic Research Foundation, Greece, eikam@eie.gr

Steve Feller, Coe College, USA, sfeller@coe.edu

The scope of this session is to enhance interactions among experts working on diverse areas of borate glass structure and chemistry, as they have a direct influence on glass properties and applications. Topics of the session will include: structure by spectroscopy, diffraction techniques and modeling, thermodynamics and glass structure, glass basicity and chemistry, and high temperature and high pressure studies.

Session 6: Phosphate Glasses

Doris Möncke, National Hellenic Research Foundation, Greece, dmoencke@eie.gr

Richard K. Brow, Missouri University of Science & Technology, USA, brow@mst.edu

Ladislav Koudelka, University Pardubice, Czech Republic, ladislav.koudelka@upce.cz

Phosphate glasses containing high loads of rare-earth ions are well-established as laser glass, amplifiers, or waveguides. Studying the structure and chemistry of phosphate glass systems, including the interconnectivity with other elements, is of crucial interest. Phosphates are excellent glass formers that can be combined with many elements, including intermediate oxides such as tellurites or tungstates, which are interesting for their high refractive index, high third-order susceptibility, and applications in nonlinear optics. Phosphates are also excellent stabilizing high-ionic glass systems from sulphate-phosphates, to halogenide glasses, including ion-conducting silver iodide containing glasses, or fluoride-phosphate glasses that are used as a host matrix for all types of photoluminescent dopants.

Additional applications include such extremes as hazardous waste immobilization or fertilizers, or applications from filter via sealing to bioglasses.

Session 7: Silicate Glass Structure

Randall Youngman, Corning Inc., USA, youngmanre@corning.com
Daniel Neuville, Institut de Physique du Globe de Paris, France, neuville@ipgp.fr

This session will look at experimental and computational studies of silicate glasses, focusing on atomic structure elucidation over a variety of length scales. Studies of glass compositions ranging from pure silica to those containing other components, but rich in silicon dioxide, are appropriate topics for presentation. Advanced experimental methods are also sought for discussion: Solid-state nuclear magnetic resonance; vibrational spectroscopies; synchrotron–based methods like neutron scattering and high energy X-ray diffraction, and their use in understanding the critical linkage between glass structure and properties. Advanced modeling studies of silicate-based glasses, and especially the powerful combination of both modeling and experimental approaches, are also encouraged.

Session 8: Crystallization of Glasses and Glass-Ceramics (ICG TC07)

Mark Davis, Schott, USA, mark.davis@us.schott.com
Ralf Müller, Bundesanstalt fur Materialforschung und-prufung, Germany, ralf.mueller@bam.de)

Topics covered will include, but are not limited to: Fundamental approaches to nucleation and crystal growth (the interplay of theory, modeling, and experiment); experimental studies (compositional and processing influences); advanced methods, techniques and characterization tools (in situ, real time); role of nucleation agents (halogens, rare-earth and transition metal oxides, noble metals); properties of glass-ceramics (thermal, mechanical, electrical, optical, chemical); processing and glass crystallization phenomena (sintered glass-ceramics, composites, solders, seals, coatings, fibers, etc.); microstructure/property relationships in glass-ceramics (strength, transparency, chemical resistance); novel processing techniques (laser sintering, sol-gel, field-induced nucleation, etc.); commercial and new glass-ceramic applications (appliances, armor, biomedical, dental, optical, seals); crystallization phenomena in related materials (metallic glasses, polymer glasses); and crystallization phenomena specifically relevant to earth and planetary sciences (crystal size distributions, interaction with bubble formation, and impact on eruptive processes).

Session 9: Sol-Gel Glasses

Lisa Klein, Rutgers University, USA, licklein@rutgers.edu
Andrei Jitianu, City University of New York, USA, andrei.jitianu@lehman.cuny.edu

Sol-gel processing uses low-temperature approaches to produce glasses and optical materials with high purity, excellent homogeneity, and well-controlled morphology. This symposium will focus on all aspects of sol-gel derived and nanostructured materials, including: Sol-gel routes to bulk, fiber, thin film, coating, colloidal, and porous materials; sol-gel routes to hybrid organic-inorganic materials; structural characterization using spectroscopic, scattering, and imaging techniques; new functionalities based on the optical, electrical, thermal, catalytic, mechanical, chemical, and biomedical properties; and new sol-gel materials and products for energy applications.

Session 10: Metal-Organic Framework Glasses

Thomas Bennett, Cambridge University, UK, tdb35@cam.ac.uk

Metal-organic frameworks comprise an enormous class of materials, formed from inorganic nodes connected by organic ligands into three-dimensional networks. Over 55,000 exist and are primarily investigated for their abilities in gas sorption, drug delivery, separation and catalysis. Recently, they have also been shown to be a family of glass-formers. These melt-quenched glasses have random networks of transition metal ions linked by organic ligands, and so exist outside of the inorganic, organic and metallic categories currently known. This session will explore the latest research in the noncrystalline metal-organic framework field, involving synthesis methods, structural characterization, physical and chemical properties, and applications.

