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Tracking the Magnetization Evolution in γ-Fe_2O_3 / Metallic Fe Core-Shell Nanoparticle Variants[1] C. KONS, Z. NEMATI, H. SRIKANTH, M.-H. PHAN, University of South Florida, K. KRYCKA, J. BORCHERS, NCNR-NIST, D. KEAVNEY, APS, Argonne National Lab, D.A. ARENA, University of South Florida — Iron-core magnetic nanoparticles (MNPs) with oxide shells exhibit varying magnetic properties due to the different ordering temperatures of the core and shell spins, as well as the coupling across the metal/oxide interface. While spin coupling across two dimensional interfaces has been well explored, less is known about three dimensional interfaces such as those presented in the MNPs. In this work, MNPs were synthesized with a bcc Fe core and γ-Fe_2O_3 shell and placed in an oxygen rich environment to encourage the transition from cores shell (CS) to core void shell (CVS) to hollow (H) structures. Static magnetic measurements (MvT) and AC magnetometry were performed to explore the magnetic behavior of the various synthesized structures. To further understand the nature of the spin coupling in the MNPs, TEM and conventional magnetometry as well as variable-temperature small angle neutron scattering (SANS), x-ray absorption spectroscopy (XAS) and x-ray magnetic circular dichroism (XMCD) spectroscopy were performed. Modeling of the x-ray spectra and SANS data will enable us to develop a cohesive picture of spin coupling, freezing and frustration along the three-dimensional metal / oxide interface.

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