Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Shape transition and migration of $TiSi_2$ nanostructures embedded in a Si matrix ANDERSON SUNDA-MEYA, Department of Physics, North Carolina State University, DAVID J. SMITH, Department of Physics, Arizona State University, ROBERT J. NEMANICH, Department of Physics, North Carolina State University — While the embedding of epitaxial nanostructures, like SiGe, on Si surfaces does not affect their epitaxial position on the substrate, this study establishes that under conditions of epitaxial Si deposition, $TiSi_2$ nanostructures undergo a shape transition and "migrate" to the surface. They were grown on a Si(001) surface by depositing 0.5 nm of Ti at 750 $^\circ$ C and annealing for 2 min. They were then buried under a Si capping layer at different temperatures and thicknesses. AFM and XREM have been used to study their shape, geometry and evolution. Many of the buried structures were found to display a near uniform hemispherical shape. Their density and size were observed to be temperature dependent. The buried islands induce inhomogeneous stress profiles on the capping layer surface. The AFM images of the islands showed square holes at the surface aligned along the [110] directions suggesting that the Si layer was terminated along {111} planes. Many islands displayed faceting observed in cross-sectional electron micrographs. The observed structural changes are rationalized in terms of the interplay between thermodynamics and kinetics, solid state capillarity, and the roughening transition.

Anderson Sunda-Meya
North Carolina State University

Date submitted: 04 Dec 2006 Electronic form version 1.4