Session 11: Glass-Organic Adhesion

Aravind Rammohan, Corning Inc., USA, rammohana@corning.com
Eunseog Cho, Samsung, Korea, eunseog.cho@samsung.com
Hyunbin Kim, Corning Precision Materials, Korea, hyunbin.kim@corning.com

Organic-inorganic adhesion is critical for numerous practical applications, such as protective coatings, adhesives, thin-film transistors, etc. Each organic and inorganic surface is unique and confers its own material attributes (e.g., Young's modulus or coefficient of thermal expansion) to the interface. Inorganic substrates including high-purity fused silica, ion-exchanged aluminosilicate glass, glass-crystal composites, soda lime silicate, borosilicate glasses and so on are commercially available and are widely used in industry. Thermally stable organic polymers such as polyimide (e.g., Kapton, UPILEX) are often used in high-temperature applications such as flexible display substrates, protective coatings, and adhesives because of its excellent mechanical, thermal, and chemical-resistant properties. This session explores the details of this organic-inorganic materials interface through computation and experiments, identifying key factors that modulate the interfacial behavior and understanding the role of glass/polymer chemistry, surface morphology and roughness, environmental parameters (e.g. temperature, pressure, pH) for potentially conferring novel attributes to the interface.

SYMPOSIUM II: GLASS PHYSICS

Lead Organizer: **Morten M. Smedskjaer**, Aalborg University, Denmark, mos@bio.aau.dk

Glassy materials play a vital role in a multitude of scientific and technological disciplines, and research in glass occurs at the interface of materials chemistry and physics, engineering, and industrial manufacturing. These materials have traditionally been designed and processed empirically through trial-and-error experimentation. To advance the field of glass science and technology, an unprecedented level of understanding of glass physics is required.

This symposium will address fundamental principles and applications of glass physics, across a variety of chemistries (oxide, metallic, organic, chalcogenide etc.) and length scales (from the atomistic glass structure to large-scale behavior of glass products), and including contributions from experiments, theory, and modeling. Session topics will cover the fundamentals of glass formation and crystallization, modeling and theory development, and changes in various macroscopic properties as a function of chemistry and processing.

CALL FOR PAPERS ABSTRACTS DUE JANUARY 15, 2019

Session 1: Glass Transition and Relaxation

Gerardo Naumis, National Autonomous University of Mexico, Mexico, naumis@fisica.unam.mx

Ozgur Gulbiten, Corning Inc., USA, gulbiteno@corning.com

This session will focus on key aspects of relaxation relevant for the glass transition. Experimental, modeling, and theoretical developments will be considered. The topics include: Structural relaxation, viscosity and fragility; dynamic heterogeneities; and new algorithms for modeling, rigidity, pressure and damage effects. All glass systems including oxides, metallic glasses, organic glasses and chalcogenides will be covered. Contributions from other systems that share the same phenomenology like granular matter, colloids and jammed systems are also welcome.

Session 2: Nucleation, Crystallization, and Phase Separation

Ken Kelton, Washington University in St. Louis, USA, kfk@physics.wustl.edu

Edgar D. Zanotto, Federal University of Sao Carlos, Brazil, dedz@ufscar.br

This session will focus on nucleation, crystallization and phase separation—processes that play a key role in glass formation and crystallization. Experimental, modeling and theoretical investigations will be considered. Topics will include: Steady-state and time-dependent nucleation; the Classical Theory, as well as more advanced models for nucleation; the role of the glass structure and fragility in these processes; kinetic Monte Carlo and molecular dynamics studies; finite size effects and the influence of surfaces; and immiscibility regions in the liquid and glass. Studies including all glass systems, oxide, metallic, organic and chalcogenide, are appropriate.

Session 3: Glass Under Extreme Conditions

Anita Zeidler, University of Bath, UK, A.Zeidler@bath.ac.uk

Shinji Kohara, Japan Synchrotron Radiation Research Institute, Japan, skohara@icloud.com

Extreme conditions are manifold. This session will focus of the influence of these extreme conditions on the structure and properties of glasses. Potential topics include: Properties of glasses at high pressure and/or high temperature; effect of temperature on synthesis and the properties of glasses; levitation techniques; high magnetic fields; and radiation damage to glasses.

Session 4: Topological Constraint Theory of Glass

Mathieu Bauchy, University of California Los Angeles, USA, bauchy@ucla.edu

N.M. Anoop Krishnan, Indian Institute of Technology Delhi, India, krishnan@iitd.ac.in

Topological engineering and molecular rigidity concepts have enabled many breakthroughs in our understanding of glasses and amorphous solids. This session will focus on recent advances in topological modeling and cover experimental, computational, and theoretical studies. The topics of interest include, but are not restricted to: Atomic topology of glasses, self-organization, intermediate phase; effect of temperature, pressure, or irradiation of atomic topology; topological modeling applied to the prediction of glasses' properties; advances in computational approaches applied to rigidity and topology; and topological constraint theory beyond glasses (granular materials, gels, disordered solids, phase-change materials, proteins, etc.)

Session 5: Modeling and Simulation (ICG TC27)

Jincheng Du, University of North Texas, USA, jincheng.du@unt.edu

Walter Kob, University of Montpellier, France, walter.kob@umontpellier.fr

Modeling and simulation play an important role in glass research, from understanding glass structure, to composition – property relations, to new composition and process design. This session will focus on atomistic simulation schemes and their applications to understand complex glass structures, and structural origin of properties. Other simulation methods, such as machine learning, big data and their applications in predictive modeling of glass properties will be covered. The topics will include, but are not limited to: Development of empirical potentials to simulate multicomponent glasses, e.g. glasses contain boron oxide and phosphorus oxide; study of glass/water reaction and interactions; simulation of mechanical behaviors of glasses; simulation of phase separation and crystal nucleation in glasses and melts; interfacial structure and behaviors of glass and other materials; and ab initio molecular dynamics simulations of glasses.

