Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Amorphization of Aluminum Nanoparticles SINDEE SIMON, JUAN SUN, Texas Tech University — The melting behavior of aluminum nanoparticles with an oxide passivation layer is examined using a differential scanning calorimetry (DSC). Both broad and narrow size-distributed particles are studied, and the weight-average particle radius ranges from 8 nm to 50 nm. With decreasing particle size, the melting response moves towards lower temperatures, as predicted by Gibbs-Thomson equation. The latent heat of fusion also decreases and is significantly smaller than that predicted by the surface tension; the heat of fusion is only 20 percent of the bulk value at our smallest particle size. An analysis suggests that a passivated aluminum nanoparticle of 6 nm radius will become amorphous and have no heat of fusion due to the presence of defects induced by the particle's small size. At the onset of amorphization, we calculate that in this system, approximately one defect will exist for every seven atoms.

Sindee Simon
Texas Tech University

Date submitted: 04 Dec 2004 Electronic form version 1.4