ACerS 2008 Glass & Optical Materials Division Meeting

May 18-21, 2008
Marriott University Park Hotel
Tucson, Arizona
USA

MEETING GUIDE & ABSTRACTS

www.ceramics.org/meetings/glass2008

The American Ceramic Society
www.ceramics.org

Welcome

Greetings and welcome to the 2008 Glass and Optical Materials Division Meeting. This year's program will focus on the rich range of physical phenomena critical to the design, formation and utilization of glass and optical materials and the technologies that motivate these efforts. The meeting will encompass fundamental glass science, glass manufacturing technology, and the application of glass and optical materials to photonics. In addition, two cross-cutting, special sessions are planned that will highlight the science and application of emerging technologies impacting energy sustainability, space-based technologies, and national security. Sessions headed by technical leaders from industry, government laboratories, and academia will address fundamental glass issues that ultimately form the basis for the successful manufacture of oxide glass and other amorphous substances with optimized performance. Three concurrent symposia are planned along with the special sessions. A tutorial on Non-Linear Optics in Glass is also being offered in the Optical Materials Symposium.

We extend special thanks to our award sponsors: PPG Industries, Inc. for the George W. Morey Award, Coe College and Corning Incorporated for the Stookey Lecture of Discovery Award, SCHOTT North America for sponsoring lunch for the Norbert J. Kreidl Award for Young Scholars, and Corning Incorporated for the Student Poster Contest. We would also like to thank AdValue Technology for their generous support as a Silver Level conference sponsor.

Several special activities have been planned in addition to the outstanding technical program. Enjoy exploring the world's largest collection of Arizona history artifacts, documents, and photographs at the Welcome Reception on Sunday, May 18th at the Arizona Historical Society. On Monday, May 19th, a special panel discussion has been planned for students focusing on careers in glass. On Tuesday, May 20th, please join us for the conference dinner and enjoy our guest speaker, Nancy Odegaard, Ph.D. Nancy's presentation will encompass 2000 years of pottery making tradition in the Southwest region.

The American Ceramic Society and the Glass & Optical Materials Division thank you for participating in this year's meeting. We hope you have a stimulating and memorable experience in Tucson.

Kelly Simmons – Potter
2008 ACerS Glass & Optical Materials Division Program Chair
University of Arizona

Table of Contents

Final Program

Glass & Optical Materials Division Officers

Chair
Mario Affatigato
Coe College

Vice Chair
Mark Davis
SCHOTT North America, Inc.

Chair-Elect
Hong Li
PPG Industries Inc.

Secretary
Steve Martin
Iowa State University

Schedule At A Glance

Program Schedule-At-A-Glance

Sunday, May 18

4 – 7:30 pm Registration in the Ballroom Foyer

Time	Sabino	Pima	Madera	Canyon A,B,C	Arizona Historical Society
6 – 8 pm					Welcome Reception

Monday, May 19

7 am – 7 pm Registration in the Ballroom Foyer

8 – 9 am	Stookey Award Lecture				
9 am – Noon	Glass Structure I	Materials for Alternative Energy Applications I	Photostructural Phenomena in Materials I		
Noon – 1:20 pm			Student Panel Discussion		
1:20 – 5:40 pm	Glass Structure II	Materials for Alternative Energy Applications II Ionizing Radiation Effects – Nuclear Waste Glasses	Photostructural Phenomena in Materials II		
6 – 9pm				Poster Session	

Tuesday, May 20

7:30 am – 7 pm Registration in the Ballroom Foyer

8 – 9am	Morey Award Lecture				
9 – Noon	Cell and Protein Interactions with Glass Dynamics in Glasses and Glassforming Liquids I	Ionizing Radiation Effects – Radiation Detection Ionizing Radiation Effects– Optical Materials I	Optical Fibers and Waveguides I		
Noon-1pm	Kreidl Award Lecture*				
1:20-5:20 pm	Dynamics in Glasses and Glassforming Liquids II	Ionizing Radiation Effects – Optical Materials II Ionizing Radiation Effects – General Effects	Optical Fibers and Waveguides II Non-Linear Optics in Glass		
5 – 6pm				GOMD Business Meeting	
7 – 10pm			Conference dinner		

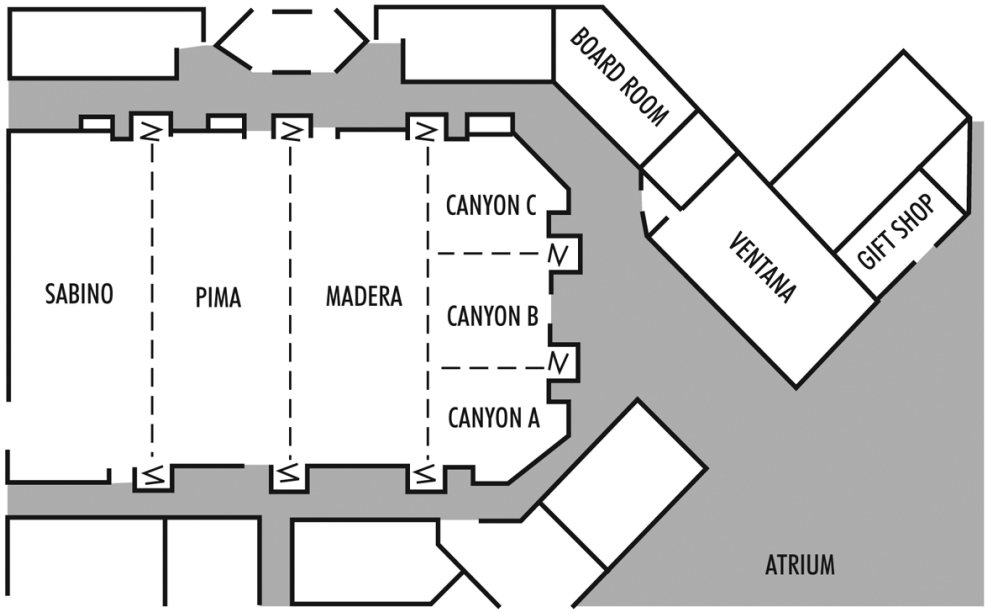
Wednesday, May 21

7:30 am – 4 pm Registration in the Ballroom Foyer

8 – 12:20pm		Energy Saving Strategies and Advanced Topics	Optical Properties of Doped Materials	Theoretical and Numerical Modeling	
1:20 – 5pm		Glass Strength Related to Knowledge About Surfaces and Other Factors			

*Boxed lunches will be available to attendees for the Kreidl Award Lecture at no cost, but lunches will be on a first come, first served basis.

Tucson Marriott University Park Floor Plan



Special Events

Welcome Reception
Sunday, May 18th – Arizona Historical Museum – 6 to 8 PM
The Arizona Historical Society has the world's largest collection of Arizona history artifacts, documents, and photographs. The address of the facility is 949 East 2nd Street. To get to the Arizona Historical Museum walk out the hotel lobby entrance and cross the street. The museum is located approximately 50 feet from the hotel on the opposite side of the street.

Careers in Glass Science Panel Discussion Student Activity
Monday, May 19th – Noon to 1:20 PM - Madera
A panel of speakers from the glass industry, start-up businesses, national laboratories, and academia will discuss their views on careers in glass science and technology. This is a chance for future glass researchers to hear about the opportunities open to them and to ask questions of experts in a wide range of research areas.

PANELISTS

Shibin Jianq, AdValue Technology
Jackie Johnson, Argonne National Labs
Kathleen Richardson, Clemson University
Mark Davis, SCHOTT North America

Complimentary boxed lunches will be available on a first come, first served basis to students attending the panel discussion.

Poster Session
Monday, May 19th – 6 to 9 PM – Canyon ABC

Conference Dinner (included with registration fee)
Tuesday, May 20th – 7 to 9:30 PM – Pima and Madera
Guest speaker, Nancy Odegaard, Ph.D.
Nancy's illustrated presentation, *Saving Treasures: Southwest Ceramic Vessels*, will cover 2000 years of pottery making tradition in the Southwest region.

Award Lectures

Monday, May 19 at 8:00 A.M. – Sabino

The ***Stookey Lecture of Discovery***, named in honor of materials pioneer Dr. S. Donald Stookey, recognizes an individual's lifetime of innovative exploratory work or noteworthy contributions of outstanding research on new materials, phenomena, or processes involving glass, that have commercial significance or the potential for commercial impact.

Award Winner: Larry Hench, Emeritus Professor, Department of Materials and Co-Director Tissue Engineering and Regenerative Medicine Centre, Imperial College, London
Sponsored by Corning Incorporated and Coe College

Tuesday, May 20 at 8:00 A.M. – Sabino

The ***George W. Morey Award*** recognizes achievements in the field of glass science and technology. The award is given for an outstanding publication on glass, either scientific or technological, published during the previous year.

Award Winner: Steve W. Martin, University Professor, Department of Materials Science Engineering, Iowa State University of Science and Technology, Iowa
Sponsored by PPG Industries Inc.

Tuesday, May 20 at 12:00 P.M. – Sabino

The ***Norbert J. Kreidl Award for Young Scholars***, recognizes excellence in research by students in the fields of glass and optical materials. Dr. Kreidl's lifelong mission was to enhance the education, achievement and advancement of young people.

Award Winner: Allison Wilhelm, University of Arizona

Note: Boxed lunches will be available on a first come, first served basis to attendees for the Kreidl Award Lecture at no cost.

Special Thanks to Our Sponsors For Their Generosity!

Conference Sponsor
AdValue Technology, LLC - Silver Level

Award Sponsors
PPG Industries Inc. - George W. Morey Award
Corning Incorporated and Coe College - Stookey Lecture of Discovery Award
Corning Incorporated - Student Poster Competition

Kreidl Lunch Sponsor
SCHOTT North America

Name	Date	Time	Room	Abstract Number
A				
Afanasiev, P.	19-May	3:20PM	Pima	GOMD-S4-012-2008
Aitken, B.	19-May	3:40PM	Sabino	GOMD-S1-015-2008
Allan, D.C.	21-May	8:20AM	Canyon A&B	GOMD-S1-057-2008
Anheier, N.C.	19-May	10:40AM	Madera	GOMD-S3-005-2008
Ashton-Patton, M.M.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-036-2008
B				
Bartlett, J.	20-May	2:40PM	Sabino	GOMD-S1-050-2008
Berghmans, F.	20-May	1:20PM	Pima	GOMD-S4-025-2008
Boatner, L.A.	20-May	9:00AM	Pima	GOMD-S4-019-2008
Boday, D.	19-May	2:20PM	Pima	GOMD-S4-010-2008
Brow, R.K.	21-May	11:00AM	Madera	GOMD-S3-046-2008
Byer, J.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-028-2008
C				
Chandra, H.	19-May	4:40PM	Madera	GOMD-S3-015-2008
Chen, G.	19-May	11:20AM	Sabino	GOMD-S1-007-2008
Chen, Q.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-029-2008
Cheng, S.	19-May	6:00PM	Canyon A,B,C	GOMD-S4-018-2008
Christensen, R.B.	19-May	2:00PM	Sabino	GOMD-S1-011-2008
Corrales, R.	20-May	2:40PM	Pima	GOMD-S4-028-2008
Crawford, C.	19-May	4:40PM	Pima	GOMD-S4-015-2008
D				
Davis, M.J.	20-May	11:00AM	Sabino	GOMD-S1-044-2008
Davis, M.J.	20-May	11:40AM	Pima	GOMD-S4-024-2008
De Silva, C.	21-May	11:40AM	Canyon A&B	GOMD-S1-065-2008
Du, J.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-021-2008
Du, J.	21-May	10:00AM	Canyon A&B	GOMD-S1-062-2008
Dubiel, M.	21-May	9:20AM	Madera	GOMD-S3-042-2008
Durante, M.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-033-2008
Dyamant, I.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-025-2008
E				
Erdmann, R.G.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-034-2008
F				
Fabian, R.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-032-2008
Faris, C.	19-May	5:00PM	Madera	GOMD-S3-016-2008
Feller, S.	19-May	3:20PM	Sabino	GOMD-S1-014-2008
Ferrari, M.	20-May	10:40AM	Madera	GOMD-S3-033-2008
Fletcher, L.B.	19-May	2:40PM	Madera	GOMD-S3-011-2008
Fox, B.P.	20-May	2:00PM	Pima	GOMD-S4-026-2008
G				
Ganjoo, A.	19-May	11:40AM	Madera	GOMD-S3-007-2008
Gjersing, E.L.	19-May	11:40AM	Sabino	GOMD-S1-008-2008
Glebov, B.L.	20-May	11:20AM	Pima	GOMD-S4-023-2008
Glebov, L.B.	20-May	10:40AM	Pima	GOMD-S4-022-2008
Gorska, N.	20-May	4:00PM	Sabino	GOMD-S1-053-2008
Griscom, D.L.	19-May	4:20PM	Pima	GOMD-S4-014-2008
Gross, T.M.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-035-2008
Gross, T.M.	20-May	1:20PM	Sabino	GOMD-S1-046-2008
Guignard, M.	19-May	9:00AM	Sabino	GOMD-S1-001-2008
Gulati, S.	21-May	1:20PM	Pima	GOMD-S2-010-2008
Gupta, P.	21-May	8:40AM	Canyon A&B	GOMD-S1-058-2008
H				
Harley, G.A.	19-May	11:40AM	Pima	GOMD-S4-006-2008
Haynes, M.J.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-038-2008
Hewak, D.	19-May	9:00AM	Madera	GOMD-S3-001-2008
Hobbs, L.W.	20-May	4:00PM	Pima	GOMD-S4-030-2008
Honma, T.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-024-2008
Hu, J.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-019-2008
I				
Ito, S.	21-May	2:00PM	Pima	GOMD-S2-011-2008

Name	Date	Time	Room	Abstract Number
J				
Jain, H.	19-May	11:20AM	Madera	GOMD-S3-006-2008
Jain, P.	20-May	9:00AM	Sabino	GOMD-S1-039-2008
James, M.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-020-2008
James, T.L.	21-May	11:20AM	Madera	GOMD-S3-047-2008
Jiang, S.	20-May	11:00AM	Madera	GOMD-S3-034-2008
Johnson, B.R.	20-May	9:40AM	Pima	GOMD-S4-020-2008
Johnson, J.	19-May	10:00AM	Sabino	GOMD-S1-004-2008
K				
Kaempf, D.	21-May	8:00AM	Pima	GOMD-S2-002-2008
Keefer, K.	21-May	8:00AM	Canyon A&B	GOMD-S1-056-2008
Khatibi, E.	21-May	4:20PM	Pima	GOMD-S2-016-2008
Khoshakhlagh, P.	20-May	9:40AM	Sabino	GOMD-S1-041-2008
Kieffer, J.	21-May	10:40AM	Canyon A&B	GOMD-S1-063-2008
King, E.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-028-2008
Kokuoz, B.	21-May	10:00AM	Madera	GOMD-S3-044-2008
Kokuoz, B.	21-May	10:40AM	Madera	GOMD-S3-045-2008
Kramer, R.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-026-2008
Krol, D.M.	20-May	3:20PM	Madera	GOMD-S3-039-2008
Kucera, C.J.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-027-2008
Kurkjian, C.R.	21-May	2:40PM	Pima	GOMD-S2-012-2008
Kurkjian, C.R.	21-May	4:00PM	Pima	GOMD-S2-014-2008
L				
LaCourse, W.C.	19-May	4:20PM	Sabino	GOMD-S1-018-2008
LaCourse, W.C.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-021-2008
Larson, C.M.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-029-2008
Le Messurier, D.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-039-2008
Li, H.	21-May	11:20AM	Pima	GOMD-S2-008-2008
Lian, J.	20-May	4:40PM	Pima	GOMD-S4-031-2008
Licina, V.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-031-2008
Lipinska-Kalita, K.	19-May	9:20AM	Sabino	GOMD-S1-002-2008
Lonnroth, N.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-030-2008
Loucks, R.J.	21-May	12:00PM	Canyon A&B	GOMD-S1-066-2008
Loy, D.A.	19-May	11:20AM	Pima	GOMD-S4-005-2008
Loy, D.A.	19-May	2:40PM	Pima	GOMD-S4-011-2008
Lucas, P.	19-May	10:00AM	Madera	GOMD-S3-003-2008
Lucas, P.	20-May	2:20PM	Sabino	GOMD-S1-049-2008
Lumeau, J.H.	19-May	5:20PM	Madera	GOMD-S3-017-2008
M				
Maass, P.	20-May	11:20AM	Sabino	GOMD-S1-045-2008
Martin, S.W.	20-May	10:40AM	Sabino	GOMD-S1-043-2008
Massera, J.	20-May	2:00PM	Madera	GOMD-S3-036-2008
Mauro, J.C.	21-May	9:00AM	Canyon A&B	GOMD-S1-059-2008
Mecholsky, J.	19-May	4:40PM	Sabino	GOMD-S1-019-2008
Mei, Q.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-024-2008
Mogus-Milankovic, A.	20-May	2:00PM	Sabino	GOMD-S1-048-2008
Moore, E.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-022-2008
Morgan, S.H.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-022-2008
Morris, S.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-037-2008
Mueller, K.T.	19-May	1:20PM	Sabino	GOMD-S1-009-2008
Muriithi, B.	19-May	2:00PM	Pima	GOMD-S4-009-2008
Musgraves, J.	19-May	4:00PM	Madera	GOMD-S3-013-2008
P				
Peng, L.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-023-2008
Petit, L.	19-May	2:00PM	Madera	GOMD-S3-009-2008
Priven, A.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-020-2008
Priven, A.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-023-2008
Prokhorenko, O.A.	19-May	6:00PM	Canyon A,B,C	GOMD-S2-001-2008
Prokhorenko, O.A.	21-May	10:20AM	Pima	GOMD-S2-006-2008
Prokhorenko, O.A.	21-May	11:00AM	Pima	GOMD-S2-007-2008
Q				
Qiu, J.	20-May	9:40AM	Madera	GOMD-S3-032-2008
R				
Ravarian, R.	20-May	10:00AM	Sabino	GOMD-S1-042-2008
Rich, J.S.	19-May	10:40AM	Pima	GOMD-S4-003-2008

Presenting Author List

Name	Date	Time	Room	Abstract Number
Rich, J.S.	19-May	6:00PM	Canyon A,B,C	GOMD-S4-016-2008
Righini, G.C.	20-May	9:00AM	Madera	GOMD-S3-031-2008
Riley, M.R.	20-May	9:20AM	Sabino	GOMD-S1-040-2008
Roze, M.	19-May	4:00PM	Sabino	GOMD-S1-017-2008
Rue, D.M.	21-May	9:00AM	Pima	GOMD-S2-004-2008
S				
Salancon, E.	20-May	3:20PM	Pima	GOMD-S4-029-2008
Schaller, R.D.	21-May	8:00AM	Madera	GOMD-S3-040-2008
Schmitt, M.L.	21-May	11:20AM	Canyon A&B	GOMD-S1-064-2008
Schneider, Z.	19-May	4:20PM	Madera	GOMD-S3-014-2008
Schulzgen, A.	19-May	1:20PM	Madera	GOMD-S3-008-2008
Sen, S.	20-May	3:20PM	Sabino	GOMD-S1-051-2008
Seo, D.	19-May	9:40AM	Pima	GOMD-S4-002-2008
Seo, I.	19-May	1:40PM	Pima	GOMD-S4-008-2008
Shaw, A.H.	19-May	1:20PM	Pima	GOMD-S4-007-2008
Shea, K.J.	19-May	3:20PM	Madera	GOMD-S3-012-2008
Sidebottom, D.	20-May	4:40PM	Sabino	GOMD-S1-055-2008
Simmons, J.H.	19-May	9:00AM	Pima	GOMD-S4-001-2008
Simmons-Potter, K.	20-May	2:20PM	Pima	GOMD-S4-027-2008
Souza, G.P.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-025-2008
Soyer Uzun, S.	19-May	11:00AM	Sabino	GOMD-S1-006-2008
Stebbins, J.F.	19-May	2:20PM	Sabino	GOMD-S1-012-2008
Sundaram, S.K.	19-May	9:40AM	Madera	GOMD-S3-002-2008
T				
Tanabe, S.	21-May	8:40AM	Madera	GOMD-S3-041-2008
Tandia, A.	21-May	9:40AM	Canyon A&B	GOMD-S1-061-2008
Timofeev, N.	21-May	9:20AM	Canyon A&B	GOMD-S1-060-2008
Tischendorf, B.	21-May	11:40AM	Pima	GOMD-S2-009-2008
Tomozawa, M.	20-May	4:20PM	Sabino	GOMD-S1-054-2008
Troles, J.	20-May	2:20PM	Madera	GOMD-S3-037-2008
U				
Upadhyay, A.	20-May	3:40PM	Sabino	GOMD-S1-052-2008
V				
Villain, O.	19-May	9:40AM	Sabino	GOMD-S1-003-2008
Villone, J.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-030-2008
Vu, M.	19-May	6:00PM	Canyon A,B,C	GOMD-S1-027-2008
W				
Wachtel, P.F.	19-May	11:00AM	Pima	GOMD-S4-004-2008
Wang, R.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-026-2008
Watson, M.	21-May	8:40AM	Pima	GOMD-S2-003-2008
Weber, R.	19-May	10:40AM	Sabino	GOMD-S1-005-2008
Weber, W.J.	19-May	4:00PM	Pima	GOMD-S4-013-2008
Wertz, J.	19-May	6:00PM	Canyon A,B,C	GOMD-S4-017-2008
Wilhelm, A.A.	20-May	2:40PM	Madera	GOMD-S3-038-2008
Witcher, J.J.	19-May	2:20PM	Madera	GOMD-S3-010-2008
Wu, J.	19-May	1:40PM	Sabino	GOMD-S1-010-2008
Y				
Yang, G.	19-May	10:20AM	Madera	GOMD-S3-004-2008
Yang, H.	21-May	9:40AM	Madera	GOMD-S3-043-2008
Yoldas, B.E.	21-May	9:40AM	Pima	GOMD-S2-005-2008
Youngman, R.	19-May	2:40PM	Sabino	GOMD-S1-013-2008
Yue, Y.	21-May	3:20PM	Pima	GOMD-S2-013-2008
Z				
Zhang, L.	20-May	1:40PM	Sabino	GOMD-S1-047-2008
Zhang, X.	20-May	1:20PM	Madera	GOMD-S3-035-2008
Zhang, Y.	20-May	10:00AM	Pima	GOMD-S4-021-2008
Zhao, D.	19-May	6:00PM	Canyon A,B,C	GOMD-S3-018-2008

MEETING REGULATIONS

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Registration Requirements: ***Attendance at any meeting of the Society shall be limited to duly registered persons.***

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Sunday, May 18, 2008

Welcome Reception

6:00–8:00 PM

Arizona Historical Society

Monday, May 19, 2008

Stookey Lecture of Discovery Award

8:00–9:00 AM

Room: Sabino

Glass Science

Glass Structure I

Room: Sabino

Session Chair: Randall Youngman, Corning Incorporated

9:00 AM

(GOMD-S1-001-2008) Role of Titanium Dioxide in the Early Stages of the Nucleation of Cordierite Glass
M. Guignard*, L. Cormier, N. Menguy, Université Pierre et Marie Curie, France

9:20 AM

(GOMD-S1-002-2008) High-Pressure Synchrotron X-Ray Diffraction Studies of Nanocrystalline Composites: Exploring New Routes for the Development of Advanced Materials
K. Lipinska-Kalita*, O. Hemmers, P. Kalita, University of Nevada Las Vegas, USA; G. Mariotto, University of Verona, Italy; T. Hartmann, Idaho State University, USA; Y. Ohki, Waseda University, Japan; C. Segre, Illinois Institute of Technology, USA

9:40 AM

(GOMD-S1-003-2008) Variability of Cr3+ Environments in Oxide Glasses: A Structural Probe?
O. Villain*, G. Calas, L. Galoisy, L. Cormier, IMPMC, France

10:00 AM

(GOMD-S1-004-2008) Strontium Environment Transition in Tin Silicate Glasses by Neutron and X-ray Diffraction
J. Johnson*, Argonne National Lab, USA; J. Urquidi, New Mexico State University, USA; D. Holland, Warwick University, United Kingdom; C. Johnson, Northern Illinois University, USA; P. Appleyard, Cranfield University, United Kingdom

10:20 AM

Break

10:40 AM

(GOMD-S1-005-2008) Structure Measurements and Processing of Metastable Liquids and Glasses
R. Weber*, Materials Development, Inc., USA; C. Benmore, Q. Mei, Argonne National Laboratory, USA; M. Wilding, University of Wales, United Kingdom

11:00 AM

(GOMD-S1-006-2008) Intermediate-Range Order in Ge-As Sulfide Glasses: Diffraction and RMC Modeling Results
S. Soyer Uzun*, S. Sen, University of California, Davis, USA

11:20 AM

(GOMD-S1-007-2008) Structural Features of Intermediate Phase in Chalcogenide Glasses: A Synchrotron X-Ray Study
G. Chen*, F. Inam, D. Drabold, Ohio University, USA; P. Chen, P. Boolchand, University of Cincinnati, USA

11:40 AM

(GOMD-S1-008-2008) Vibrational Mode Softening Behavior in Binary Chalcogenide Glasses
E. L. Gjersing*, S. Sen, University of California Davis, USA; B. Aitken, Corning Incorporated, USA

Optical Materials

Photostructural Phenomena in Materials I

Room: Madera

Session Chair: Pierre Lucas, University of Arizona

9:00 AM

(GOMD-S3-001-2008) Chalcogenide Glass, The Shape of Things to Come (Invited)
D. Hewak*, University of Southampton, United Kingdom

9:40 AM

(GOMD-S3-002-2008) THz Spectroscopy of Photomodification of Chalcogenide Glasses
S. K. Sundaram*, B. J. Riley, J. V. Crum, N. C. Anheier, Pacific Northwest National Laboratory, USA

10:00 AM

(GOMD-S3-003-2008) Rigidity Percolation Impediment of Light-Induced Matrix Softening in Network Glasses
P. Lucas*, L. Calvez, Z. Yang, University of Arizona, USA

10:20 AM

(GOMD-S3-004-2008) Photo-Sensitive and Photo-Insensitive Chalcogenide Glasses in GexAs45-xSe55
G. Yang*, H. Jain, A. Ganjoo, D. Zhao, Lehigh University, USA; Y. Xu, H. Zeng, G. Chen, East China University of Science and Technology, China

10:40 AM

(GOMD-S3-005-2008) Mid-Infrared Photonics Component Development Using Chalcogenide Glasses (Invited)
N. C. Anheier*, B. E. Bernacki, K. Krishnaswami, N. Hô, Pacific Northwest National Laboratory, USA

11:20 AM

(GOMD-S3-006-2008) Role of Surface Oxidation in the Photon-Induced Ag Diffusion into Chalcogenide Glass Thin Films
A. Kovalskyy, Lehigh University, USA; M. Mitkova, Boise State University, USA; H. Jain*, Lehigh University, USA

11:40 AM

(GOMD-S3-007-2008) Nano-second Kinetics of Transient Photoinduced Changes in a-As_2Se_3 Films
A. Ganjoo*, I. Biaggio, A. Regmi, H. Jain, Lehigh University, USA

Cross-Cutting Topics

Materials for Alternative Energy Applications I

Room: Pima

Session Chair: Douglas Loy, University of Arizona

9:00 AM

(GOMD-S4-001-2008) Solar Energy: Some Critical Steps Needed for Widespread Adoption (Invited)
J. H. Simmons*, University of Arizona, USA

9:40 AM

(GOMD-S4-002-2008) Facile Surface-Functionalization of CdSe Quantum Dots for Their Composite Preparations (Invited)
D. Seo*, Arizona State University, USA

10:20 AM

Break

***Denotes Presenter**

10:40 AM

(GOMD-S4-003-2008) Inorganic Membranes for the Recovery and Purification of Hydrogen from Mixed Gas Streams
J. S. Rich*, J. E. Shelby, Alfred University, USA

11:00 AM

(GOMD-S4-004-2008) High Pressure Storage of Hydrogen in Hollow Glass Microspheres
P. F. Wachtel*, J. E. Shelby, Alfred University, USA

