2011 GLASS & OPTICAL MATERIALS DIVISION ANNUAL MEETING

Abstracts Due
November 10, 2010

CALL FOR PAPERS

2011 GOMD Annual Meeting

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Introduction:

Join the Glass & Optical Materials Division in Savannah, Georgia for a program involving the physical properties and technological processes important to glasses, amorphous solids, and all optical materials. The meeting will feature four symposia. Sessions headed by technical leaders from industry, government laboratories, and academia will cover the latest advances in glass science and technology, as well as a focused examination of the amorphous state in a general sense. The poster session will highlight late-breaking research and the annual student poster contest.

In addition to the indicated topics, open sessions will be organized for each of the symposia, and authors are encouraged to submit generally related papers. Contact the Symposium Lead for additional information.

Located in the heart of coastal Georgia's "lowcountry," Savannah is a city of striking natural beauty and exceptional vibrancy. Rich in history and culture, the newly-renovated Hilton Savannah DeSoto Hotel is situated in the heart of Savannah's historic, dining, shopping, and theatre districts; just a short stroll to River Street and the City Market. Surrounded by Savannah's beautiful landscaped squares, magnificent restored southern homes of the Colonial and Victorian eras and historic landmarks, meeting attendees and their families will enjoy everything this southern gem has to offer.

SYMPOSIUM I: GLASS SCIENCE

Lead Contact: **John Mauro**, Corning Incorporated
Corning, NY USA | mauroj@corning.com

The Glass Science Symposium will cover recent theoretical and experimental advances in fundamental and applied glass science, including glass structure, modeling and simulation, surface and interfacial phenomena, corrosion, and issues related to ancient glasses. Special focus will also be paid to glass-ceramics, non-silicate glasses, and liquid synthesis of glass.

Session A: Atomistic Modeling of Glass Structures and Interfaces

Organizer: **Jincheng Du**, University of North Texas
Denton, TX USA | jincheng.du@unt.edu

This session features progress in understanding the structure and properties of glass through classical and ab initio atomistic simulations. The focus will be on interpretation of short and medium range glass structure, calculation and prediction of macroscopic properties, and the structural origins of these properties as elucidated through atomistic simulations. Special attention will be given to understanding surface and interfacial behavior and the dissolution processes of glasses. Development of interatomic potentials, methodologies to extend the time and length scales, and other challenges in glass modeling are also within the scope of this session.

Session B: Glass Structure and Properties

Organizer: **Randall E. Youngman**, Corning Incorporated
Corning, NY, USA | youngmanre@corning.com

This session encompasses the many different approaches to glass structure characterization and how such insight relates to macroscopic glass properties. Experimental studies of oxide and non-oxide glass systems, as well as modeling efforts relating structure to properties, will be featured.

Session C: Glass Corrosion

Organizers: **Stéphane Gin**, Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA)
Marcoule, France | stephane.gin@cea.fr

Pierre Frugier, CEA
Marcoule, France | pierre.frugier@cea.fr

This session is devoted to the issues behind both the short- and long-term corrosion of glass. Short-term issues can include stress corrosion, weathering, modeling of surface-molecular interactions, and the effectiveness of interleaving. Long-term issues could include nuclear waste glass studies, long-term corrosion modeling, and glass art.

Session D: Ancient Glasses

Organizer: **Denis Strachan**, Pacific Northwest National Lab
Richland, WA USA | denis.strachan@pnl.gov

Ancient glasses are important materials for the study of sociology, archeology, geology, conservation, and glass science. They come in many forms, including natural basalts, impact ejecta, lightning fusions, and weathered ancient artifacts. The scientific understanding of the structure and alteration of these materials can assist the interpretation these materials pose for each discipline. In this session, talks will be given by an interdisciplinary mix of scientists who have dealt with ancient glasses, natural glasses, and nuclear waste glasses in order to foster improved collaborations between these scientists.

Session E: Non-silicate Glasses

Organizers: **Andriy Kovalskyy**, Lehigh University
Bethlehem, PA USA | ank304@Lehigh.edu

Juejun (JJ) Hu, University of Delaware
Newark, DE USA | hujuejun@udel.edu

The scope of the session covers scientific, technological and practical aspects of non-silicate glasses, such as chalcogenides, tellurites, gallates, germanates, heavy metal oxide glasses, etc. The expected topics include but not limited to the glasses for optical, biomedical, energy, sensor, nanoelectronic and other emerging applications. Novel contributions, which link properties, structure and functionality, are especially welcomed. The session is offering a unique opportunity for experts from both academia and industry to meet and exchange ideas on the optimization of functionality of non-silicate glasses through understanding the structure-properties relationship.

