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High Pressure studies on nanoparticles of gamma Fe_2O_3 ARUN BOMMANNAVAR, MADDURY SOMAYAZULU, HPCAT, Advanced Photon Source, Chicago, VAMAN NAIK, University of Michigan-Dearborn, RATNA NAIK, Wayne State University — Compressibility of the gamma phase of Fe_2O_3 (Maghemite) nano-particles was studied using angle dispersive x-ray diffraction on the micro-diffraction beamline at HPCAT of the Advanced Photon Source. Nano-particles of three different sizes (3 and10 and 20 nm) were studied up to 31 GPa using a diamond anvil cell equipped with c-BN seats. Two samples were synthesized by treating sulfonated divinyl benzene polystyrene resin matrix with aqueous solutions of (1) FeCl2,(2) $FeCl_3$. The particle size of γ-Fe_2O_3 prepared using FeCl3 was $\sim$ 3 nm and with FeCl2 was $\sim$ 10 nm. The 20 nm particle size sample was bought commercially. The bulk modulii for 10 nm and 20 nm samples were 212 (5) and 207 (5) GPa which are close to the bulk value of 203 (10) GPa, whereas 3.4 nm sample shows a higher value of 240 (5) GPa. Transition pressure (P_{tr}) at which maghemite transforms to hematite varies with particle size and was estimated to be 10 (2) GPa, 17 (2) GPa and 27 (2) GPa for 3 nm, 10 nm and 20 nm particle size samples, respectively.

Ratna Naik
Wayne State University

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