11:20 AM

(GOMD-S4-005-2008) Review of Sol-gel Processed Materials for Polymer Electrolyte Fuel Cell Membranes
D. A. Loy*, University of Arizona, USA

11:40 AM

(GOMD-S4-006-2008) Proton Conduction in La-based Metaphosphate Glasses
G. A. Harley*, Max-Planck-Institut für Festkörperforschung, Germany; Y. Liang, University of California Berkeley, USA; L. C. De Jonghe, Lawrence Berkeley National Laboratory, USA

12:00 PM

Careers in Glass Science Panel Discussion

Room: Madera

Glass Science

Glass Structure II

Room: Sabino

Session Chair: Randall Youngman, Corning Incorporated

1:20 PM

(GOMD-S1-009-2008) Structure and Reactivity at Glass Surfaces as Revealed by NMR and IGC Measurements Coupled with Computational Chemistry
K. T. Mueller*, R. A. Golombeck, N. M. Washton, C. G. Pantano, V. A. Bakaev, T. I. Bakaeva, R. A. Schaut, Penn State University, USA

1:40 PM

(GOMD-S1-010-2008) Composition and Temperature Effect on Aluminoborosilicate Glasses Structure
J. Wu*, J. Stebbins, Stanford University, USA

2:00 PM

(GOMD-S1-011-2008) Structure Property Relationship of Sodium Borophosphate Mixed Glass Former Oxide Glasses
R. B. Christensen*, J. Byer, S. W. Martin, Iowa State University, USA

2:20 PM

(GOMD-S1-012-2008) Temperature Effects on Oxide Melt Structure: Spectroscopic Constraints and Thermodynamic Implications
J. F. Stebbins*, Stanford University, USA

2:40 PM

(GOMD-S1-013-2008) Multi-Nuclear NMR Examination of Sodium Scandium Silicate Glasses
R. Youngman*, C. Hogue, Corning Incorporated, USA; J. Shelby, Alfred University, USA

3:00 PM

Break

3:20 PM

(GOMD-S1-014-2008) Structural Study of Rapidly Cooled Lead Silicate Glasses
S. Feller*, G. Lodden, A. Riley, T. Edwards, J. Croskrey, A. Schue, D. Liss, D. Stentz, S. Blair, M. Kelley, G. Smith, S. Singleton, M. Affatigato, Coe College, USA; D. Holland, M. Smith, University of Warwick, United Kingdom; E. I. Kamitsos, C. Varsamis, NHRF, Greece

3:40 PM

(GOMD-S1-015-2008) Effect of Phosphorus on the Properties and Structure of GeGaAs Sulfide Glasses
B. Aitken*, R. Youngman, Corning Incorporated, USA

4:00 PM

(GOMD-S1-017-2008) New Alkali-Halides and Metal-Halides Glasses
M. Roze*, L. Calvez, X. Zhang, H. Ma, J. Lucas, Université de Rennes 1, France

4:20 PM

(GOMD-S1-018-2008) MgO in Silicate Glasses: Physical Properties and Molecular Dynamic Structure Simulations
A. Cormack, Alfred University, USA; T. Wilantowitz, Rutgers University, USA; W. C. LaCourse*, Alfred University, USA

4:40 PM

(GOMD-S1-019-2008) Role of Fracture Surface Formation in the Determination of Fracture Energy
R. Smith, S. Freiman, J. Mecholsky*, University of Florida, USA

Optical Materials

Photostructural Phenomena in Materials II

Room: Madera

Session Chair: Pierre Lucas, University of Arizona

1:20 PM

(GOMD-S3-008-2008) UV-Written Grating Structures and Single-Frequency Lasers in Phosphate Glass Fiber (Invited)
A. Schulzgen*, S. Suzuki, L. Li, University of Arizona, USA; R. Matei Rogojan, J. Albert, Carleton University, Canada; N. Peyghambarian, University of Arizona, USA

2:00 PM

(GOMD-S3-009-2008) Processing and Characterization of Active and Passive Oxysulfide Glasses for Optical Applications
L. Petit*, Clemson University, USA; J. Abel, Bordeaux University, France; V. Nazabal, Rennes University, France; C. Maurel, T. Cardinal, Bordeaux University, France; K. Richardson, Clemson University, USA; M. Couzi, Bordeaux University, France; L. Burka, Clemson University, USA

2:20 PM

(GOMD-S3-010-2008) Dynamics of Femtosecond Laser Modification in Glass
J. J. Witcher*, L. B. Fletcher, D. M. Krol, University of California, Davis, USA

2:40 PM

(GOMD-S3-011-2008) Atomic Scale Changes in Er-Yb Doped Phosphate Glass Induced by Femtosecond Laser Waveguide Writing
L. B. Fletcher*, J. J. Witcher, W. J. Reichman, D. M. Krol, University of California Davis, USA; J. Bovatsek, A. Arai, IMRA America, Inc., USA

3:00 PM

Break

3:20 PM

(GOMD-S3-012-2008) Optically Transparent, Self-indicating, Photopatternable Hybrid Material (Invited)
K. J. Shea*, University of California, Irvine, USA; D. Loy, University of Arizona, USA; L. Zhao, University of California, Irvine, USA

4:00 PM

(GOMD-S3-013-2008) Photo-Induced Film Deposition from Heteroleptic Titanium Alkoxide Solutions
J. Musgraves*, B. G. Potter, University of Arizona, USA; T. J. Boyle, Sandia National Laboratories, USA

4:20 PM

(GOMD-S3-014-2008) Photoinduced Manipulation of Titanium Metal Alkoxides
Z. Schneider*, K. Simmons-Potter, University of Arizona, USA; T. Boyle, Sandia National Laboratories, USA

4:40 PM

(GOMD-S3-015-2008) Thermal Stability of Polysilane-Based Materials for "On-the-Fly" Photopatterning
H. Chandra*, K. B. Sieluzycka, V. Augustyn, S. Cooper, B. G. Potter, K. Simmons-Potter, University of Arizona, USA

5:00 PM

(GOMD-S3-016-2008) Further Studies of Laser-Induced Crystallization of Vanadate Glasses
C. Faris*, B. Franta, S. Feller, M. Affatigato, Coe College, USA

5:20 PM

(GOMD-S3-017-2008) Effect of Photoelasticity on the Refractive Index Decrement in Photo-Thermo-Refractive Glass
J. H. Lumeau*, Universityof Central Florida, USA; A. Gusarov, SCK CEN Belgian Nuclear Research Center, Belgium; L. Glebova, L. B. Glebov, Universityof Central Florida, USA

Cross-Cutting Topics

Materials for Alternative Energy Applications II

Room: Pima

Session Chair: Douglas Loy, University of Arizona

1:20 PM

(GOMD-S4-007-2008) Mixed Glass Former Effect in the Na_2S-B_2S_3-P_2S_5 System
A. H. Shaw*, Iowa State University, USA; T. Kaufmann, University of Münster, Germany; M. J. Haynes, S. W. Martin, Iowa State University, USA

1:40 PM

(GOMD-S4-008-2008) Composition, Structures and Properties of xLi2S+GeS2(x=2,3) Thin Film Electrolytes Grown by RF Sputtering
I. Seo*, S. W. Martin, Iowa State University, USA

2:00 PM

(GOMD-S4-009-2008) Silica-Nafion Nanocomposite Membranes for High Temperature Fuel Cells
D. A. Loy, B. Muriithi*, University of Arizona, USA

2:20 PM

(GOMD-S4-010-2008) Formation of Monodisperse Silica Nanoparticles Using an Anhydrous Sol-gel Process
D. A. Loy, D. Boday*, University of Arizona, USA

2:40 PM

(GOMD-S4-011-2008) Preparing Silica Membranes Using Rigid Rod Polyisocyanates as a Template for Functionalized Porosity
D. A. Loy*, University of Arizona, USA

Ionizing Radiation Effects in Amorphous Materials and Structures - Nuclear Waste Glasses

Room: Pima

Session Chairs: S.K. Sundaram, Pacific Northwest National Lab; Brad Johnson, Pacific Northwest National Lab

3:20 PM

(GOMD-S4-012-2008) Amorphous Sulfides in the Nuclear Wastes: Effects of Ionizing Radiations and Interaction with Radiolytic Hydrogen (Invited)
P. Afanasiev*, Université de Lyon 1, France

4:00 PM

(GOMD-S4-013-2008) Effects of Extreme Ionization on Amorphous and Crystalline Ceramics (Invited)
W. J. Weber*, Y. Zhang, I. Bae, Pacific Northwest National Laboratory, USA

4:20 PM

(GOMD-S4-014-2008) Electron Spin Resonance Study of a 17-Year Old Nuclear Waste Glass Simulant Containing Pu-238
D. L. Griscom*, impactGlass research international, USA; W. J. Weber, Pacific Northwest National Laboratory, USA

4:40 PM

(GOMD-S4-015-2008) Glass Fabrication and Leach Testing of Lanthanide Borosilicate Glass for Plutonium Disposition (Invited)
C. Crawford*, N. E. Bibler, J. C. Marra, K. M. Fox, Savannah River National Lab, USA

6:00–9:00 PM

Posters

Room: Canyon A,B,C

Poster Session

(GOMD-S1-020-2008) Evaluation of the Most Probable Values of Physical Properties of Materials and their Confidence Limits
A. Priven*, ITC, Inc., USA; A. Fluegel, ilis GmbH, Germany

(GOMD-S1-021-2008) Investigating Electronic Defect Formation in Germanium Doped Silica Glass with Density Functional Theory Calculations
J. Du*, University of North Texas, USA; L. Corrales, University of Arizona, USA; K. Tsemekhman, University of Washington, USA; E. J. Bylaska, Pacific Northwest National Lab, USA

(GOMD-S1-022-2008) Excitation Power and Geometry in Laser Modification of Silica
E. Moore*, R. Corrales, The University of Arizona, USA

(GOMD-S1-023-2008) High Resolution ^{17}O NMR Studies of Gallosilicate Glasses
L. Peng*, J. F. Stebbins, Stanford University, USA

(GOMD-S1-024-2008) Structure of Aluminosilicate Melts Measured Using High Energy X-ray Diffraction
Q. Mei*, Argonne National Laboratory, USA; M. C. Wilding, University of Wales, United Kingdom; C. J. Benmore, Argonne National Laboratory, USA; R. Weber, Materials Development, Inc., USA

(GOMD-S1-025-2008) Nucleation Kinetics in Photo-Thermo-Refractive (PTR) Glass
G. P. Souza*, V. M. Fokin, E. D. Zanotto, Federal University of Sao Carlos, Brazil; J. Lumeau, L. Glebova, L. B. Glebov, University of Central Florida, USA

(GOMD-S1-026-2008) Lithium Bismuthate Glasses Studied Using Laser Ionization Time of Flight Mass Spectrometry
R. Kramer*, S. Feller, M. Affatigato, Coe College, USA

(GOMD-S1-027-2008) Molar Volumes and Structure of Alkali and Alkaline-Earth Vanadate Glasses
M. Vu*, Coe College, USA; J. Helmus, Ohio State University, USA; J. Lewis, C. O'Brien, S. Shrestha, M. Affatigato, S. Feller, Coe College, USA

(GOMD-S1-028-2008) Preliminary Investigation of the Mixed Glass Former Effect on the Structure, Tg, and Density of (Na2O)y+[(B2O3)x+(P2O5)(1-x)](1-y)
J. Byer*, R. Christensen, T. Kaufmann, S. W. Martin, Iowa State University, USA

(GOMD-S1-029-2008) Structure of Ternary Na2O-(GeO2/SiO2)-P2O5 Glasses by Raman Spectroscopy and X-Ray Diffraction
C. M. Larson*, R. K. Brow, University of Missouri-Rolla, USA; U. Hoppe, Universität Rostock, Germany

(GOMD-S1-030-2008) Crystallization of a Calciumboroaluminosilicate Glass with Extended Heat-Treatment Time
N. Lonnroth*, K. A. Nielsen, Risø National Laboratory, Denmark

(GOMD-S1-031-2008) Influence of ZnO on Crystallization and Electrical Conductivity of Zinc Iron Phosphate Glasses
V. Licina*, A. Mogus-Milankovic, Rudjer Boskovic Institute, Croatia; Z. Skoko, Faculty of Science, University of Zagreb, Croatia; S. T. Reis, D. E. Day, University of Missouri-Rolla, USA

(GOMD-S1-032-2008) Dynamic Light Scattering in Ultraphosphate Glass-forming Liquids
R. Fabian*, D. Sidebottom, Creighton University, USA

(GOMD-S1-033-2008) Dynamic Light Scattering in Glassforming Aqueous Maltose
M. Durante*, D. Sidebottom, Creighton University, USA

(GOMD-S1-034-2008) Computer Simulation of Structural Relaxation in Glasses
R. G. Erdmann*, E. A. King, P. Lucas, University of Arizona, USA

(GOMD-S1-035-2008) Glasses with Fictive Temperature-Independent Properties: Minimization of Indentation Size Effect and Maximization of Indentation Crack Resistance
T. M. Gross*, M. Tomozawa, Rensselaer Polytechnic Institute, USA

(GOMD-S1-036-2008) Conductivity of Mixed Alkali Germanate Glasses
M. M. Ashton-Patton*, J. E. Shelby, New York State College of Ceramics, USA

(GOMD-S1-037-2008) Properties of K_2O-Rb_2O-GeO_2 Glasses
S. Morris*, M. M. Ashton-Patton, J. E. Shelby, New York State College of Ceramics, USA

(GOMD-S1-038-2008) Investigation of Heat Capacities for the 0.5P2O5+0.5[x(Na2O)+(1-x)(Li2O)] System
M. J. Haynes*, S. W. Martin, Iowa State University, USA

(GOMD-S1-039-2008) Atomic-scale Structure of 0.5Li2S+0.5[(1-x)GeS2+xGeO2] Glasses (x=0.,0.1,0.2,0.4,0.6,0.8) by High-energy X-ray Diffraction and Computer Simulations
D. Le Messurier*, V. Petkov, Central Michigan University, USA

(GOMD-S2-001-2008) Modeling of Silica Glass Forming
O. A. Prokhorenko*, L.G.P. Intl. LLC, USA

(GOMD-S3-018-2008) Photoinduced Changes in the Structure and Properties of Oxychalcogenide Glasses
D. Zhao*, A. Ganjoo, A. Kovalskyy, H. Jain, Lehigh University, USA; G. Yang, Y. Xu, G. Chen, East China University of Science and Technology, China

(GOMD-S3-019-2008) Demonstration of High-Q Chalcogenide Glass Ring Resonators
J. Hu*, Massachusetts Institute of Technology, USA; N. Carlie, L. Petit, Clemson University, USA; A. Agarwal, Massachusetts Institute of Technology, USA; K. Richardson, Clemson University, USA; L. Kimerling, Massachusetts Institute of Technology, USA

(GOMD-S3-020-2008) Zygo Optical Systems and Glass Materials
M. James*, Zygo Corporation, USA

(GOMD-S3-021-2008) Color Variations due to Gold Nano-Particles in Fully- and Partially-developed Photosensitive Glass
W. C. LaCourse*, J. Karkheck, NYS College of Ceramics at Alfred University, USA

(GOMD-S3-022-2008) Luminescence of Rare-Earth Doped Lithium-Lanthanum-Aluminosilicate Oxyfluoride Glasses and Glass-Ceramics
S. H. Morgan*, Z. Pan, K. James, Y. Cui, A. Burger, R. Mu, Fisk University, USA

(GOMD-S3-023-2008) Patent Search for Chemical Compositions of Materials with SciMaterial IP
A. Priven*, A. Sukharevsky, ITC, Inc., USA

(GOMD-S3-024-2008) Writing of c-axis Oriented Lithium Niobate Crystal Line on Glass Surface by Laser Irradiation
T. Honma*, K. Koshiba, Nagaoka Univeristy of Technology, Japan; Y. Benino, Okayama University, Japan; T. Komatsu, Nagaoka Univeristy of Technology, Japan

(GOMD-S3-025-2008) Crystallization of the Non-linear Optical Phase La2CaB10O19 from La2O3–CaO–B2O3 Glasses
I. Dyamant*, E. Korin, J. Hormadaly, I. Bar, Ben-Gurion University, Israel

(GOMD-S3-026-2008) X-Ray Photoelectron Spectroscopy Investigation of GexAsySe1-x-y Glasses
R. Wang*, D. Choi, L. Barry, Australian National University, Australia

(GOMD-S3-027-2008) Rare-Earth Doped Polymethylmethacrylate (PMMA) Bulk Material for Optical Applications
B. Kokuoz, C. J. Kucera*, J. Ballato, Clemson University, USA

(GOMD-S3-028-2008) Crystallization Processes in Glass-Ceramics with Different Structural Coordination
P. Lucas, E. King*, University of Arizona, USA; X. Zhang, B. Bureau, Universite de Rennes, France

(GOMD-S3-029-2008) Preparation and Characterization of New Fluorotellurite Glasses for Photonics Application
Q. Chen*, G. Liao, J. Xing, Q. Chen, D. Milanese, H. Gebavi, M. Fokine, M. Ferraris, politecnico di Torino, Italy

(GOMD-S3-030-2008) Optimization of Luminescent Properties of GaN and InGaN/GaN Quantum Well Structures for Application in Ion-Photon Emission Microscopy
J. Villone*, B. L. Doyle, G. Vizkelethy, E. S. Bielejec, D. L. Buller, J. A. Knapp, D. D. Koleske, Sandia National Labs, USA

(GOMD-S4-016-2008) Hollow Glass Microspheres for the Separation of Hydrogen From Mixed Gas Streams
J. S. Rich*, J. E. Shelby, Alfred University, USA

(GOMD-S4-017-2008) Preparation of New Fluorescent Silica-Silsesquioxane Nanoparticles
D. A. Loy, J. Wertz*, University of Arizona, USA

(GOMD-S4-018-2008) Irradiation Effects of Intensive Electron Beam on High Purity Silica
S. Cheng*, Corning Incorporated, USA

Tuesday, May 20, 2008

George W. Morey Award Lecture

8:00 AM

Room: Sabino

Glass Science

Cell and Protein Interactions with Glass

Room: Sabino

Session Chair: Mark Riley, University of Arizona

9:00 AM

(GOMD-S1-039-2008) Role of Glass-Forming Matrices in Cryopreservation: A ^{31}P NMR Line Shape Simulation Study
P. Jain*, S. Sen, S. Risbud, University of California, Davis, USA

9:20 AM

(GOMD-S1-040-2008) Cellular Adhesion and Response to Thermally Modified, Sol-Gel Derived TiO2 Thin Films
M. Coe, D. L. DeRosa, University of Arizona, USA; J. D. Musgraves, J. Blaine, B. G. Potter, The University of Arizona, USA; M. R. Riley*, University of Arizona, USA

9:40 AM

(GOMD-S1-041-2008) Novel Injectable Bioglass/Chitosan Composite for Bone Substitute Materials
P. Khoshakhlagh*, S. Rabiee, F. Moztarzadeh, R. Ravarian, R. Moradi, N. Nosoudi, Amirkabir University of Technology, Iran

10:00 AM

(GOMD-S1-042-2008) Preparation and Characterization of Macroporous Bioglass/ Hydroxyapatite Composite for Biomedical Applications
R. Ravarian*, S. Rabiee, F. Moztarzadeh, P. Khoshakhlagh, N. Nosoudi, Amirkabir University of technology, Iran

10:20 AM

Break

Dynamics in Glasses and Glassforming Liquids I

Room: Sabino

Session Chair: David Sidebottom, Creighton University

10:40 AM

(GOMD-S1-043-2008) Ionic Conduction in Trivalent Doped Tetrahedral Network Chalcogenide Glasses: Similarities and Differences to Oxide Glasses
S. W. Martin*, W. Yao, Iowa State University, USA; J. Saienga, TA Instruments, USA

11:00 AM

(GOMD-S1-044-2008) Characterization of Electrically-Conductive Glass-Ceramics
M. J. Davis*, P. Vullo, SCHOTT North America, Inc., USA

11:20 AM

(GOMD-S1-045-2008) Non-Exponential Relaxations in Ion-Conducting Glasses (Invited)
P. Maass*, Institute of Physics, Germany

Optical Materials

Optical Fibers and Waveguides I

Room: Madera

Session Chair: Shibin Jiang, Ad-Value Photonics

9:00 AM

(GOMD-S3-031-2008) Advances in Glasses and Fabrication Processes for Integrated Optical Amplifiers (Invited)
G. C. Righini*, CNR - National Research Council of Italy, Italy; S. Berneschi, M. Brenci, S. Pelli, IFAC CNR, Italy; G. Nunzi Conti, Centro Enrico Fermi, Italy; A. Chiappini, A. Chiasera, M. Ferrari, IFN CNR, Italy

9:40 AM

(GOMD-S3-032-2008) Broadband Near-Infrared Luminescence and Optical Amplification of Activated Ion-doped Glasses and Glass Ceramics (Invited)
J. Qiu*, Zhejiang University, China

10:20 AM

Break

10:40 AM

(GOMD-S3-033-2008) Er3+-Activated Waveguiding Glass Ceramics, Microcavities and Nano-Microsphere: Fabrication and Spectroscopic Assessment
M. Ferrari*, C. Armellini, A. Chiappini, A. Chiasera, Y. Jestin, CNR-IFN, Italy; E. Moser, C. Tosello, M. Montagna, University of Trento, Italy; G. C. Righini, CNR, Italy; S. Berneschi, M. Brenci, S. Pelli, IFAC-CNR, Italy; G. Nunzi Conti, S. Soria, Centro Enrico Fermi, Italy

11:00 AM

(GOMD-S3-034-2008) Multicomponent Oxide Glass Fibers for Fiber Lasers and Amplifiers
S. Jiang*, AdValue Photonics Inc., USA

Cross-Cutting Topics

Ionizing Radiation Effects in Amorphous Materials and Structures - Radiation Detection

Room: Pima

Session Chairs: S.K. Sundaram, Pacific Northwest National Lab; Brad Johnson, Pacific Northwest National Lab

9:00 AM

(GOMD-S4-019-2008) New Glass Scintillators for Radiation Detection Applications (Invited)
L. A. Boatner*, D. Wisniewski, J. S. Neal, J. O. Ramey, Oak Ridge National Lab, USA

9:40 AM

(GOMD-S4-020-2008) Changes in DC Conductivity of Amorphous Semiconductors with Exposure to Ionizing Radiation (Invited)
B. R. Johnson*, J. V. Crum, R. M. VanGinhoven, C. E. Seifert, B. J. Riley, S. K. Sundaram, Pacific Northwest National Lab, USA

10:00 AM

(GOMD-S4-021-2008) Characterization of Ion-induced Scintillation in Ceramics
Y. Zhang*, V. Shutthananda, W. J. Weber, Pacific Northwest National Laboratory, USA

10:20 AM

Break

Ionizing Radiation Effects in Amorphous Materials and Structures - Optical Materials I

Room: Pima

Session Chairs: Brad Johnson, Pacific Northwest National Lab; S.K. Sundaram, Pacific Northwest National Lab

10:40 AM

(GOMD-S4-022-2008) Effects of Ionizing Radiation on Properties of Volume Bragg Gratings in a Photo-Thermo-Refractive Glass (Invited)
L. B. Glebov*, University of Central Florida, USA

11:20 AM

(GOMD-S4-023-2008) In-Situ and Post-Exposure Effects of Ionizing Radiation on Optical Properties of Nd:YAG and Cr:YAG
B. L. Glebov*, K. Simmons-Potter, The University of Arizona, USA; D. C. Meister, Sandia National Laboratories, USA

11:40 AM

(GOMD-S4-024-2008) Compaction Effects of Radiation on Zerodur
M. J. Davis*, SCHOTT North America, Inc., USA; C. Kunisch, SCHOTT AG, Germany

Norbert J. Kreidl Award Lecture

12:00 PM

Room: Sabino

Glass Science

Dynamics in Glasses and Glassforming Liquids II

Room: Sabino

Session Chair: David Sidebottom, Creighton University

1:20 PM

(GOMD-S1-046-2008) Indentation-Induced Microhardness Change in Glasses: Possible Fictive Temperature Increase caused by Plastic Deformation
T. M. Gross*, M. Tomozawa, Rensselaer Polytechnic Institute, USA

1:40 PM

(GOMD-S1-047-2008) Glass Formation from Iron-rich Phosphate Melts
L. Zhang*, R. K. Brow, M. E. Schlesinger, University of Missouri-Rolla, USA

2:00 PM

(GOMD-S1-048-2008) Insight into Crystallization of Iron Phosphate Glasses
A. Mogus-Milankovic*, Ruder Boskovic Institute, Croatia; S. Zeljko, Faculty of Science, University of Zagreb, Croatia; L. Vesna, M. Sveto, Ruder Boskovic Institute, Croatia; D. E. Delbert, R. T. Signo, University of Missouri-Rolla, USA

2:20 PM

(GOMD-S1-049-2008) Relaxation Processes and Mechanical Properties of Chalcogenide Glass Fibers
P. Lucas*, E. King, University of Arizona, USA; Y. Gueguen, J. Sangleboeuf, Universite de Rennes, France; G. Delaizir, University of Arizona, USA; C. Boussard-Pledel, B. Bureau, X. Zhang, T. Rouxel, Universite de Rennes, France

2:40 PM

(GOMD-S1-050-2008) Mechanisms of Nucleation and Growth in Cerium Containing Photosensitive Glasses
J. Bartlett*, W. LaCourse, New York State College of Ceramics, USA

3:00 PM

Break

3:20 PM

(GOMD-S1-051-2008) Spectroscopic Evidence of a Plastic Phase in an Inorganic Molecular Glass
S. Sen*, E. Gjersing, University of California, Davis, USA; B. Aitken, Corning Incorporated, USA

3:40 PM

(GOMD-S1-052-2008) Molecular Dynamics Simulations of Thermal Transport Mechanisms in Network Glasses and Melts
A. Upadhyay*, N. Gorska, J. Kieffer, University of Michigan, USA

4:00 PM

(GOMD-S1-053-2008) Glass Formation in Alkali Germanates: A Combined Inelastic Light Scattering and MD Simulation Study
N. Gorska*, J. Kieffer, University of Michigan, USA

4:20 PM

(GOMD-S1-054-2008) Origin of Non-Exponential Structural Relaxation of a High Purity Silica Glass
M. Tomozawa*, Rensselaer Polytechnic Institute, USA; A. Koike, Asahi Glass Co., Japan; S. Ryu, Samsung-Corning, South Korea

4:40 PM

(GOMD-S1-055-2008) Viscoelastic Relaxation of Molten Phosphorus Pentoxide
D. Sidebottom*, J. Changstrom, Creighton University, USA

Optical Materials

Optical Fibers and Waveguides II

Room: Madera

Session Chair: Shibin Jiang, Ad-Value Photonics

1:20 PM

(GOMD-S3-035-2008) Tellurium Based Chalcogenide Glasses and Fibers for Space Application (Invited)
J. Lucas, C. Boussard-Plédel, B. Bureau, H. Ma, X. Zhang*, University of Rennes - CNRS, France

2:00 PM

(GOMD-S3-036-2008) Tellurite and Borophosphate-based Glasses for MIR Fiber Applications
J. Massera*, A. Haldeman, Clemson University, USA; R. Thieulin, Université de Monptellier, France; H. Gebavi, D. Milanese, Politecnico di Torino, Italy; L. Petit, K. Richardson, Clemson University, USA

2:20 PM

(GOMD-S3-037-2008) Microstructured Chalcogenide Fibers Single-mode from 1.55 µm to Mid-Infrared
J. Troles*, University of Rennes 1, France; L. Brilland, PERFOS, France; F. Smektala, University of Bourgogne, France; N. Traynor, PERFOS, France; H. Patrick, F. Desevedavy, University of Rennes 1, France; G. Renvesez, University of Aix Marseille 3, France

2:40 PM

(GOMD-S3-038-2008) New Tellurium Based Infrared Glasses for Optical Sensing Applications
A. A. Wilhelm*, P. Lucas, University of Arizona, USA; C. Boussard-Plédel, P. Houizot, B. Bureau, J. Lucas, Université de Rennes I Campus de Beaulieu, France; M. R. Riley, University of Arizona, USA

Cross-Cutting Topics

Ionizing Radiation Effects in Amorphous Materials and Structures - Optical Materials II