Session F: Glass-Ceramics

Organizer: **Amanda Brennecka**, Sandia National Labs
Albuquerque, NM USA | alyoung@sandia.gov

This session will cover recent progress in glass ceramic research, including compositions, processing, properties, and applications. The fundamental aspects of nucleation and crystallization phenomena will be discussed. Mechanical, electrical and thermal properties of glass-ceramics as related to the chemical and crystallographic constituents of the materials will also be discussed.

Session G: Surface and Interfacial Phenomena

Organizer: **Carlo G. Pantano**, The Pennsylvania State University
University Park, PA USA | cgp2@psu.edu

The integration of glass into complex systems including displays, photovoltaic and other solar collectors, lab-on-a-chip devices, energy efficient and smart windows, solid state lighting substrates and packaging, and structural composites requires improved understanding of their surface and interface chemistry, structure and properties. This session will address issues including adsorption, coupling agents and silanization, polymer adhesion, thin film interfaces, nanoscopic/macroscopic characterization and testing of interfaces, chemical stability of interfaces, modeling, and relevant properties of glass interfaces.

SYMPOSIUM II: THE AMORPHOUS STATE

Lead Contact: **Joseph V. Ryan**, Pacific Northwest National Lab
Richland, WA USA | joe.ryan@pnl.gov

In all chaos there is a cosmos, in all disorder a secret order – Carl Jung. This symposium strives to further understand the varying disordered structures that define the amorphous state of matter. From metallic to oxide glasses, from modeling to experiment, understanding the structure and evolution of these materials will enable scientists to engineer and tailor them for useful purpose.

Session A: The Glass Transition and Relaxation in Glasses and Glassforming Liquids

Organizers: **Prabhat K. Gupta**, The Ohio State University
Columbus, OH USA | gupta.3@osu.edu

A fundamental understanding of glass transition and relaxation is essential for enabling future breakthroughs in glass science and technology. This session will cover recent developments in the thermodynamics and dynamics of glass transition and relaxation phenomena from theoretical, experimental, and simulation perspectives.

Session B: Model/Experiment: Links and Limits

Organizer: **David Drabold**, Ohio University
Athens, OH USA | drabold@ohio.edu

This session explores the linkage between theory and experiment for amorphous systems including how to compare computer models and diffraction data; state of the art for structural modeling; and emerging linkages in NMR theory and experiment, transport theories to compute T-dependence of conductivity from first principles and I-V characteristics from atomistic models, and experiment and theory at high pressure.

Submit abstracts by November 10, 2010 at www.ceramics.org/gomd2011

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Session C: Topology and Rigidity

Organizers: **Pierre Lucas**, University of Arizona
Tucson, AZ USA | pierre@u.arizona.edu

John Mauro, Corning Incorporated
Corning, NY USA | MauroJ@Corning.com

The topological description of amorphous structures has been an active subject of studies since the development of the rigidity percolation theory by Phillips and Thorpe more than three decades ago. With this topological approach, a glass is considered a network of bond constraints with varying degrees of rigidity which can directly affect the physical and chemical property of the material. Many advances have been brought out in topological modeling and rigidity theory as well as in their experimental verification over the years however this field is still currently the subject of intense studies. This session will focus on recent developments of both theoretical and experimental aspects of the topological description of glasses. Contributions covering modeling as well as physical measurements of properties and structure are encouraged for this session.

Session D: Medium Range Order

Organizer: **Paul Voyles**, University of Wisconsin
Madison, WI USA | voyles@engr.wisc.edu

Scientific inquiry has pushed the envelope to ever smaller size scales, with sub-angstrom level resolution now available in many electron and atomic force microscopes. In this rush to increase resolution, however, a size scale has been largely skipped over. Long-range (>50Å) order has long been studied with diffraction techniques and is generally well known. Conversely, the short-range (<8Å) order is also relatively easily obtained via scattering techniques and the radial distribution function. Relatively little attention has been paid to length scales between these ranges, however. Recent studies have shown that understanding this medium-range order can often be the key to predicting properties and behavior in nominally amorphous materials.

Session E: Amorphous Metals

Organizer: **Joseph V. Ryan**, Pacific Northwest National Lab
Richland, WA USA | joe.ryan@pnl.gov

The amorphous state is not, obviously, limited to oxide structures. Similarly though, while understanding the disorder present in metallic glasses is critical to the successful application of these materials in a variety of engineering applications, many details of their structure remain elusive. This session explores the particular atomic, cluster, defect, and network models proposed for this interesting class of materials, as well as the experimental work that drives these interpretations. Structure/property relationships will also be discussed.

