SYNTHESIS AND CHARACTERIZATION OF MAGNETITE NANOPARTICLES FUNCTIONALIZED WITH ORGANIC SURFACTANT AND ESSENTIAL OIL

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Currently, magnetic nanoparticles (NPs) are promising because of their potential applications in biomedical technology or devices, such as drug delivery, magnetic resonance imaging (MRI), magnetic hyperthermia, etc. An adequate NPs functionalization and their characterization can guarantee ideal conditions for the applications in biological systems. Using magnetic NPs functionalized with organic substances and/or adding an essential oil one can take advantage of the magnetic properties of the NPs which could be controlled by applying external magnetic fields and the active principle of the EO [1-4]. In this work, magnetite NPs were synthesized by the thermal decomposition method. The functionalization has been obtained with oleic acid (OA) and, subsequently, the essential oil (EO) extracted from the Croton Cajucara Benth (CCB) has been added. The structural characterization of samples has been obtained by X-ray diffraction (XRD) and indicates the formation of the magnetite phase. Transmission Electron Microscope images are consistent with the crystallite size. The data analysis reveals a mean particle size of 10.5 nm and a polydispersity of ? = 0.16 for AO coated magnetite NPs and 13.7 nm and a polydispersity of ? = 0.15 for the AO/EO coated magnetite NPs. A thermogravimetric analysis (TGA) experiments have been used to verify the correct functionalization. The magnetic properties of the NPs before and after the functionalization were performed using a SQUID magnetometer. Magnetization vs. magnetic field curves obtained at 300K reveals the absence of coercive field; meanwhile, the irreversible features determined form Zero Field Cooled (ZFC) and Field Cooled (FC) curves suggest a superparamagnetic behavior. A blocking temperature of $T_B = 154$ K for the uncoated magnetite NPs and a $T_B = 39$ K for the AO/EO coated magnetite NPs have been determined. These results indicate that the AO/EO coating strongly weakens the particle-particle interactions.

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References:


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