Room: Pima

Session Chairs: Brad Johnson, Pacific Northwest National Lab; S.K. Sundaram, Pacific Northwest National Lab

1:20 PM

(GOMD-S4-025-2008) Radiation Effects on Optical Fibers: Fundamentals and Applications (Invited)
F. Berghmans*, Vrije Universiteit Brussel, Belgium; B. Brichard, A. Gusarov, M. Van Uffelen, SCK-CEN, Belgium; H. Thienpont, Vrije Universiteit Brussel, Belgium

2:00 PM

(GOMD-S4-026-2008) Temperature and Dose-Rate Effects on Gamma Radiation-Induced Photodarkening of Rare-Earth-Doped Optical Fibers
B. P. Fox*, K. Simmons-Potter, University of Arizona, USA; W. J. Thomes, NASA Goddard Space Flight Center, USA; D. C. Meister, R. P. Bambha, D. A. Kliner, Sandia National Laboratories, USA

2:20 PM

(GOMD-S4-027-2008) Optical Materials and Components for use in High-Radiation Environments (Invited)
K. Simmons-Potter*, University of Arizona, USA

2:40 PM

(GOMD-S4-028-2008) Laser Modification of Silica (Invited)
R. Corrales*, E. Moore, The University of Arizona, USA; R. M. Van Ginhoven, Pacific Northwest National Laboratory, USA

3:00 PM

Break

Ionizing Radiation Effects in Amorphous Materials and Structures - General Effects

Room: Pima

Session Chairs: S.K. Sundaram, Pacific Northwest National Lab; Brad Johnson, Pacific Northwest National Lab

3:20 PM

(GOMD-S4-029-2008) Thermal Decomposition of Amorphous Hydrogenated Carbon Films (Invited)
E. Salancon*, Marseille University, France; D. Thomas, T. Schwarz-Selinger, W. Jacob, Max-Planck Institut für plasmaphysik, Germany

4:00 PM

(GOMD-S4-030-2008) Radiolytically-Induced Topological Re-Arrangements in Amorphous Networks (Invited)
L. W. Hobbs*, Massachusetts Institute of Technology, USA

4:40 PM

(GOMD-S4-031-2008) Ionizing Radiation Effects in Complex Ceramics (Invited)
J. Lian*, Rensselaer Polytechnic Institute, USA; M. Lang, F. Zhang, University of Michigan, USA; L. Wang, University of Michigan, USA; R. C. Ewing, University of Michigan, USA

Tutorial: Non-Linear Optics in Glass

Room: Madera

3:20–5:00 PM

(GOMD-S3-039-2008) Nonlinear Optics in Glass (Invited)
D. M. Krol*, UC Davis, USA

GOMD Business Meeting

5:00 PM

Room: Canyon A&B

GOMD Conference Dinner

7:00 PM

Room: Madera/Pima

Wednesday, May 21, 2008

Glass Science

Theoretical and Numerical Modeling

Room: Canyon A&B

Session Chairs: L. Rene Corrales, University of Arizona; John Mauro, Corning Incorporated

8:00 AM

(GOMD-S1-056-2008) Comprehensive Theory of Silicate Solution Thermodynamics
K. Keefer*, Keith Keefer Consulting, USA; B. deJong, Utrecht University, Netherlands

8:20 AM

(GOMD-S1-057-2008) Phenomenological Glass Compaction Models: Recent Developments
D. C. Allan*, J. C. Mauro, Corning Incorporated, USA; P. Gupta, The Ohio State University, USA

8:40 AM

(GOMD-S1-058-2008) Configurational Entropy of Glass (Invited)
P. Gupta*, The Ohio State University, USA; J. Mauro, Corning Incorporated, USA

9:00 AM

(GOMD-S1-059-2008) Continuously Broken Ergodicity and the Glass Transition
J. C. Mauro*, Corning Incorporated, USA; P. K. Gupta, The Ohio State University, USA; R. J. Loucks, Alfred University, USA

9:20 AM

(GOMD-S1-060-2008) Composition-Structure-Property Relationship in SiO_2, Al_2O_3-SiO_2 and CaO-Al_2O_3-SiO_2 Glasses: A Molecular Modeling Study (Invited)
A. Tandia, Corning Incorporated, USA; N. Timofeev*, Corning Incorporated, Russian Federation; P. Diep, A. L. Rovelstad, Corning Incorporated, USA

9:40 AM

(GOMD-S1-061-2008) Molecular Modeling Study of the Micro-Structure Evolution of Calcium Alumino-Silicate Glass during Thermal Quench
A. Tandia*, Corning Incorporated, USA; N. Timofeev, Corning Incorporated, Russian Federation; P. Diep, A. L. Rovelstad, Corning Incorporated, USA

10:00 AM

(GOMD-S1-062-2008) Fluorine Distribution and Structural Relaxation in Fluorine Doped Silica Glasses
J. Du*, University of North Texas, USA

10:20 AM

Break

10:40 AM

(GOMD-S1-063-2008) Hidden Structures in Network Glasses and the Universality of Thermo-Mechanical Anomalies (Invited)
L. Huang, North Carolina State University, USA; J. Kieffer*, University of Michigan, USA

11:20 AM

(GOMD-S1-064-2008) Modeling of Iron Redox Ratio and Corrosion Behavior of Iron Phosphate Glasses
M. L. Schmitt*, R. K. Brow, University of Missouri-Rolla, USA

11:40 AM

(GOMD-S1-065-2008) Theoretical Insight into Photostructural Modifications of Heteroleptic Ti-alkoxides for Molecular Assembly
C. De Silva*, J. Musgrave, Z. Schneider, R. Corrales, B. G. Potter, K. Simmons-Potter, The University of Arizona, USA; T. J. Boyle, Sandia National Laboratories, USA

12:00 PM

(GOMD-S1-066-2008) Enthalpy Landscape Model of the Selenium Glass Transition
J. C. Mauro, Corning Incorporated, USA; R. J. Loucks*, Alfred University, USA

Optical Materials

Optical Properties of Doped Materials

Room: Madera

Session Chair: B.G. Potter, University of Arizona

8:00 AM

(GOMD-S3-040-2008) Ultrafast Response of Semiconductor Nanocrystals to High-Photon Energy Absorption: Multiexcitons from a Single Photon (Invited)
R. D. Schaller*, V. I. Klimov, Los Alamos National Lab, USA

8:40 AM

(GOMD-S3-041-2008) Silicate Glass Ceramic Phosphors for Solid-State Lighting (Invited)
S. Tanabe*, Kyoto University, Japan

9:20 AM

(GOMD-S3-042-2008) Structure and Optical Properties of Soda-lime Glasses Containing Ag and Au Nanoparticles
M. Dubiel*, J. Haug, H. Kruth, Martin Luther University of Halle-Wittenberg, Germany; H. Hofmeister, K. Schicke, Max Planck Institute of Microstructure Physics, Germany

9:40 AM

(GOMD-S3-043-2008) Effect of Silver Concentration on the Silver Activated Phosphate Glass
H. Yang*, W. Hsu, National United University, Taiwan; S. Hsu, W. Chen, National Yang-Ming University, Taiwan

10:00 AM

(GOMD-S3-044-2008) Core-Shell Structured and Color Tunable Rare-Earth Doped LaF3 Nanoparticles
B. Kokuoz*, J. Ballato, Clemson University, USA

10:20 AM

Break

10:40 AM

(GOMD-S3-045-2008) Creating Ultrahigh Loading Level Composites: Up to 80% LaF3 Nanoparticle Doped Fluoropolymers
B. Kokuoz*, J. Ballato, Clemson University, USA

11:00 AM

(GOMD-S3-046-2008) Effect of RE Coordination on the Optical Properties of RE Phosphate Glasses
N. Wyckoff, R. K. Brow*, University of Missouri-Rolla, USA; U. Hoppe, Rostock University, Germany

11:20 AM

(GOMD-S3-047-2008) Approximating Lanthanide Diffusion Using Multi-Layered Alkali Earth Nanoparticles
T. L. James*, B. Kokuoz, J. Ballato, Clemson University, USA

Issues in Glass Technology

Energy Saving Strategies and Advanced Topics

Room: Pima

Session Chairs: Hong Li, PPG Industries, Inc.; Michael Greenman, Glass Manufacturing Industry Council; Arun Varshneya, Alfred University; Harrie Stevens, Alfred University

8:00 AM

(GOMD-S2-002-2008) DOE and Glass Industry Cooperation: Past, Present and Future (Invited)
D. Kaempf*, U.S. Dept. of Energy, USA

8:40 AM

(GOMD-S2-003-2008) Applications of Hybrid Glass Melting Technology
M. Watson*, M. Habel, Air Products and Chemicals, Inc., USA

9:00 AM

(GOMD-S2-004-2008) Thermochemical Recuperation For Heat Recovery (Invited)
D. M. Rue*, H. Kurek, M. Khinkis, GTI, USA

9:40 AM

(GOMD-S2-005-2008) Non-Compositional Modification of Thermoplastic and Photonic Properties of Glass (Invited)
B. E. Yoldas*, Sisecam, USA

10:20 AM

(GOMD-S2-006-2008) Continuous Fiber Forming Modeling (Invited)
O. A. Prokhorenko*, L.G.P. Intl. LLC, USA

11:00 AM

(GOMD-S2-007-2008) Reducing CO2 Emission at Glass Melting
O. A. Prokhorenko*, L.G.P. Intl. LLC, USA

11:20 AM

(GOMD-S2-008-2008) Rare Earth Stabilization of Boron in Borosilicate Melts
H. Li*, R. Hicks, PPG Industries, Inc., USA

11:40 AM

(GOMD-S2-009-2008) Performance of Glassed Feedthroughs Under Electrical Bias
B. Tischendorf*, J. Taylor, Medtronic, USA

Glass Strength Related to Knowledge About Surfaces and Other Factors

Room: Pima

Session Chairs: Hong Li, PPG Industries, Inc.; Michael Greenman, Glass Manufacturing Industry Council

1:20 PM

(GOMD-S2-010-2008) Making Glass Stronger and More Useful (Invited)
S. Gulati*, Corning Incorporated, USA

2:00 PM

(GOMD-S2-011-2008) Cracking Behavior and Nano-Structure of Glass (Invited)
S. Ito*, Asahi Glass. Co., Ltd., Japan

2:40 PM

(GOMD-S2-012-2008) Birefringence Measurement of Residual Stresses in Indented Glasses
C. R. Kurkjian*, University of Southern Maine, USA; A. Errapart, H. Aben, Tallinn University of Technology, Estonia; R. Oldenbourg, Marine Biological Laboratory, Woods Hole, USA; M. J. Matthewson, Rutgers University, USA

3:00 PM

Break

3:20 PM

(GOMD-S2-013-2008) Enthalpy, Anisotropy and Strength of Glass Fibers (Invited)
Y. Yue*, M. Lund, Aalborg University, Denmark; J. Deubener, M. Ya, Clausthal University of Technology, Germany

4:00 PM

(GOMD-S2-014-2008) Effect of Stress on the Behavior of NBOHC Defects in Silica Fiber
C. R. Kurkjian*, University of Southern Maine, USA; A. Kosolapov, Fiber Optics Research Center, Russian Federation; L. B. Fletcher, L. Lei, D. M. Krol, University of California, Davis, USA

Monday, May 19, 2008

Glass Science

Glass Structure I

Room: Sabino
Session Chair: Randall Youngman, Corning Incorporated

9:00 AM

(GOMD-S1-001-2008) Role of Titanium Dioxide in the Early Stages of the Nucleation of Cordierite Glass

M. Guignard*, L. Cormier, N. Menguy, Université Pierre et Marie Curie, France

Fifty years after Stookey's discovery of a method of making ceramics, nucleation and crystallization in glass to produce glass-ceramics remains of great interest to both academic and industrial communities. Many questions concerning the part played by nucleating agents during the formation of nuclei are still to be resolved. The objective of this study was to reach a better understanding of the early stages of the nucleation in alumino-silicates glass-ceramics containing TiO2 as nucleant. The mechanisms of nucleation were studied in a cordierite glass by means of differential thermal analyses, x-ray diffraction and scanning and transmission electron microscopy. Preliminary results demonstrated that titanium-rich particles crystallized within the volume of the glass during the early stages of the heat treatment. In parallel, neutron and x-ray diffractions were employed as techniques to investigate the evolution of the local environment of magnesium and titanium during the nucleation process.

9:20 AM

(GOMD-S1-002-2008) High-Pressure Synchrotron X-Ray Diffraction Studies of Nanocrystalline Composites: Exploring New Routes for the Development of Advanced Materials

K. Lipinska-Kalita*, O. Hemmers, P. Kalita, University of Nevada Las Vegas, USA; G. Mariotto, University of Verona, Italy; T. Hartmann, Idaho State University, USA; Y. Ohki, Waseda University, Japan; C. Segre, Illinois Institute of Technology, USA

Our team develops glass-ceramic composites. They consist of nanometer-sized crystals embedded in parent matrices made of glass. These nanocomposites combine the best of the crystal and glass 'worlds' and exhibit a remarkable combination of flexibility of composition and tunability of properties. Their basic framework is the same: nanometer-sized crystals embedded in a host glass, but their composition and properties are very different. We investigate the structural integrity and structural transformation of these composites when exposed to elevated pressures. High-pressure offers the exciting possibility to synthesize novel solids with unique optical, electronic, magnetic or thermo-mechanical properties - currently a major challenge in materials science. We present a review of our recent, in situ high-pressure synchrotron radiation based x-ray diffraction studies of some of our glass-derived nanocrystalline composites.

9:40 AM

(GOMD-S1-003-2008) Variability of Cr3+ Environments in Oxide Glasses: A Structural Probe?

O. Villain*, G. Calas, L. Galoisy, L. Cormier, IMPMC, France

Chromium is a large used dopant for silicate glasses, as a coloring and a nucleating agent. Such properties are greatly influenced by the local structure. We study silicate, borate and borosilicate glasses with various contents in cation modifiers. All glasses are doped with 0.5%-Cr3+ and studied with optical absorption spectroscopy and X-ray absorption spectroscopy (EXAFS). EXAFS shows an octahedral coordination with Cr-O distances higher than in minerals. Radial disorder is higher in borosilicate than in silicate glasses. Optical absorption is sensitive to the modification of Cr environment (site geometry, Cr-O bond covalency). The nature of cation modifiers is hence crucial in silicate glasses. Cation mixing shows a major influence of alkalis relative to alkaline earths. Cr is far more sensitive to the Na2O content in borate than in silicate glasses. In sodium borosilicate glasses, optical properties are linked to the Si/B ratio. The suitability of Cr3+ to probe the structure of glasses is discussed.

10:00 AM

(GOMD-S1-004-2008) Strontium Environment Transition in Tin Silicate Glasses by Neutron and X-ray Diffraction

J. Johnson*, Argonne National Lab, USA; J. Urquidi, New Mexico State University, USA; D. Holland, Warwick University, United Kingdom; C. Johnson, Northern Illinois University, USA; P. Appleyard, Cranfield University, United Kingdom

The effect of Sr modifier atoms on the structure of stannosilicate glasses of composition (Sr0)x(SnO)0.5-x(SiO2)0.5, with $0 \leq x \leq 0.15$, has been studied using Mössbauer spectroscopy and neutron and x-ray diffraction. The tin is mostly in the Sn2+ state. The Sr-O bond length undergoes a step decrease from (2.640 ± 0.005) Å to (2.585 ± 0.005) Å as x increases from 0.10 to 0.15, indicating a decrease in coordination number from 8 to 7. A Sn-Sn distance of 3.507 ± 0.005 Å is revealed by a first order difference calculation from the $x = 0$ sample. This is too short to be consistent with significant edge sharing of [SnO3] trigonal pyramids.

10:40 AM

(GOMD-S1-005-2008) Structure Measurements and Processing of Metastable Liquids and Glasses

R. Weber*, Materials Development, Inc., USA; C. Benmore, Q. Mei, Argonne National Laboratory, USA; M. Wilding, University of Wales, United Kingdom

Capabilities for in-situ measurements of bulk liquid structure using aerodynamic levitation, laser beam heating, and high energy x-rays and a lab-based synthesis instrument were recently commissioned at the APS. The new capabilities and recent results of measurements on liquid oxides, binary oxide glasses and synthesis of glasses for experiments at high pressure will be presented. By combining fast detection of x-rays with aerodynamic levitation melting to access metastable states, it is possible to probe liquids and glasses in new ways. The instrument uses high energy (~115 keV) x-rays to probe the bulk liquid structure. Examples of recent and ongoing research will be used to illustrate the use of the instrument. Results include studies of binary metal oxide-silicon dioxide systems that exhibit a "strong-fragile" transition as the silica component becomes too diluted to form the network. Plans for further development of the instrument and the outlook for new research will be presented.

11:00 AM

(GOMD-S1-006-2008) Intermediate-Range Order in Ge-As Sulfide Glasses: Diffraction and RMC Modeling Results

S. Soyer Uzun*, S. Sen, University of California, Davis, USA

Large scale structural models of chalcogenide glasses in Ge-As-S system with Ge:As=1:1 and with S concentrations ranging between 33.3 and 70.0 atom% have been constructed using a combination of neutron and x-ray diffraction and reverse-monte-carlo (RMC) simulations. Ge and As atoms are primarily bonded to S atoms in stoichiometric and S-excess glasses. Formation of As-As bonds at low and intermediate levels of S-deficiency results in violation of chemical order and in formation of As-rich structural moieties. Ge takes part in metal-metal bonding, predominantly via formation of Ge-As bonds, only in the most S-deficient glasses disrupting the topological continuity of the As-rich clusters. These metal-rich clusters control the intermediate-range order and are manifested in the compositional dependence of the intensity, position and width of the first sharp diffraction peak in structure factor. Implications of these results in understanding structure-property relationships will be discussed.

11:20 AM

(GOMD-S1-007-2008) Structural Features of Intermediate Phase in Chalcogenide Glasses: A Synchrotron X-Ray Study

G. Chen*, F. Inam, D. Drabold, Ohio University, USA; P. Chen, P. Boolchand, University of Cincinnati, USA

In a covalent glass network, a floppy-to-rigid phase transition was predicted near average coordination number of 2.40. Experiments have shown that this phase transition spans a range of glass compositions across which a network is able to self-organize and remain in an almost stress-free state. The compositional interval is called the intermediate phase (IP), which has been observed in numerous glass systems, mostly through spectroscopic and thermodynamic methods. However, structural features of the IP are not as well established. To search for the structural signature of the IP, we now conduct x-ray absorption fine structure, x-ray diffraction, and small-angle x-ray scattering on the Si-Se and the Ge-Se binary glasses, which show the IP. Structural features of the glasses at short range, medium range, and nanoscale are obtained as a function of glass compositions including the IP. The experimental results will be compared with those obtained from molecular dynamics simulations.

11:40 AM

(GOMD-S1-008-2008) Vibrational Mode Softening Behavior in Binary Chalcogenide Glasses

E. L. Gjersing*, S. Sen, University of California Davis, USA; B. Aitken, Corning Incorporated, USA

Mode softening behavior of stretching vibrations of heteropolar and homopolar bonds has been investigated for chalcogenide glasses in the systems GexSe100-x, GexS100-x, and AsxS100-x using variable temperature Raman spectroscopy. Temperature dependence of mode frequency softening is found to be identical for Ge-Ge, As-As, Ge-S and Ge-Se bonds at temperatures below Tg. For modes associated with Se-Se stretching, softening behavior is observed to depend on the average coordination number. In contrast, As-S bonds display almost no mode softening within the investigated temperature range. The rate of mode softening is found to increase at temperatures above Tg indicating a jump in vibrational entropy across the glass transition. However, intra-molecular modes in the molecular As4S3 glass show no such discontinuity in mode softening behavior across Tg indicating that the glass transition is characterized by a jump primarily in configurational entropy.

Optical Materials

Photostructural Phenomena in Materials I

Room: Madera
Session Chair: Pierre Lucas, University of Arizona

9:00 AM

(GOMD-S3-001-2008) Chalcogenide Glass, The Shape of Things to Come (Invited)

D. Hewak*, University of Southampton, United Kingdom

Many emerging photonic devices applications require chalcogenide films, from nanometer to millimeter thicknesses, to utilize the functionality of these materials. Other applications are exploiting microspheres and nanoparticles formed from these incredibly versatile glasses. As research into sulphide-based glasses accelerates, it is being realized that many of the properties which more traditional optical materials lack for active applications can be found with the sulphides. Like silica, sulphide glasses are photosensitive and have enhanced sensitivity which can be exploited, not with high power excimer lasers operating in the ultraviolet, but with a inexpensive lasers operating in the visible. Moreover, there is a wealth of other photoeffects unique to chalcogenides including: photodiffusion, photodarkening, photoexpansion, to name a few. In this talk, these diverse active properties of chalcogenide bulk glass, thin film and microspheres will be reviewed.

9:40 AM

(GOMD-S3-002-2008) THz Spectroscopy of Photomodification of Chalcogenide Glasses

S. K. Sundaram*, B. J. Riley, J. V. Crum, N. C. Anheier, Pacific Northwest National Laboratory, USA

Terahertz (THz) spectroscopy was chosen to study photomodification of selected chalcogenide glasses. Four different glasses in the As-S family were irradiated using appropriate light source to induce photostructural changes in these materials. The glasses were prepared in-house. All samples were prepared as a window of ~2-3 mm thick with an optical quality polish. THz transmission measurements were performed in the range 172 – 265 GHz, using a THz spectrometer. The spectrometer consists of a backward wave oscillator (BWO), which is an electro-vacuum diode, in which THz emission is generated by electrons decelerating in a periodic electric field and a detector that detects the waves transmitted through the sample. The results were fitted to the Fresnel expressions for complex transmission and to the resulting graphs to determine the transmission, refractive index (n), and other properties. The change in these properties are correlated to photomodification processes in these materials.

10:00 AM

(GOMD-S3-003-2008) Rigidity Percolation Impediment of Light-Induced Matrix Softening in Network Glasses

P. Lucas*, L. Calvez, Z. Yang, University of Arizona, USA

Network glasses such as chalcogenides constitute rich systems to study the physical effects associated with glass structures due to the possibility of tuning the dimensionality of the network from a chain-like polymeric nature to a heavily cross-linked network structure while retaining the same chemical components. This can be achieved by simply tuning the average coordination <r> of the glassy network through simple compositional variation, for example by choosing the ratio of divalent, trivalent or tetravalent atoms. Here, we show the density of structural constraint associated with the average coordination number strongly affect the ability of a glass to switch from one inherent structure to another during the photoexcitation process. Effects of intensity and wavelength associated with this process are also investigated.

10:20 AM

(GOMD-S3-004-2008) Photo-Sensitive and Photo-Insensitive Chalcogenide Glasses in GexAs45-xSe55

G. Yang*, H. Jain, A. Ganjoo, D. Zhao, Lehigh University, USA; Y. Xu, H. Zeng, G. Chen, East China University of Science and Technology, China

IR transmitting chalcogenide glasses are known for their photosensitivity to band-gap radiation, which produces several types of photo-induced changes in structure and properties. Whereas photosensitivity is useful in applications such as optical writing, photolithography, etc., a photo-stable glass is needed for IR optics. With the goal of finding a glass that transmits in the mid-IR region, yet is stable against exposure to irradiation, we have investigated the GexAs45-xSe55 series, which is characterized by opposite photo-responses viz. photo-darkening in binary As-Se (i.e. x=0) and photo-bleaching in some Ge-Se compositions (e.g. GeSe2). Most interestingly, the glass with x=10 shows negligible photosensitivity, which is a desirable characteristic for their application in infrared optics. As a result, a glass composition that is not affected by band-gap laser irradiation is discovered.

10:40 AM

(GOMD-S3-005-2008) Mid-Infrared Photonics Component Development Using Chalcogenide Glasses (Invited)

N. C. Anheier*, B. E. Bernacki, K. Krishnaswami, N. Hô, Pacific Northwest National Laboratory, USA

Mid-infrared (MIR) sensing research at Pacific Northwest National Laboratory is focused on fabricating miniaturized integrated optical

components and developing optical fiber processing methods by exploiting the unique optical and material properties of chalcogenide glass. Recently, we fabricated and demonstrated the first single-mode channel waveguide and a 3 dB splitter designed for 8-10 μm quantum cascade laser wavelengths. The design and material issues related to device fabrication using photodarkening as well as alternative methods employing embossing and etching methods will be presented. Recent progress in the fabrication of multi-component chalcogenide glass optical components using glass compression molding techniques will be discussed, and the development of thermal processing techniques essential to the creation of MIR optical fiber components. We anticipate that this chalcogenide glass research will provide vital solutions to the system integration challenges for many MIR sensing systems.

11:20 AM

(GOMD-S3-006-2008) Role of Surface Oxidation in the Photon-Induced Ag Diffusion into Chalcogenide Glass Thin Films

A. Kovalskyy, Lehigh University, USA; M. Mitkova, Boise State University, USA; H. Jain*, Lehigh University, USA

We have investigated the surface oxidation processes during photon-induced Ag diffusion into chalcogenide glass (ChG). High resolution XPS is used to compare the electronic structure of ChG films before, during and after Ag diffusion. Both Ge- and As based ChG (As40S60 and Ge30Se70) have been studied. For each composition, one set of samples was prepared and irradiated at UHV, and then characterized under in situ conditions. Another set was prepared in a separate chamber and irradiated in ambient atmosphere. It is shown that the mechanism and kinetics of Ag diffusion depend on the environment during irradiation. In all cases, Ag-Ch bond forms at the expense of Ge(As)-Ch bond. For the exposure in ambient atmosphere, Ge and As oxides are created during diffusion. For the samples never exposed to oxygen, depletion of the Ge-Se backbone in Se due to the formation of Ag-Se bonds leads to appearance of ethane-like units, while in the case of As40S60 we observed clustering of As atoms.

11:40 AM

(GOMD-S3-007-2008) Nano-second Kinetics of Transient Photoinduced Changes in a-As_2Se_3 Films

A. Ganjoo*, I. Biaggio, A. Regmi, H. Jain, Lehigh University, USA

The unique photosensitivity of chalcogenide glasses with photons of energy ≥ optical bandgap makes them promising materials for integrated mid to far IR photonic applications. We have conducted a comprehensive study of the nano-second dynamics of a-As_2Se_3 thin films using transient grating method. Two interfering 20 ps pulses (λ: 532 nm) are used to write a diffraction grating into the sample and the resulting dynamics are observed using a weak He-Ne beam (λ: 633 nm). We observe that it is possible to photoinduce a transient refractive index change of ~ 10^{-3} for an illuminating laser density of ~1 mJ/cm^2 . This refractive index change occurs instantaneously with the duration of pump pulse, and decays exponentially with a time constant of ~100 ns. From the square dependence of the time constants on the grating spacing, we conclude that diffusion of the carriers dominates the decay of the changes and extract the diffusion constants and the mobility of the carriers (holes in this case).

Cross-Cutting Topics

Materials for Alternative Energy Applications I

Room: Pima

Session Chair: Douglas Loy, University of Arizona

9:00 AM

(GOMD-S4-001-2008) Solar Energy: Some Critical Steps Needed for Widespread Adoption (Invited)

J. H. Simmons*, University of Arizona, USA

The use of solar energy to power the modern world is so obvious that one has to question why it is not widely used today. This presentation reviews the role of solar energy in the energy and renewable energy landscapes and looks at the scientific, technical and economic conditions that make it attractive and also limit its widespread adoption. Many of the solar energy conversion methods are analyzed and compared, including the next generation photovoltaic devices and approaches, with special attention to nanostructured solar cell materials.

9:40 AM

(GOMD-S4-002-2008) Facile Surface-Functionalization of CdSe Quantum Dots for Their Composite Preparations (Invited)

D. Seo*, Arizona State University, USA

Semiconducting photoluminescent II-VI quantum dots (QDs) have been a subject of intense studies in recent years and yet experimental challenges still remain especially in their functionalization and composite synthesis. Our approach starts with development of new synthetic methodologies that operate under mild reaction conditions assisted by microwave heating. Chemical robustness of surface-functionalized QDs has been achieved through single-step functionalization of CdSe nanocrystals during simultaneous ZnS-shell coating process, which subsequently provided large QD-silica monoliths, QD-polystyrene composite microparticles and magnetic QD-silica microbeads.

