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Supporting Information

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Controlled Synthesis and Chemical Conversions of FeO Nanoparticles

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Nanoparticle characterization. The size and morphology of the nanoparticles were characterized by a transmission electron microscope (TEM, Philip EM 420) and a scanning electron microscope (SEM, Leo 1500). X-ray powder diffraction patterns of the nanoparticles were collected on a Bruker AXS D8-Advanced diffractometer with Cu *Kα* radiation (λ = 1.5418 Å). Magnetic measurements were performed on a Lakeshore 7404 high sensitivity vibrating sample magnetometer (VSM) with fields up to 1.5 tesla at room temperature. The nanoparticles were deposited from their hexane dispersions either on an amorphous carbon-coated copper grid for TEM image analyses or on a Si substrate for SEM, XRD and magnetic studies. The mass of iron oxide was calculated from the iron concentration of the nanoparticles that were dissolved in aqua-regia solution and measured by inductively coupled plasma – atomic emission spectroscopic (ICP-AES) analysis.

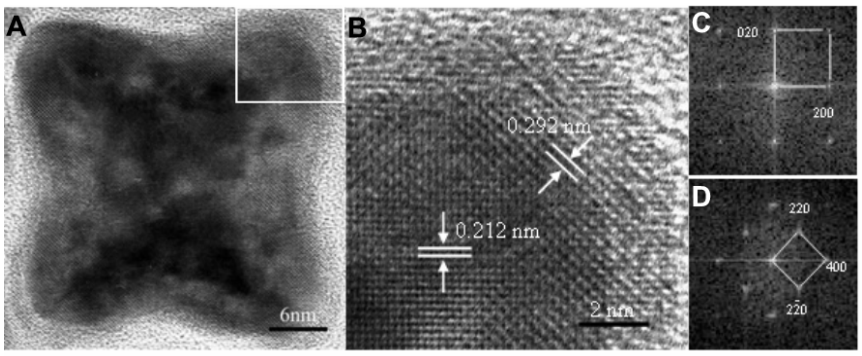

Figure S1. HRTEM images of (A) a single 32 nm FeO truncated octahedral nanoparticle and (B) the white box area in (A), and FFT patterns of (C) the core area and (D) the shell region in the image (B). The nanoparticle has core/shell structure with both the core and shell being well crystallized. The atomic lattice fringes in the surface and the core area in Figure S1B have a distance 0.292 nm and 0.211 nm respectively. These are close to interspacing of (220) planes (0.296 nm) in Fe_3O_4, and of (200) planes (0.219 nm) in FeO. The fast Fourier

transform (FFT) patterns of the core (Figure S1C) and the shell area (Figure S1D) proves the presence of two crystal phases of FeO in the core and Fe_3O_4 on the shell. The thin layer coating present in the structure is attributed to the surface oxidation of the nanoparticles. This is consistent with what has been concluded from the XRD analysis in Figure 2.

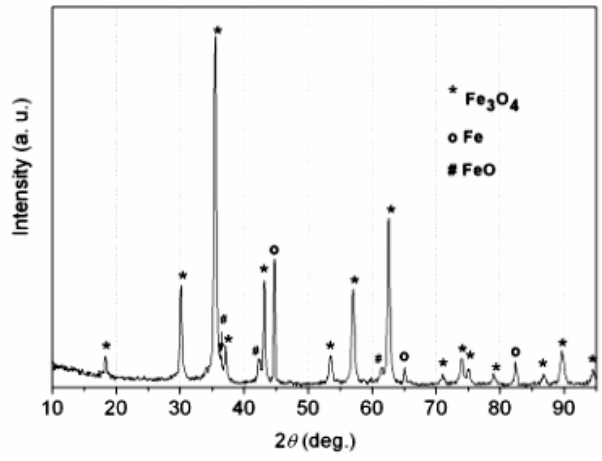

Figure S2. XRD pattern of iron and iron oxide nanocomposites from the annealing of 53 nm FeO nanoparticles at 500°C under an Ar atmosphere, followed by controlled cooling from 500°C to room temperature at a cooling rate of 1°C/min.

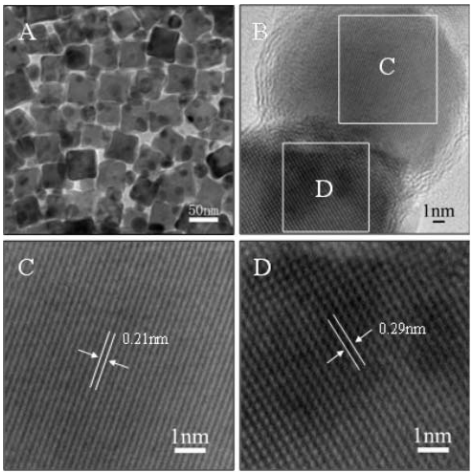

Figure S3. (A) TEM image of the iron and iron oxide nanocomposites formed from the annealing of 53 nm FeO nanoparticles at 500°C under an Ar atmosphere followed by controlled cooling from 500°C to room temperature at a cooling rate of 1°C/min; (B) HRTEM image of a part of a single composite nanoparticle; (C) & (D) the close-up views of the white boxes in (B).