Session 6: Glass Surfaces (ICG TC19)

Seong Kim, The Pennsylvania State University, USA, shkim@engr.psu.edu

Matthew Linford, Bringham Young University, USA, mrlinford@chem.byu.edu

Ilkay Sökmen, Sisecam, Turkey, isokmen@sisecam.com

Surface properties of glass materials play critical roles in practical applications in various fields. Thus, fundamental understanding of glass surface science is important for improvement of existing as well as development of new functionalities of various glass materials. This session will be an active discussion forum sharing and discussing new advancements in compositional and structural characterizations of glass surfaces and how chemical reactivity and mechanical durability of glass materials can be explained, interpreted, or predicted with new insights from such characterizations. Experimental, theoretical, and computational works are all considered. All types of glass materials will be covered including oxides, metallic glasses, organic glasses and chalcogenides.

Session 7: Mean-Field and Low-Dimensional Theories of Glasses

Lisa Manning, Syracuse University, USA, mmanning@syr.edu

Patrick Charbonneau, Duke University, USA, patrick.charbonneau@duke.edu

This session will focus on recent theoretical and computational advances to understand the glass transition and glassy rheology in structural glasses, using high-dimensional and mean field models and connecting them to results in two and three dimensions. Specific topics include: Theoretical predictions for glasses and jammed solids in infinite dimensions; jamming, packing, and glass transitions in four and higher dimensions; new computational models for accessing glass transition (including swap Monte Carlo); Computational methods for analyzing vibrational spectrum in 2- and 3-D; and methods for identifying low-energy excitations and two-level systems in structural glasses.

Session 8: Optical Properties of Glass

Mingying Peng, South China University of Technology, China, pengmingying@scut.edu.cn

Qinyuan Zhang, South China University of Technology, China, qyzhang@scut.edu.cn

Zhongmin Yang, South China University of Technology, China, yangzm@scut.edu.cn

This session will focus on the optical properties of various glass materials, including the design, preparation, and performance of optical devices. The topics will include luminescence dynamics, laser glass, glass fiber, fiber laser, and fluorescent glass or hybrid glass for emerging fields such as lighting, display, etc. Attention will also be given to the interaction of laser with glass to understand the mechanism of glass failure, especially for high power fiber laser or precise glass machining using laser etc.

Session 9: Strength, Fracture, and the Mechanical Properties of Glasses (ICG TC06)

Lothar Wondraczek, University of Jena, Germany, lothar.wondraczek@uni-jena.de

Morten Smedskjaer, Aalborg University, Denmark, mos@bio.aau.dk

This session will focus on theoretical and experimental aspects of strength, fracture, and mechanical properties of noncrystalline materials, covering the fields of metallic, inorganic nonoxide, and oxide glasses, in addition to recently emerging hybrid glass systems. The reported research will include results at all length scales, from the atomistic details of the crack tip to the large-scale behavior of civil engineering structures. Particular attention will be given to the design of strong, tough, and damage-resistant glasses based on fundamental understanding of the structural origins of elasticity, plasticity, and fracture. Topics will include but are not limited to: deformation processes; subcritical crack growth and fatigue; dynamic fracture and fractography; network topology and elastic properties; design of glasses with superior mechanical properties; structural connection to deformation and fracture; toughening strategies; fundamentals of crack tip formation and propagation; and application of in situ techniques.

Session 10: Acoustic Properties of Glass

Benoit Rufflé, University of Montpellier, France, benoit.ruffle@umontpellier.fr

Anne Tanguy, University of Lyon, France, anne.tanguy@insa-lyon.fr

Elasticity, which is intimately related to acoustics, is a fundamental property of materials and is used in the determination of various physical properties in glass science, such as thermal shock resistance, thermal optical coefficients or fracture toughness. Indeed, the elastic modulus gives a global view of a material stiffness and reflects both the network connectivity and the inter-atomic potentials. The disorder nature of the glass itself gives rise to peculiar elastic/acoustic properties.

This session will welcome experimental, numerical and theoretical contributions focused on the understanding of elastic/sound properties in glasses and melts. Potential topics: Elasticity and glass structure; anelasticity and sound absorption; elastic heterogeneity and disorder; temperature, pressure effects; and new experimental or numerical methods.

Session 11: Thermal Properties of Glass

Lina Hu, Shandong University, China, hulina0850@sina.com

Limin Wang, Yanshan University, China, limin_wang@ysu.edu.cn

Jacob König, Institute Jozef Stefan, Slovenia, jakob.konig@ijs.si

The studies of thermal properties are crucial to understand the energy states and the stability (relaxation and phase transition) in glasses and the corresponding liquids. This session will be organized to address essential problems and new achievements in the thermal properties of glasses. Inorganic, chalcogenide, molecular, metallic and ionic glasses produced by the traditional melt-quenching methods or other advanced techniques with various forms like fibers, foams, ribbons, films or bulk will be covered. A wide range of subjects concerning the studies of thermal expansion, specific heat capacity, thermal conductivity, fictive temperature and characteristic transformation temperatures, as well as various enthalpy and entropy behaviors involved in relaxation, rejuvenation and aging.