10:40 AM

(GOMD-S4-003-2008) Inorganic Membranes for the Recovery and Purification of Hydrogen from Mixed Gas Streams

J. S. Rich*, J. E. Shelby, Alfred University, USA

As demand for clean and renewable energy increases, the appeal of a hydrogen-based economy continues to grow. Stringent fuel cell demands will require major increases in the production of hydrogen, the separation of hydrogen from other gases, and the purification of hydrogen. A possible solution lies in the concept of cheap hollow glass microspheres functioning in a manner similar to a molecular sieve, but remaining useful at temperatures up to several hundred degrees. The current study evaluates the parameters for the separation of hydrogen from gas streams comprised of nitrogen, argon, carbon dioxide, and helium. Infrared light has been evaluated in terms of diffusion enhancement and in the removal of adsorbed gases. Low temperature heat treatments have also been investigated for the removal of adsorbed gases. Gases are analyzed using residual gas analysis for composition and hydrogen purity.

11:00 AM

(GOMD-S4-004-2008) High Pressure Storage of Hydrogen in Hollow Glass Microspheres

P. F. Wachtel*, J. E. Shelby, Alfred University, USA

Development of a hydrogen based economy depends on development of the ability to produce hydrogen in large quantities, purify the hydrogen to levels required for fuel cells, and to store and transport hydrogen in a cheap, safe manner. Storage and transport of high pressure hydrogen in hollow glass microspheres (HGMS) offers a potential solution to the problems involved in use of high pressure tanks or cryogenic shipment of liquid hydrogen. The present paper will discuss recent results of studies involving high pressure hydrogen storage in HGMS, including the storage density, response of hydrogen release to exposure to infrared light and to heat, and the retention of hydrogen at temperatures ranging from subambient to 50°C. Results indicate that photo-induced hydrogen outgassing of HGMS filled with high pressures of hydrogen provides a potential solution to the problem of storage and transport of large quantities of hydrogen.

11:20 AM

(GOMD-S4-005-2008) Review of Sol-gel Processed Materials for Polymer Electrolyte Fuel Cell Membranes

D. A. Loy*, University of Arizona, USA

Sol-gel processed materials have been developed for both electrodes and electrolytes in proton exchange fuel cells. This presentation will

review the efforts in both areas and discuss future trends and opportunities for using sol-gel processed materials in fuel cells.

11:40 AM

(GOMD-S4-006-2008) Proton Conduction in La-based Metaphosphate Glasses

G. A. Harley*, Max-Planck-Institut für Festkörperforschung, Germany; Y. Liang, University of California Berkeley, USA; L. C. De Jonghe, Lawrence Berkeley National Laboratory, USA

La-based phosphate glasses have been shown to have high proton conductivities up to 500°C though the proton dynamics are relatively unknown. In this study, several compositions of meta- and ultra-phosphate glasses were fabricated and their structure and electrical properties were analyzed. The addition of alkaline earth elements (Ca, Sr, Ba) as substitution for La increased the proton concentration and increased conductivity over the lanthanum-only metaphosphate glass at 400°C by almost two orders of magnitude. The addition of small amounts of aluminum to the system further increased the conductivity by another order of magnitude. Structural analysis shows protons to be incorporated as charge compensating defects and to be coordinated to the substitutional divalent cation and subsequently transported by hopping via phosphate tetrahedra. This mode of proton transport is expected to be common in all phosphate glasses in this temperature range. Conductivities as high as $2.92x10^{-5}$ S/cm at 400°C have been observed.

Glass Science

Glass Structure II

Room: Sabino
Session Chair: Randall Youngman, Corning Incorporated

1:20 PM

(GOMD-S1-009-2008) Structure and Reactivity at Glass Surfaces as Revealed by NMR and IGC Measurements Coupled with Computational Chemistry

K. T. Mueller*, R. A. Golombeck, N. M. Washton, C. G. Pantano, V. A. Bakaev, T. I. Bakaeva, R. A. Schaut, Penn State University, USA

The reactivity of oxide glass surfaces is affected by a number of parameters including the structural speciation of glass formers and modifiers on the surface. We have studied bulk and surface structure as well as surface reactivity with a variety of methods, and here we describe solid-state nuclear magnetic resonance (NMR) and inverse gas chromatography (IGC) experiments that probe surface reactivity. Through the study of alcohol probe molecules interacting with glass surfaces, our data indicate that a number of reactive sites are present on multicomponent glass surfaces. Combining experimental methods with computational chemistry we form a more complete picture of the ties between reactive sites and surface structure, particularly the relationship between local structure (next-nearest neighbors) for a binding site, relative binding affinities, and chemical shifts for the NMR-active nuclei in the bound probe molecules as well as the surface binding sites.

1:40 PM

(GOMD-S1-010-2008) Composition and Temperature Effect on Aluminoborosilicate Glasses Structure

J. Wu*, J. Stebbins, Stanford University, USA

Quantitative determination of the atomic-scale structure of multicomponent glasses, and the effects of composition and temperature on them, is a complex problem. Here we examine two joins of five-component glasses with constant B, Al, Si but varying Na/Ca ratio. We have used B-11 and Al-27 MAS NMR to measure the different B and Al coordinations and calculated the contents of non-bridging oxygens (NBO). The fraction of [4]B species increases in a non-linear manner with increasing Na/(Na+Ca). The small amount of [5]Al (a few percent) increases with decreasing Na/(Na+Ca). To explore the effects of fictive temperature, fast quenched and annealed samples were compared. Lower cooling rates increase the fraction of [4]B species in all compositions. The conversion of [3]B to [4]B is also expected to convert NBO to bridging oxygens, which should correspond to changes in thermodynamic properties such as configurational entropy and configurational heat capacity.

2:00 PM

(GOMD-S1-011-2008) Structure Property Relationship of Sodium Borophosphate Mixed Glass Former Oxide Glasses

R. B. Christensen*, J. Byer, S. W. Martin, Iowa State University, USA

Mixed glass former $(Na_2O)y[(B_2O_3)x\ (P_2O_5)(1-x)](1-y)$ [y = 0.35, 0.50. 0.65, and x =0, 0.2, 0.4…1] glasses were investigated to examine the structure and property changes with changing amounts of glass formers B_2O_3 and P_2O_5. Short-range structures were investigated using Raman, Infrared, and NMR spectroscopy to quantify their dependence on glass former concentration. Long range structures were investigated using x-ray diffraction. Physical properties, density and T_g, were investigated to quantify their dependence on glass former concentration. These results will be used to show the dependence of the structure and physical properties of these glasses as a function of the changing concentration of the glass formers.

2:20 PM

(GOMD-S1-012-2008) Temperature Effects on Oxide Melt Structure: Spectroscopic Constraints and Thermodynamic Implications

J. F. Stebbins*, Stanford University, USA

Oxide melts have significant configurational components to their thermodynamic properties, requiring that their structures become increasingly disordered at higher temperature. In several oxide melt systems, spectroscopic and scattering studies have begun to quantify such structural changes. Comparison of apparently diverse systems can lead to new insights into underlying common features of interactions among structural species. Particularly important are changes in oxygen speciation that are associated with changes in network cation coordination. We will present new data on temperature effects on the structure of calcium aluminosilicate (CAS) glass melts from both room-T, high resolution NMR and in-situ high-T spectroscopy, and will show the relationship of these changes to well-known effects in borates and borosilicates. In at least some CAS melts, known structural changes can now account for much or most of the known configurational entropy at high temperature.

2:40 PM

(GOMD-S1-013-2008) Multi-Nuclear NMR Examination of Sodium Scandium Silicate Glasses

R. Youngman*, C. Hogue, Corning Incorporated, USA; J. Shelby, Alfred University, USA

Glasses in the Na_2O-Sc_2O_3-SiO_2 ternary are known to exist over a fairly large compositional range and can contain up to approximately 15 mol% Sc_2O_3. The glass transition temperatures increase with addition of Sc_2O_3 and approach 800 °C for those with the highest levels of scandium oxide. The refractive index and density of these glasses also increase linearly with Sc_2O_3 content. We will discuss the properties of these ternary glasses in light of new structural details provided by ^{45}Sc, ^{23}Na and ^{29}Si NMR spectroscopies. Previous characterization of these types of glasses lacked any direct study of the Sc^{3+}, but in employing ^{45}Sc MAS and 3QMAS NMR, we are able to describe the local bonding environment of scandium. Further insights into the network structure of sodium scandium silicate glasses are gleaned from complementary NMR studies of ^{23}Na and ^{29}Si.

3:20 PM

(GOMD-S1-014-2008) Structural Study of Rapidly Cooled Lead Silicate Glasses

S. Feller*, G. Lodden, A. Riley, T. Edwards, J. Croskrey, A. Schue, D. Liss, D. Stentz, S. Blair, M. Kelley, G. Smith, S. Singleton, M. Affatigato, Coe College, USA; D. Holland, M. Smith, University of Warwick, United Kingdom; E. I. Kamitsos, C. Varsamis, NHRF, Greece

A series of lead silicate glasses spanning a wide compositional range (up to 83 molar percent PbO) were prepared and 29Si MAS NMR, MS-TOF, and FTIR was performed on them. The results indicate that the lever rule is approximately followed until about 60 molar percent lead oxide (Q(n) —> Q(n-1)), though with considerable dissociation of the stoichiometric groups into silicate units with lesser and greater numbers of non-bridging oxygens as shown in the equilibrium relation 2Qn —> Q(n+1) + Q(n-1). Above 60 percent lead oxide oxygen remains with lead to form a competing lead oxide glass network. The evidence for this is provided from each of the spectroscopic techniques employed.

3:40 PM

(GOMD-S1-015-2008) Effect of Phosphorus on the Properties and Structure of GeGaAs Sulfide Glasses

B. Aitken*, R. Youngman, Corning Incorporated, USA

With the aim of improving the thermal stability of Ga-containing GeAs sulfide glasses, we have studied the effect of replacing As or Ga with P in a Ge25As75Ga25S65 glass. Substitution of P for either Ga or As results in a blueshift of the absorption edge until the P/Ga ratio exceeds unity, with the edge remaining constant with further increase in P concentration. In addition, the Tg of P->As-substituted glasses passes through a maximum for P/Ga~1, hinting at the existence of a structural transition. 31P MAS NMR spectra of glasses where P/Ga<1 are dominated by a resonance at 81ppm, indicating that P is present mainly as PS4/2 species that are associated with Ga to form coupled GaPS4 tetrahedra. In more P-rich glasses, PS4/2 species are progressively replaced by S=PS3/2 and PS3/2 groups, resulting in a decrease in network connectivity. Consequently, the concentration of coupled GaPS4 tetrahedra is maximized in glasses where P/Ga~1, corresponding to the discontinuity in physical properties.

4:00 PM

(GOMD-S1-017-2008) New Alkali-Halides and Metal-Halides Glasses

M. Roze*, L. Calvez, X. Zhang, H. Ma, J. Lucas, Université de Rennes 1, France

The introduction of alkali-halides and metal-halides in the GeSe2-Ga2Se3-MI (MI = CsI, NaI, KI, AgI) systems has been investigated. Pure chalcogenide glasses transparent from the visible range to 16µm were synthesized. Large glass forming regions were discovered as more than 40 mol. % of CsI and 50 mol. % of AgI can be introduced in the glassy matrix. A systematic study of thermo-mechanical properties and optical properties was performed. Furthermore, ion exchange experiments between K+ and Cs+ or Rb+ were performed in order to improve mechanical properties by creating surface compression. Penetration depths were analyzed with a SEM coupled with Energy Dispersive Spectroscopy. Bi-axial flexural strength was used to demonstrate the increase of mechanical properties on these samples. Also, the synthesis of glass ceramics with better mechanical properties was demonstrated with several compositions.

4:20 PM

(GOMD-S1-018-2008) MgO in Silicate Glasses: Physical Properties and Molecular Dynamic Structure Simulations

A. Cormack, Alfred University, USA; T. Wilantowitz, Rutgers University, USA; W. C. LaCourse*, Alfred University, USA

While it is generally considered that MgO plays a structural role similar to that of CaO, the properties of R2O – CaO – M2O3 – SiO2 glasses are strongly influenced by substitution of MgO for CaO. The present paper presents data on hardness, toughness, Young's modulus and other properties of mixed-alkaline earth glasses. Results of molecular dynamics simulations of the structure of Na2O – (CaO+MgO) – SiO2 will also be presented in which the structural role of MgO is elucidated. Observed property variations can be qualitatively accounted for by the MD generate structures.

4:40 PM

(GOMD-S1-019-2008) Role of Fracture Surface Formation in the Determination of Fracture Energy

R. Smith, S. Freiman, J. Mecholsky*, University of Florida, USA

The projected area of the fracture surface drastically underestimates the true fracture area created as the crack propagates. Using indented flexural bars of soda lime silica glass, fracture energy was determined for varying indentation loads. The "true" fracture area was determined using an AFM procedure coupled with knowledge of the fractal nature of the fracture process. The evidence of a non-smooth fracture surface presents two questions that should be reexamined: (1) if the fracture surface is not smooth, then does the assumption of the projected area account for all the energy absorbing mechanisms in the creation of the fracture surface in the calculation of the work of fracture? and (2) can the work of fracture be calculated for fast fracture events if the entire roughness of the fracture surface is measured? These questions will be addressed with respect to the fracture of glass bars and AFM fracture surface measurements.

Optical Materials

Photostructural Phenomena in Materials II

Room: Madera
Session Chair: Pierre Lucas, University of Arizona

1:20 PM

(GOMD-S3-008-2008) UV-Written Grating Structures and Single-Frequency Lasers in Phosphate Glass Fiber (Invited)

A. Schulzgen*, S. Suzuki, L. Li, University of Arizona, USA; R. Matei Rogojan, J. Albert, Carleton University, Canada; N. Peyghambarian, University of Arizona, USA

Phosphate glasses are excellent host materials for lasers using rare earth ion transitions. They offer high ion solubility, excellent optical properties, and resistance against damage by high optical powers. Fabricating gratings in phosphate glasses by UV-light illumination, however, proved to be a considerable challenge. In this presentation we will demonstrate our recent advances in developing photosensitive phosphate glasses, UV-writing of fiber gratings, and fabricating single-frequency fiber lasers. Large photo-induced index changes have been obtained that enable the fabrication of narrow-band gratings with high reflectivity in phosphate fiber. DBR and DFB fiber lasers have been analyzed and we will show that highly doped phosphate glasses can be utilized to fabricate single frequency fiber lasers with Watt-level output. In addition, we will demonstrate dual wavelength lasers with tunable wavelength difference.

2:00 PM

(GOMD-S3-009-2008) Processing and Characterization of Active and Passive Oxysulfide Glasses for Optical Applications

L. Petit*, Clemson University, USA; J. Abel, Bordeaux University, France; V. Nazabal, Rennes University, France; C. Maurel, T. Cardinal, Bordeaux University, France; K. Richardson, Clemson University, USA; M. Couzi, Bordeaux University, France; L. Burka, Clemson University, USA

Sulfide based glasses exhibit both high non linear optical properties and low phonon energy which are key parameters that make them promising materials for optical applications. By incorporating oxygen in the sulfide network, the chemical and structural stability as well as the glass' stability under IR laser irradiation can be enhanced. In this

presentation, we review how the chalcogenide glasses in the system Ge-(Ga)-As(Sb)-S are prepared for applications as active and passive oxysulfide glasses. The thermal, optical and structural properties are discussed as a function of the S/O ratio. The luminescence properties of the active oxysulfide glasses have been evaluated and compared to those of active oxide and chalcogenide glasses and discussed as a function of S/O ratio. We will also study the effect of Na2O addition on the structure and luminescence properties of the oxysulfide glasses.

2:20 PM

(GOMD-S3-010-2008) Dynamics of Femtosecond Laser Modification in Glass

J. J. Witcher*, L. B. Fletcher, D. M. Krol, University of California, Davis, USA

Femtosecond lasers have been used to modify glasses such as fused silica in order to write low-loss optical waveguides inside the glass. This technology can potentially be used for the fabrication of three-dimensional all-optical integrated circuits. While some basic devices have been made and structural changes have been characterized after fs-laser radiation, the mechanism responsible for the modification process, and in particular its dynamics, is not well understood. We have studied the dynamics of fs-laser modification in fused silica using an amplified Ti:sapphire laser. A pump-probe setup was used to determine the electron density created by the absorption of the fs-laser pump pulse. Electron density and its temporal evolution were determined for varying pump pulse energies. We will discuss how the connection between the resulting modification and electron density provides insight into the dynamics of the fs-laser modification process.

2:40 PM

(GOMD-S3-011-2008) Atomic Scale Changes in Er-Yb Doped Phosphate Glass Induced by Femtosecond Laser Waveguide Writing

L. B. Fletcher*, J. J. Witcher, W. J. Reichman, D. M. Krol, University of California Davis, USA; J. Bovatsek, A. Arai, IMRA America, Inc., USA

Femtosecond laser modification in active, rare-earth doped glasses can be used to fabricate 3-D optical devices. Previous work on waveguide writing in Er-Yb doped phosphate glass has shown that the waveguide quality depends on laser writing parameters. We have written waveguides using the IMRA FCPA μJewel D-400 fs-fiber laser with pulse repetition rates ranging from 250kHz to 2.2MHz. At every pulse repetition rate a series of waveguides was written while varying scan speeds from 50μm/s to 100mm/s and pulse energies from 80nJ to 320nJ. Laser-induced structural changes in the glass were characterized using confocal fluorescence and Raman microscopy. The measurements show that the structural changes have a complex dependence on the laser writing parameters, with the most noticeable changes observed where thermal accumulation occurs. We will present a discussion of the observed waveguide results and interpret them in relation to the structural changes in the glass network.

3:20 PM

(GOMD-S3-012-2008) Optically Transparent, Self-indicating, Photopatternable Hybrid Material (Invited)

K. J. Shea*, University of California, Irvine, USA; D. Loy, University of Arizona, USA; L. Zhao, University of California, Irvine, USA

We report a new, multiresponsive homogeneous hybrid material with a photocleavage weak-link that can be used for creating refractive index and fluorescent patterns. The colorless, transparent, thermally robust sol-gel material is derived from a photodimer of 7-hydroxycoumarin. Irradiation at short wavelengths induces photofragmentation of the coumarin photodimer and produces features that fluoresce (λem ~390 nm) upon irradiation at λex~ 335 nm. The photoinduced chemical change produces high resolution fluorescent patterns that are mirrored in both refractive index and topology of the material. These sol-gel derived hybrid materials, which are prepared in a single step, would be suitable for fabricating optical circuits, interference filters, waveguides, media for optical data storage and as part of secure recognition systems and as a reversible photolithography resist. Furthermore, the preassembled, coumarin dimer, weak-link should be easily integrated into other polymeric materials.

4:00 PM

(GOMD-S3-013-2008) Photo-Induced Film Deposition from Heteroleptic Titanium Alkoxide Solutions

J. Musgraves*, B. G. Potter, University of Arizona, USA; T. J. Boyle, Sandia National Laboratories, USA

Excitation, with 248nm light, of a solution of the heteroleptic titanium alkoxide $(OPy)_2Ti(TAP)_2$ [where OPy = pyridine carbinoxide and TAP = 2,4,6 tris(dimethylamino)phenoxide] in anhydrous pyridine has been shown to create an insoluble photoproduct in the region of the incident laser beam. Analysis of the photoproduct by Raman spectroscopy indicates the presence of hydrolysis and condensation products as well as features consistent with the unreacted metal alkoxide, indicating destabilization of the alkoxide material that leads to intermolecular linking reactions. Further analysis indicates that it is excitations resonant with the π-π^* transitions in the aromatic ligands, as well as in the solvent, that provide this destabilization rather than excitations resonant with the charge transfer band in the molecule. The microstructure, refractive index, and absorption characteristics have been examined as a function of patterning wavelength, fluence, and water content of the precursor solutions.

4:20 PM

(GOMD-S3-014-2008) Photoinduced Manipulation of Titanium Metal Alkoxides

Z. Schneider*, K. Simmons-Potter, University of Arizona, USA; T. Boyle, Sandia National Laboratories, USA

The heteroleptic titanium metal alkoxide $(OPy)_2Ti(TAP)_2$, where OPy = $NC_5H_4(CH_2O)$, TAP = $OC_6H_2(CH_2N(CH_3)_2)_3$-2,4,6, is under investigation as a candidate precursor for thin film and solution-based synthesis of oxide materials via the photoactivation of intermolecular reactions (e.g. hydrolysis/condensation) at selected ligand sites about the metal center. The structural changes occurring within ligand groups from conventional chemical reaction kinetics as well as the ability to disrupt bond formations in the molecular structure using UV radiation are of key interest. In the present work, absorption spectroscopy techniques are employed to identify and isolate photoinduced changes in the ligand structures of these thin films and their dependence on incident wavelength, total fluence, and wet/dry illumination environments. One- and two-dimensional solution-based NMR experiments are also utilized to determine the locations of disruption in bond formations as a result of photoexciting precursor molecule coordination sites.

4:40 PM

(GOMD-S3-015-2008) Thermal Stability of Polysilane-Based Materials for "On-the-Fly" Photopatterning

H. Chandra*, K. B. Sieluzycka, V. Augustyn, S. Cooper, B. G. Potter, K. Simmons-Potter, University of Arizona, USA

The UV-induced refractive index changes observed in linear-chain polysilanes are associated with the photoscissioning of the Si-Si backbone chain. Our previous work in poly[(methyl)(phenyl)]silylene (PMPS) confirmed the subsequent formation of siloxane bridges in these materials under aerobic conditions. In the present study, we address the thermal degradation of both as-deposited and UV-irradiated PMPS as a means to evaluate the overall stability of a photoinduced refractive-index contrast. Although the thermally-mediated structural modification appears qualitatively consistent with optically-induced effects, vibrational spectroscopy indicates that the extended conformation of the Si-O-Si moieties formed under elevated temperatures differ from those obtained after photoexposure. The results are discussed in terms of the opportunity for structural relaxation within the polymer under the different excitation conditions used.

5:00 PM

(GOMD-S3-016-2008) Further Studies of Laser-Induced Crystallization of Vanadate Glasses

C. Faris*, B. Franta, S. Feller, M. Affatigato, Coe College, USA

We report on the crystallization of alkali and alkaline earth vanadate glasses upon low-power laser irradiation. Barium and lead vanadate samples were exposed to 785 nm light in a variety of arrangements and power settings. A time study of the crystallization enabled us to compare the lead and barium vanadate samples, and to relate the results to their differing specific heat). In other experiments we investigated the effect of the thermal history of the 50BaO.50V2O5 glass by conducting a pre-irradiation sweep of the sample at powers ranging from 20-200 mW before focusing on a spot. This conditioning made crystallization of the spot easier, and exceeded the effect of annealing the sample at Tx. We also looked at the effect of the laser light on grains of lead vanadate glass powder, and observed melting and resolidification, crystallization, and ablation, all from single grains. This research was supported by the National Science Foundation under grant DMR-CER-0502051 and by Coe College.

5:20 PM

(GOMD-S3-017-2008) Effect of Photoelasticity on the Refractive Index Decrement in Photo-Thermo-Refractive Glass

J. H. Lumeau*, Universityof Central Florida, USA; A. Gusarov, SCK CEN Belgian Nuclear Research Center, Belgium; L. Glebova, L. B. Glebov, Universityof Central Florida, USA

Photo-thermo-refractive (PTR) glass is a photosensitive multicomponent silicate glass containing photosensitive agents such as cerium and silver. Photoinduced crystalline phase precipitation results in refractive index variations in exposed areas of PTR glass, which has been successfully used for phase hologram recording. However, even if this glass has been used for several years for the recording of high quality volume Bragg gratings, the mechanisms of refractive index decrement have not been revealed yet. In this paper we investigate the effect of thermal treatment on refractive index and specific volume change. An original interferometer was used for the measurement of the refractive index change and an optical profilometer was used for the measurement of the change of volume of the glass. A correlation between refractive index change and the change of PTR glass volume is studied. Effect of the photo-elastic phenomenon on the refractive index decrement in PTR glass is discussed.

Cross-Cutting Topics

Materials for Alternative Energy Applications II

Room: Pima

Session Chair: Douglas Loy, University of Arizona

1:20 PM

(GOMD-S4-007-2008) Mixed Glass Former Effect in the Na_2S-B_2S_3-P_2S_5 System

A. H. Shaw*, Iowa State University, USA; T. Kaufmann, University of Münster, Germany; M. J. Haynes, S. W. Martin, Iowa State University, USA

The ionic conductivity of the mixed glass former $x Na_2S_3 - (1-x)[y B_2S_3 - (1-y) P_2S_5]$ system (x=0.33,0.66 0≤y≤1) has been analyzed. Within the ternary system, a maximum in the ionic conductivity was observed at x ~ 0.4, which is in agreement with conductivity maxima in other mixed glass former systems. The variations in the ionic conductivity are related to those in density and the glass transition temperature. Structural investigations by Raman, IR, and DSC were carried out on this system. For the high alkali system, the measured ionic conductivity reached a maximum value of 4.2*10-5 $S*cm^{-1}$ for x=0.4 at 25^0C and is associated with a minimum in the conductivity activation energy of 17.3 kJ/mol. A preliminary model of the relationships between the ionic conductivities, physical properties, and structures of these mixed glass former glasses will be presented.

1:40 PM

(GOMD-S4-008-2008) Composition, Structures and Properties of xLi2S+GeS2(x=2,3) Thin Film Electrolytes Grown by RF Sputtering

I. Seo*, S. W. Martin, Iowa State University, USA

In this study, lithium thiogermanate thin amorphous films were prepared as electrolytes for lithium rechargeable batteries by RF sputtering deposition in Ar and N2 gases. The targets for RF sputtering were prepared by milling the appropriate amounts of the starting materials in the xLi2S+GeS2(x=2, 3), Li4GeS4 and Li6GeS5, binary system. The ~1 μm thin film electrolytes were grown onto a variety of substrates using 30 to 40 Watt power and 30 mtorr gas pressure. XPS and Auger spectroscopies were used to characterize the composition of the films. IR and Raman spectroscopy were used to further characterize the chemical bonding in the films. Ionic conductivity measurements of the electrolyte film using impedance spectroscopy were used to examine the Li2S and N dependence of the conductivity. In this talk, our recent measurements of these new fast ion conducting thiogermanate films will be reviewed and discussed.

2:00 PM

(GOMD-S4-009-2008) Silica-Nafion Nanocomposite Membranes for High Temperature Fuel Cells

D. A. Loy, B. Muriithi*, University of Arizona, USA

High temperature (>80 °C) operation of fuel cells solves the CO poisoning of the electrocatalysts and thermal-management problems associated with current proton exchange membrane (PEM) fuel cell technology. Nafion-based membranes have high proton conductivity at low temperatures, but at higher temperatures conductivity and fuel cell performance rapidly dwindle. Nanocomposites have been shown to increase the working temperature range and improve their mechanical properties. Here we show the effects of size and the chemistry of the silica particles on the properties of the resultant nanocomposites. Silica nanoparticles with controlled size (using the Stober method) and tailored surface chemistry using silane coupling were dispersed in Nafion to make 100-150μm thick nanocomposite membranes. The results of our morphological studies and the influence of the size and chemical modification of the well-defined silica particles on the properties of the composite membranes will be presented.

2:20 PM

(GOMD-S4-010-2008) Formation of Monodisperse Silica Nanoparticles Using an Anhydrous Sol-gel Process

D. A. Loy, D. Boday*, University of Arizona, USA

Silica nanoparticles are become increasingly important for composite membranes, drug delivery systems, membrane integrity tests, and photonic solids. Presently they are prepared by alkaline hydrolysis and condensation (Stober synthesis) or by emulsion polymerizations. Here we would like to report the synthesis of monodisperse silica nanoparticles under anhydrous conditions in non-polar organic solvents. Tetraethoxysilane is reacted with anhydrous formic acid in toluene to afford well defined nanoparticles. Results of their synthesis and characterization will be presented.

