

SYNTHESIS AND CHARACTERIZATION OF MAGNETITE NANOPARTICLES FUNCTIONALIZED WITH CARBOXYL AND AMINO ACIDS FOR BIOMEDICAL APPLICATIONS

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Abstract

This work involves the synthesis of magnetite nanoparticles (NPs) functionalized with lauric acid (LA), oleic acid (OA) and lysine (Lys). The synthesis was carried out using a chemical route of co-precipitation. This route allows the production of NPs functionalized using a basic infrastructure, low cost of production. After synthesis of functionalized NPs these were characterized with the techniques: X-ray diffraction (XRD), transmission electron microscopy (TEM), Mössbauer spectroscopy (MS), vibrating sample magnetometry (VSM), X-ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy (FTIR) and thermogravimetry analysis (TGA). Of the analysis made by the different techniques we concluded that functionalized NPs are of very good quality. Of the VSM measurements we have that the magnetic saturation, for NPs coated with AL, is 60 emu/g. The XRD and TEM measurements show that the NPs have an average size between 9 and 11 nm with spinel crystal structure with lattice parameter of 8.37 Å. XPS measures determined that iron atoms has a valence of +3 and +2, with a total ratio of iron atoms Fe³⁺:Fe²⁺ of 2:1. Of the FTIR measurements we show that AL and AO molecules are chemically bound to the surface of the NPs. By TGA measures we calculate the number of functionalized molecules. In the case of NPs coated with AL and AO were 1974 and 1486, respectively.

Keywords: Magnetic nanoparticles, nanomagnetism

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