Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

High coercive cobalt ferrite $\text{Co}_x\text{Fe}_3(3-x)\text{O}_4$ nano-composite thin films prepared by spin-on process\(^1\) P. TALAGALA, R. NAIK, Wayne State University, G. M. TSOI, L. E. WENGER, University of Alabama at Birmingham, R. SURYANARAYANAN, Universite of Paris - Sud, V. M. NAIK, University of Michigan - Dearborn — Spin coating technique have been employed to synthesize $\text{Co}_x\text{Fe}_{3-x}\text{O}_4$ $(0.5 \leq x \leq 1.9)$ nano-composite thin films of $\sim 10$ nm crystalline size on sapphire, glass, and aluminum substrates. The films were annealed in various environments such as air, $\text{H}_2/\text{Ar}$, and vacuum. The structural properties were characterized by XRD and Raman Spectroscopy. The magnetic hysteresis measurements of the films exhibit a large coercivity $H_C(15 - 17 \text{ kOe})$ at 5 K. Low temperature processed films demonstrate supermagnetic characteristics with $H_C = \sim 150 \text{ Oe}$ and reduced remanence $M_r/M_s = \sim 0.05$ at 300K. These films show a spin-glass behavior with the blocking temperature $T_B \propto H^2$ for low fields and $T_B \propto H^{2/3}$ for high fields. High temperature processed films with various annealing conditions demonstrate $H_C$ as high as 1.8 kOe at 300K. Estimated magnetic anisotropy value of the films is in the range of $0.8 - 2.4 \times 10^6 \text{ erg/cm}^3$. Optical absorption spectra exhibit band gaps in the visible range of 1.4 - 1.7 eV and in the IR range (1.0 eV and 0.7 eV). Annealing in hydrogen shows a reduction of resistivity. Further details of the structural, electrical and magnetic properties of the films will be presented.

\(^1\)This Work is supported by NSF-REU grant No. EEE 0097736

P. Talagala
Wayne State University

Date submitted: 30 Nov 2005