Structural and magnetic properties of starch-coated magnetite nanoparticles

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Abstract: Magnetic Fe_3O_4 nanoparticles are prepared by the coprecipitation method and coated with starch as a surfactant. Their structural and magnetic behaviours are studied by means of X-ray diffraction (XRD), Transmission Electron Microscopy (TEM), Raman spectrum, Fourier Transform Infrared (FT-IR) as well as with a Vibrating Sample Magnetometer (VSM). The magnetic Fe_3O_4 nanoparticles under investigation have an average size of about 14 nm. The coated magnetic nanoparticles exhibit super-paramagnetic behaviours with a blocking temperature of about 170 K and saturation magnetisation ranging between 30 and 50 emu g^{-1}. In addition, the results of FT-IR indicated that interactions between the Fe_3O_4 particles and starch layers are much improved.

Author Keywords: Colloidal stability; Magnetic stability; Magnetite nanoparticles; Surface modification

Index Keywords: Average size; Blocking temperature; Colloidal stability; Coprecipitation method; Fourier transform infrared; Magnetic behaviour; Magnetic nanoparticles; Magnetic stability; Magnetisation; Magnetite nanoparticles; Raman Spectrum; Structural and magnetic properties; Surface modification; TEM; Vibrating sample magnetometer; Infrared spectroscopy; Magnetic materials; Magnetic properties; Magnetism; Magnetite; Oxide minerals; Precipitation (chemical); Raman spectroscopy; Saturation magnetization; Stability; Starch; Surface active agents; Surface treatment; Transmission electron microscopy; X ray diffraction; Nanoparticles; magnetite; nanoshell; starch; superparamagnetic iron oxide nanoparticle; article; chemical structure; coated particle; controlled study; infrared spectroscopy; magnetism; material coating; materials testing; nanoanalysis; nanoimaging; nanotechnology; particle size; precipitation; priority journal; process development; Raman spectrometry; surface property; temperature measurement; transmission electron microscopy; X ray diffraction

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