Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Magnetic properties of cobalt nanowires and nanotubes JIA GRACE LU, DONGDONG LI, RICHARD THOMPSON, GERD BERGMANN, University of Southern California — Ferromagnetic Co nanowire and nanotube arrays have been synthesized via low voltage electrodeposition method. High resolution TEM and XRD results show that the nanostructures are uniform in size, and consist predominantly *hcp* structure with the magnetocrystalline easy axis (*c*-axis) perpendicular to the wire axis. For solid wires, SQUID measurement demonstrates the dominance of shape anisotropy, manifested by the weak temperature dependence of the enhanced coercive field along the wire axis. MFM shows a strong dipole at the ends and a spatial magnetization modulation along the wire with a period around 700 nm. Based on theoretical modeling, such intrinsic modulation originates from the competition between the magnetocrystalline along the easy axis and the shape anisotropy along the wire axis. In contrast, for Co nanotube with wall thickness ∼15 nm and outer diameter ∼80 nm, SQUID shows a sheared hysteresis dependence for field applied along the tube axis, and MFM yields weak magnetic signal. They manifest that the magnetization follows a circumferential direction around the tube. This has been confirmed by theoretical model taking into account the magnetocrystalline, shape demagnetization and magnetic exchange energies.

Jia Grace Lu
University of Southern California

Date submitted: 17 Nov 2009 Electronic form version 1.4