

# **Carnegie Mellon**

## **Materials Science and Engineering Seminar Series**

**Jan Schroers**

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Department of Mechanical Engineering

*“Bulk Metallic Glasses Form Like Plastics”*

**Friday, October 22, 2010**  
**10AM Seminar in Baker Hall 136A**

Bulk metallic glass (BMG) formers are multicomponent alloys that vitrify with remarkable ease during solidification. Technological interest in these materials has been generated by their unique properties, which often surpass those of conventional structural materials. The metastable nature of BMGs, however, has imposed a barrier to broad commercial adoption, especially where the processing requirements of these alloys conflict with conventional metal processing methods. Research on the crystallization of BMG formers has uncovered novel processing opportunities using thermoplastic forming (TPF), which utilizes the dramatic softening exhibited by a BMG as it approaches its glass transition temperature. Fabrication processes based on TPF decouple the rapid cooling required to form a glass from the forming step, mitigate the effects of heterogeneities on crystallization, and overcome geometrical limitations associated with casting. This talk introduces such techniques that are unique among metals. For example, when TPF based blow molding of BMGs, geometries can be achieved that were preciously unachievable with any other metal processing method [1]. Due to the absence of an intrinsic size limitation and a phase transition first order during solidification, BMGs can be precision net-shaped on the micro [2], nano [3] and even atomic [4] length scale. This talk concludes with a summary of potential applications for BMGs and the required science and technological hurdles that must be overcome to result in a societal impact of BMGs similar in magnitude to that of thermoplastics in the 20<sup>th</sup> century.

Jan Schroers is an associate professor in the Department of Mechanical Engineering at Yale University. He received his master in physics from University of Cologne (1994) and his Ph.D. in physics from the RWTH Aachen in 1997. Subsequently, he served as a postdoctoral researcher in the Materials Science Department at Caltech (1998-2002). He spent three years with Liquidmetal Technologies as a Director of Research where he developed processing methods for bulk metallic glasses. He is the author and co-author of over 75 publications and 11 patents. His research focuses on advanced materials, their synthesis, characterization, and processing related issues. Focus materials are metallic glasses, metallic foams, and composites. He developed processing methods based on thermo plastic forming of metallic glasses, which allows to process them like plastics. Currently, his research focuses on using metallic glasses in bio, nano, and energy applications. He also develops characterization and synthesis methods for the development of novel highly engineered materials.