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Self Assembled $CoFe_2O_4$ Nanoparticles within Block Copolymer Films: Structural and Magnetic Properties G.C. PAPAEFTHYMIOU, A.J. VIESCAS, Villanova University, Villanova, PA, S.R. AHMED, P. KOFINAS, University of Maryland, College Park, MD — Nanosize $CoFe_2O_4$ particles have been synthesized by self-assembly within diblock co-polymers, through a room-temperature templating strategy, amenable to large scale fabrication. XRD, TEM, SQUID and Mossbauer studies are combined in order to explore the morphological, structural, micromagnetic and interfacial characteristics of this nanocomposite system. TEM micrographs indicate low polydispersity, with particle size of 9.6 nm diam. Low temperature Mossbauer studies predict average sub lattice saturation hyperfine magnetic fields H (A) =501 kOe and H [B] = 527 kOe, respectively, for the tetrahedral and octahedral iron coordination sites of the ferrite spinel structure. Superparamagnetic relaxation processes, analyzed within a cubic magnetic anisotropy model, give a magnetic anisotropy density K = $3.23x10^5 J/m^3$, while SQUID magnetometry predicts a saturation coercivity of 6.1 kOe. Deviations from bulk $CoFe_2O_4$ and unsupported $CoFe_2O_4$ nanoparticles are discussed in terms of finite-size effects and interfacial interactions.

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