Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Tuning of the magnetocrystalline anisotropy in $Co_xFe_{3-x}O_4$ nanoparticles through cobalt doping RONALD TACKETT, SUDAKAR CHANDRAN, RATNA NAIK, GAVIN LAWES, Wayne State University, CORNELIU RABLAU, PREM VAISHNAVA, Kettering University — We report on the effect of cobalt doping on the magnetocrystlline anisotropy of $Co_xFe_{3-x}O_4$ nanopaticles. The $Co_xFe_{3-x}O_4$ ($0 \leq x \leq 0.15$) nanoparticles were synthesized through the coprecipitation of ammounium hydroxide in an environment of Fe^{2+}, Fe^{3+}, and varying concentrations of Co^{2+}. The size and crystallinity were confirmed using transmission electron microscopy, with a mean size of 17 ± 4 nm which was found to be constant across the different cobalt dopings. The magnetic properties were investigated through the use of dc and ac magnetic susceptibility, with the effective magnetocystalline anistropies being extracted from these data. The effective magnetocrystalline anisotropy found from each method were, within acceptable experimental error, found to agree, as well as increase linearly with cobalt doping. The effective anisotropy values were found to increase in magnitude by 100% as the cobalt fraction was increased from $x = 0$ to $x = 0.1$. This trend allows for the tuning of the magnetic isotropy of iron oxide nanoparticles through cobalt doping.

Ronald Tackett
Wayne State University

Date submitted: 28 Nov 2007 Electronic form version 1.4