Session 12: Electromagnetic Properties of Glass

Gang Chen, Ohio University, USA, cheng3@ohio.edu

B.G. Potter, University of Arizona, USA, bgpotter@email.arizona.edu

Electrical and magnetic properties of glass and amorphous materials enable technological advancements in many fields including, but not limited to photovoltaics, computer memory, radiation detection, fuel cells, thermoelectrics, and batteries. This session will focus on fundamental understanding of the electrical and magnetic properties of glass and glass-based composite materials. Topics include: Experimental and theoretical studies of charge and energy transport; electronic and ionic conductivity; dielectricity; ferroelectricity; piezoelectricity; metal-insulator transition; superconductivity and magnetism of disordered solids such as amorphous semiconductors; ionic conductors; spin glasses; and bulk metallic glasses.

SYMPOSIUM III: GLASS TECHNOLOGY AND MANUFACTURING

Lead Organizer: **Mathieu Hubert**, Corning Inc., USA, hubertm@corning.com

Glass has been present on our planet in the form of natural glasses (such as obsidian) for hundreds of thousands of years, and the manufacture of "synthetic" glass was invented more than five millennia ago. Throughout the ages, skilled glass technologists and scientists have improved its technology and manufacturing processes, and glass has become an essential part of our everyday lives. Despite its already rich history, glass manufacture keeps innovating to produce better and cheaper products while reducing the energetic and environmental footprints of the glass-making process.

This symposium welcomes contributions highlighting the key role of glass technology and manufacture and the constant progresses in its different key aspects, from the raw materials to the melt, from glass furnaces to the sustainability of the process, and from traditional forming processes to new techniques such as glass 3D printing.

CALL FOR PAPERS ABSTRACTS DUE JANUARY 15, 2019

Session 1: Raw Materials, Batch Melting, and Fining (TC18)

Jaroslav Klouzek, University of Chemistry and Technology Prague, Czech Republic, Jaroslav.Klouzek@vscht.cz

Mathieu Hubert, Corning, USA, hubertm@corning.com

In modern glassmaking, glass manufacturers must carry out careful selection of their raw materials and ensure that their batch is properly converted into a melt, followed by efficient fining. Each of these steps is essential to the production of glass articles with good quality and free of defects, and can also have a significant impact on the production costs of the glass. Raw materials, batch melting and fining are critical components of the glass production and improvements and innovations on these topics are a strong driver of the glass industry.

This session welcomes both fundamental and applied contributions related to raw materials selection and alternative raw materials, batching strategies, batch melting kinetics and thermodynamics, as well as studies on fining of glass melts.

Session 2: Glass Furnace Operation and Design (TC21)

Aaron Huber, Johns Manville, USA, hubera@jm.com

With the everyday acceptance of modeling, TC21 (formerly modeling) combined with TC15 (sensors and controls) to form a new TC21 committee with the focus on Glass Furnace Design and Operation. The TC21 committee requests papers for this session with a focus on designs or new technology leading to improvements for glass furnaces and operations. Improvements in emissions, throughput, life, energy and quality are all important aspects for a glass furnace. This session invites papers presenting the concept or technology, demonstrating the difference it will make with modeling and implementation results.

Session 3: Glass-Refractory Interactions

Irene Peterson, Corning Inc., USA, petersonim@corning.com

Hong Li, Nippon Electric Glass, USA, hli@ppg.com

The performance of the tank refractories is critical to the efficient production of high-quality glass. This session will include talks on: New refractories; the relationship between microstructure, chemistry and performance of refractories; measurements of thermal and physical properties of refractories; behavior of refractories in service, changes of chemistry and microstructure during service; corrosion; glass – refractory interaction; and failure mechanisms.

Session 4: Glass Forming Operations

Adnan Karadag, Şişecam, Turkey, adkaradag@sisecam.com

Glass's ability to form in all kinds of shapes is one of the main reasons of its omnipresence in our everyday life. Glass manufacturers have developed a wide array of forming techniques to produce all kinds of articles such as flat glass, fiber glass, container glass, etc. This session welcomes contributions covering the different technical aspects and innovations in the field of forming techniques.

Session 5: Towards Carbon-Free Glass Production

Anne-Jans Faber, CelSian Glass & Solar, Netherlands, anne-jans.faber@celsian.nl

Oscar Verheijen, CelSian Glass & Solar, Netherlands, oscar.verheijen@celsian.nl

The worldwide energy transition to durable energy resources will have major consequences for the glass manufacturing industry. Today the carbon dioxide emissions for the production of 1 kg of glass typically vary between 0.4 and 1 kg, depending on glass type and quality, furnace type and process efficiency. In this session the technological challenges for the glass industry to face the Paris climate agreement will be the leading topic. We invite speakers to present their view on innovative melting technologies enabling carbon dioxide neutral glass production, including flexible hybrid melters, full electric melters, application of low carbon combustion processes and use of carbonate-free raw materials.

Session 6: Glass Recycling and Sustainability

Stefano Ceola, Stazione Sperimentale del Vetro, Italy, sceola@spevetro.it

The recycling of crushed waste glass, called cullet, can potentially be used everywhere for the production of new glass articles. In such case the end-of-life glass needs to be collected separately from the rest of the waste, to be delivered to specialized facilities for proper treatment (grinding, cleaning, sorting, etc.) and to be supplied to glass industries under the form of furnace-ready cullet.

Due to its increasing quality and its multiple benefits, cullet represents a large part of the batch charge, reaching up to 90% of the input feed in some European plants. Its usage gives so many energetic and environmental advantages, that it has become an irreplaceable component in the majority of large-scale production contexts. As such, glass industry has built a large experience in the usage of cullet and has learned to overcome the difficulties connected to its use, developing suitable technologies and a specific know-how. This session welcomes papers highlighting the different aspects of glass recycling, its impact on glass production, on the environment and its key role in the sustainability of the glass industry.

