

Hydrothermal synthesis of magnetite nanoparticles as MRI contrast agents.

ABSTRACT

Magnetite (Fe_3O_4) nanoparticles prepared using hydrothermal approach were employed to study their potential application as magnetic resonance imaging (MRI) contrast agent. The hydrothermal process involves precursors $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ and FeCl_3 with NaOH as reducing agent to initiate the precipitation of Fe_3O_4 , followed by hydrothermal treatment to produce nano-sized Fe_3O_4 . Chitosan (CTS) was coated onto the surface of the as-prepared Fe_3O_4 nanoparticles to enhance its stability and biocompatible properties. The size distribution of the obtained Fe_3O_4 nanoparticles was examined using transmission electron microscopy (TEM). The cubic inverse spinel structure of Fe_3O_4 nanoparticles was confirmed by X-ray diffraction technique (XRD). Fourier transform infrared (FTIR) spectrum indicated the presence of the chitosan on the surface of the Fe_3O_4 nanoparticles. The superparamagnetic behaviour of the produced Fe_3O_4 nanoparticles at room temperature was elucidated using a vibrating sample magnetometer (VSM). From the result of custom made phantom study of magnetic resonance (MR) imaging, coated Fe_3O_4 nanoparticles have been proved to be a promising contrast enhanced agent in MR imaging.

Keyword: Surfaces; Magnetic properties; Biomedical applications; Hydrothermal.