HOTEL INFORMATION

Hilton Savannah DeSoto
15 East Liberty Street | Savannah, Georgia
(912) 231-1633 | 800-455-8667

Room Rates*
$139.00 plus tax - Single/Double/Triple/Quad
$ 99.00 plus tax - Student
$106.00 plus tax - Government

*Reserve your room by April 15, 2011 to secure the negotiated conference rate.

Session F: Spin Glasses

Organizers: **John McCloy**, Pacific Northwest National Lab
Richland, WA USA | john.mccloy@pnl.gov

Kostya Trachenko, Queen Mary's College
London, UK | k.trachenko@qmul.ac.uk

The glassy state is not confined to only structural components of materials. Disorder in magnetic and dielectric materials lead to novel properties as well as presenting different possible probes to study disorder. Topics in this session can include theoretical and experimental aspects of disordered materials such as spin glasses (metallic, insulating, and semiconducting), ferroelectrics (i.e. relaxors), and glasses with magnetic components (i.e. magnetite), for example. Theoretical works to understand the behavior of the freezing temperature and imaging studies (i.e. MFM, PFM) to visualize the electromagnetic structural disorder are encouraged.

Session G: Water Dynamics — Role in Glass Structure and Properties

Organizer: **Minoru Tomozawa**, Rensselaer Polytechnic Institute
Troy, NY USA | tomozm@rpi.edu

Water in glass has disproportionally large influence on glass properties. For example, a small quantity of impurity water in glass can greatly reduce viscosity, mechanical strength and degrade chemical durability of glasses. It can also greatly affect optical transparency and ionic transport characteristic of glasses. Water in the environment can also affect the glass properties, e.g. chemical corrosion and mechanical fatigue. Water can enter into glasses through diffusion during glass melting, usage and heat-treatment. It is, therefore, important to understand process and mechanism of water-glass interaction. In this symposium, a variety of topics related to water-glass interaction will be discussed.

Session H: Environment-induced Restructuring

Organizer: **Linn Hobbs**, Massachusetts Institute of Technology
Cambridge, MA USA | hobbs@mit.edu

The amorphous state can come about through many mechanisms unrelated to the glass transition. Topological rearrangements of glass and crystalline structures can occur through radiation-induced displacements, radiolytic effects, transmutation, extended diffusion, mechanical alloying, pressure, and environmental changes such as corrosion. This session aims to explore these phenomena and ways to counteract or utilize them, such as radiation-hardened materials, radioactive wastes, amorphous material synthesis, optimized proton-exchange membranes, and stress hardened materials.

SYMPOSIUM III: OPTICAL MATERIALS AND DEVICES

Lead Contact: **Adam J. Stevenson**, École nationale supérieure de chimie de Paris
Paris, France | ajsteven130@gmail.com

Optical materials and devices are of critical importance for a variety of applications including sustainable energy, remote sensing, medical diagnostics and treatment, and national defense. This symposium will address processing and properties of optical materials as well as design, fabrication, and performance of optical devices. This symposium will focus on ceramic/glass optical materials and devices, but will include contributions from the organic materials research community as interactions between polymeric/organic materials and inorganic materials are important for many applications.

Session A: Optical Absorption

Organizer: **Mark Davis**, Schott North America Inc.
Duryea, PA USA | mark.davis@us.schott.com

All aspects relating to absorption and/or redirection of energy in glass and related materials will be the subject of this symposium including absorption (intrinsic and extrinsic sources and their temperature dependencies), scattering, reflection, energy trapping, resonance behavior, and characterization techniques. Theoretical and experimental approaches are welcome.

Session B: Photosensitivity and Photomodification

Organizers: **Pierre Lucas**, University of Arizona
Tucson, AZ USA | pierre@u.arizona.edu

Kathleen Richardson, Clemson University
Clemson, SC USA | richar3@clemson.edu

This session will cover topics involving light-induced structural modifications in amorphous solids. Optically induced processes can provide the basis for significant modification in structure and associated material properties/processes, including physical, chemical, electrical, and optical behavior. These include but are not limited to femtosecond-laser-writing in silicates, photostructural effects in chalcogenides, photo-reactivity in polymeric glasses, photo-ablation, and others. Topics pertaining to light-matter interactions, whether beneficial and intended such as photo-patterning or detrimental and unintended such as photo-degradation are of interest. Contributions on the experimental and theoretical aspects of these topics are encouraged for this session.

