Thematic area: " Nanocomposites and nanomaterials"

Influence of exchange and dipole-dipole interaction on the magnetic properties and heating efficiency in the core (γ -Fe_2O_3)-shell ($CoFe_2O_4$) nanoparticles.

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Magnetic nanoparticles represent a particularly interesting class of materials from scientific, technological and biological point of view. Due to their unique properties such systems are considered as very promising materials for biotechnology and medical applications such as: magnetic separation, enzyme immobilization, biosensors, drug and gene delivery, hyperthermia and contrast enhancement in magnetic resonance imaging (MRI). [1,2].

This work presents the results of the investigations of structural and magnetic properties of core/shell two-phase γ -Fe_2O_3/$CoFe_2O_4$ nanoparticles covered by an oleic acid synthesized by precipitation from non-aqueous solutions in an argon atmosphere. The structure and morphology were analyzed by X-ray diffraction and transmission electron microscopy. Magnetic behavior of the particles was studied with a commercial Physical Property Measurement System (PPMS) (Quantum Design) over the temperature range 2-300 K in the selected applied fields. Also the potential of these particles for magnetic fluid hyperthermia by determination of the specific absorption rate at a constant frequency of 300 kHz and amplitude of 7.7 kA/m was analyzed.

As a reference samples single phase γ -Fe_2O_3 and $CoFe_2O_4$ nanoparticles and their mixture have also been studied. The magnetic behaviour of these materials will be explained in terms of inter- and intraparticle interactions and different anisotropy of the constituent magnetic phases. The magnetic results will be related to the heating efficiency of nanoparticle systems studied associated with their possible hyperthermia applications in anticancer treatment. Obtained core/shell nanoparticle system is a good candidate for hyperthermia cancer treatment.

1. *Challa S.S.R. Kumar, Faruq Mohammad*. Magnetic nanomaterials for hyperthermia-based therapy and controlled drug delivery// Adv Drug Delivery Rev.- 2011.- **63**.-P. 789-808.
2. *J.-H. Lee, J.-T. Jang, J.-S. Choi et al.*Exchange-coupled magnetic nanoparticles for efficie nthe atinduction// Nature Nanotechnology.- 2011.- **6**. N 7. –P. 418–422.