

**Mechanical Characterization of a Nanocrystalline Aluminum
Alloy through Nanoindentation**

Evan Harvey

Dr. Leila Ladani

MINT Center

The University of Alabama

Abstract

Materials with nano-scale microstructure have become increasingly popular due to their benefit of substantially increased strengths. The increase in strength as a result of decreasing grain size is defined by the Hall-Petch equation $\sigma = \sigma_0 + kd^{(-1/2)}$, where σ_0 is a material's initial yield stress, d is the material's average grain diameter, and k is a material constant. With increased interest in miniaturization of components, methods of mechanical characterization of small volumes of material are necessary because traditional means such as tensile testing becomes increasingly difficult with such small test specimens. This study seeks to characterize elastic-plastic properties of nanocrystalline Al-5083 through nanoindentation and related data analysis techniques.