Session 7: 3D Printing of Glass and Rapid Prototyping

Laura Cook, Corning Inc., USA, cooklb@corning.com
Neil Palumbo, Corning Inc., USA, palumboan@corning.com

Traditional manufacturing and prototyping continually evolves to include faster, cheaper, and more customizable methods as a result of changing demands and technological advances. Additive manufacturing, or 3D printing, is revolutionizing this industry by providing cost-effective, agile, customizable solutions in record time. Materials of the most interest include polymers and metals, while others such as composites and biomaterials are advancing rapidly. Glass and glass-based materials provide exclusive value to traditionally printable materials, including unique temperature, chemical, and electrical properties and are a highlight to the overall value 3D printing provides. This session invites abstracts pertaining to the research, development, and application of glass 3D printing and rapid prototyping as it relates to forming practices, glass quality, and material properties, as well as studies on fundamental theories within.

SYMPOSIUM IV: EMERGING APPLICATIONS OF GLASS

Lead Organizer: **Juejun Hu**, Massachusetts Institute of Technology, USA, hujuejun@mit.edu

SESSION 1: Energy and Environmental Aspects–Fundamentals and Application

Joachim Deubener, Clausthal University of Technology, Germany, joachim.deubener@tu-clausthal.de

Glass can be engineered with a wide range of properties and in many different forms to make it important in both active and passive applications for current and emerging energy and environmental technologies. This session aims to draw an arc from the fundamental approaches (interplay of theory, modeling and experiment) via material properties (compositional influences and signatures) and their characterization (in situ, ex situ) to manufacturing (novel processing techniques), long-time performance and recycling aspects (cradle-to-cradle) of glasses and glass systems for energy/environmental applications.

Current applications and future directions in the fields of architecture, mobility, power as well as chemical (catalysis) and biological (biomass) interactions will be addressed to foster the value of thinking about designed-in sustainable solutions in their particular areas of scientific or technical glass research. The session will be subdivided in the following: Glass substrates, active glassy materials; and thin-film technologies.

Session 2: Glass in Healthcare (TC04)

Julian Jones, Imperial College London, UK, julian.r.jones@imperial.ac.uk
Delia Brauer, Friedrich-Schiller-Universität Jena, Germany, delia.brauer@uni-jena.de
Qiang Fu, Corning Inc., USA, fuq2@corning.com

Bioactive glasses have been used for bone regeneration since the 1980s, but recent applications have grown into wound healing, dental remineralization or targeted delivery of therapeutic ions. This session addresses biomedical glasses composed of silicate, borate, and phosphate compositions, melt-derived, sol-gel and mesoporous glasses, as well as preparation of three-dimensional architectures such as scaffolds, particles and fibers, including nanomaterials, coatings and composites.

Topics to be covered include but are not limited to: Compositional design of glasses for biomedical applications; characterization and modeling of structure and properties; interactions of glasses with the biological environment; applications in regenerative medicine and tissue engineering; glasses and glass-ceramics in dentistry; hybrids and nanoparticles for therapeutic use; and commercialization and manufacturing of bioactive glass products.

CALL FOR PAPERS ABSTRACTS DUE JANUARY 15, 2019

Session 3: Glass-Based Integrated Optics

Hongtao Lin, Zhejiang University, China, hometown@mit.edu

Tian Gu, Massachusetts Institute of Technology, USA, gutian@mit.edu

Innovations in glass-based photonics have revolutionized a wide range of technologies in integrated optics, including both passive and active optical devices. The advancements of glass in photonic and electronic devices continue contributing to the reform of information technology. This session invites the latest development in these exciting areas spanning fundamental materials properties, novel devices, and system-level applications of glass photonics in photonic integrated circuits and fiber optics.

Topics of interest include: Advanced glass-based optical technologies for long-haul to short-reach communication; applications of innovative glass-based optical devices and architectures, including but not limited to, waveguides, fibers, optical interposers, diffractive optics, thin-film optical coatings, and integrated photonic systems; phase change materials for nonvolatile electronic and photonic applications; novel oxide and non-oxide glass compositions and fabrication technology for light guiding, emission and nonlinear signal processing; and advanced glass fabrication and integration techniques for integrated optics.

Session 4: Glass in Sensor Technology

Pierre Lucas, University of Arizona, USA, pierre@email.arizona.edu

Younès Messaddeq, Université Laval, Canada, Younes.Messaddeq@copl.ulaval.ca

This session welcomes presentations covering all aspects of glass for sensor technology. This includes but is not limited to: Optical sensing over all wavelength ranges (UV, visible, IR and terahertz); electrochemical and ionic sensing; Brillouin sensing; and radiation sensing and imaging. All glassy platforms for sensing are of interest, including, fiber, film, bulk or integrated circuits. This session will cover both the fundamental and applied aspects of glassy materials for sensing from materials properties to sensor design. This includes both passive and active glasses such as luminescent sensors and scintillators.

