

Magnetic Properties and Cytotoxicity of Ga-Mn Magnetic Ferrites Synthesized by the Citrate Sol-Gel Method

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Abstract : Magnetic spinel ferrites are materials that possess size, magnetic properties and heating ability adequate for their potential use in biomedical applications. The $\text{Mn}_{0.5}\text{Ga}_{0.5}\text{Fe}_2\text{O}_4$ magnetic nanoparticles (MNPs) were synthesized by sol-gel method using citric acid as chelating agent of metallic precursors. The synthesized samples were identified by X-Ray Diffraction (XRD) as an inverse spinel structure with no secondary phases. Saturation magnetization (M_s) of crystalline powders was 45.9 emu/g, which was higher than those corresponding to GaFe_2O_4 (14.2 emu/g) and MnFe_2O_4 (40.2 emu/g) synthesized under similar conditions, while the coercivity field (H_c) was 27.9 Oe. The average particle size was 18 ± 7 nm. The heating ability of the MNPs was enough to increase the surrounding temperature up to 43.5°C in 7 min when a quantity of 4.5 mg of MNPs per mL of liquid medium was tested. Cytotoxic effect (hemolysis assay) of MNPs was determined and the results showed hemolytic values below 1% in all tested cases. According to the results obtained, these synthesized nanoparticles can be potentially used as thermoseeds for hyperthermia therapy.

Keywords : manganese-gallium ferrite, magnetic hyperthermia, heating ability, cytotoxicity

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