Wednesday, June 24 • 1:30 PM – Biology/Physics Building (BPB), Rm. 130

Designing Shape Memory Materials for Damping, Actuation, and Energy Applications

Ying Chen
Assistant Professor of Materials Science and Engineering
Rensselaer Polytechnic Institute, Troy, NY

Abstract: Shape memory alloys have the remarkable capability to switch between two "programmed" geometries upon the application and removal of stimuli such as stress, heat, or magnetic field. Their shape memory properties result from a diffusionless and crystallographically reversible martensitic phase transformation that occurs by shear. However, many polycrystalline shape memory alloys are limited by their inherent brittleness caused by severe stress concentration at grain boundaries during martensitic transformations. In this talk, I will present two strategies that we have developed to overcome this limitation. I will discuss our recent work on small scale oligocrystalline alloys with bamboo grain structures, and potential technological developments that can result from our understanding of the small-scale properties and size effects. When bulk polycrystalline structures are desirable, we design dual-phase alloys in which a ductile non-transforming second phase is precipitated along grain boundaries to cushion the grain boundaries and alleviate stress concentrations. Oligocrystalline and polycrystalline shape memory alloys with excellent shape memory properties and mechanical durability are promising for many damping, actuation, and energy applications.

Biographical Sketch: Dr. Ying Chen earned her B.S. in Materials Science and Engineering from Tsinghua University in Beijing, China in 2004 and Ph.D. in Materials Science and Engineering from MIT in 2008. She was a postdoctoral associate at the MIT Institute for Soldier Nanotechnologies from 2008 to 2010, before joining GE Global Research Center in Niskayuna, NY as a materials scientist. She worked on high temperature superalloys at GE GRC for a little over a year, and then joined the Rensselaer faculty at the end of 2011. Her research focuses on elucidating microstructure-mechanical property relationships in metallic materials using both experimental and mesoscale modeling approaches. http://faculty.rpi.edu/node/1149

For additional information, please contact Prof. Michael T. Pettes at (860) 486-2855, pettes@engr.uconn.edu or Laurie Hockla at (860) 486-2189, hockla@engr.uconn.edu