

MSE SEMINAR

March 17, 2017
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

Katherine Frei

**Graduate Student
Materials Science and Engineering, Virginia Tech**

“Nanoporous gold characterization”

Abstract:

Nanoporous structured metals is an exciting topic that has been highly researched due to its potential in applications including sensing, catalysts, gas storage, and heat exchangers, made possible by its high surface area to volume ratio and high porosity. However, this material, especially nanoporous gold, generally shows a brittle behavior despite it consisting of a normally ductile constituent element, limiting these many commercial applications. This contrasting structure – mechanical property relationship appears to be significant when the ligament size reaches less than 15 nm. There have been multiple simulated studies on the tensile mechanical properties and the fracture mode of this material, but limited physical tensile testing research exists due to technical difficulty of conducting such experiments with small fragile samples. We examine the tensile mechanical properties of nanoporous gold with ligament sizes ranging from 10 to 15 nm using *in situ* tensile testing under an environmental scanning electron microscope (ESEM). A specially designed tensile stage and sample holders are used to deform the sample inside the ESEM, allowing us to observing both the macro and microscopic structure changes in both 2D and 3D. Our experimental results will advance our understandings of how the ligament size and its structure (both internal and surface) influence the mechanical properties of nanoporous gold, and they also serve as a statistically relevant multi scale input parameters to increase the accuracy of future simulated studies that will take this material a step towards commercial use by providing a thorough understanding of its size-dependent mechanical limitations.

Biosketch:

Katherine Frei is a MS student in Material Science and Engineering, advised by Dr. Mitsu Murayama, and studying nanoporous gold. She received a BS in Mechanical Engineering from Texas A&M University. Outside of research, she spends much of her spare time practicing and teaching dance. She works at Sapphire Ballroom in Christiansburg and leads a dance group here at Virginia Tech