Magnetocaloric properties of $Ga_xFe_{3-x}O_4$ nanoparticles coated with chitosan

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The use of magnetic nanoparticles in magnetic fluid hyperthermia and a growing interest in nanotechnology cause development of variety of isostoichiometric materials of different shapes [1,2]. Small angles neutron scattering, as well as transmission and scanning electron microscopy measurements, confirm the change in shape of core and core-shell nanoparticles of gallium-iron oxides from parallelepiped to spherical ones [3,4]. According to magnetization and Mössbauer spectroscopy results, gallium-doped magnetite particles belong to very soft magnetic materials. Due to nano-size of core type particles, they exhibit a variety of superparamagnetic behavior versus temperature. The X-ray diffraction patterns confirm a single phase of the reverse spinel structure as the Massart synthesis result. Admixture in the form of trivalent gallium as a non-magnetic ion significantly modifies the magnetic ordering of ferrite. Calorimetric measurements disclosed large sensitivity of the specific absorption rates of electromagnetic radiation at 10^5 Hz frequency range versus ferrofluid concentration dispersed in water (10 mg/mL, 5 mg/mL, and 2.5 mg/mL). Magnetism of $Ga_xFe_{3-x}O_4$ with $0 < x < 1.5$ particles coated with chitosan was tested in external fields up to 1.3 T.

References:

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