2:40 PM

(GOMD-S4-011-2008) Preparing Silica Membranes Using Rigid Rod Polyisocyanates as a Template for Functionalized Porosity

D. A. Loy*, University of Arizona, USA

Nanocomposite films composed of rigid rod polyisocyanates copolymerized into silica networks were prepared as potential membranes with enhanced carbon dioxide selectivity. Polyisocyanates with pendant triethoxysilyl groups were copolymerized with tetramethoxysilane to afford composites. Poly(3-triethoxysilylpropylisocyanate) was prepared by a cyanide initiated anionic polymerization

to provide a helical polymer that assumes a rigid rod conformation. However, copolymers of polyisocyanate and tetraethoxysilane formed amorphous films in the presence of aqueous acetic acid, and hydrogen fluoride catalyst. Upon heating to above 250 C the polymer backbone depolymerized to afford a silica membrane with anisotropic channels. The morphology, surface area, and chemical functionality of the ordered sol-gel films will be discussed as well as potential applications.

Ionizing Radiation Effects in Amorphous Materials and Structures - Nuclear Waste Glasses

Room: Pima

Session Chairs: S.K. Sundaram, Pacific Northwest National Lab; Brad Johnson, Pacific Northwest National Lab

3:20 PM

(GOMD-S4-012-2008) Amorphous Sulfides in the Nuclear Wastes: Effects of Ionizing Radiations and Interaction with Radiolytic Hydrogen (Invited)

P. Afanasiev*, Université de Lyon 1, France

Currently applied in Europe technology of nuclear waste storage includes bitumen embedding. During the storage it was observed that swelling of bitumen occurs due to formation of radiolysis H2, which leads to the explosion risk. Addition of amorphous Co sulfide proved to decrease the swelling phenomena. This initiated the research of the influence of ionizing radiation on the amorphous sulfides and their interaction with H2. Amorphous and crystalline inorganic sulfides were studied including Co, Mo and Ru. It was observed than amorphous sulfides can absorb high amounts of H2. The evolution of materials was studied in the range of doses from 0.1 to 4 MGy, as well as their interaction with H2. The changes in the structure are related to the opening and closure of the S-S bridges. Under hydrogen pressure, removal of defects is possible, considered as "chemical annealing".

4:00 PM

(GOMD-S4-013-2008) Effects of Extreme Ionization on Amorphous and Crystalline Ceramics (Invited)

W. J. Weber*, Y. Zhang, I. Bae, Pacific Northwest National Laboratory, USA

Under the high electron and ion fluxes available in the laboratory today, extreme ionization rates occur that dramatically affect the kinetics of microstructural evolution, phase changes, and crystallization processes in ceramics. Under such conditions, ionization-induced electronic excitations can have lifetimes on the order of the time between consecutive events, which creates a steady-state concentration of localized electronic defects that affect local bonding and diffusion. Amorphous materials exposed to extreme ionization are observed to readily undergo decomposition, bubble formation, and enhanced diffusion of alkali elements and oxygen. Extreme ionization from electrons is observed to induce nanoscale deformation in ceramics and significantly lower the energy barriers for recrystallization at crystalline-amorphous interfaces. Finally, the temperature dependence of irradiation damage evolution in ceramics is impacted by simultaneous ionization that enhances dynamic defect recovery processes.

4:20 PM

(GOMD-S4-014-2008) Electron Spin Resonance Study of a 17-Year Old Nuclear Waste Glass Simulant Containing Pu-238

D. L. Griscom*, impactGlass research international, USA; W. J. Weber, Pacific Northwest National Laboratory, USA

Glasses for high-level nuclear waste disposal must be durable not only against attack by ground water but also against decomposition due the decays of the immobilized radionuclides. To explore the latter effect, samples of Defense Reference Glass (DRG) were prepared with 0, 10, and 90% replacement of Pu-239 with Pu-238 (1.0 wt% PuO2) to emulate the effects of ~4,700 years of Pu-239 α decays in the 17 years between sample fabrication at PNNL and the Electron Spin Resonance (ESR) studies carried out at NRL and reported here for the first time. All observed ESR signals were due to Fe3+ (DRG contains 10 wt% Fe2O3). A broad ESR signal at g=2.06 decreased by 35% while the sharp line at g=4.3 increased by 100% with increasing Pu-238 substitution. The broad line is believed to arise from Fe3+ clusters, whereas the g=4.3 signal is well known to arise from isolated Fe3+ ions. These results are interpreted as indicating that α decays in the high-Pu-238 sample homogenized ~35% of the clusters.

4:40 PM

(GOMD-S4-015-2008) Glass Fabrication and Leach Testing of Lanthanide Borosilicate Glass for Plutonium Disposition (Invited)

C. Crawford*, N. E. Bibler, J. C. Marra, K. M. Fox, Savannah River National Lab, USA

A plutonium glass waste form is a leading candidate for Savannah River Site (SRS) immobilization of excess weapons-grade plutonium for subsequent disposition in a geologic repository. Current testing investigates different Lanthanide Borosilicate glass formulations containing 9.5 wt% weapons-grade PuO_2. Microstructure characterization (XRD/SEM) and powdered glass static leach testing via the ASTM Product Consistency Test have been performed. Ultrafiltration methods were also employed to investigate possible presence of nanoscale colloidal plutonium particles in the leachate. Normalized release values for the actual Pu-containing glasses are very low and similar to Hf-glass surrogates. Data from these LaBS glass studies involving relatively low cumulative alpha ^{239}Pu damage of ~ 10^{15} α-decays/g will be presented in the context of several recent related publications on radiation damage in ^{238}Pu and ^{244}Cm doped alkali borosilicate glasses having 10^{16} to 10^{18} α-decays/g.

Poster Session

Room: Canyon A,B,C

6:00–9:00 PM

(GOMD-S1-020-2008) Evaluation of the Most Probable Values of Physical Properties of Materials and their Confidence Limits

A. Priven*, ITC, Inc., USA; A. Fluegel, ilis GmbH, Germany

Physical properties of many materials (glasses, melts, metal alloys, water and other solutions, some kinds of organic polymers, etc.) are mainly determined by their chemical compositions. For such materials, a lot of mathematical models were suggested. However, some problems appear when using these models. In particular, they might contradict with each other, and it is difficult to judge about their accuracy. In addition, the accuracy of the same model can considerably change in different composition areas. We propose a new algorithm allowing evaluation of confidence limits of a particular property prediction model concerning a specified composition as well as generation of statistical models. In case of inorganic glasses, we use the global glass property informnation system SciGlass. On the base of mentioned information we evaluate the most probable values of glass and melt properties and estimate their confidence limits.

(GOMD-S1-021-2008) Investigating Electronic Defect Formation in Germanium Doped Silica Glass with Density Functional Theory Calculations

J. Du*, University of North Texas, USA; L. Corrales, University of Arizona, USA; K. Tsemekhman, University of Washington, USA; E. J. Bylaska, Pacific Northwest National Lab, USA

UV irradiation induced electronic defect formation and structural relaxation is considered to be the underlying mechanism for the photorefractive behavior that controls the fabrication of Bragg gratings in photonic devices and the degradation of silica stepper lenses in photolithography. In this work, we use plane wave periodic Density functional theory (DFT) calculations to investigate the charge trapping and associated structural relaxation in germanium doped silica

glasses. We found that both trapped exiton and electron are highly localized on germanium atom and the oxygen ions directly coordinated to it. Large structural relaxation is observed in both electron and exiton self-trapping. Self trapped holes, on the other hand, were found to be localized on the oxygen ions. The results show that self-interaction correction (SIC) in DFT is required to localize self-trapped hole centers while standard DFT predicts delocalization of the electron densities.

(GOMD-S1-022-2008) Excitation Power and Geometry in Laser Modification of Silica

E. Moore*, R. Corrales, The University of Arizona, USA

Molecular dynamics (MD) computer simulations provide a powerful tool to explore the atomic level mechanisms of materials modification induced by coherent radiation sources such as lasers. In spite of the complex mechanisms involved in the absorbance of photons by materials (via a laser source) it is possible to imitate the transition of that absorbance in the form of thermal energy in a straight forward fashion. In this presentation, we detail the methodology used to model and simulate the absorbance of photons that are converted to thermal energy in a focused region. This work shows the difference in carrying out an MD simulation of a cylindrical thermally excited region versus one where the thermally excited region is contained within the bulk. In the first case, periodic boundary conditions lead to an infinite cylinder being excited. In the latter case, the thermal excitations are isolated within the bulk structure. Energy dissipation and the role of rapid quenching can thus be deduced.

(GOMD-S1-023-2008) High Resolution ^{17}O NMR Studies of Gallosilicate Glasses

L. Peng*, J. F. Stebbins, Stanford University, USA

Structural information for gallosilicate glasses is of interest and important because these glasses not only serve as a direct comparison to the widely used aluminosilicate glasses, but may have potential applications such as infrared transmission fibers. We have applied ^{17}O MAS and multiple-quantum MAS NMR spectroscopy to investigate the oxygen local environments in Na-, Li-, Ca- and Y-gallosilicate glasses. Signals due to different oxygen species can be resolved with their concentrations quantified and NMR parameters determined. The NMR data closely resemble those of aluminosilicate glasses, indicating that the gallium ions occupy the same types of sites as aluminum ions. However, wider line widths, more non-bridging oxygens and less obedience of "Al/Ga avoidance" have been found to be associated with the larger gallium cation. The results demonstrate that ^{17}O NMR is a powerful method in studying the structure and properties of gallosilicate glasses.

(GOMD-S1-024-2008) Structure of Aluminosilicate Melts Measured Using High Energy X-ray Diffraction

Q. Mei*, Argonne National Laboratory, USA; M. C. Wilding, University of Wales, United Kingdom; C. J. Benmore, Argonne National Laboratory, USA; R. Weber, Materials Development, Inc., USA

Containerless high energy x-ray diffraction measurements on SiO2-Al2O3 liquids have been performed as a function of composition. The structure factor shows a non-linear decrease in the height of the first sharp diffraction peak with increasing Al2O3 content indicating a rapid breakdown of the corner shared SiO2 intermediate range ordered network. The cations are on average surrounded by four oxygens across the entire compositional range. However each oxygen atom is surrounded, on average, by two cations for compositions <40 %Al2O3, after which it steadily increases as edge and corner shared AlO4 polyhedra dominate the melt structure and SiO4 tetrahedra exist only in small clusters, to a value of 2.5 at 80% Al2O3. These structural changes are associated with increasing liquid fragility from SiO2 (strong) towards the fragile Mullite (2SiO2.3Al2O3) composition.

(GOMD-S1-025-2008) Nucleation Kinetics in Photo-Thermo-Refractive (PTR) Glass

G. P. Souza*, V. M. Fokin, E. D. Zanotto, Federal University of Sao Carlos, Brazil; J. Lumeau, L. Glebova, L. B. Glebov, University of Central Florida, USA

High spectral and angular selectivity in photonics devices can be achieved by writing holograms in the volume of photo-thermo-refractive (PTR) glass, which is a Na Zn Al silicate glass containing Br and F and doped with Ce, Ag, Sb, and Sn. Hologram writing involves exposing PTR glass to an interference pattern in the UV, and heating to ~470-600oC for precipitation of NaF nanocrystals. The mechanisms responsible for both photo-induced and spontaneous crystallization are not fully understood. This contribution is a study of crystal nucleation kinetics based on optical and electron microscopies after UV exposure and heat treatment. Microstructural characteristics such as crystal number density and size distribution are presented. Consecutive heat treatments resulted in NaF precipitation followed by shift of Tg to higher temperatures. This effect is mostly pronounced in UV-exposed glass. Structural changes after exposure to UV and thermal treatment are used for explanation of related refractive index changes.

(GOMD-S1-026-2008) Lithium Bismuthate Glasses Studied Using Laser Ionization Time of Flight Mass Spectrometry

R. Kramer*, S. Feller, M. Affatigato, Coe College, USA

We report on the structure of lithium bismuthate glasses studied using laser-ionization time of flight mass spectrometry and Raman spectroscopy. Pure Bi molecular units (with no oxygen) increase throughout the compositional range, as x increases. Bismuth oxide groups grow early on but then decrease when the Li2CO3 content crosses 50 mol%. Both the time of flight data and the Raman spectra confirm the retention of carbonate groups within the glass starting at x = 50 mol%. We argue that the oxygen is remaining sequestered in the carbonate groups, freeing up more and more units composed of bismuth alone. We also noted a corresponding early growth in the amount of lithium and lithium-oxide peaks in the TOF spectra. In general the main structure of the glass appears to be BiO6 octahedra or BiOn polyhedra, and the lithium ions mostly bond with the polyhedra's oxygen. This research was supported by the National Science Foundation under grant DMR-CER-0502051 and by Coe College.

(GOMD-S1-027-2008) Molar Volumes and Structure of Alkali and Alkaline-Earth Vanadate Glasses

M. Vu*, Coe College, USA; J. Helmus, Ohio State University, USA; J. Lewis, C. O'Brien, S. Shrestha, M. Affatigato, S. Feller, Coe College, USA

Densities as well as glass transition and recrystallization temperatures were determined for a series of rapidly quenched alkali and alkaline-earth vanadate glasses. Alkali vanadate glasses include lithium, sodium, potassium, rubidium, and cesium whereas the alkaline-earth vanadate glass systems were magnesium, calcium, strontium and barium. A simple model employing VO2.5 and VO3 groups was used to predict the change of coordination of vanadate units upon modification. The volumes of VO2.5 and VO3 groups as a function of modifier composition were then determined from the density data and their comparison to structure is discussed. Molar volumes were found and modeled as well. Also, some spectroscopic results from these novel systems will be presented.

(GOMD-S1-028-2008) Preliminary Investigation of the Mixed Glass Former Effect on the Structure, Tg, and Density of (Na2O)y+[(B2O3)x+(P2O5)(1-x)](1-y)

J. Byer*, R. Christensen, T. Kaufmann, S. W. Martin, Iowa State University, USA

As a prerequisite to developing high conducting glassy electrolytes, a complete structural analysis of the $(Na_2O)_y+[(B_2O_3)_x+(P_2O_5)_{(1-x)}]_{(1-y)}$ Mixed Glass Former system has begun. Structural analysis has been performed using IR, Raman, XRD and DSC measurements. It has been observed that with the addition of the glass modifier, the P-O-P structure has a significant peak until around x=0.8. The Raman spectrum shows that the P-O-P structure vanishes, as the amount of B_2O_3

increases which suggests, along with the IR spectra, that it is related to P-O-P chains as opposed to rings. In addition to the spectroscopy, the Tg values from DSC measurements show that around the composition of x=0.8, the Tg decreases to 360°C which may be linked to the decrease in P-O-P structures. Further analysis of the spectroscopy results will be performed to provide a better understanding of the Mixed Glass Former Effect on density and the Tg values.

(GOMD-S1-029-2008) Structure of Ternary Na2O-(GeO2/SiO2)-P2O5 Glasses by Raman Spectroscopy and X-Ray Diffraction

C. M. Larson*, R. K. Brow, University of Missouri-Rolla, USA; U. Hoppe, Universität Rostock, Germany

Increases in the Ge-O coordination number in binary Na2O-GeO2 and P2O5-GeO2 glasses have previously been observed by diffraction experiments [1]. Similar effects have been observed in binary Na2O-SiO2 and P2O5-SiO2 glasses [2]. The present study is focused on clarifying the structure of ternary germanate and silicate glasses containing Na2O and P2O5. X-ray diffraction and Raman spectroscopy experiments were used to probe the Ge-O & Si-O coordination environments in Na2O-GeO2-P2O5 and Na2O-SiO2-P2O5 glasses. X-ray diffraction and Raman spectroscopy data were fitted using Gaussian functions to obtain NGe-O & NSi-O for each glass composition and are presented here.

(GOMD-S1-030-2008) Crystallization of a Calciumboroaluminosilicate Glass with Extended Heat-Treatment Time

N. Lonnroth*, K. A. Nielsen, Risø National Laboratory, Denmark

The continuous crystallization process of a calciumboroaluminosilicate glass was observed by dilatometric measurements on long-term heat-treated samples. The samples were first held at 950 °C for 4 hours followed by heat-treatment at 800 °C for times between 0 h and 44 days. With increasing time, the thermal expansion coefficient increased from $6.6x10^{-6}$ K^{-1} to above $10x10^{-6}$ K^{-1}. The crystallinity and crystal structure of the samples was studied by means of X-ray diffraction and SEM imaging. The variation of the thermal expansion coefficient was related to crystallization and to the changes in the relative amounts of the observed crystalline phases. This shows that extended time is needed for the phases to approach the equilibrium state of the compositions at a certain temperature. Also, to be able to determine the final crystal structure at a temperature, long experimental times have to be used.

(GOMD-S1-031-2008) Influence of ZnO on Crystallization and Electrical Conductivity of Zinc Iron Phosphate Glasses

V. Licina*, A. Mogus-Milankovic, Rudjer Boskovic Institute, Croatia; Z. Skoko, Faculty of Science, University of Zagreb, Croatia; S. T. Reis, D. E. Day, University of Missouri-Rolla, USA

The purpose of the present study is to investigate influence of crystallization on conductivity of zinc iron phosphate glasses before and after heat treatments. The heat treatments were performed on the 10ZnO-30Fe2O3-60P2O5 (mol%) glass in several cycles at 600 and 650 °C. After each treatment the electrical conductivity was measured using impedance analyzer over wide frequency (0,01 Hz – 4 MHz) and temperature range (303 - 473 K). The structure was analyzed by XRD, SEM and TEM. The XRD indicated crystalline growth with preferred orientation of the crystalline phase Fe3(P2O7)2 after heat treatments. Two semicircles in the complex impedance spectra, $Z^*(\omega)$, was observed as a result of the formation of the nanocrystals. Total electrical conductivity decreases after crystallization at 600 C for 1h, whereas increases after heat treatments at 650 °C. Significant increase in electrical conductivity is a result of conductivity through grain boundaries, i.e. interfaces between crystallites.

(GOMD-S1-032-2008) Dynamic Light Scattering in Ultraphosphate Glass-forming Liquids

R. Fabian*, D. Sidebottom, Creighton University, USA

Phosphate glasses feature prominently in many technological applications and yet the viscoelastic response of the glass forming liquid has not received much attention. He we report results of dynamic light scattering studies of certain ultraphosphate liquids obtained at temperatures well above the glass transition. The study covers a wide compositional range from pure P2O5 whose bridging oxygens form a three dimensional network to the alkali-modified metaphosphates which form two dimensional chains. We find that both the fragility index and the heterogeneity parameter display systematic trends in response to these changes in the covalent structure of the oxide network.

(GOMD-S1-033-2008) Dynamic Light Scattering in Glassforming Aqueous Maltose

M. Durante*, D. Sidebottom, Creighton University, USA

We report results of a photon correlation spectroscopy study of the glassforming dynamics in aqueous maltose solutions of varying concentration. These measurements represent a companion study to earlier measurements conducted in aqueous glucose wherein two distinct relaxations were observed: a q-independent, viscoelastic (alpha) relaxation occurring at short times and a q-dependent 'ultraslow' mode associated with the quasi-diffusional motion of glucose clusters at long times. We find that the maltose solutions also display two distinct relaxations. However, both are q-dependent and neither appear consistent with the viscoelastic alpha relaxation. We discuss the possible origins for these two quasi-diffusional modes.

(GOMD-S1-034-2008) Computer Simulation of Structural Relaxation in Glasses

R. G. Erdmann*, E. A. King, P. Lucas, University of Arizona, USA

The glass transition is a complex phenomenon governed by the thermodynamics and kinetics of the relaxation toward equilibrium of the bond structure in a material. These processes can be accurately described using the the Tool-Narayanaswamy-Moynihan model, which accounts for the effect of the fictive temperature, as well as non-linearity and non-exponentiality on structural relaxation. Here we present a user-friendly interactive graphical computer application which models the kinetics of the fictive temperature and make direct comparisons between model output and experimental heat capacity data obtained from differential scanning calorimetry.

(GOMD-S1-035-2008) Glasses with Fictive Temperature-Independent Properties: Minimization of Indentation Size Effect and Maximization of Indentation Crack Resistance

T. M. Gross*, M. Tomozawa, Rensselaer Polytechnic Institute, USA

Glasses can be classified as normal or anomalous depending on their fictive temperature-property relationship. Intermediate between normal and anomalous glasses there are glass compositions with fictive temperature independent properties. Both types of glasses are shown to exhibit a plastic deformation-induced fictive temperature increase during microhardness indentation. The fictive temperature increase changes the density in the plastically deformed region in opposite ways for normal and anomalous glasses. It is found that intermediate glasses with fictive temperature independent density do not exhibit this density change. These glasses with fictive temperature independent density are shown to exhibit a minimum amount of the indentation size effect (ISE). It is also found that glasses with fictive temperature-independent mechanical properties exhibit a maximum in the indentation load required for crack initiation.

(GOMD-S1-036-2008) Conductivity of Mixed Alkali Germanate Glasses

M. M. Ashton-Patton*, J. E. Shelby, New York State College of Ceramics, USA

Germanate glasses with low concentrations of a single alkali result in unique conductivity curves for each individual cation. Increasing the amount of alkali (≥ 20 mol%) in the glass results in a similar electrical response by all five alkali ions. In silicate glasses mixing alkali ions decreases the conductivity to values below the conductivity of each of the individual binary glass at the same composition. This study investigates the effect of alkali addition on the electrical conductivity of three pairs of mixed alkali germanate glasses, Li^+:Cs^+, Na^+:K^+, and K^+:Rb^+. A small amount of alkali results in an increase in the electri-

cal conductivity by at least an order of magnitude followed by a steady decrease in the electrical conductivity. Binary glasses with 20 mol % alkali addition have a conductivity on the order of 10^{-6} Scm^{-1}; the conductivity of mixed alkali glasses is at least 3 orders of magnitude lower. The electrical behavior will also be compared with the glass transition temperature and the density of the glass.

(GOMD-S1-037-2008) Properties of K_2O-Rb_2O-GeO_2 Glasses

S. Morris*, M. M. Ashton-Patton, J. E. Shelby, New York State College of Ceramics, USA

Potassium and rubidium have the most similar ionic radii of all the mixed alkali pairs, with a Rb^+:K^+ ratio of 1.07 (Shannon radii). This study examines the properties of these glasses while holding the GeO_2 content at 85 and 90 mol% and varying the amount of K_2O and Rb_2O in the glasses. The glass transition temperature, electrical conductivity, infrared spectra, and density were measured. The glass transition temperature and electrical conductivity show an obvious mixed alkali effect across each tie-line.

(GOMD-S1-038-2008) Investigation of Heat Capacities for the 0.5P2O5+0.5[x(Na2O)+(1-x)(Li2O)] System

M. J. Haynes*, S. W. Martin, Iowa State University, USA

The heat capacities of 0.5[x(Na2O)+(1-x)(Li2O)] + 0.5P2O5 mixed alkali glasses were measured from sub-ambient temperatures to beyond their glass transition temperatures using differential scanning calorimetry. The low temperature glassy state heat capacities were explored to determine whether a thermal "mobile cation" glass transition could be observed in the DSC in analogy to the mechanical relaxation peak observed in the dynamical mechanical analysis experiment. Even though the DMA shows a very strong and pronounced mechanical relaxation peak, there is no evidence that this relaxation carries any heat with it, that is, at the limits of the detectability of the DSC, the mobile cation relaxation cannot be observed. However, high quality low temperature heat capacities of these mixed alkali glasses will be reported for the first time. The high temperature heat capacities of these glasses was examined to explore the effect of the mixed alkali on the strength of the primary glass transition.

(GOMD-S1-039-2008) Atomic-scale Structure of 0.5Li2S+0.5[(1-x)GeS2+xGeO2] Glasses (x=0.,0.1,0.2,0.4,0.6,0.8) by High-energy X-ray Diffraction and Computer Simulations

D. Le Messurier*, V. Petkov, Central Michigan University, USA

Lithium ion containing oxy-sulphide glasses show an anomalous increase in their conductivities at certain ratios of oxygen to sulphur. These oxy-sulphide glasses are preferred over their sulphur-iodide cousins, due to their increased chemical stability and suitability for applications such as electrolytes in solid state batteries. Glasses in the composition range 0.5Li2S+0.5[(1-x)GeS2+xGeO2], where x=0.,0.1,0.2,0.4,0.6,0.8, were studied using high-energy x-ray diffraction and reverse Monte Carlo (RMC) simulations. Two different structure types were used as initial model configurations – that of Li2GeS3 crystal and of GeS2 glass. The configurations were refined against the experimental diffraction data. The resulted structure models are analyzed in terms of near atomic neighbor distributions, bond angles and connectivity. The new structure information is used to shed light on the observed conductivity increase.

(GOMD-S2-001-2008) Modeling of Silica Glass Forming

O. A. Prokhorenko*, L.G.P. Intl. LLC, USA

The purpose of the present work was to make possible parametric studies of processes of forming of silica glass parts by using pressing, blowing and drawing taken separately or combined in a single technological operation. In order to achieve this goal we needed to develop accurate mathematical models, and fast and user-friendly computer programs. Advanced methods of mathematical physics, and optimized algorithms have been used. Results of studies of the processes in questions can be valid only in case one uses accurate data on physical properties of pure or doped silica glasses. Temperature dependences of viscosity, specific heat, absorption, emission and reflection spectra, and other physical properties have been measured using precise methods. As the result we have obtained a tool for studies of the processes in question without doing extensive experimental work.

(GOMD-S3-018-2008) Photoinduced Changes in the Structure and Properties of Oxychalcogenide Glasses

D. Zhao*, A. Ganjoo, A. Kovalskyy, H. Jain, Lehigh University, USA; G. Yang, Y. Xu, G. Chen, East China University of Science and Technology, China

We have investigated the impact of oxygen on the structure and optical properties of chalcogenide glasses. Oxychalcogenide bulk glasses of xAs2S3-(1-x)Sb2(S/O)3 compositions are prepared by conventional melt-quench method, and then glassy films are deposited by thermal evaporation. Fourier Transform Infrared Spectroscopy (FT-IR), X-ray Photoelectron Spectroscopy (XPS), and Extended X-ray Absorption Fine Structure (EXAFS) are used to investigate how oxygen affects their structure. Optical properties of their thin films are studied by infrared and visible optical spectroscopy. Photo-induced changes and their kinetics are studied by in-situ dynamic measurements. The structure and optical studies show that the oxygen dramatically affects the electronic structure, and consequently influences the photo sensitivity of chalcogenide glasses.

(GOMD-S3-019-2008) Demonstration of High-Q Chalcogenide Glass Ring Resonators

J. Hu*, Massachusetts Institute of Technology, USA; N. Carlie, L. Petit, Clemson University, USA; A. Agarwal, Massachusetts Institute of Technology, USA; K. Richardson, Clemson University, USA; L. Kimerling, Massachusetts Institute of Technology, USA

We have demonstrated the first chalcogenide glass ring resonator using a CMOS-compatible lift-off technique with thermally evaporated As2S3 films. The device features a small footprint of 0.012 mm^2, a cavity Q (quality factor) of 10,000 and an extinction ratio of 32 dB, simultaneously. These resonators exhibit a very high sensitivity to refractive index changes, with a demonstrated detection capability of Δn_As2S3 = (4.5E-6 ± 10%) RIU (Refractive Index Unit). The resonators were applied to derive photorefractive response of As2S3 to λ = 550 nm light. The ring resonator devices are a versatile platform for both sensing and glass material property investigation.

(GOMD-S3-020-2008) Zygo Optical Systems and Glass Materials

M. James*, Zygo Corporation, USA

Zygo Optical Systems located in Tucson is related to Zygo Corp in Conn. There are differences in the business models. Zygo Corp produces Instruments and develops Metrology as its prime business ZOS designs and develops products for specific customers using state of the art Opto/Mechanical designs. These range from Telescopes used in the NIF Facility in Lawrence Livermore to optical devices used in the medical industry. ZOS therefore has a keen interest in the development and refinement of the Glass materials industry as our requirements for top grade optical materials are stringent. This ranges from availability and quantity highly refined glass melts that are in existence. The Opto Mechanical industry is opening up in the commercial world at a fast rate. Scarce materials will become more so. ZOS could describe its role in the commercial world, discussing its problems and issues with cutting edge design work that is highly dependent upon the quality of the materials being produced today. Would this be useful to the society?

