

[Back to Symposium Sessions](#)

Symposium MB4 : Glassy, Nanocrystalline and Other Complex Alloy Systems and Their Applications

[Nov 28](#)[Nov 29](#)[Nov 30](#)[Dec 01](#)[Dec 02](#)

2016-12-02 [+](#) [Show All Abstracts](#)

Symposium Organizers

Mo Li, Georgia Institute of Technology

Hans Fecht, Univ of Ulm

Joseph Poon, University of Virginia

Christopher Schuh, Massachusetts Institute of Technology

MB4.10: Complex Alloy Systems IX

Session Chairs

Mo Li

Xun-Li Wang

Friday AM, December 02, 2016

Sheraton, 3rd Floor, Fairfax A

9:00 AM - *MB4.10.01

Self-Nanoscaling in Nanocomposite Magnets upon Severe Plastic Deformation

[J. Ping Liu](#)¹

¹ University of Texas at Arlington Arlington United States

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9:30 AM - *MB4.10.02

Nanocrystalline CVD Diamond Coatings—Fabrication, Structure, Morphology, Properties and Applications

[Peter Gluche](#)¹, [Ralph Gretzschel](#)¹, [Matthias Wiora](#)¹, [Stefan Strobel](#)¹, [Michael Mertens](#)², [Kai Bruhne](#)², [Hans-J. Fecht](#)²

¹ GFD Gesellschaft fuer Diamantprodukte mbH Ulm Germany, ² Institute of Micro and Nanomaterials Ulm University Ulm Germany

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10:00 AM - MB4.10.03

Visualization of Metallic Glass Casting and Determination of Respective Cooling Curves via High-Speed Infrared Thermography

Fabian Haag¹, Gueven Kurtuldu¹, Jorg Loffler¹

¹ Department of Materials, Laboratory of Metal Physics and Technology ETH Zurich Zurich Switzerland

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10:15 AM - MB4.10.04

Thermally Stable Nanocrystalline Aluminum Alloys with Extreme Strength through Grain Boundary Doping

Jason Trelewicz¹, Timothy Rupert²

¹ Stony Brook University Stony Brook United States, ² University of California, Irvine Irvine United States

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10:30 AM - MB4.10.05

Stress-Induced Relaxation and Hardening in a Zr-Based Bulk Metallic Glass under Elastostatic Compression

Yi-Mei Wang¹, Meng Zhang¹, Lin Liu¹

¹ State Key Laboratory of Materials Processing and Die and Mold Technology Huazhong University of Science and Technology Wuhan China

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10:45 AM - MB4.10.06

Fe-Co-Ni Phase Diagram Construction by Combinatorial Materials Chip Approach

Lanting Zhang^{1 2}, Yujie Wang^{1 3}, Ningning Yan⁴, Tieren Gao⁵, Hui Xing^{1 2}, Jindong Li^{1 3}, Hong Wang^{1 2 4}

¹ Materials Genome Initiative Center Shanghai Jiao Tong University Shanghai China, ² School of Materials Science and Engineering Shanghai Jiao Tong University Shanghai China, ³

Department of Physics and Astronomy Shanghai Jiao Tong University Shanghai China, ⁴ China Building Materials Academy Beijing China, ⁵ University of Maryland College Park United States

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11:00 AM - *

Break

11:30 AM - MB4.10.07

Generating Nanoporous Au by De-Alloying Amorphous and Partially Crystallized Alloy

Eirini Maria Paschalidou¹, Gianluca Fiore¹, Annett Gebert², Steffen Oswald², Ulrike Wolff², Tonny Spassov⁴, Lyuben Mihaylov⁴, Federica Celegato³, Federico Scaglione¹, Paola Rizzi¹, Livio Battezzati¹

¹ Chemistry University of Turin Torino Italy, ² IFW-Dresden Dresden Germany, ⁴ University of Sofia Sofia Bulgaria, ³ Istituto Nazionale di Ricerca Metrologica Torino Italy

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11:45 AM - MB4.10.08

Functional Composites by Liquid Metal Dealloying

Bernard Gaskey¹, Ian McCue¹, Jonah Erlebacher¹

¹ Materials Science and Engineering Johns Hopkins University Baltimore United States

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12:00 PM - MB4.10.09

Direction-Specific Interaction Forces between Nanocrystals

Xin Zhang¹, Yang He³, Zhizhang Shen¹, Maria Sushko¹, Jia Liu², Sebastien Kerisit¹, Langli Luo², Scott Mao³, Chongmin Wang², James De Yoreo¹, Kevin Rosso¹

¹ Physical and Computational Sciences Directorate Pacific Northwest National Laboratory Richland United States, ³ Department of Mechanical Engineering and Materials Science University of Pittsburgh Pittsburgh United States, ² Environmental Molecular Sciences Laboratory Pacific Northwest National Laboratory Richland United States

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12:15 PM - MB4.10.10

Suppression of Crystallization in Ca-Mg-Cu Ternary Bulk Metallic Glass under Stress

Muhammad Naeem¹, Si Lan¹, Bing Wang¹, Xiaoya Wei¹, Yang Ren², Xun-Li Wang¹

¹ Department of Physics and Materials Science City University of Hong Kong Kowloon Hong Kong, ² Advanced Photon Source Argonne National Laboratory Argonne United States

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Ca-based bulk metallic glasses (BMGs) have the lowest density compared to any other BMG group, and elastic and bulk moduli comparable to human bones which make them potential candidate for biomedical applications. They have low characteristic temperatures e.g., T_g , just above 100°C. It is crucial to investigate their crystallization behavior at high temperature and under stress to explore the stability of amorphous structure and to determine their suitability for potential applications. So far very few studies are conducted on their crystallization behaviors and there is no in-situ study. In this study, three $Ca_{75-x}Mg_{25}Cu_x$ ($x=18, 27$ and 35) BMGs with different glass forming abilities are considered. Effect of increasing Cu concentration on the as-cast amorphous structure is explored. Crystallization kinetics of $Ca_{40}Mg_{25}Cu_{35}$ BMG are studied under isothermal annealing above the glass transition temperature with and without load in-situ by using synchrotron high-energy x-ray diffraction. Under isothermal annealing conditions, crystallization process started right from the beginning of the experiment and its rate was quite rapid. However when compressive load was applied simultaneously while isothermally heating at the same temperature, no change in the atomic order was observed during the first ten minutes and after that there was only atomic rearrangement without any noticeable crystallization. It is suggested that stress restricted the atomic mobility, which suppressed crystallization.

12:30 PM - MB4.10.11

Interstitial Compositionally Complex Alloys with Transformation and Twinning Induced Plasticity

Zhiming Li¹, Cem Tasan², Hauke Springer¹, Baptiste Gault¹, Dierk Raabe¹

¹ Max-Planck-Institut für Eisenforschung Düsseldorf Germany, ² Department of Materials Science and Engineering Massachusetts Institute of Technology Boston United States

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