Session 5: Glass for Buildings and Transportation

Mehran Arbab, PPG, USA, arbab@ppg.com

Andriy Romanyuk, GlasTrösch AG, a.romanyuk@glastroesch.ch

Glass is indispensable in architectural and vehicular design. How will glass science and industry respond to the technical requirements of tomorrow's smart buildings, autonomous cars and advanced aircraft, and will glass remain compatible with future sustainability requirements? This session will consider the fundamental aspects of glassmaking and use in building and transportation industries. Topics of interest may include: issues and opportunities with glass use (building façade, building interior, vehicles); future of glass in autonomous vehicles (e.g., electromagnetic radiation attenuation); aesthetics and optical quality including color and distortion; coatings on glass; color design and color control for glass and coated glass; challenges in glass making including energy efficiency and raw materials; fabricated glass quality and processes; thin glass in architecture and transportation; glass strength (surface flaws, chemical tempering, thermal tempering); surface chemistry (corrosion, storage, cleaning, marking, water management); and sustainability in production and use.

Session 6: Glass and Glass Ceramics for Packaging and Sealing

Steve Dai, Sandia National Laboratories, USA, sxdai@sandia.gov

Amber Tremper, Corning Inc., USA, TremperAL@corning.com

Robert Hettler, Schott Electronic Packaging, Germany, robert.hettler@schott.com

This session invites presentations on glass and glass-ceramic technologies in two broad application areas: electronic/microelectronic packaging and hermetic glass/glass-ceramic-to-metals seals. Topics include: Material development and characterization, material compatibility, interfacial reactions, stress simulation and validation, reliability, failure analysis, device aging and lifetime, and device for extreme environment. Contributions covering fundamental materials sciences, novel processing and characterization techniques, best-in-class engineering practices, and high-performance glasses and glass-ceramics enabled devices and microsystems are sought.

Session 7: Photosensitive Glasses and Glass-Ceramics

Nadja Lönnroth, Corning Inc., USA, LonnrothNT@corning.com

This session covers photosensitivity in a broad range, investigating the materials interaction with electromagnetic radiation and how the radiation changes the materials properties. Traditionally UV wavelengths have been utilized to induce, for example, colorization, refractive index and density change and crystallization by addition of elements sensitive to the radiation which upon illumination and subsequent heat treatment induces the new properties. Another well-known field is photochromism, where the additions of elements forming the needed silverhalide crystals induce photochromic behavior in certain glass compositions. Similarly solarization is the unwanted colorization of a glass or glass ceramic due to short wavelength radiation interacting with the material.

Topics of interest include but are not limited to: New photosensitive glasses or glass ceramics; understanding the underlying radiation-material interaction phenomena; new ways to utilize existing photosensitive materials or new devices enabled by photosensitivity.

Session 8: Glass for Nuclear Waste Immobilization (TC05)

Olivier Pinet, French Alternative Energies and Atomic Energy Commission, France, olivier.pinet@cea.fr

The session gathers experts from the area of material science, process and technology to discuss the present and future challenges in the field of vitrification of hazardous waste.

The session seeks presentations in the following areas: Fundamentals of waste glass, glass long term durability, waste glass properties, vitrification process, vitrification technology, self-heating and self-irradiation effects in glasses containing radioactive waste, waste glass and vitrification process modeling, and industrial experience feedback.

Session 9: Quantum Dots and Nanocrystals in Glasses

Jong Heo, Pohang University of Science and Technology, Korea, jheo@postech.ac.kr

Heike Ebendorff-Heidepriem, University of Adelaide, Australia, heike.ebendorff@adelaide.edu.au

Takumi Fujiwara, Tohoku University, Japan, fujiwara@laser.apph.tohoku.ac.jp

Nanostructured glasses with built-in quantum dots and nanocrystals offer emerging applications compared to single-phase glasses. The unique characteristics of size-sensitive optical properties from quantum dots provide new opportunities for nonlinear optics, versatile fiber optic amplifiers, and color converters for light-emitting diodes. Nanocrystals with tailored characteristics such as high ionic conductivity and efficient emission characteristics also provide potential applications for all solid-state batteries and advanced display technologies. This session will provide a platform for discussing the significant achievements and potentials of this new generation of the glasses. We will focus especially on innovative ways to control the dynamics and spatial distribution of nanocrystals, which are important for the realization of powerful optics. Session topics include, but are not limited to: Innovative process methods, light interactions with nanocrystals and quantum dots, optical spectroscopy, advanced analytical methods in addition to potential applications for optical communication, and lighting and energy devices.

Session 10: Glass Materials and Devices for Photonic Systems (TC20)

Giancarlo Righini, Enrico Fermi Centre, Italy, giancarlo.righini@centrofermi.it

Shibin Jiang, AdValue Photonics, USA, sjiang@advaluephotonics.com

The session addresses research and development of new or advanced glass materials and technologies that have the potential for innovation in optics and photonics, with special concern for lighting and displays, communications, energy, and laser technologies.

Session 11: Fiberglass (TC28)

Yuanzheng Yue, Aalborg University, yy@bio.aau.dk

Hong Li, Nippon Electric Glass, USA, hli@ppg.com

Glass fibers play a critical role in renewable, green energy generation and in energy efficiency improvement because they are important materials used in wind power systems (turbine blades) and thermal insulation applications (glass wool fibers). Besides their practical usages, glass fibers are also of scientific interest for being in a state far from equilibrium in contrast to the annealed state of glass, plus their significantly higher surface areas. This session will address both scientific and technological problems for both continuous and discontinuous (wool) glass fibers. Interdisciplinary topics of the session will include: Fiber glass microstructure; relaxation behavior, fiber spinnability; melt rheology; mechanical properties; fiber surface; chemical durability; biosolubility; high-temperature stability; thermal insulating behavior; fiber spinning technology; special compositions; process modeling and controlling; fiber recycling; and composite design. The future trends of the fiberglass science and technology will be also discussed.

