Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Structural origin of low temperature glassy relaxation in magnetic nanoparticles SUVRA LAHA, Wayne State University, RAJESH REGMI, Memorial Sloan-Kettering Cancer Center, GAVIN LAWES, Wayne State University — Magnetic nanoparticles often exhibit glass-like relaxation features at low temperatures. Here we discuss the effects of doping boron, cobalt, gadolinium and lanthanum on the low temperature magnetic properties of Fe_3O_4 nanoparticles. We investigated the structure of the nanoparticles using both X-ray diffraction and Raman studies, and find evidence for secondary phase formation in certain samples. We acquired Transmission Electron Microscopic images to give direct information on the morphology and microstructure of these doped nanoparticles. We measured the ac out-of-phase susceptibility ($\chi^{//}$) vs temperature (T) to parameterize the low temperature glassy magnetic relaxation. All samples show low temperature magnetic relaxation, but the amplitude of the signal increases dramatically for certain dopants. We attribute these low temperature frequency-dependent magnetic relaxation features to structural defects, which are enhanced in some of the doped Fe_3O_4 nanoparticles. These studies also confirm that the low temperature relaxation in nanoparticles arises from single particle effects and are not associated with interparticle interactions.

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Date submitted: 13 Nov 2012 Electronic form version 1.4