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Site Determination of Mn Doping in Protein Encapsulated γ-Fe_2O_3 Nanoparticles[1] V. POOL, Dept of Physics, Montana State University, M. KLEM, C. JOLLEY, T. DOUGLAS, Dept. of Chem. and Biochem, Montana State University, M. YOUNG, Dept. of Plant Sciences and Pathology, Montana State University, E. ARENHOLZ, Advanced Light Source, Berkeley National Labs, Y.U. IDZERDA, Dept of Physics, Montana State University — In this study, Mn has been doped (0-33%) into 6 nm, γ-Fe_2O_3 nanoparticles grown inside the horse-spleen ferritin (HSF) protein and compared to similarly protein encapsulated pure γ-Fe_2O_3 and Mn-oxide nanoparticles to determine the Mn doping site. By using soft-X-ray absorption spectroscopy (XAS), soft-X-ray magnetic circular dichroism (XMCD), and frequency dependent Alternating Current Magnetic Susceptibility (ACMS), we have ascertained that the Mn dopant is substituting preferentially as Mn^{+2} and prefers the octahedral site in the γ-phase Fe_2O_3 spinel structure. The measured Mn L_{23} XAS spectra are compared to measured reference powders and molecular-orbital calculations supporting this conclusion of the Mn dopant substitution site. We find that the Mn L_{23} XAS multiplet structure for the nanoparticles is simpler than for our bulk standards, complicating this identification but suggesting that the nanoparticle lattices are relaxed from the distortions present in the bulk.

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