(GOMD-S3-021-2008) Color Variations due to Gold Nano-Particles in Fully- and Partially-developed Photosensitive Glass

W. C. LaCourse*, J. Karkheck, NYS College of Ceramics at Alfred University, USA

Gold nano-particles can give rise to color variations depending on time of exposure, irradiation wavelength, initial gold concentration and the heat-treatment conditions use to develop the nano-particles. Typically the variations are observable through the thickness of a sample. Colors from purple-blue to the gold-ruby are possible. The

present paper details how these color variations, and the particle size can be controlled. Corresponding changes in optical absorption spectra will be discussed.

(GOMD-S3-022-2008) Luminescence of Rare-Earth Doped Lithium-Lanthanum-Aluminosilicate Oxyfluoride Glasses and Glass-Ceramics

S. H. Morgan*, Z. Pan, K. James, Y. Cui, A. Burger, R. Mu, Fisk University, USA

Luminescence properties were investigated for Tb^{3+} doped lithium-lanthanum-aluminosilicate oxyfluoride glasses and glass-ceramics. Transparent glass-ceramics (TGCs) were obtained with the formation of LaF_3 nano-crystals in the glass matrix. Optical absorption, photoluminescence at 325 nm and 488 nm, and radio-luminescence (using alpha radiation) were measured. The intensity of luminescence increased from TGCs compared to that from glasses. The PL from Tb^{3+} ions in transparent glass-ceramics revealed sharp Stark-splitting peaks generally seen in a crystal host. With UV or alpha excitation, the luminescence from Tb^{3+} ions is attributed to an energy transfer mechanism. This energy transfer is significantly influenced by doping concentration. Our results indicate that Tb-doped TGCs could have a better light yield compared to Tb-doped glasses for scintillator application. Supported by NSF/CREST HRD-0420516 and DOD/ARO W911NF-05-1-0040, 05-1-0453.

(GOMD-S3-023-2008) Patent Search for Chemical Compositions of Materials with SciMaterial IP

A. Priven*, A. Sukharevsky, ITC, Inc., USA

Patent search for chemical compositions of materials requires to find all patent documents where a given set of components (e.g. oxides contained in a glass) is mentioned. This search is a problem having no easy solution. In particular, the same species are specified differently in the patent literature: thus, silica contained in a glass can be specified not only as "silica" or "SiO2", but also in terms of atoms ("silicon", "oxygen", "oxides of the IVa group elements"), ions (SiO_3^{2-} etc.), batch minerals ("aluminosilicates", "feldspar", etc.) and other kinds of species. For a multi-component composition, search for all combinations of possible names seems an unrealistic task. We propose the new search system SciMaterial IP for chemical compositions of patented materials where all information about claimed components is collected regardless of the used nomenclature. Use of this system allows to easily find the required documents among many hundred thousand available items.

(GOMD-S3-024-2008) Writing of c-axis Oriented Lithium Niobate Crystal Line on Glass Surface by Laser Irradiation

T. Honma*, K. Koshiba, Nagaoka Univeristy of Technology, Japan; Y. Benino, Okayama University, Japan; T. Komatsu, Nagaoka Univeristy of Technology, Japan

Crystal lines consisting of LiNbO3 are patterned on the surface of Li2O-Nb2O5-SIO2 glass with an addition of 0.3wt% CuO by irradiations of continuous-wave laser with a wavelength of 1080 nm. For the crystal line with a width of 5 micro-meter written by a laser scanning with a power of 1.3 W and a speed of 7 μm/s, the c-axis orientation of LiNbO3 crystals along the laser scanning direction is demonstrated from polarized micro-Raman scattering spectra and azimuthal dependence of second harmonic intensities.

(GOMD-S3-025-2008) Crystallization of the Non-linear Optical Phase La2CaB10O19 from La2O3–CaO–B2O3 Glasses

I. Dyamant*, E. Korin, J. Hormadaly, I. Bar, Ben-Gurion University, Israel

Glasses in the La2O3–CaO–B2O3 ternary system were studied in order to crystallize the non-linear optical (NLO) phase La2CaB10O19 (LCB). Clear bulk glasses were made from compositions within the glass-forming range of the ternary system using conventional melting techniques. Thermal properties and crystallization kinetics characterizations were done by differential thermal analysis and dilatometry, to determine the crystallization heat treatments and the LCB crystallization mechanism. X-ray diffraction patterns of glasses heated above the onset crystallization temperatures indicated that LCB could be crystallized from clear glasses of near-stoichiometric compositions. Second harmonic generation effect as determined by a green light emission using a Nd:YAG laser, was demonstrated for some of the heat treated glasses, as a complementary method for a NLO crystalline phase detection.

(GOMD-S3-026-2008) X-Ray Photoelectron Spectroscopy Investigation of GexAsySe1-x-y Glasses

R. Wang*, D. Choi, L. Barry, Australian National University, Australia

We have measured and analysed x-ray photoelectron spectra of a series of GexAsySe1-x-y glasses to understand the evolution of the bond structure. The valence band spectra show that a number of Se-rich structures can be found in the samples. After decomposing Ge, As and Se 3d spectra into several doublets and assigning them to the different local bond structures, it was found that, while GeSe4/2 tetrahedral, AsSe3/2 pyramidal and Se trimers decrease in their integrated areas, most defect bonds increase with increasing mean coordination number. Moreover, when the appearance of Se trimers is reasonable in Se-rich samples, they never vanish even in Se-poor samples. A possible mechanism to form Se trimers in Se-poor samples is discussed.

(GOMD-S3-027-2008) Rare-Earth Doped Polymethylmethacrylate (PMMA) Bulk Material for Optical Applications

B. Kokuoz, C. J. Kucera*, J. Ballato, Clemson University, USA

Rare-earth doped Polymethylmetacylate (PMMA) is a well known optical material for different types of applications including coatings, optical waveguides and optical fibers. High rare-earth loading levels in a polymer host can be achieved by using an organic surfactant (ligand) attached to the heavy metal rare-earth ions. Here, we report bulk PMMA rods loaded with rare-earth doped LaF3 nanoparticles. Various ligands with UV absorbing capabilities are employed to obtain maximum luminescence from different rare-earth dopants at various concentrations and at various wavelengths. This type of organic-inorganic system does not only enable a broad excitation range for the rare-earths due to the donor-acceptor relation between the surfactant and optical center but also enables very high clarity bulk polymer materials. Rare-earth doped PMMA has been successfully prepared and their preparation and characterization using fluorescence spectroscopy and UV-VIS spectroscopy will be discussed.

(GOMD-S3-028-2008) Crystallization Processes in Glass-Ceramics with Different Structural Coordination

P. Lucas, E. King*, University of Arizona, USA; X. Zhang, B. Bureau, Universite de Rennes, France

Infrared glass-ceramics can be produced by proper heat treatment of chalcohalide glasses. It is known that the connectivity of network glasses controls the temperature dependence of their viscoelastic properties. Here we show that the crystallization process depends on the average coordination of the chalcogenide glass matrix. The bond density directly affects the activation energy for viscous flow and consequently the activation energy for crystallization.

(GOMD-S3-029-2008) Preparation and Characterization of New Fluorotellurite Glasses for Photonics Application

Q. Chen*, G. Liao, J. Xing, Q. Chen, D. Milanese, H. Gebavi, M. Fokine, M. Ferraris, politecnico di Torino, Italy

Novel fluorotellurite glasses were studied as candidates for fabricating mid-infrared optical fiber lasers. The thermal and optical properties including refractive indexes, UV-Vis-IR and FTIR spectra are reported. Raman spectra were recorded in order to analyze the changes in the glass structure with increasing ZnF2 concentration. The effects of adding ZnF2 on the optical properties of the fluorotellurite glass system are also discussed. It is demonstrated that the addition of ZnF2 greatly increased the thermal stability of the glass. Adding ZnF2 also reduced the hydroxyl (OH) content of the glass resulting in lower optical absorption in the infrared region. In addition, with increasing of ZnF2, the glass absorption cut-off edge at around 400 nm shifted

to shorter UV wavelength. Raman spectra were recorded in order to analyze the changes in the glass structure with increasing ZnF2 concentration. And they showed the increase of transformation of TeO3+1 to TeO3 structures.

(GOMD-S3-030-2008) Optimization of Luminescent Properties of GaN and InGaN/GaN Quantum Well Structures for Application in Ion-Photon Emission Microscopy

J. Villone*, B. L. Doyle, G. Vizkelethy, E. S. Bielejec, D. L. Buller, J. A. Knapp, D. D. Koleske, Sandia National Labs, USA

The development of a new microscopy technique, namely ion-photon emission microscopy, is crucial for analyzing failure and pinpointing radiation sensitive elements in today's complex integrated circuits. In order for this technique to be useful, a thin (<5 μm) self-supporting luminescent layer, demonstrating sufficient quantum efficiency when excited by ions, as well as rapid decay, must be developed. As a result of their potential for producing high light intensity with short lifetimes, n-type GaN as well as InGaN/GaN quantum well structures grown by MOCVD on sapphire substrates are being studied as possible candidates. Another obstacle entails the removal of this layer from the sapphire substrate, to create a free-standing film, while maintaining a high-quality material. Results from progress on this issue, as well as lifetime measurements, ionoluminescence, and the application of these films in emission microscopy will be presented.

(GOMD-S4-016-2008) Hollow Glass Microspheres for the Separation of Hydrogen From Mixed Gas Streams

J. S. Rich*, J. E. Shelby, Alfred University, USA

A key limitation to the development of a hydrogen based economy lies in the purity of hydrogen. Current methods for the purification of this gas are energy intensive and/or require difficult to manufacture materials (ie. selectively porous molecular sieves). A possible solution lies in the concept of inexpensive hollow glass microspheres acting as selectively permeable and reusable inorganic membranes. The current study evaluates the parameters for the separation of hydrogen from various mixed gas streams using traditional heat treatment and investigates infrared light in terms of diffusion enhancement using residual gas analysis. Adsorption of gases is a limiting factor in the functionality of the microspheres for purification, due to their high surface area. Infrared light and thermal treatment have been investigated for the removal of adsorbed gases.

(GOMD-S4-017-2008) Preparation of New Fluorescent Silica-Silsesquioxane Nanoparticles

D. A. Loy, J. Wertz*, University of Arizona, USA

Fluorescent nanoparticles are attractive for biotechnologies, security tagging, and membrane integrity testing. Here we report the preparation of amorphous silica-silsesquioxane nanoparticles using a modified Stober procedure. The particles can be prepared with narrow size distributions between 20-400 nanometers in diameter. Initial studies involved preparation of silica nanoparticles then modifying the surface with a fluorescent dye with a trialkoxysilane group. The alkoxysilane group reacts to form covalent Si-O-Si linkages with the surface such that the nanoparticles are fluorescent. Second generation particles were prepared by copolymerizing a silsesquioxane monomer with a fluorescent bridging group between two trialkoxysilane monomers with a silica precursor to create a new class of inherently fluorescent particles. Details of the nanoparticles' syntheses, characteization and application to membrane integrity testing will be presented.

(GOMD-S4-018-2008) Irradiation Effects of Intensive Electron Beam on High Purity Silica

S. Cheng*, Corning Incorporated, USA

The electron beam induced irradiation effects on high purity silica were investigated using an analytical transmission electron microscope with field emission electron source. A field emission TEM, operated at accelerating voltage of 200 kV provided an intensive nm electron probe containing a current density approaching 10 to the power 5 A/cm2. The Electron Energy Loss Spectrometer attached to the TEM, provided a tool to monitor the structural change during the irradiation process. The Energy Loss Near Edge Structure (ELNES) of Si L2,3-edges was used to study the bonding between ions of Si and O in the specimen. The low energy loss was used to generate the optical absorption data to study the defects created by the irradiation. The details of the experimental setting and the structural changes of the silica specimen will be presented.

Tuesday, May 20, 2008

Glass Science

Cell and Protein Interactions with Glass

Room: Sabino
Session Chair: Mark Riley, University of Arizona

9:00 AM

(GOMD-S1-039-2008) Role of Glass-Forming Matrices in Cryopreservation: A ^{31}P NMR Line Shape Simulation Study

P. Jain*, S. Sen, S. Risbud, University of California, Davis, USA

There are two views to explain the mechanism by which certain glass-forming sugars preserve living cells; the water replacement model and the vitrification model. Here, both models are tested by obtaining dynamical and orientational parameters of the PO_4 headgroups of lipid bilayers in trehalose, glucose and hydroxyethyl starch (HES) glass forming matrices using variable temperature ^{31}P NMR spectroscopy. The phase transition of DPPC bilayers is characterized in all cases by a sudden onset of rapid rotational diffusion of the PO_4 headgroups. In the presence of trehalose and glucose, this phase transition temperature is 10K higher than in pure DPPC and DPPC/HES. Glassy trehalose and glucose are found to strongly restrict any change in the orientation of the diffusion axis of the lipid headgroups during phase transformation. The ability of these glasses to maintain the dynamical and orientational rigidity of lipid headgroups plays an important role in cryopreservation of biomaterials.

9:20 AM

(GOMD-S1-040-2008) Cellular Adhesion and Response to Thermally Modified, Sol-Gel Derived TiO2 Thin Films

M. Coe, D. L. DeRosa, University of Arizona, USA; J. D. Musgraves, J. Blaine, B. G. Potter, The University of Arizona, USA; M. R. Riley*, University of Arizona, USA

Interactions between individual cells and surfaces can be modulated through induction of adhesion compounds that anchor cells to surface features. Thermally modified, sol-gel derived TiO2 films have been produced for use as cell culture substrates. The effect of thermal treatment on the adhesion and activation of cells cultured on these substrates has been investigated. Cell attachment and function of 3 common types of cell cultures were assessed. Cell types display a preference for surfaces receiving low or high thermal treatments based on the cell propensity to make strong anchoring. In most cases, cell attachment and spreading is reduced on surfaces receiving treatments of 260°C and above. The activation of macrophages in response to a bacterial endotoxin can be modulated by the surface properties with anchorage-independent and anchorage-dependent macrophages displaying different behavior.

9:40 AM

(GOMD-S1-041-2008) Novel Injectable Bioglass/Chitosan Composite for Bone Substitute Materials

P. Khoshakhlagh*, S. Rabiee, F. Moztarzadeh, R. Ravarian, R. Moradi, N. Nosoudi, Amirkabir University of Technology, Iran

Glasses based on the SiO2-CaO-P2O5 system constitute an important group of materials that have found wide application as bone implants. Sol-gel processing has been successfully used in the production of a variety of materials for biomedical applications. Chitosan is

a biocopolymer comprising of glucosamine and N-acetylglucosamine, obtained by deacetylation of chitin. It has been reported to be safe, osteoconductive. The large number of orthopedic procedures, including many performed arthroscopically, has led to great interest in injectable biodegradable materials for regeneration of bone and cartilage. New injectable, bioglass/chitosan composites was investigated in this study. The prepared composite was characterized by FTIR, XRD and SEM. The objective of this study was to develop a new composite and the effect of chitosan on injectability was investigated. This bone graft may be useful in surgical sites that are not freely accessible by open surgery or when using minimally invasive techniques.

10:00 AM

(GOMD-S1-042-2008) Preparation and Characterization of Macroporous Bioglass/ Hydroxyapatite Composite for Biomedical Applications

R. Ravarian*, S. Rabiee, F. Moztarzadeh, P. Khoshakhlagh, N. Nosoudi, Amirkabir University of technology, Iran

Bioglasses could elicit a specific biological in vivo response at the interface and attach to the tissues such as bone, with a strong chemical bond. Certain compositions of bioactive glasses containing SiO2–CaO–P2O5 bond to both soft and hard tissue without an intervening fibrous layer. Sol–gel glass exhibits high specific area and porous structures, which can promote cell adhesion. HA shows good biocompactibility with human body. The bioglass was synthesized by sol-gel method and HA powder was precipitated through a wet chemical process. In this research a composite of bioglass/hydroxyapatite was prepared for a porous scaffold. Macroporous scaffold prepared by foam casting method is a promising substrate material for bone tissue engineering. But, it is difficult to produce macroporous bioglasses with pores larger than 100 μm. The composite was assessed using SEM, XRD, FTIR. Density and compression tests were also performed.

Dynamics in Glasses and Glassforming Liquids I

Room: Sabino
Session Chair: David Sidebottom, Creighton University

10:40 AM

(GOMD-S1-043-2008) Ionic Conduction in Trivalent Doped Tetrahedral Network Chalcogenide Glasses: Similarities and Differences to Oxide Glasses

S. W. Martin*, W. Yao, Iowa State University, USA; J. Saienga, TA Instruments, USA

The role of trivalent dopants in oxide tetrahedral glasses has been long known and the effect of the elimination of non-bridging oxygens they cause on the physical properties has been well studied. However, the use of trivalent dopants in tetrahedral chalcogenide glasses has only recently been studied and their effects on the structure and properties are unknown. In this study, we have examined the effect of different trivalent dopants, Ga2S3 and La2S3, on the structure of M2S + M2S3 + GeS2 glasses and the effect of the different alkali, Li, Na, K and Cs in the same M2S3, M = Ga, system. In the case of the Ga+3, elimination of non-bridging sulfurs appears to be the dominate role, whereas for the larger and more ionic La+3, creation of octahedral LaS3- non-bridging sulfur structures appears to be the dominant structural effect. In this talk, the different structures and properties of these trivalent doped glass systems will be examined and reported.

11:00 AM

(GOMD-S1-044-2008) Characterization of Electrically-Conductive Glass-Ceramics

M. J. Davis*, P. Vullo, SCHOTT North America, Inc., USA

Glass-ceramics potentially offer a unique processing route by which to make thermally stable, electrically-conductive materials. We've examined the electrical characteristics of the system lithium disilicate + silver, fabricated either by melting stoichiometric lithium disilicate + 1 wt% silver, or via ion-exchange of bulk material or powder of the same base composition. Samples were ceramized under reducing conditions. Sintering behavior of the powders was generally poor due to resulting high silver contents. Bulk ion-exchanged samples showed high DC conductivities (about 10^{-2} S/m), localized to a 20 micron-thick surface layer. Samples formed via the melting route produced true bulk DC conductivities of about 10^{-3} S/m. Complex, nonlinear behavior was the norm for dielectric constant and loss (1 kHz), DC conductivity, depolarization current, and current-voltage measurements. Further study is required to understand the structure-property relationships of these unusual materials.

11:20 AM

(GOMD-S1-045-2008) Non-Exponential Relaxations in Ion-Conducting Glasses (Invited)

P. Maass*, Institute of Physics, Germany

Motions of ions and charged defects in glasses, crystals, composite materials and biological systems give rise to slow non-exponential relaxation processes, which are observable within a wide range of timescales larger than vibrational times. These processes manifest themselves in numerous dynamical probes, like ac-conductivity, nuclear spin-relaxation, quasi-elastic neutron scattering, and mechanical relaxation. Theoretical approaches will be discussed to describe the corresponding response functions [1], with focus on stoichiometric and structural effects [2,3], quasi-universalities, and nonlinear transport behavior in glassy electrolytes. [1] W. Dieterich and P. Maass, Chem. Phys. 284, 439 (2002). [2] R. Peibst, S. Schott, and P. Maass, Phys. Rev. Lett. 95, 115901 (2005); P. Maass and R. Peibst, J. Non-Cryst. Solids 352, 5178 (2006). [3] C. Müller, E. Zienicke, S. Adams, J. Habasaki, and P. Maass, Phys. Rev. B 75, 014203 (2007).

Optical Materials

Optical Fibers and Waveguides I

Room: Madera
Session Chair: Shibin Jiang, Ad-Value Photonics

9:00 AM

(GOMD-S3-031-2008) Advances in Glasses and Fabrication Processes for Integrated Optical Amplifiers (Invited)

G. C. Righini*, CNR - National Research Council of Italy, Italy; S. Berneschi, M. Brenci, S. Pelli, IFAC CNR, Italy; G. Nunzi Conti, Centro Enrico Fermi, Italy; A. Chiappini, A. Chiasera, M. Ferrari, IFN CNR, Italy

Since the first demonstrations in 1987 of Er3+-doped fiber amplifiers, rare earth doped glasses have been attracting a continuous attention for the implementation of integrated optical amplifiers and lasers, mostly for telecommunication applications. The progress has concerned the development of both the glass material (in terms of host composition and of doping) and the fabrication processes. Here we present a brief overview of recent advances in the area of erbium doped waveguide amplifiers (EDWAs) based on oxide glass matrices. Particular reference is made to our work on silica-based and tellurite glasses; our fabrication processes included ion exchange, RF-sputtering and sol-gel deposition. Different patterning and writing techniques for the channel waveguide fabrication are discussed as well.

9:40 AM

(GOMD-S3-032-2008) Broadband Near-Infrared Luminescence and Optical Amplification of Activated Ion-doped Glasses and Glass Ceramics (Invited)

J. Qiu*, Zhejiang University, China

Optical fiber amplifier plays an important role in the optical communication. Considerable effort has been devoted to develop optical fiber amplifiers which can be used to produce optical gains at differ-

ent communication bands. In this paper, we introduce recent research progress on the development of novel materials for optical amplification. We observed broadband near-infrared luminescence and optical amplification of Bi-doped glasses and Ni-doped glass ceramics, which are very promising for the realization of ultrabroad band optical amplification.

10:40 AM

(GOMD-S3-033-2008) Er3+-Activated Waveguiding Glass Ceramics, Microcavities and Nano-Microsphere: Fabrication and Spectroscopic Assessment

M. Ferrari*, C. Armellini, A. Chiappini, A. Chiasera, Y. Jestin, CNR-IFN, Italy; E. Moser, C. Tosello, M. Montagna, University of Trento, Italy; G. C. Righini, CNR, Italy; S. Berneschi, M. Brenci, S. Pelli, IFAC-CNR, Italy; G. Nunzi Conti, S. Soria, Centro Enrico Fermi, Italy

We report on recent advances in optical nanocomposites materials, planar microcavity, and spherical nano-microspheres. Bottom-up fabrication and optical assessment of Er3+-activated SiO2-HfO2 waveguide glass ceramic, with losses around 0.3 dB/cm at 1.5 μm is presented. Concerning confined structures, fabrication by rf sputtering technique of an Er3+-activated microcavity with a quality factor of 171 using oxide-based dielectric materials is demonstrated. Fabrication and spectroscopic assessment of sol-gel-derived Er3+-activated silica nano-microspheres with a quantum efficiency of 76% is reported.

11:00 AM

(GOMD-S3-034-2008) Multicomponent Oxide Glass Fibers for Fiber Lasers and Amplifiers

S. Jiang*, AdValue Photonics Inc., USA

High power fiber lasers and amplifiers have attracted significant attention in last few years. Many breakthroughs were demonstrated in both academically and commercially. Output power of greater than 1kW was demonstrated and commercially available, which were widely believed impossible. But most effort in high power fiber laser development focuses on rare-earth doped silica fiber. We are actively design new glass compositions, fabricate new fibers, and design new fiber lasers and amplifiers to take advantages of multi-component glasses. Our current progress on rare-earth doped multi-component oxide glass fibers for fiber laser and fiber amplifiers will be presented.

Cross-Cutting Topics

Ionizing Radiation Effects in Amorphous Materials and Structures - Radiation Detection

Room: Pima

Session Chairs: S.K. Sundaram, Pacific Northwest National Lab; Brad Johnson, Pacific Northwest National Lab

9:00 AM

(GOMD-S4-019-2008) New Glass Scintillators for Radiation Detection Applications (Invited)

L. A. Boatner*, D. Wisniewski, J. S. Neal, J. O. Ramey, Oak Ridge National Lab, USA

Single-crystal scintillators exhibit outstanding performance in terms of their light yield, decay times, and energy resolution. However, the growth of large single crystals is a time-consuming and expensive method. The crystal growth process is eliminated for glass scintillators since glasses can be fabricated as large-area plates or formed as optical fibers. Li-6 can also be incorporated in glasses for neutron detection. Glass scintillators suffer from low light yields relative to single-crystal counterparts. Accordingly, we are carrying out research on alternate glass systems with the goal of identifying new scintillating glasses with improved light yields. Specifically, we are investigating a variety of phosphate glasses doped with trivalent cerium for use in systems for gamma-, X-ray and neutron detection. Here we present the results of studies in which the glass composition and activator ion content are varied, co-doping strategies are employed, and the glasses are subjected to thermochemical processing.

9:40 AM

(GOMD-S4-020-2008) Changes in DC Conductivity of Amorphous Semiconductors with Exposure to Ionizing Radiation (Invited)

B. R. Johnson*, J. V. Crum, R. M. VanGinhoven, C. E. Seifert, B. J. Riley, S. K. Sundaram, Pacific Northwest National Lab, USA

The effects of ionizing radiation on amorphous semiconductors were examined by characterizing changes in DC ionization current as a function of exposure to alpha radiation. Two different glass systems were studied: a chalcopyrite glass (CdGexAs2; where $0.45 \leq x \leq 1.0$), with a tetrahedrally coordinated structure, and a chalcogenide glass (As40Se(60-x)Tex; where $0 \leq x \leq 12$), with a layered or three-dimensionally networked structure, depending upon tellurium content. These compounds were chosen for their similarity in density, electrical resistivity, and bandgap to CdZnTe (CZT), a commonly used crystal for gamma detection. Changes in DC ionization current were measured as a function of radiation exposure, temperature, and applied bias. A sharp increase in current ranging from 30% to 475% was consistently observed in the presence of a sealed alpha source. These results demonstrate the potential of these materials to detect ionizing radiation.

10:00 AM

(GOMD-S4-021-2008) Characterization of Ion-induced Scintillation in Ceramics

Y. Zhang*, V. Shutthananda, W. J. Weber, Pacific Northwest National Laboratory, USA

Demands for improved radiation detectors for national security, medical imaging and high-energy nuclear physics applications have prompted research efforts on new materials discovery and efficient techniques to characterize material properties relevant to detector performance. A recently developed fast analysis technique utilizing a time of flight telescope will be discussed, where material response to single particle excitation can be recorded. Scintillation responses of several ceramic materials, including bismuth germinate (BGO), cerium-doped yttrium–aluminum perovskite (YAP:Ce,), europium-doped calcium fluoride (CaF2:Eu), cerium-doped oxyorthosilicates of gadolinium (GSO), cerium-doped oxyorthosilicates of yttrium (YSO), cerium-doped oxyorthosilicates of lutetium (LSO), and mixed scintillators Lu2−xGdxSiO5 (LGSO) and cerium doped Lu2−xYxSiO5 (LYSO), etc, to energy deposition of charged particles are characterized in terms of light yield, nonlinearity and energy resolution.

Ionizing Radiation Effects in Amorphous Materials and Structures - Optical Materials I

Room: Pima

Session Chairs: S.K. Brad Johnson, Pacific Northwest National Lab; Sundaram, Pacific Northwest National Lab

10:40 AM

(GOMD-S4-022-2008) Effects of Ionizing Radiation on Properties of Volume Bragg Gratings in a Photo-Thermo-Refractive Glass (Invited)

L. B. Glebov*, University of Central Florida, USA

This presentation is a survey of the joint research conducted in Belgium Nuclear Center and CREOL/UCF. Photo-thermo-refractive (PTR) glass is a new photosensitive material for volume hologram recording. Theses holograms (volume Bragg gratings) have shown high efficiency and robustness resulted in wide applications for different optical and laser systems. Effects of exposure to fast protons and gamma radiation were studied to determine stability of such a

material in conditions of exploitation in space environment. Spectra of additional absorption and diffraction efficiency of volume Bragg gratings recorded in PTR glass were measured and analyzed. It was shown that induced absorption bands are mainly in visible and UV regions. No changes in refractive index modulation were detected. Ability of the use of such optical elements in long-term space application is demonstrated.

11:20 AM

(GOMD-S4-023-2008) In-Situ and Post-Exposure Effects of Ionizing Radiation on Optical Properties of Nd:YAG and Cr:YAG

B. L. Glebov*, K. Simmons-Potter, The University of Arizona, USA; D. C. Meister, Sandia National Laboratories, USA

The application of optical components and devices in space-based systems, and in other harsh radiation environments, has driven the need for research to understand the impact of ionizing radiation on the performance of optical materials. Yttrium Aluminum Garnet (YAG) is a laser host material with stable mechanical, optical, and environmental properties. Common dopants for YAG include both Nd and Cr, appearing as Nd^{3+}, Cr^{3+}, and Cr^{4+}. In this paper we will discuss the impact of γ irradiation on the optical properties of doped-YAG laser materials. Samples with varying composition have been examined using optical spectroscopy before, during and after γ irradiation. In contrast with the Cr:YAG, significant transient radiation-induced photodarkening was observed in Nd:YAG samples. The impact of this effect on material and device performance will be discussed and optical luminescence will be used to help interpret the different responses.

