Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Finite size effects and long wavelength magnetic structures in Mn_3O_4 nanoparticles R. REGMI, R. TACKETT, G. LAWES, Department of Physics and Astronomy, Wayne State University — Mn_3O_4 (Hausmannite) having normal spinel structure with Mn^{2+} ion at tetrahedral A site and Mn^{3+} ion at octahedral B site orders ferrimagnetically to Yafet-Kittel phase at 42K. The interplay between the different magnetic ions leads to additional magnetic transitions in bulk, including incommensurate and commensurate phases developing at 40K and 34K respectively. We have investigated the magnetic properties of Mn_3O_4 nanoparticles through both thermodynamic and magnetic studies. Both of these measurements observe only a single magnetic transition at 42K; the transitions at 40K and 34K appear to be completely suppressed. We motivate this suppression by comparing the long wavelength of the magnetic structure in the lower temperature phases with the particle size. These nanoparticles also exhibited superparamagnetic blocking near 40K and frequency dependent magnetic loss at 30K, which we attribute to surface spin effects.

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Date submitted: 22 Nov 2008 Electronic form version 1.4