

Probing structure-property relationships in Cu-Ni and Cu-Zn alloys in nanofoam form with nanoindentation

Alexandra Loaiza^{1,*}, David Bahr¹

1. School of Materials Engineering, Purdue University, West Lafayette, IN, USA

*yloaizal@purdue.edu

The properties of nanostructured materials can differ from their equivalent bulk material by an order of magnitude. At the nanometer scale structural characteristics start to play an important role, and size effects can become the predominant factor on the final property. Using a novel polymer templating method, we fabricated low density (sub-10%) nanofoams of Cu-Ni alloys with different chemistries, ligament size and relative density. The modulus and strength was determined using nanoindentation tests to find the modulus and hardness of these materials. Relative density was found as one of the dominant parameters on the mechanical properties, showing significant decreases in strength and modulus around 6% relative density. The mechanical results are not only a consequence of the relative density; however, the combination of ligament size and solid solution strengthening do influence the result. The structure of nanofoams can be tailored to have desired outcomes by controlling the combination of foam chemistry, architecture, and density.