Session C: Optical Ceramics

Organizers: **Adam J. Stevenson**, École nationale supérieure de chimie de Paris
Paris, France | ajsteven130@gmail.com

Robert J. Pavlacka, Army Research Lab
Aberdeen, MD USA | robert.pavlacka@us.army.mil

Polycrystalline transparent materials are viable replacements for single crystals in a variety of optical applications including solid state lasers, transparent armor, high temperature windows, and scintillators. Further, advantages inherent to ceramic processing may enable new devices and applications that are currently not possible with single crystal materials. This session will focus on processing and properties of transparent polycrystalline materials and the performance of devices that incorporate transparent ceramics. Topics of special interest include novel green forming methods, microstructure control (including grain size, morphology, and texture), sintering and advanced densification methods (microwave, FAST, etc.), optical properties and chemistry of grain boundaries, optical performance, and device performance.

Session D: Active Optics

Organizer: **David Scrymgeour**, Sandia National Labs
Albuquerque, NM USA | ajsteven130@gmail.com

The ability to control and modify the propagation and properties of electromagnetic waves is the backbone of modern communications, imaging, printing, display, and optical storage technologies. The coupling of light to various modalities such as strain, electric fields, or temperature allow for the direct control and manipulation of light. These novel materials and tunable optical phenomena are enabling future innovative photonic devices and emerging applications such as lasing, optical beam steering and shaping, solid-state lighting, spatial light modulators, optical storage, nonlinear optics and tunable and frequency selective filters. This session seeks to bring together researchers and engineers from academia and industry who share interests in materials and unconventional material effects that can be used to actively modulate and modify the performance of optical components. Emphasis will be placed equally on materials, devices, and applications.

Session E: Optical Coatings

Organizer: **S. K. Sundaram**, Pacific Northwest National Lab
Richland, WA USA | sk.sundaram@pnl.gov

Optical coatings encompass one or more layers of coatings on optical materials (e.g., glasses) or components that change reflection or transmission of the coated surfaces. The coatings are generally thin and made of different materials (e.g., metals, oxides, polymer) that can be tailored to tune the reflection-transmission ratio of the material or component. Some examples include highly reflecting coatings, anti-reflection coatings, and multi-functional coatings. Advanced coatings and chemical/photo-modification processes can be used to control the flow of light, e.g., gratings, photonic band gap structures. This session intends to cover all aspects of optical coatings on materials, components, and devices.

Session F: Sensors and Scintillators

Organizer: **Mary Bliss**, Pacific Northwest National Lab
Richland, WA USA | mary.bliss@pnl.gov

A wide variety of optical materials are used as active and passive sensors for heat, electromagnetic radiation, mechanical/acoustic and particle detection. These materials are also useful for transmitting signals in high noise environments. This session will cover the basic properties of glass and ceramic sensors, their fabrication, novel devices, device applications and performance.

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Session G: Solar Energy and Photocatalysis

Organizers: **Matthew T. Lloyd**, National Renewable Energy Lab
Golden, CO USA | matthew.lloyd@nrel.gov

Dana C. Olson, National Renewable Energy Lab
Golden, CO USA | dana.olson@nrel.gov

Due to the potential for low-temperature, low-cost fabrication of optoelectronic devices derived from organic semiconducting materials, there is considerable interest in understanding the fundamental property, processing, and performance relationships in these disordered materials. Soft materials can be integrated with the unique functional aspects of inorganic semiconductors or conductors in the form of sol-gels, nanoparticles, quantum dots, and nanowire-based thin films to afford independent optimization of discrete components within a given device. Although a strong technological need has been demonstrated for high-performance photovoltaics, light emitters, photocatalytic materials, and other large area thin-film electronics, many mechanistic details remain unresolved. These sessions will provide a forum to discuss the latest research problems involving the characterization and design of devices, new synthetic techniques, functional inorganic and organic-inorganic composite (hybrid) devices, structure/property/process relationships, environmental stability, and nanostructed architectures.

Session H: Ion Conductors and Energy Storage Materials

Organizer: **Steve W. Martin**, Iowa State University of Science and Technology
Ames, IA USA | swmartin@iastate.edu

As the push towards renewable energy sources advances, there is an equally critical need for energy storage systems to assist in leveling the variations that are inherent to such renewable sources as wind and solar energy. One particularly promising approach is to use high energy density battery and super capacitor systems. Both of these systems depend critically upon high conductivity, safe, reliable and inexpensive electrolyte separators. Glasses, glass-ceramics, and ceramics have shown significant advantages over organic liquid electrolytes that are common in the typical lithium batteries on the market today. However, these advantages such as high conductivity, non-flammability, and resistance to electrode dendrite growth also come with some disadvantages. This session is targeted to highlight the significant progress in developing new solid electrolytes for energy storage applications with the goal of advancing these materials in such applications as wind and solar energy storage. Oral and poster presentations are sought in the broad area of glassy, glass-ceramic, and ceramic solid electrolytes that describe the fundamentals of ion transport, the structures of the host matrix to foster facile ion transport, the experimental techniques to examine the ion conductivity and the atomic level structures of these materials, the applications of these materials in solid state batteries, such as Li-air cells, and super capacitors, and the performance of solid electrolyte based energy storage systems in application.

