Aug. 1 (Mon), 2016, 13:30-15:00 @ Rm.216
ESISM Seminar (host: N.Tsuji (5462))

Study of Serrated Flows in Bulk Metallic Glasses and High Entropy Alloys

Presenter: P. K. Liaw[1,a]

Collaborators: X. Xie[1], S. Y. Chen[1], J. Antonaglia[2], J. P. Liu[3], J. W. Qiao[4], Y. Zhang[3], G. Y. Wang[1], Y. Yokoyama[5], G. Wang[6], J. L. Ren[7], S. Ogata[8], Y. C. Lo[8], N. Tsuji[9], and K. A. Dahmen[2]

[1]Department of Materials Science & Engineering, The University of Tennessee, Knoxville, USA
[2]Department of Physics, University of Illinois at Urbana-Champaign, USA
[3]State Key Laboratory for Advanced Metals and Materials, University of Science and Technology Beijing, China
[4]College of Materials Science and Engineering, Taiyuan University of Technology, China
[5]Cooperative Research and Development Center for Advanced Materials, Institute for Materials Research, Tohoku University, Japan
[6]School of Materials Science and Engineering, Shanghai University, China
[7]Department of Mathematics, Zhengzhou University, China
[8]Department of Mechanical Science and Bioengineering, Osaka University, Japan
[9]Department of Materials Science and Engineering, Kyoto University, Japan

[a]email: pliaw@utk.edu

ABSTRACT

Bulk metallic glasses (BMGs) and high entropy alloys (HEAs) attract more and more attention for their unique mechanical properties. Recent work suggests that BMGs and HEAs show serrated flows at certain temperatures and strain rates, which is similar to the Portevin–Le Chatelier effect (PLC) in traditional alloys. Therefore, the study of serration behavior could provide a unique way to investigate the deformation dynamics of BMGs and HEAs, and, consequently, to endow us with the fundamental understanding of deformation mechanisms for BMGs and HEAs. In this study, compressive behavior of BMGs and HEAs are characterized statistically, and a new model developed from the mean-field theory is utilized to describe the serrated flows in BMGs and HEAs.

Acknowledgements: PKL very much appreciates the financial support from the US National Science Foundation (CMMI-1100080 and DMR-1611100), the Department of Energy (DOE), Office of Nuclear Energy's Nuclear Energy University Program (NEUP) 00119262, the DOE, Office of Fossil Energy, with the National Energy Technology Laboratory (DE-FE-0008855 and DE-FE-0024054), and the U.S. Army Research Office (W911NF-13-1-0438), with C. Huber, C. V. Cooper, D. Farkas, A. Ardell, E. Taleff, V. Cedro, R. Dunst, R. O. Jensen, L. Tan, S. Lesica, S. N.

Mathaudhu, and D. M. Stepp as contract monitors. KAD gratefully acknowledges the NSF grants of DMR-1005209 and DMS-1069224. PKL and KAD are grateful to the DOE, Office of Fossil Energy (DE-FE-0011194) with S. Markovich and J. Mullen as contract monitors. YZ very much appreciates the financial support from the National Natural Science Foundation of China (Nos. 51010001 and 51001009), 111 Project (B07003), and the Program for Changjiang Scholars and the Innovative Research Team of the University.

Short Biography: Peter K. Liaw was born in Chiayi, Taiwan. He graduated from the Chiayi High School, obtained his B.S. in Physics from the National Tsing Hua University, Taiwan, and his Ph.D. in Materials Science and Engineering from Northwestern University, USA, in 1980.

After working at the Westinghouse Research and Development (R&D) Center for thirteen years, he joins the faculty and becomes an Endowed Ivan Racheff Chair of Excellence in the Department of Materials Science and Engineering at The University of Tennessee (UT), Knoxville, since March 1993. He has been working in the areas of fatigue, fracture, nondestructive evaluation, and life-prediction methodologies of structural alloys and composites. Since joining UT, his research interests include mechanical behavior, nondestructive evaluation, biomaterials, and processing of high-temperature alloys and ceramic-matrix composites and coatings with the kindest and greatest help of his colleagues at UT and the near-by Oak Ridge National Laboratory. He has published over seven hundred and fifty journal papers, edited more than sixteen books, and presented numerous invited and keynote lectures at various national and international conferences, universities, and industries.

He was awarded the Royal E. Cabell Fellowship at Northwestern University. He is a recipient of numerous "Outstanding Performance" awards from the Westinghouse R&D Center. He was the Chairman of the TMS (The Minerals, Metals and Materials Society) "Mechanical Metallurgy" Committee, and the Chairman of the ASM (American Society for Metals) "Flow and Fracture" Committee. He has been the Chairman and Member of the TMS Award Committee on "Application to Practice, Educator, and Leadership Awards." He is a fellow of ASM. He has been given the Outstanding Teacher Award, the Moses E. and Mayme Brooks Distinguished Professor Award, the Engineering Research Fellow Award, the National Alumni Association Distinguished Service Professor Award, the John Fisher Professorship, and L. R. Hesler Award at The University of Tennessee, and the TMS Distinguished Service Award.

He has been the Director of the National Science Foundation (NSF) Integrative Graduate Education and Research Training (IGERT) Program, the Director of the NSF International Materials Institutes (IMI) Program, and the Director of the NSF Major Research Instrumentation (MRI) Program at UT. Several of his graduate students have been given awards for their research and presentations at various professional societies and conferences. Moreover, his students are teaching and doing research at universities, industries, and government laboratories.