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Local crystal structure of iron oxide nanoparticles synthesized from Ferritin MICHAEL KRISPIN, MARCUS PREISINGER, PETER PFALZER, SIEGFRIED HORN, Institute of Physics, University of Augsburg, 86159 Augsburg, Germany, DANIEL STRONGIN, Temple University — We have investigated the size dependence of the local crystal structure of nanosized iron oxide by extended x-ray absorption fine structure (EXAFS) at the iron K-edge. Hematite (α -Fe₂O₃) nanoparticles of different diameters were produced by thermal treatment of horse spleen ferritin molecules and remineralized apo-ferritin molecules, respectively. The structure of these particles was compared to α -Fe₂O₃ and γ -Fe₂O₃ nanopowder references. The Fourier transformed EXAFS spectra of the nanoparticles differ significantly from hematite and maghemite reference spectra and change systematically as a function of particle diameter, signalling a corresponding evolution of the structure. We show that the Fe–O bond length decreases with decreasing diameter of the particles and with decreasing particle density. This is explained by a core-shell model, in which the fraction of a γ -Fe₂O₃ like particle shell increases while the hematite core decreases with decreasing particle size.

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