11:40 AM

(GOMD-S4-024-2008) Compaction Effects of Radiation on Zerodur

M. J. Davis*, SCHOTT North America, Inc., USA; C. Kunisch, SCHOTT AG, Germany

We present a re-analysis of experimental data describing the compaction effects of electron radiation on Zerodur. These data include high-dose, high dose-rate bulk density measurements as well as lower-dose, interferometrically-measured surface figure changes. We show that previous attempts to deduce linear compaction from figure changes are in error and in fact have precluded earlier attempts to predict radiation effects for an arbitrary optical geometry. By interpreting surface figure measurements in light of a more relevant physical model—-a simplified bimetal equation—-we are able for the first time to accurately predict expected deformation as a function of prescribed dose for both laboratory and space-based experiments. Moreover, we show that a real discrepancy exists between compaction estimates from bulk density experiments and those from surface figure measurements.

Glass Science

Dynamics in Glasses and Glassforming Liquids II

Room: Sabino
Session Chair: David Sidebottom, Creighton University

1:20 PM

(GOMD-S1-046-2008) Indentation-Induced Microhardness Change in Glasses: Possible Fictive Temperature Increase caused by Plastic Deformation

T. M. Gross*, M. Tomozawa, Rensselaer Polytechnic Institute, USA

The microhardness in the plastically deformed region around a large indentation was measured for different types of glasses. In soda-lime silicate glass, a typical normal glass, the plastically deformed region was softer than the undeformed region of the glass, while in silica glass, a typical anomalous glass, the plastically deformed region was harder than the undeformed region of the glass. Asahi less brittle glass, an intermediate glass between normal and anomalous glasses, was found to exhibit little change in hardness in the vicinity of the large indentation. These findings can be explained by a plastic deformation-induced fictive temperature increase leading to a lower hardness for soda-lime silicate glass and a higher hardness for silica glass. This plastic deformation-induced fictive temperature increase may be analogous to the phenomenon of mechanical rejuvenation in the field of polymer science.

1:40 PM

(GOMD-S1-047-2008) Glass Formation from Iron-rich Phosphate Melts

L. Zhang*, R. K. Brow, M. E. Schlesinger, University of Missouri-Rolla, USA

Chemically durable iron pyrophosphate glasses (nominal molar composition, 40 Fe_2O_3 • 60 P_2O_5, Fe/P = 0.67) are well–known and have found applications as host materials for radioactive wastes. We have examined the glass forming tendencies of Fe_2O_3-rich ($1.00 \geq Fe/P \geq 1.50$) phosphate melts. Roller quenching was used to vitrify compositions near the eutectic at 58 Fe_2O_3 • 42 P_2O_5. The glass forming ability is related to the eutectic type of the system. The influence of Fe_2O_3 on the glass transition temperature (Tg) and crystallization behavior was studied using differential thermal analysis and X-ray diffraction techniques. With increasing Fe_2O_3 content, Tg and crystallization temperature (Tx) increase. When heat–treated above Tg, crystalline Fe_2O_3 and $FePO_4$ form in glasses with Fe/P near 1.5, while $FePO_4$ forms in crystallized glasses with Fe/P near 1.0. The Fe^{2+}/Fe^{3+} ratios in quenched materials were determined by Mössbauer spectrometry, and were dependent on the Fe/P ratio and the melt conditions.

2:00 PM

(GOMD-S1-048-2008) Insight into Crystallization of Iron Phosphate Glasses

A. Mogus-Milankovic*, Ruder Boskovic Institute, Croatia; S. Zeljko, Faculty of Science, University of Zagreb, Croatia; L. Vesna, M. Sveto, Ruder Boskovic Institute, Croatia; D. E. Delbert, R. T. Signo, University of Missouri-Rolla, USA

Crystallization of 40Fe2O3-60P2O5 glass and its effects on electrical conductivity have been studied by XRD, DTA, SEM and IS. The conductivity was measured for as-quenched glass and after thermal treatment up to 800C. XRD has shown barely detectable beginning of crystallization at 490C. With increasing annealing temperature, these glasses turned into nanomaterials consisting of crystallites of FePO4 embedded in glassy matrix. Formation of nanocrystallites leads to an enhancement of glass matrix conductivity as compared with the as-quenched glass. Heat treatment at 650C causes massive crystallization. Formation of Fe3(P2O7)2 microcrystallites causes a drop of electrical conductivity due to the blocking of the conduction pathways at crystal/glass matrix interfaces. Further thermal treatment at 724 and 804C leads to predominant growth of Fe3(P2O7)2 crystals. Increase of electrical conductivity of this glass-ceramics is explained by a strengthening of the interactions between Fe sites in crystalline phases.

2:20 PM

(GOMD-S1-049-2008) Relaxation Processes and Mechanical Properties of Chalcogenide Glass Fibers

P. Lucas*, E. King, University of Arizona, USA; Y. Gueguen, J. Sangleboeuf, Universite de Rennes, France; G. Delaizir, University of Arizona, USA; C. Boussard-Pledel, B. Bureau, X. Zhang, T. Rouxel, Universite de Rennes, France

Enthalpy relaxation processes in chalcogenide fibers are investigated by differential scanning calorimetry and compared with bending-stress relaxation measurements obtained by rolling fibers on a mandrel and recording the viscoelsatic relaxation parameters. While the kinetics of the two processes are clearly different, several qualitative correlations are demonstrated between the enthalpy state and the mechanical properties of chalcogenide glass fibers. It appears that the

ability to undergo stress relaxation is dependent upon the fictive temperature of the glass. Stress relaxation is contingent upon the ability of a glass to undergo enthalpy relaxation and is precluded or minimal in glasses that have already relaxed enthalpy or which relaxation time is overwhelmingly large.

2:40 PM

(GOMD-S1-050-2008) Mechanisms of Nucleation and Growth in Cerium Containing Photosensitive Glasses

J. Bartlett*, W. LaCourse, New York State College of Ceramics, USA

The mechanism of nanoparticle formation within silicate glasses containing cerium and silver is studied. Ionization of cerium by ultraviolet irradiation and subsequent formation of electron trap centers is evaluated. The role of these electron trap centers as sites for nanoparticle nucleation and growth is discussed. The dependence of nanoparticle growth kinetics on rate of diffusion and structural rearrangement for cases of thermal and microwave processing is under investigation.

3:20 PM

(GOMD-S1-051-2008) Spectroscopic Evidence of a Plastic Phase in an Inorganic Molecular Glass

S. Sen*, E. Gjersing, University of California, Davis, USA; B. Aitken, Corning Incorporated, USA

31P nuclear magnetic resonance spectroscopy is used to study the nature of the temperature-dependent molecular dynamics in a P-doped molecular As-sulfide glass in the region of glass transition. 31P NMR line shapes show the existence of an isotropic tumbling motion of the constituent molecules in the glass that is detectable even at ~ 70 K below the glass transition temperature indicating a strong decoupling of this motion from viscosity and diffusion. The presence of strong dynamic orientational disorder at temperatures where the positional disorder is likely to be nearly frozen-in implies that this molecular glass-former behaves as a plastic glass. This novel dynamical disorder is shown to have important implications in understanding the Kauzmann catastrophe and to provide evidence in favor of a dynamical rather than thermodynamic origin of glass transition.

3:40 PM

(GOMD-S1-052-2008) Molecular Dynamics Simulations of Thermal Transport Mechanisms in Network Glasses and Melts

A. Upadhyay*, N. Gorska, J. Kieffer, University of Michigan, USA

The network in silicate and borosilicate glasses and melts constitutes the fabric that most effectively transmits mechanical impulses and elastic vibrations. Conversely, disruption of this network through introduction of modifier cations creates defects in this medium that cause scattering and damping of propagating phonons. We used molecular dynamics simulations based on a newly developed charge-transfer multiple-coordination potential to investigate the mechanisms of phonon thermal transport in various glass-forming systems. We used the Green-Kubo formalism to determine the thermal conductivities in these structures. We systematically varied the network character by changing the proportions of Si and B as the network-former species, as well as by changing the type of network modifier species (e.g., Li, Na, K, Rb, Cs, and Ca). We present results relating thermal conductivity to structural characteristics such as ring statistics and higher-order spatial correlation functions.

4:00 PM

(GOMD-S1-053-2008) Glass Formation in Alkali Germanates: A Combined Inelastic Light Scattering and MD Simulation Study

N. Gorska*, J. Kieffer, University of Michigan, USA

The glass formation process in alkali germanates is of interest in the context of polyamorphism because of the germanate anomaly. Using concurrent Raman and Brillouin light scattering we studied the structure and visco-elastic properties of alkali germanate liquids and glasses, as a function of temperature and composition. Using Raman scattering we monitor relative amounts of four and six coordinated germanium, while Brillouin scattering is used to measure the complex mechanical modulus of these systems. The storage modulus provides information about the structural integrity and network connectivity, while the loss modulus measures the energy dissipated in aperiodic molecular motion. To interpret the experimental observations, we carried out molecular dynamics simulations based on a newly developed charge-transfer multiple-coordination potential. The relationship between the coordination of germanium, the melt viscosity, and the glass formation tendency will be discussed.

4:20 PM

(GOMD-S1-054-2008) Origin of Non-Exponential Structural Relaxation of a High Purity Silica Glass

M. Tomozawa*, Rensselaer Polytechnic Institute, USA; A. Koike, Asahi Glass Co., Japan; S. Ryu, Samsung-Corning, South Korea

While most other glasses exhibit non-exponential structural relaxation characteristics even when the change of fictive temperature is small, high purity silica glasses are expected to show exponential structural relaxation since the glasses exhibit no observable memory effect. This was confirmed by showing that the non-exponential exponent or betha value of the KWW function of a high purity silica glass approaches unity when the change of the fictive temperature approaches zero. The non-exponentiality of the structural relaxation of this glass when fictive temperature change is finite is due to the change of relaxation tiime during the relaxation.

4:40 PM

(GOMD-S1-055-2008) Viscoelastic Relaxation of Molten Phosphorus Pentoxide

D. Sidebottom*, J. Changstrom, Creighton University, USA

We report the first ever dynamic light scattering study of the viscoelastic relaxation in anhydrous liquid P2O5. Properties of the time decay of the dynamic structure factor, including the average structural relaxation time and the stretching exponent, were obtained for temperatures from 850 °C to near the glass transition (Tg = 419 °C) using photon correlation spectroscopy. Analysis indicates that P2O5 is a strong glassforming liquid but one which exhibits an abnormally non-exponential relaxation near Tg. The viscoelastic behavior of P2O5 is compared with that of its metaphosphate counterpart to demonstrate how changes in bond connectivity influence both fragility and levels of dynamic heterogeneity.

Optical Materials

Optical Fibers and Waveguides II

Room: Madera
Session Chair: Shibin Jiang, Ad-Value Photonics

1:20 PM

(GOMD-S3-035-2008) Tellurium Based Chalcogenide Glasses and Fibers for Space Application (Invited)

J. Lucas, C. Boussard-Plédel, B. Bureau, H. Ma, X. Zhang*, University of Rennes - CNRS, France

The European DARWIN space mission is planned for finding earth-like extra solar planets which can contain life. The system will operate in the infrared region from 6 to 20 µm in order to detect CO2, O3 and H2O and to minimize the brightness difference between planets and stars. Sulfur and selenium based glasses are transparent up to 11 and 15 µm respectively. Only tellurium based glasses can be considered for this application. The biggest challenge is to obtain glasses with sufficient stability against crystallization in order to withstand fiber drawing without risk of crystallization. Germanium, gallium, iodine and selenium are introduced in small quantities in tellurium. The

best glass has a difference between the glass transition temperature and crystallization temperature higher than 110°C. The glasses can contain more than 75 mol% of Tellurium and they show good transmission up to 20 μm. Waveguide fabrication by fiber drawing and by fiber burying will be presented.

2:00 PM

(GOMD-S3-036-2008) Tellurite and Borophosphate-based Glasses for MIR Fiber Applications

J. Massera*, A. Haldeman, Clemson University, USA; R. Thieulin, Université de Monptellier, France; H. Gebavi, D. Milanese, Politecnico di Torino, Italy; L. Petit, K. Richardson, Clemson University, USA

The demands for high-speed optical communications are increasing at a tremendous rate. Tellurite based glasses are known to have good infrared transmission and high linear and nonlinear refractive indices while borophosphate based glasses allow doping with a large rare earth amount. These glasses in fiber form are highly suitable for optical communication. In this presentation, we discuss how compositions are chosen for fiberization using target attributes such as refractive index, thermal stability to devitrification, and mechanical stability. We report our recent efforts to prepare high optical quality core and core-clad tellurite and borophosphate based preforms with low bubble content and superb compositional homogeneity using a rotational caster. We show that optical core and core-clad fibers can be drawn from these performs. We also discuss how to decrease the propagation loss in these fibers.

2:20 PM

(GOMD-S3-037-2008) Microstructured Chalcogenide Fibers Single-mode from 1.55 μm to Mid-Infrared

J. Troles*, University of Rennes 1, France; L. Brilland, PERFOS, France; F. Smektala, University of Bourgogne, France; N. Traynor, PERFOS, France; H. Patrick, F. Desevedavy, University of Rennes 1, France; G. Renvesez, University of Aix Marseille 3, France

An original way to obtain single-mode fibers is to design microstructured optical fibers (MOFs). In addition, Holey fibers present unique optical properties thanks to the high degree of freedom fro the design of their geometrical structure. Our group has prepared various chalcogenide holey fibers working in the IR range in order to associate the non linear properties of these glasses with the original MOFs properties. For example, small effective mode area fibers (13 μm2) have been realised to exacerbate the non linear optical properties for telecom applications such as signal regeneration, and supercontinuum sources. On the contrary, for military applications in the 3-5 windows, large effective mode area (1000 μm2) have also been designed to permit the propagation of high power gaussian laser beams. Furthermore, single mode guiding in our MOF have been demonstrated at 1.55 and 9.3 μm. To our knowledge it is the first endlessly single mode chalcogenide glass MOF never obtained.

2:40 PM

(GOMD-S3-038-2008) New Tellurium Based Infrared Glasses for Optical Sensing Applications

A. A. Wilhelm*, P. Lucas, University of Arizona, USA; C. Boussard-Plédel, P. Houizot, B. Bureau, J. Lucas, Université de Rennes I Campus de Beaulieu, France; M. R. Riley, University of Arizona, USA

A new family of tellurium based glasses from the Ge-Te-I ternary system is explored for use as optical fiber and waveguides in infrared sensing applications. Exploration of the ternary system is conducted in order to optimize the glass composition for molding and fiber drawing processes. The optimum glass former in this system is found to be $Ge_{20}Te_{73}I_7$, with a maximum difference $\Delta T = 124°C$. The Ge-Te-I glasses are found to exhibit a large optical window extending from 2-22 microns, high conductivity, and rheological properties that permit both fibering and molding of the glass. The large optical window and good rheological properties make the Ge-Te-I glasses interesting candidates for fiber sensors. Furthermore, the high electrical conductivity of the glass allows application as both an electrode and sensing element in electro-deposition experiments of biological species.

Cross-Cutting Topics

Ionizing Radiation Effects in Amorphous Materials and Structures - Optical Materials II

Room: Pima

Session Chairs: Brad Johnson, Pacific Northwest National Lab; S.K. Sundaram, Pacific Northwest National Lab

1:20 PM

(GOMD-S4-025-2008) Radiation Effects on Optical Fibers: Fundamentals and Applications (Invited)

F. Berghmans*, Vrije Universiteit Brussel, Belgium; B. Brichard, A. Gusarov, M. Van Uffelen, SCK-CEN, Belgium; H. Thienpont, Vrije Universiteit Brussel, Belgium

Advanced photonic technologies for optical communication and sensing are being introduced in many environments where the presence of highly energetic radiation is a concern. These new application fields include space, civil nuclear industry, high energy physics experiments and future thermonuclear fusion plasma reactors. The types and intensity of radiation that optical components can encounter vary considerably with the application field. We therefore first summarize the main characteristics of the radiation environments in which optical components – and more particularly optical fibers – are typically used. We illustrate this with a number of application examples. We then recall the physical mechanisms that are responsible for changing the characteristics of irradiated optical fibers. Finally we deal with radiation effects research results on a number of selected optical fibers as well as on fiber Bragg gratings.

2:00 PM

(GOMD-S4-026-2008) Temperature and Dose-Rate Effects on Gamma Radiation-Induced Photodarkening of Rare-Earth-Doped Optical Fibers

B. P. Fox*, K. Simmons-Potter, University of Arizona, USA; W. J. Thomes, NASA Goddard Space Flight Center, USA; D. C. Meister, R. P. Bambha, D. A. Kliner, Sandia National Laboratories, USA

Rare-earth doped fibers, such as Er- and Yb-doped aluminosilicates can be advantageous in space-based systems due to their stability, their high-bandwidth transmission properties and their lightweight, small-volume properties. In such environments the effect of ionizing-radiation on the optical transmission of these fibers is of paramount importance. For the present work, gamma-radiation-induced changes in the optical transmission of a suite of Erbium- and Ytterbium-doped optical fibers were examined. The effect of dose rate and thermal annealing on photodarkening in the radiation environment was also studied. In situ spectral transmittance data over the near IR was monitored during Co-60 irradiations for total doses ranging from 2 krad (Si) to over 150 krad (Si). The elevated temperature thermal anneals were found to lead to a decrease in the rate of photodarkening in all fibers while larger dose rates consistently increased the rate of photodarkening.

2:20 PM

(GOMD-S4-027-2008) Optical Materials and Components for use in High-Radiation Environments (Invited)

K. Simmons-Potter*, University of Arizona, USA

The advantages of remote access, compact volume and increased functionality have fueled a growing interest in optical technologies for use in harsh operational environments including those that subject optical components and systems to a broad range of ionizing-radiation fluxes. Past research has demonstrated that optical materials and devices generally exhibit measurable optical loss in the presence

of ionizing radiation. This is particularly true when the source is high-energy photons from hard x-ray or gamma radiation. This deleterious loss in optical transmittance can result in significant degradation of optical signals in such systems, rendering materials and components inoperable. In the present talk, research on the gamma-radiation response of a range of optical materials and components will be discussed. Efforts to radiation-hardened elements for use in high-flux and in high total-dose settings will be reported.

2:40 PM

(GOMD-S4-028-2008) Laser Modification of Silica (Invited)

R. Corrales*, E. Moore, The University of Arizona, USA; R. M. Van Ginhoven, Pacific Northwest National Laboratory, USA

Recent experiments have shown a clear threshold for the onset of densification of silica subjected to laser irradiation as a function of laser power. In this work, we use molecular dynamics simulations as a tool to unfold the underlying mechanisms that control the action at the molecular level of laser induced modification of silica glass and crystal states. We find that at low thermal fluences, very few or no discernable modifications occur, while as the thermal fluence energy is increased, significant changes in the density occur. It is observed that densification of materials is correlated with the formation of empty space in the form of meso-voxels. Our initial studies have considered thermal energy as the sole source of minimal defect formation. This presentation will include a size effect analysis, and the effects of over- and under-damping energy dissipation. We will also describe the role of shock waves that could have significant consequences in real systems. Finally, the role of Coulomb explosions will be presented, time permitting.

Ionizing Radiation Effects in Amorphous Materials and Structures - General Effects

Room: Pima

Session Chairs: S.K. Sundaram, Pacific Northwest National Lab; Brad Johnson, Pacific Northwest National Lab

3:20 PM

(GOMD-S4-029-2008) Thermal Decomposition of Amorphous Hydrogenated Carbon Films (Invited)

E. Salancon*, Marseille University, France; D. Thomas, T. Schwarz-Selinger, W. Jacob, Max-Planck Institut für plasmaphysik, Germany

Thermally induced decomposition of hard and soft amorphous hydrocarbon films was investigated by thermal effusion spectroscopy. Released species were detected by a sensitive quadrupole mass spectrometer using two different experimental setups for thermal effusion. Species released in a molecular beam setup were detected in direct line of sight to the sample surface, while species released in a remote UHV oven had no direct line of sight to the mass spectrometer. Soft, hydrogen-rich carbon films exhibit a desorption maximum at T~740 K while hard films with a low hydrogen content have their maximum at T~870 K. Additionally, the spectrum of released species differs dramatically between hard and soft films. We found a significant redeposition of species released from soft films and a high reactivity of these films to the air exposure.

4:00 PM

(GOMD-S4-030-2008) Radiolytically-Induced Topological Re-Arrangements in Amorphous Networks (Invited)

L. W. Hobbs*, Massachusetts Institute of Technology, USA

Glasses encounter high levels of ionizing radiation in applications ranging from high-level nuclear waste glasses to radiation-modified optical fibers to optoelectronic devices in radiation fields. Radiolytic damage mechanisms occuring in glass-forming silicate, germanate, borate, borosilicate and phosphate compounds lead to atom displacements, decomposition, phase separation, and alterations of network topology that mimic amorphization of crystalline ceramics. Our ability to follow such topological changes experimentally is limited, because the changes occur in an intermediate correlation range (typically > 5th atom neighbors) to which diffraction- and resonance-based probes are disappointingly insensitive. Atomistic modeling at present provides more abundant information on structural rearrangement options and potential for phase separations. The most evident physical property indicator is density change, which correlates with topological alterations.

4:40 PM

(GOMD-S4-031-2008) Ionizing Radiation Effects in Complex Ceramics (Invited)

J. Lian*, Rensselaer Polytechnic Institute, USA; M. Lang, F. Zhang, University of Michigan, USA; L. Wang, University of Michigan, USA; R. C. Ewing, University of Michigan, USA

The ionizing radiation effects in complex ceramics (including pyrochlore, perovskite, zircon, and apatite) irradiated by energetic ion beam (up to GeV) or e-beam (several 100 keV) were investigated by transmission electron microscopy, Raman spectroscopy, and synchrotron X-ray diffraction. Various types of phase transformations occurred in these complex ceramics including radiation-induced amorphization, order-disorder structural transition, phase decomposition, recrystallization and nanostructurization. The threshold electronic energy loss responsible for amorphization and order-disorder structural transition of pyrochlores was investigated. Dual beam irradiations of energetic ions and electrons significantly increase the amorphization resistance of pyrochlore and zircon. Amorphization and phase decomposition occurred in different apatites upon e-beam irradiation; whereas, epitaxial recrystallization and nanocrystallization can be induced in pre-amorphized apatite and SrTiO3 under in-situ TEM observation.

Tutorial — Non-Linear Optics in Glass

Room: Madera

3:20 PM

(GOMD-S3-039-2008) Nonlinear Optics in Glass (Invited)

D. M. Krol*, UC Davis, USA

Nonlinear optical effects play a role in many applications where glasses are used as optical materials, either in bulk, thin film or optical fiber form. In some cases, e.g damage of optical components, these effects are detrimental for device performance; in other cases, e.g. nonlinear optical switching, they are providing the principle mechanism on which the device is based. In this tutorial I will present an overview of the fundamentals of nonlinear optics and I will discuss a range of nonlinear optical phenomena and applications, including laser-structuring of glass and nonlinear effects in optical fibers.

Wednesday, May 21, 2008

Glass Science

Theoretical and Numerical Modeling

Room: Canyon A&B

Session Chairs: L. Rene Corrales, University of Arizona; John Mauro, Corning Incorporated

8:00 AM

(GOMD-S1-056-2008) Comprehensive Theory of Silicate Solution Thermodynamics

K. Keefer*, Keith Keefer Consulting, USA; B. deJong, Utrecht University, Netherlands

A mean field theory of the solution thermodynamics of molten silicates can be derived from a species equilibrium. The equilibria

are half reactions in which one-half of a bridging oxygen reacts with one-half of an oxygen provided by dissolved metal oxide to form a non-bridging oxygen. These equilibria describe the distribution of non-bridging oxygens among the tetrahedra and the free energy of the system, but the partitioning of the species into phases cannot be determined. However, these equilibria can be mapped onto a distribution of oxygen linkages for which the enthalpy and configurational entropy can be determined, at the expense of chemical information. By combining these two approaches, both the chemistry of a silicate solution as a species distribution and its liquid-liquid and liquid-crystalline phase behavior can be described.

8:20 AM

(GOMD-S1-057-2008) Phenomenological Glass Compaction Models: Recent Developments

D. C. Allan*, J. C. Mauro, Corning Incorporated, USA; P. Gupta, The Ohio State University, USA

We study the efficacy of different kinds of phenomenological models for predicting the shrinkage (or expansion) of glass after thermal cycling. In particular we have examined a possible benefit from using a stretched exponential description for relaxation in which the exponent is itself temperature-dependent. This represents a departure from traditional models that assume thermo-rheological simplicity. We provide some fundamental justification for a particular form of temperature-dependent exponent and compare the success of different choices of model in representing experimentally measured compaction data.

8:40 AM

(GOMD-S1-058-2008) Configurational Entropy of Glass (Invited)

P. Gupta*, The Ohio State University, USA; J. Mauro, Corning Incorporated, USA

There is no greater issue of fundamental importance to glass science than the question of configurational entropy of a glass. According to the current (and widely accepted) view, the configurational entropy of a glass is frozen (all the way to T = 0) at the value corresponding to that of the liquid at Tg. Contrary to this traditional view which is deeply entrenched in the fabric of glass science, we claim that the configurational entropy of a glass is much less (and may even be zero under certain conditions) than that of the liquid at Tg. We provide arguments in support of our claim based on basic principles of the nonequilibrium statistical mechanics and of thermodynamics. In addition, we show that while no evidence exits - to our knowledge - that contradicts our claim, there is at least some experimental evidence in support of our claim.

9:00 AM

(GOMD-S1-059-2008) Continuously Broken Ergodicity and the Glass Transition

J. C. Mauro*, Corning Incorporated, USA; P. K. Gupta, The Ohio State University, USA; R. J. Loucks, Alfred University, USA

A system that is initially ergodic can become nonergodic, i.e., display "broken ergodicity," if the relaxation time scale of the system becomes longer than the observation time over which properties are measured. The phenomenon of broken ergodicity is of vital importance to the study of glass and other condensed matter systems. In this talk, we present a general statistical mechanical framework for modeling systems with continuously broken ergodicity. Our approach enables the direct computation of entropy loss upon ergodicity breaking, accounting for actual transition rates between microstates and observation over a specified time interval. In contrast to previous modeling efforts, we make no assumptions about phase space partitioning or confinement. We further present a hierarchical master equation technique for implementing our approach and demonstrate its compliance with the second and third laws of thermodynamics.

9:20 AM

(GOMD-S1-060-2008) Composition-Structure-Property Relationship in SiO_2, Al_2O_3-SiO_2 and CaO-Al_2O_3-SiO_2 Glasses: A Molecular Modeling Study (Invited)

A. Tandia, Corning Incorporated, USA; N. Timofeev*, Corning Incorporated, Russian Federation; P. Diep, A. L. Rovelstad, Corning Incorporated, USA

We performed a molecular modeling study of SiO_2, Al_2O_3-SiO_2 and CaO-Al_2O_3-SiO_2 glasses to understand the relationship between glass structure and glass properties, and their variation with composition. Simulated annealing Monte-Carlo and molecular dynamics techniques are used to generate the glass structure and to investigate the dynamic properties. We studied the variation of short and middle range structure parameters, static and dynamic properties with successive addition of Al_2O_3 and CaO constituents into SiO_2. The level of the glass network polymerization and the amount of network defects such as non-bridging oxygen, oxygen tri-clusters, and Al 5-coordinated were found to essentially depend on the glass composition and have a critical influence on properties. Our results demonstrate a strong correlation between the above named defects, self-diffusivity, vibrational density of states, elasticity, primitive rings statistics and glass composition.

