

## Hydrothermal synthesis of magnetite nanoparticles as MRI contrast agents.

### ABSTRACT

Magnetite ( $\text{Fe}_3\text{O}_4$ ) 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  $\text{FeCl}_3$  with  $\text{NaOH}$  as reducing agent to initiate the precipitation of  $\text{Fe}_3\text{O}_4$ , followed by hydrothermal treatment to produce nano-sized  $\text{Fe}_3\text{O}_4$ . Chitosan (CTS) was coated onto the surface of the as-prepared  $\text{Fe}_3\text{O}_4$  nanoparticles to enhance its stability and biocompatible properties. The size distribution of the obtained  $\text{Fe}_3\text{O}_4$  nanoparticles was examined using transmission electron microscopy (TEM). The cubic inverse spinel structure of  $\text{Fe}_3\text{O}_4$  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  $\text{Fe}_3\text{O}_4$  nanoparticles. The superparamagnetic behaviour of the produced  $\text{Fe}_3\text{O}_4$  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  $\text{Fe}_3\text{O}_4$  nanoparticles have been proved to be a promising contrast enhanced agent in MR imaging.

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