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The role of oleic acid concentration on the physicochemical properties of cobalt ferrite nanoparticles

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In the present work the physicochemical properties of oleic acid coated cobalt ferrite nanoparticles (CFO NPs) were examined. The CFO NPs were prepared by the solvothermal synthesis in a water/pentanol (2:1) system at 180 °C, where the oleic acid concentration was systematically varied (0-2 M). The samples were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR) and vibrating sample magnetometry (VSM). The XRD results showed that the average crystallite size of CFO decreases as the oleic acid concentration increases from 0 up to 0.25 M, while further increase of surfactant content has no influence on the crystallite size. The TEM analysis confirmed XRD findings and additionally revealed the change of particles' morphology. Samples prepared with 0-0.2 M oleic acid consist of agglomerated NPs, while samples with oleic acid concentration higher than 0.25 M contain well-dispersed and sphere-like NPs. The FTIR analysis confirmed the presence of oleic acid and its covalent bidentate-type bonding to the CFO NPs surface. The magnetic measurements revealed strong influence of oleic acid coating on samples` magnetic order, which changes from ferrimagnetic to superparamagneticwith increase of surfactant concentration.

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