SYMPOSIUM IV: GLASS TECHNOLOGY

Lead Contact: **Jim Marra**, Savannah River National Lab
Aiken, SC USA | james.marra@srnl.doe.gov

Where would we be without glass? Advances in communications, alternative and renewable energy and medicine have all been enabled through the development and application of glasses. Improvements in the processing and properties of glass have contributed to many technological breakthroughs but there are still advancements to be made! This symposium will focus on applications of glass technology in several "hot" areas such as energy production and storage, environmental applications, and medicine and biotechnology. The symposium will also focus on glass melting and processing as a means to improve glass production and increase the functionality of glass. The important topic of glass strength and high strength products is also a focus topic of this symposium.

Session A: Glasses for Energy and Environmental Applications

Organizer: **Amanda Billings**, Savannah River National Lab
Aiken, SC USA | amanda.billings@srnl.doe.gov

Glass has proven to be a critical material for emerging energy and environmental applications. This session is a great opportunity for researchers, engineers, and students to discuss the most recent advances in glass technology in the subject areas of renewable energy, clean energy, energy storage, and environmental remediation. This could include, but is not limited to glass, glass composites and glass ceramics as they relate to nuclear and wind power generation, environmental clean-up, sealants for solid oxide fuel cells, high-efficiency energy utilization, energy efficient lighting, glass microspheres for hydrogen storage, chemical separation, and air and water purification.

Session B: Glass Strength

Organizers: **Elam Leed**, Johns Manville
Littleton, CO USA | Elam.Leed@jm.com

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

In the spirit of the GMIC "Usable Glass Strength" research coalition, this session will focus on activities that can help move the practical strength of glass closer to its theoretical strength. Steps have been made in the past in certain applications but the remaining opportunity is enormous and has far reaching implications for the world of glass and for that matter, the world. Topics can range from basic research on flaw generation and strength reduction mechanisms to surface healing and practical applications of strength improvements in manufacturing. The work presented will be applicable to flat glass, containers, fiberglass, specialty glasses, or most likely all of the above.

Session C: Glasses for Medicine and Biotechnology

Organizer: **Brad Tischendorf**, Medtronic
Minneapolis, MN USA
brad.tischendorf@medtronic.com

This session will provide a forum for the discussion of biomedical amorphous materials of all kinds. This symposium will be broad in scope and will include discussions on bioactive (or inert) glasses and glass-ceramics in applications such as tissue scaffolding, pharmaceutical packaging and delivery, biocompatible coatings, surface modifications, sensors, bone and dental cements, and biological systems/surface interactions. Abstracts that combine multiple materials sets with intent to provide functional implantable devices are especially welcome.

Session D: Glass Melting and Processing

Organizer: **Rajiv Tiwary**, PPG Industries, Inc.
Pittsburgh, PA USA | tiwary@ppg.com

This session will focus on state-of-the-art industrial, experimental, and modeling approaches to problems in glass melting and forming. Topics covered may include mathematical simulation of furnaces, thermal modeling of glass melting and forming, glass melting techniques, batch chemistry, gas exchange between glass and bubbles, characterization and prevention of defect formation in glass, viscoelastic behavior of glass, and residual stress formation.

Session E: Liquid Synthesis and Sol-gel Derived Materials

Organizer: **Gang Chen**, Ohio University
Athens, OH USA | Cheng3@ohio.edu

Sol-gel processing uses low-temperature approaches to produce glass and ceramic materials with high purity, excellent homogeneity, and well controlled morphology. This session will focus on all aspects of sol-gel derived materials including but not limited to (1) various sol-gel routes to bulk, film, colloidal, porous, and hybrid materials; (2) structural characterization using spectroscopic, scattering, and imaging techniques; (3) computer simulations through the molecular dynamics, Monte-Carlo, and reverse Monte-Carlo methods; and (4) new functionalities based on the optical, electrical, thermal, mechanical, chemical, and biomedical properties.

POSTER SESSION & STUDENT POSTER COMPETITION:

Organizer: **Robert A. Schaut**, Corning Incorporated
Corning, NY USA | schautra@corning.com

Poster abstracts will be accepted for all sessions and symposia. Students are encouraged to enter their presentations in the annual poster competition for professional recognition and cash awards!