Session 12: Multimaterial Fibers

Fabien Sorin, École polytechnique fédérale de Lausanne, Switzerland, fabien.sorin@epfl.ch

Sylvain Danto, University of Bordeaux, France, sylvain.danto@u-bordeaux.fr

Alexander Stolyarov, Massachusetts Institute of Technology Lincoln Laboratory, USA, sasha@affoa.org

Multimaterial fibers are high-aspect ratio, filament-like structures integrating different materials at prescribed positions and with micro-to nanoscale feature sizes. Such integrated fiber architectures enable to impart thin and flexible fibers with not only optical but also other functionality such as electronic, optoelectronic, mechanical, acoustic, or thermal. Their controllable geometry and flexibility make multimaterial fibers ideal candidates for next generation devices such as biomedical probes, surgery tools, robotics, flexible optoelectronics, sensing, advanced textiles and many more. Among the various functional materials integrated within fibers, glasses constitute an important building block owing to their processing attributes and the ability to widely tune their functional properties.

A variety of soft- and high-T_g glasses have been used in the form of cladding, fiber core, thin film, nanowires and microspheres. Whether glasses were directly co-drawn from a solid preform, melt spun, deposited onto a fiber post-draw, or realized any other way, their integration in novel confined and elongated geometries has triggered intense research. This symposium aims to present and discuss the latest advances in the field of multimaterial fibers, particularly concerning the study and use of glassy materials within fiber-based devices. Contributions are welcomed, both at the fundamental and applied levels, regarding processing, phase change (crystallization) and engineering of new glasses within multimaterial fibers. We also encourage work investigating the tailoring and exploitation of glass functional properties, as well as technological applications of multimaterial fiber- and fabric-based devices.

Session 13: Open Session on Glasses for Pharma (TC12)

Massimo Guglielmi, University of Padova, Dipartimento di Ingegneria Industriale, Italy, massimo.guglielmi@unipd.it

Daniele Zuccato, Stevanato Group, Italy, daniele.zuccato@stevanatogroup.com

Holger Roehl, Roche, Switzerland, holger.roehl@roche.com

Glass is the optimal material for storing pharmaceutical products. The market needs for pharmaceutical glass containers increase and the requirements in terms of mechanical resistance, chemical durability, production flexibility and costs become more and more stringent. The composition of glass, as well the manufacturing processes, have been changing over the years to fulfil the requirements of the pharma industry, and the efforts to optimize both are far to be at the end. This session addresses the main topics in the field, starting from contributions by the members of ICG TC12–Pharma Packaging.

Topics to be covered include but are not limited to:

- Advances in glass compositions
- Advances in production processes
- Chemical properties and interaction of glass with drugs (extractable, leachable, delamination, etc.)
- Mechanical resistance of pharmaceutical glass containers
- Regulatory issues
- Analytical issues

The session will end with a roundtable on the hot topics in the field.

CALL FOR PAPERS ABSTRACTS DUE JANUARY 15, 2019

SYMPOSIUM V: GLASS EDUCATION (TC23)

Lead Contact: **Ana Candida Rodrigues,** Federal University of São Carlos, Brazil,acmr@ufscar.br

In this symposium, we encourage discussion from both scientific and industrial points of view to bring the two in closer collaboration for the training of qualified people. Examples that reinforce the importance of professional training and suggestions for activities that may fill possible gaps in the relationship between industry and academy with respect to glass-related education are welcomed.

SYMPOSIUM VI: ARCHAEOMETRY (TC17)

Lead Contact: **Stephen P. Koob**, The Corning Museum of Glass, Corning NY, USA, koobsp@cmog.org

Robert H. Brill, The Corning Museum of Glass., Corning NY, USA

This symposium is a specialized forum for research and application of archaeometry and archaeological sciences in glassy materials, covering the full spectrum of topics, techniques, chronologies and regions.

Proposed sessions include:

Archaeometry: Archaeometry is the investigation of ancient and historical glasses by means of any scientific methods (chemical, isotopic, or any other laboratory technique). It is directed toward solving problems of origin, dating, and provenance of glass objects whether they are delicate vessels, shards, beads, tesserae, frits, faience, or slags. Any presentations or case studies of any archaeological glassy materials are welcome in this session, no matter if the study involves a delicate vessel, glass shards, tesserae, frits or slags.

Conservation problems: This session's focus is the conservation of vitreous materials and the deterioration of glasses, with less emphasis on the understanding of early glassmaking, but more on historic and current compositional problems and encompasses the conservation of our cultural heritage, as well as important problems in modern glass science. Corrosion studies have been a major theme in the field of biomedical glasses, but the weathering of archaeological glasses provides real case studies for assessing the long-term stability for vitrified toxic or radioactive waste. Presentations on other deterioration problems, from bio-degradation to color changes under UV or sun light (solarization) are welcome as well. Papers focused on the protection of archaeological and historic glasses (on site or in museums or stained glass windows exposed to the elements) and the recommendations for their conservation and protection are also welcomed.

New techniques of analyses in the context of archaeometry: With the advancement of instrumental analysis, portable instruments, studies presenting case studies using these new techniques will be of great interest to the community. In addition, results from round robin tests or the comparison of sensitivities and detection limits of various techniques are just as valuable.