9:40 AM

(GOMD-S1-061-2008) Molecular Modeling Study of the Micro-Structure Evolution of Calcium Alumino-Silicate Glass during Thermal Quench

A. Tandia*, Corning Incorporated, USA; N. Timofeev, Corning Incorporated, Russian Federation; P. Diep, A. L. Rovelstad, Corning Incorporated, USA

We used simulated annealing Monte Carlo and molecular dynamic techniques to investigate the effects of thermal quench on the structure, and dynamic properties of CaO-Al_2O_3-SiO_2 glass. At each stage of the quench we calculated coordination number (CN), bond angle, network polymerization, linkages inside Al/Si tetrahedra, and primitive rings. We considered nine compositions with $R=[Al_2O_3]/([CaO]+[Al_2O_3]) = 0.4$, 0.5, and 0.6 at different levels of silica: 60, 70, 80 mol%. We found significant variation of the network polymerization with respect to R, and temperature. The Si based network seems to be more resistant than the Al based network to an increase of temperature. Analysis of the Oxygen CN shows a correlation between glass transition temperature and network polymerization. Comparison between the variations of diffusion constant and CN with temperature helped identify a possible diffusion mechanism of the network formers through a bond exchange model.

10:00 AM

(GOMD-S1-062-2008) Fluorine Distribution and Structural Relaxation in Fluorine Doped Silica Glasses

J. Du*, University of North Texas, USA

Fluorine doping leads to a number of property modifications in silica glasses that find important technological applications in microelectronics, optical fiber communication and catalysis. These property changes are intimately related to the atomic structures of the glasses. It is generally believed that fluorine breaks the Si-O-Si linkage and forms Si-F terminal bonds. However, a number of structural issues remain unresolved. For example, early NMR studies reveal that fluorine mainly forms [SiO3F] in low doping level but recent NMR study and molecular dynamics simulations suggest the five coordinated [SiO4F] speciation. In this paper, I will use classical molecular dynamics simulations with reliable force fields to investigate the structures of fluorine doped silica glasses. Ion diffusion is studied to understand the effect of fluorine on structural relaxation. Density functional theory based ab initio calculations are performed to verify the stability of different SiOF species.

10:40 AM

(GOMD-S1-063-2008) Hidden Structures in Network Glasses and the Universality of Thermo-Mechanical Anomalies (Invited)

L. Huang, North Carolina State University, USA; J. Kieffer*, University of Michigan, USA

Using MD simulations based on a charge-transfer multiple-coordination potential, designed to describe systems that undergo reactions and structural transitions, we have been able to elucidate the mechanisms responsible for anomalous thermo-mechanical properties observed in glasses (e.g., elastic moduli increase upon heating, decrease upon compression, NTE, etc.) Comparing the behaviors of 3-ccordinated and 4-coordinated glasses, we have discovered that this phenomenon is universal for all major network formers. We find that upon compressing or expanding both tetrahedral and trigonal glasses, mechanically or thermally, these undergo reversible structural transitions by invoking mechanisms similar to those responsible for the transformations between different polymorphs of the crystalline counterparts of these materials. These transitions are responsible for the anomalous behaviors. This investigation has also led to the discovery of previously unknown crystalline polymorphs of B2O3.

11:20 AM

(GOMD-S1-064-2008) Modeling of Iron Redox Ratio and Corrosion Behavior of Iron Phosphate Glasses

M. L. Schmitt*, R. K. Brow, University of Missouri-Rolla, USA

Binary iron phosphate glasses of nominal molar compositions xFe2O3-(100-x)P2O5 will exhibit an iron redox ratio (Fe2+/ΣFe) due to reduction of iron upon melting. This redox ratio directly affects the structure and properties of the glass and is a function of nominal composition, melting conditions and post-melt heat treatments. A model has been proposed to predict the iron redox ratio within the glass based on thermodynamic equilibria and glass basicity. Validity of the model is supported by the comparison of predicted redox ratios with experimental Mössbauer and wet chemistry results. In addition, a model describing the corrosion behavior of the iron phosphate glasses in aqueous solutions has been developed that accounts for bond hydration rates and glass structure. High Performance Liquid Chromatography (HPLC) and pH shifts are used to analyze glass structure and corrosion behavior in the development and validation of this model. This work is supported by the NSF under grant DMR-0502463.

11:40 AM

(GOMD-S1-065-2008) Theoretical Insight into Photostructural Modifications of Heteroleptic Ti-alkoxides for Molecular Assembly

C. De Silva*, J. Musgrave, Z. Schneider, R. Corrales, B. G. Potter, K. Simmons-Potter, The University of Arizona, USA; T. J. Boyle, Sandia National Laboratories, USA

Experimental investigations of heteroleptic metal alkoxides have demonstrated the opportunity to selectively disrupt ligand moieties leading to hydrolysis and condensation via UV-exposure. Such controlled photoexcitation processes provide a new prospect to manipulate the evolution of metal oxide network topologies. Successful utilization of such an approach, however, lies on the fundamental understanding of the intrinsic photophysical characteristics of the metal-ligand complexes. Here we report the detailed molecular level electronic structure studies and photoexcitation spectra of a Ti-alkoxide complex, $(OPy)_2Ti(TAP)_2$ to validate experimental findings and to guide the experimental process. DFT and TDDFT level of calculations are being carried out on the individual ligands and the title complex in order to determine the molecular structure and the electronic structural changes associated with the experimental photoexcitation spectrum upon UV irradiation.

12:00 PM

(GOMD-S1-066-2008) Enthalpy Landscape Model of the Selenium Glass Transition

J. C. Mauro, Corning Incorporated, USA; R. J. Loucks*, Alfred University, USA

We present a statistical model of the selenium glass transition based on the enthalpy landscape approach and nonequilibrium statistical mechanics. The model offers predictive calculation of the macroscopic properties of a glass-forming system, accounting for the effects of both composition and thermal history. In particular, we compute volume-temperature diagrams for selenium, starting from the equilibrium liquid state and cooling through the glass transition regime. Since the model implementation is not limited by time scale, we can achieve realistic cooling rates not accessible to standard molecular simulations. To demonstrate the versatility of our modeling approach, we compute the molar volume of selenium glass with cooling rates ranging from 10^{-12} to 10^{12} K/s. The model can also capture thermal compaction behavior upon subsequent heat treatment of the initially cooled glass.

Optical Materials

Optical Properties of Doped Materials

Room: Madera

Session Chair: B.G. Potter, University of Arizona

8:00 AM

(GOMD-S3-040-2008) Ultrafast Response of Semiconductor Nanocrystals to High-Photon Energy Absorption: Multiexcitons from a Single Photon (Invited)

R. D. Schaller*, V. I. Klimov, Los Alamos National Lab, USA

Absorption of a single photon by a semiconductor nanocrystal can produce multiple excitons with up to 100% efficiency depending upon the energy of the photon [Phys. Rev. Lett. 2004, 92, 186601]. Generation of multiexcitons from a single photon, which has been confirmed by several other research groups since our initial demonstration, also begins to occur once the process is energetically possible. This is in contrast to bulk materials, which undergo this process with low efficiency. We monitor multiexciton generation as a function of absorbed photon energy and observe that multiexcitons are produced on an ultrafast timescale. This effect is particularly attractive as a means of increasing solar cell power conversion efficiency via an increase in photocurrent for photon absorption at the blue end of the solar spectrum and has been cited as a possible operation mechanism for low-cost, high-efficiency Generation III solar cells.

8:40 AM

(GOMD-S3-041-2008) Silicate Glass Ceramic Phosphors for Solid-State Lighting (Invited)

S. Tanabe*, Kyoto University, Japan

Following development of Ce:YAG glass ceramics, we have developed Eu2+-doped silicate GC phosphors. Among various phosphors for white LED, the Eu2+-doped alkali-earth silicates have excellent properties because of broad luminescence due to the 4f6 5d1-4f7 transition. In this study, Eu-doped glasses with MO-2SiO2 composition (M=Ca, Sr and Ba) were prepared by conventional melting and cerammization was carried out. Precipitated crystal phase in the GCs was analyzed, and PL and PLE spectra were measured. By using a violet LD, the total radiant flux, fluorescence quantum yield and color-coordinates were evaluated with an integrating sphere. From glasses of BaO-SiO2 system, GC of single-phase BaSi2O5 was obtained, which showed the same PLE and PL spectra as those of the powder phosphor with the same composition. The fluorescence quantum yield was increased with cerammization temperature and reached 70%. The density was 98% of its theoretical density and the material showed better durability than the powder.

9:20 AM

(GOMD-S3-042-2008) Structure and Optical Properties of Soda-lime Glasses Containing Ag and Au Nanoparticles

M. Dubiel*, J. Haug, H. Kruth, Martin Luther University of Halle-Wittenberg, Germany; H. Hofmeister, K. Schicke, Max Planck Institute of Microstructure Physics, Germany

We investigated the formation of very small Ag nanoparticles by Ag/Na ion exchange as well as the precipitation of Ag and Au particles by ion implantation processing. At first, the structural relaxation of the glass matrix due to Ag incorporation and particle nucleation processes has been characterized by X-ray absorption spectroscopy. Then, transmission electron microscopy (TEM) and small angle X-ray scattering (SAXS) have been used to reveal the formation of metal nanoparticles of sizes from 0.5 to 15 nm. The formation of both, monometallic Au and Au-Ag alloy nanoparticles, could be achieved by high-dose sequential implantation of Au+ and Ag+ ions and subsequent thermal treatment, as could be shown by optical density measurements. This way, shifting of the surface plasmon resonance maximum position in between 400 and 600 nm could be realized. Structural characterization of the nanoparticles has been completed by X-ray absorption spectroscopy and by high-resolution TEM.

9:40 AM

(GOMD-S3-043-2008) Effect of Silver Concentration on the Silver Activated Phosphate Glass

H. Yang*, W. Hsu, National United University, Taiwan; S. Hsu, W. Chen, National Yang-Ming University, Taiwan

The influence of silver concentration in silver activated phosphate glasses, xAg2O(1-x)(30Na2O-10Al2O3-60P2O5) for x in the range form 0 to 10 mole%, was studied. The properties of silver-activated phosphate glasses, including glass transition temperature (Tg), softening temperature (Td), thermal expansion coefficient (TEC), density, chemical durability, relative sensitivity to radiation and UV/VIS transmittance, have been determined. The decrease in transmittance near 300nm is a measure of the glass to radiation. The relative sensitivity of radiation was up to the maximum at 0.05 mol% silver-oxide doped. But thereafter the relative sensitivity of radiation decreased with increasing of the silver concentration. Tg, Td, density, chemical durability and Q3 structure of glasses decrease while TEC and Q1 structure increase with increasing of silver concentration.

10:00 AM

(GOMD-S3-044-2008) Core-Shell Structured and Color Tunable Rare-Earth Doped LaF3 Nanoparticles

B. Kokuoz*, J. Ballato, Clemson University, USA

Color tunability within a single composition is a rare phenomenon. Especially, rare earth (RE) doped materials do not show multiple emissions from several lanthanide dopants due to the fact that energy transfer often times results and quench all but a few of the possible fluorescence lines. This problem can be solved by optimizing the energy transfer and developing architecturally structured core/shell nanoparticles. However, RE ions still can be application limiting due to their reasonably narrow absorption and emissions linewidths. To overcome this problem organic-inorganic hybrid systems have been developed with absorbing organic molecules (surfactant) attached to doped nanoparticles. In this work, we developed color tunable RE-doped LaF3 nanoparticles by employing a UV absorbing ligand to the surface of the particles. Fine color tune ability ranging from red to greenish-blue, including white light, is achieved from a single particle by changing the excitation wavelength.

10:40 AM

(GOMD-S3-045-2008) Creating Ultrahigh Loading Level Composites: Up to 80% LaF3 Nanoparticle Doped Fluoropolymers

B. Kokuoz*, J. Ballato, Clemson University, USA

Rare earth doped nanocrystals suffer from agglomeration at high loading levels which results in the undesirable scattering of light. It would be highly desirable to develop techniques for maximizing the loading levels of nanomaterials in a host while minimizing scattering. By developing nanoparticles which have functional ligands, a pressed or gelled nano-powder can be crosslinked into a bulk material without the use of a matrix. The benefits can be seen in the increased loading levels and decreased scattering. These nanoparticles can form highly crosslinked materials (100%)with outstanding thermal and chemical stability.Through the use of blends of functional and passive ligands, the percent crosslinking can be controlled. In this work LaF3 nanoparticles with trifluorvinyl ether (TFVE) ligands are synthesized. Polymerization is carried out for pressed and gelled nano-powder and the optical, as well as mechanical performance of these new type composites are reported.

11:00 AM

(GOMD-S3-046-2008) Effect of RE Coordination on the Optical Properties of RE Phosphate Glasses

N. Wyckoff, R. K. Brow*, University of Missouri-Rolla, USA; U. Hoppe, Rostock University, Germany

Rare earth (RE) phosphate glasses were prepared with compositions xRE2O3(1-x)P2O5, where RE varied from La to Lu and $0 \leq x \leq 0.3$. Previous results show the RE CN decreases from 8-9 for $x<0.15$ to 6-7 for $x \geq 0.25$. The change in RE CN is explained by a structural model that considers the number of NBO available to coordinate isolated RE ions in the P structure. Excitation, emission, and absorption spectra were collected and several optical parameters were found to be sensitive to RE CN. For example, the hypersensitivity parameter (R) was calculated from the intensities of the 5D0→7F2 and 5D0→7F1 emission transitions collected from Eu-P glasses. R remains constant for Eu2O3<15 mole%, then increases with x, reflecting an increase in the average covalency of the Eu-O bond. Also, the absorption spectra of Nd-phosphate glasses were analyzed using the Judd-Ofelt theory. The J-O parameters were determined and Ω2, increases with x, reflecting an increase in the average Nd-O bond covalency as the Nd CN decreases.

11:20 AM

(GOMD-S3-047-2008) Approximating Lanthanide Diffusion Using Multi-Layered Alkali Earth Nanoparticles

T. L. James*, B. Kokuoz, J. Ballato, Clemson University, USA

Limited information is available on the diffusion behavior of rare earth elements in low phonon energy host materials (i.e. LaF3, BaF2). In the development of rare earth doped multi-layered nanoparticles, it was found that the lanthanide location and clustering greatly affect the optical response of these materials. As a result, it was believed this system would provide a powerful way to examine diffusion through optical means. A variety of alkali earth host materials were doped with each of five rare earth elements to form core nanoparticles with up to three shells using a solution/precipitation chemistry method. High resolution TEM and XRD were used to verify particle size and distribution. The various particles were fired to 650°C at 15 minute time intervals and the photoluminescence of the particles (pre and post firing) was measured and diffusion coefficients approximated.

Issues in Glass Technology

Energy Saving Strategies and Advanced Topics

Room: Pima

Session Chairs: Hong Li, PPG Industries, Inc.; Michael Greenman, Glass Manufacturing Industry Council; Arun Varshneya, Alfred University; Harrie Stevens, Alfred University

8:00 AM

(GOMD-S2-002-2008) DOE and Glass Industry Cooperation: Past, Present and Future (Invited)

D. Kaempf*, U.S. Dept. of Energy, USA

The Department of Energy's partnership with the glass industry has been highly productive since its launch in 1995. Energy efficiency

within glass melting facilities has been significantly improved as the result of cost-shared research projects, energy assessments, numerous workshops and informative technical documents. The DOE has been instrumental in active cooperation within and among industry sectors with its support for the creation of the Glass Manufacturing Industry Council in 1998. This support has led to routine and constructive collaboration between the public and private sector. The DOE's objective for reducing energy intensity by 25% over the next 10 years among energy intensive industries ensures that more is yet to come. A discussion of future collaboration leading to achieving this objective will be the focus of this presentation. Of particular interest is the deployment and full implementation of "next generation melting" that has been at the core of our cooperation for the past five years.

8:40 AM

(GOMD-S2-003-2008) Applications of Hybrid Glass Melting Technology

M. Watson*, M. Habel, Air Products and Chemicals, Inc., USA

The Cleanfire® HGM™ (Hybrid Glass Melter) combines oxy-fuel combustion over the unmelted batch and air-fuel combustion over the refining zone of a glass furnace. This offers a number of advantages over both air-fuel and oxy-fuel furnaces. Two on-the-fly field implementations of HGM are presented. In the first, the regenerators for ports #1 and #2 had failed, and the desire was to maintain production while the regenerators were repaired. Several oxy-fuel applications were used during the repair, enabling the evaluation of different types of retrofit options available for HGM. In the second example, a furnace was scheduled for rebuild; however the desire was to maximize production until the end of the furnace campaign. Initially oxy-fuel boost burners coupled with lancing and general oxygen enrichment were used to maintain production levels. As the regenerators continued to deteriorate, the lances were moved down-tank and replaced by water-cooled oxy-fuel burners. Field observations and a summary of the benefits are presented.

9:00 AM

(GOMD-S2-004-2008) Thermochemical Recuperation For Heat Recovery (Invited)

D. M. Rue*, H. Kurek, M. Khinkis, GTI, USA

Rising fuel costs and carbon emissions goals are leading glassmakers to examine means to recover exhaust gas heat. Thermochemical recuperation (TCR) provides the highest possible direct recovery of exhaust gas heat by blending some or all of the feed natural gas with no oxygen present. High temperatures drive endothermic reforming, forming a gas containing unconverted natural gas, hydrogen, and carbon monoxide. This syngas is supplied to the burners at a moderate temperature. The remaining exhaust gas heat can be used to further heat fuel gas or to preheat oxygen. GTI tests have found high conversions of natural gas and high thermal efficiencies without the need of a catalyst. Heat recovery is higher than for thermal recuperation alone. Duct insulation is less and cheaper because much of the heat is recovered chemically, and only a portion is recovered thermally. This paper reviews the TCR concept, summarizes the results of TCR lab testing, and discusses ways to apply TCR effectively to oxy-gas glass melters.

9:40 AM

(GOMD-S2-005-2008) Non-Compositional Modification of Thermoplastic and Photonic Properties of Glass (Invited)

B. E. Yoldas*, Sisecam, USA

The nature of network structure along with the strength of chemical bonds essentially deterimines the thermoplastic properties of glass, ie, melting temperature, viscocity etc. In traditional glass forming processes thermoplastic properties are altered by introducing network modifiers, such as alkaly ions, to lower the melting temperature and viscocity of the glass. In this presentation, a non-compositional concept to alter the thermoplastic properties of glass networks will be presented. The same processes can also be used to introduce various photonic effects such as photoluminescence and phosphorescence.

10:20 AM

(GOMD-S2-006-2008) Continuous Fiber Forming Modeling (Invited)

O. A. Prokhorenko*, L.G.P. Intl. LLC, USA

The purpose of the present work was to develop mathematical model of continuous fiber drawing, which allows both realistic simulation of the process, and the studies of influence of different variables on critical parameters of the filaments. To achieve this goal we developed accurate sub-models, describing behavior of glass inside the head, the tips, the drawing cone, air-cooled and water-sprayed areas. The development was based on general principles of multi-filament bushing technology. Advanced methods of math-physics, and optimized algorithms have been used to develop fast modeling program. For convenience of the modeling team and the users, user-friendly graphic interface has been developed. Since the model uses only the data from open sources (generic head and bushing geometry, so data on physical properties of fiber glasses, etc.), the reported stage of the development can be considered as pre-competitive. Thus, we have developed a tool for the studies of the processes in question without, or with minimal amount of experimental work.

11:00 AM

(GOMD-S2-007-2008) Reducing CO2 Emission at Glass Melting

O. A. Prokhorenko*, L.G.P. Intl. LLC, USA

The main objective of the present work was to show how combining pre-treated batch materials, low-melting energy and processing-friendly glass formulas, and optimized furnace design results in significant energy saving and reducing CO2 emission. Each energy-saving and emission-reducing approach is considered with use of combination of advanced experimental and modeling methods. As the result a concept of optimized glass melting has been formulated.

11:20 AM

(GOMD-S2-008-2008) Rare Earth Stabilization of Boron in Borosilicate Melts

H. Li*, R. Hicks, PPG Industries, Inc., USA

Chemical stabilizing or capturing boron species in melts was studied as an alternative approach to boron emission control against current emission control system in commercial borosilicate E-glass production. Laboratory study shows boron emission can be reduced by incorporating rear earth oxides (RE). 11B MAS-NMR technique was performed on glasses containing La2O3 to elucidate its effect on BO3/BO4 speciation. Raman spectroscopy was used to study both bulk and fiber samples. The NMR results show incorporation of La2O3 increases BO3/BO4 ratio and Raman results suggest La2O3 functioning as glass modifier creating primarily Q^2 (the supscript means the number of nonbridging oxygen per TO4 unit where T = Si or Al) at the expense of Q^3 and Q^4. The use of La2O3 in glass was shown to benefit glass melting and fiber forming processes, i.e., decreasing glass melting and fiber forming temperatures, respectively, as well as maintaining fiber-forming window (the difference between forming and liquidus temperature).

11:40 AM

(GOMD-S2-009-2008) Performance of Glassed Feedthroughs Under Electrical Bias

B. Tischendorf*, J. Taylor, Medtronic, USA

Medtronic produces a wide variety of medical devices that are used around the world to alleviate pain, restore health, and extend life. Many of these devices use glassed feedthroughs to provide a hermetic electrical conduit. This electrical signal can be AC, DC pulsed, or DC biased. The use of these components in long term implanted devices

gives rise to a stringent testing methodology to verify their integrity over the lifetime a patient. During this testing, the application of an electrical signal to the feedthrough can significantly impact the performance of both the glass and metal components that make up that seal. Reported in this work will be several glass compositions where bulk immersion stability of a feedthrough sealing glass does not necessarily accurately represent the stability of glassed feedthroughs under electrical bias. This highlights the importance of ensuring that laboratory testing adequately duplicates actual use conditions.

Glass Strength Related to Knowledge About Surfaces and Other Factors

Room: Pima

Session Chairs: Hong Li, PPG Industries, Inc.; Michael Greenman, Glass Manufacturing Industry Council

1:20 PM

(GOMD-S2-010-2008) Making Glass Stronger and More Useful (Invited)

S. Gulati*, Corning Incorporated, USA

On atomic scale silicate glasses are very strong but not so useful. On bulk scale they are useful but not very strong. Is there a happy medium? If so, what is it? How strong and how bulky? This brief review presents an attempt to understand the weakness of glass and how it is being addressed for current and future applications.

2:00 PM

(GOMD-S2-011-2008) Cracking Behavior and Nano-Structure of Glass (Invited)

S. Ito*, Asahi Glass. Co., Ltd., Japan

Recently, the demand for light weight glass continues to rise. To obtain such glass, the thickness of glass must be decreased. However, due to a micro-crack on the surface formed by a contact damage, the strength of such thin glass becomes a serious problem. The susceptibility of glass to cracking is affected by its brittleness, which can be related to the ratio of hardness to fracture toughness. Lower hardness, i.e., easier deformation and higher fracture toughness can be useful characteristics for greater crack-resistance. In this study, we investigated relationships among mechanical properties and crack formation, and investigated the glass structures under stress by using molecular dynamics simulation. From these results, we will discuss the effect of nano-structure of glass on cracking behavior, and propose a guiding principle to create new less brittle glasses.

2:40 PM

(GOMD-S2-012-2008) Birefringence Measurement of Residual Stresses in Indented Glasses

C. R. Kurkjian*, University of Southern Maine, USA; A. Errapart, H. Aben, Tallinn University of Technology, Estonia; R. Oldenbourg, Marine Biological Laboratory, Woods Hole, USA; M. J. Matthewson, Rutgers University, USA

The inert intrinsic strength of glass (~8-14 GPa) can be lowered to ~0.07 GPa by indent- or scratch-induced cracking. It is important to understand the stresses that arise during these processes in order to be able to modify them by compositional changes and thus develop a more robust glass. To this end, we have studied quantitatively and report for the first time, preliminary values for the 3D distribution of residual stresses induced by indentation of silica and soda-lime-silica glasses. Photoelastic measurement technology and algorithms have been developed to allow calculation of the complete stress tensor in 3D around an axially symmetric indent. Special algorithms were required to allow calculation in regions with steep stress gradients. The results have been compared with surface stress measurements made using an indentation probe, and with available theory.

3:20 PM

(GOMD-S2-013-2008) Enthalpy, Anisotropy and Strength of Glass Fibers (Invited)

Y. Yue*, M. Lund, Aalborg University, Denmark; J. Deubener, M. Ya, Clausthal University of Technology, Germany

In this work we study the relationships between the tensile strength and the frozen-in glass structure, and its relaxation. To do so, we carry out fiber drawing experiments, physical aging, calorimetric and optical birefringence measurements, and tensile strength test on E-glass fibers. It is found that anisotropy and enthalpy begin to relax well below Tg. However, the former relaxes faster than the latter during physical aging. We have clarified the difference in the tensile strength between the continuous glass fibers and the discontinuous glass wool fibers. Finally, we have revealed how the decay of the tensile strength of the fibers due to physical aging is related to that of both enthalpy and anisotropy.

4:00 PM

(GOMD-S2-014-2008) Effect of Stress on the Behavior of NBOHC Defects in Silica Fiber

C. R. Kurkjian*, University of Southern Maine, USA; A. Kosolapov, Fiber Optics Research Center, Russian Federation; L. B. Fletcher, L. Lei, D. M. Krol, University of California, Davis, USA

Defects in oxide glasses have been studied extensively since the discovery of the E' center in glassy silica by Weeks in 1956. One such defect, which is associated with a 1.9 ev (630 nm) absorption and resonance fluorescence, is also found in 'some' pure silica fibers and has been assigned to non-bridging oxygen hole centers (NBOHCs). A very interesting study of this center was carried out by Hibino and Hanafusa in 1988. They found that the photoluminescence resulting when this band is pumped in the UV increased in intensity as a function of applied tensile stress up to 4 GPa, and was essentially reversible. This connection between the macroscopically applied mechanical stress and the number or activity of atomic scale defects suggests the possibility of using this absorption/fluorescence to elucidate the fracture process. In this work we have developed a sensitive technique for the study of this fluorescence and applied it to study the changes in fluorescence as a function of the applied bending stress.

Author Index

*** Denotes Presenter**

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2008-2010 Meetings & Expositions of The American Ceramic Society

June 1-6, 2008
The 15th International Conference on Textures of Materials (ICOTOM 15)
Organized by The American Ceramic Society and The Minerals, Metals & Materials Society (TMS)
Carnegie Mellon University
Pittsburgh, Pennsylvania, USA
www.ceramics.org/icotom15

June 9-10, 2008
Environmental, Health and Safety Issues in Nanomaterials Workshop
Sheraton Crystal City Hotel
Crystal City, Virginia, USA
www.ceramics.org/ehsworkshop

June 29-July 4, 2008
2nd International Congress on Ceramics
Gran Guardia Palace - Verona, Italy
www.icc2.org

October 5-9, 2008
Materials Science & Technology Conference and Exhibition - MS&T '08 combined with the ACerS 110th Annual Meeting
David L. Lawrence Convention Center
Pittsburgh, Pennsylvania, USA
www.matscitech.org

November 16-20, 2008
International Conference on Sintering - Sintering 2008
Hilton La Jolla Torrey Pines
La Jolla, California, USA
www.ceramics.org/sintering2008

January 18-23, 2009
33rd International Conference & Exposition on Advanced Ceramics & Composites
Hilton Daytona Beach Resort & Ocean Center
Daytona Beach, Florida, USA

May 31-June 5, 2009
8th Pacific Rim Conference on Ceramic and Glass Technology
Includes 2009 Annual Meeting of the International Commission on Glass (ICG)
Hyatt Regency Vancouver
Vancouver, British Columbia, Canada
www.ceramics.org/pacrim8

October 25-30, 2009
Materials Science & Technology 2009 Conference and Exhibition - MS&T '09 combined with the ACerS 111th Annual Meeting
David L. Lawrence Convention Center
Pittsburgh, Pennsylvania, USA

January 24-29, 2010
34th International Conference & Exposition on Advanced Ceramics & Composites
Hilton Daytona Beach Resort & Ocean Center
Daytona Beach, Florida, USA

October 17-21, 2010
Materials Science & Technology 2010 Conference and Exhibition-MS&T'10 combined with the ACerS 112th Annual Meeting
George R. Brown Convention Center
Houston, Texas, USA

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