

Mechanical & Aerospace Engineering

seminar

The “Nanocrystalline Metals” Renaissance of the 21st Century: Tailoring “Bulk” Nanocrystalline Metals for Enhanced Thermal Stability and Mechanical Properties

September 12, 2014 at 1:30pm in SCOB 210

abstract

It is a new beginning for innovative fundamental and applied science in nanocrystalline materials. Many of the processing and consolidation challenges that have haunted nanocrystalline materials are now more fully understood, opening the doors for bulk nanocrystalline materials and parts to be produced. While there are still challenges remaining, recent advances in experimental, computational, and theoretical capability have allowed for bulk specimens that have heretofore been pursued only on a limited basis. This talk will discuss the methodology for synthesis and consolidation of bulk nanocrystalline materials using mechanical alloying, the alloy development and synthesis process for stabilizing these materials at elevated temperatures, and the physical and mechanical properties of nanocrystalline materials with a focus on nanocrystalline copper and a nanocrystalline Cu-Ta system, consolidated via equal channel angular extrusion, with properties rivaling that of nanocrystalline pure Ta. Moreover, modeling and simulation approaches as well as experimental results for grain growth, grain boundary processes, and deformation mechanisms in nanocrystalline copper will be briefly reviewed and discussed. Integrating experiments and computational materials science for synthesizing bulk nanocrystalline materials can bring about the next generation of ultrahigh strength materials for defense and energy applications.

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biosketch

Dr. Mark A. Tschopp is a materials engineer at the U.S. Army Research Laboratory in the Weapons and Materials Research Directorate. He obtained his Ph.D. degree in materials science and engineering in 2007 from the Georgia Institute of Technology and his B.S./M.S. degree in metallurgical engineering from the Missouri University of Science and Technology. Dr. Tschopp has spent 4 years in casting research at GM Powertrain, 2 years in material sustainability and mechanics at the Air Force Research Laboratory, and 4+ years as faculty at Mississippi State University. He has published over 100 journal papers, book chapters, conference papers, and technical reports with >900 citations for the >60 peer reviewed journal papers (Google Scholar). He has been either the presenter or co-author on >100 presentations and seminars at national and international conferences, including >50 invited talks, keynote talks, and invited seminars. He is an active member of ASM International, TMS, and ASME.

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