SYMPOSIUM VII: ARUN K. VARSHNEYA FESTSCHRIFT

Organizers: **John C. Mauro**, The Pennsylvania State University, USA, jcm426@psu.edu

Vijay Jain, Savannah River Remediation, USA, Vijay.Jain@srs.gov

This symposium honors Professor Arun K. Varshneya—educator, mentor, scholar, and entrepreneur. Dr. Varshneya, Emeritus Professor of Glass Science and Engineering at Alfred University and president of Saxon Glass Technologies has dedicated nearly six decades of his life to the advancement of glass science, engineering, and technology. Born in Agra, India, Arun stands on the shoulders of the late Professor Ronald W. Douglas of Sheffield University (UK) for his undergraduate education and the late Professor Alfred R. Cooper of Case Western Reserve University for his graduate education. Since his first technical presentations at the American Ceramic Society Annual Meeting in 1966 and at the International Congress on Glass in 1968, he has become one of the more recognized faces among global glass professionals. Varshneya's leadership as an educator, mentor, scholar, and entrepreneur is clearly exemplified by many of the achievements that have paved the path for the future generations of glass scientists and engineers worldwide.

As an educator, or "Glass Guru," Varshneya is best known for his textbook, *Fundamentals of Inorganic Glasses*, soon to appear in its third edition. The book combines a rigorous approach to glass science and technology with an accessible writing style, making it an ideal textbook for both upper-level undergraduates and graduate students. In addition to Alfred, he has taught short courses on glass science and technology in many countries across the globe. He is a very engaging lecturer whose passion for glass science is truly contagious.

As a scholar, Varshneya and his students have worked and published on topics covering almost every physical property of glass, glass making, and processing. It is no surprise that Encyclopedia Britannica invited him in 1998 to be the guest author of a 13-page entry on "Industrial Glass." He also has about 150 publications.

As an entrepreneur, Varshneya is a co-founder and president of Saxon Glass Technologies, a company that converts his science and technology of glass chemical strengthening to useful products that benefit mankind. Early development of the strengthening of cell phone display covers was actually conducted at Saxon Glass and Alfred University. The main product of the company, however, is the chemically strengthened borosilicate glass cartridge for the EpiPen, an auto-injection device delivering epinephrine antidote to prevent anaphylactic shock in people suffering from severe, life-threatening allergies. Before Varshneya's involvement, the EpiPen device suffered from an unacceptably high glass fracture rate during administration. With a carefully controlled process, failure of critical medicine delivery due to glass fracture has virtually disappeared in the over quarter billion number of products sold during the past 20 years.

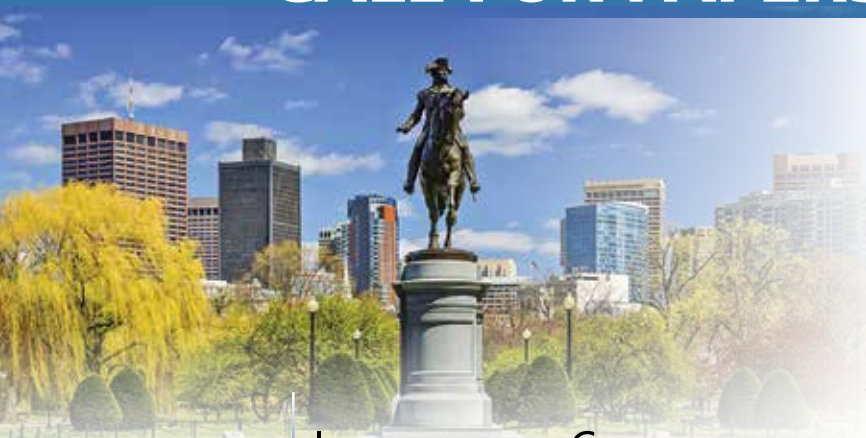
Varshneya and his wife, Darshana, are also well known for their philanthropy, both locally in Alfred, NY, and throughout the broader glass and ceramics community. They often extend welcome with open arms to guests from overseas visiting Alfred University.

Varshneya has spent countless hours furthering the mission of The American Ceramic Society, the Society of Glass Technology, and the International Commission on Glass. His honors include Distinguished Life Member and Fellow of The American Ceramic Society, Fellow of the Society of Glass Technology, and President's Award from the International Commission on Glass.

This symposium honors the lifetime contributions of Professor Varshneya, which have had a profound impact on many facets of glass science and technology and, more importantly, on the people throughout the glass community worldwide. This one-day symposium will consist of invited and contributed talks on topics that have influenced significant advancements based on his work. These topics may include: Fundamental glass science and technology, structure–property relationships, modeling of glass structures, glass strengthening and stronger glass products, glass-to-metal sealing, chalcogenide glasses, and glass education. In addition, light-hearted, brief anecdotal reflections may also be entertained.

CALL FOR PAPERS

ABSTRACTS DUE JANUARY 15, 2019



The American Ceramic Society
www.ceramics.org

550 Polaris Parkway, Suite 510
Westerville, OH 43082-7045 USA

25TH International Congress on Glass (ICG2019)

Hosted by ACerS Glass & Optical Materials Division

100 years

June 9–14, 2019

Boston Park Plaza Hotel and Towers

Boston, Massachusetts, USA

June 9 – 14, 2019 | Boston Park Plaza Hotel and Towers | Boston, Massachusetts | USA

25TH International Congress on Glass (ICG2019)

Hosted by ACerS Glass & Optical Materials Division

100 years

CALL FOR PAPERS

Abstracts Due January 15, 2019

www.ceramics.org/icg2019