BOOK of ABSTRACTS

25th Congress of Chemists and Technologists of Macedonia

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CXTM

Сојуз на хемичарите и технолозите на Македонија

Society of Chemists and Technologists of Macedonia

25th Congress of SCTM
with international participation

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EXTERNAL MAGNETIC FIELD-INDUCED AGGREGATION AND SEDIMENTATION PROCESSES ARISING IN MAGNETIC FLUIDS

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The spectral analysis of external magnetic field influence on hydrothermally synthesized $CoFe_2O_4$, $FeFe_2O_4$, and $MgFe_2O_4$ nanoparticles in ferrofluid was presented. In order to control particle growth, stabilize particles against aggregation and enhance dispersibility in an aqueous medium, surface coating was achieved using citric and oleic acid, popular surfactants in preparation of magnetic particles for medical applications. New experimental settings were developed for the study of behavior of ferrofluids with the applied magnetic field strength in the range of 30-400 mT. Field-induced change of transmittance occurred and a precipitation of all studied samples was obtained. Contrary to the linear aggregates of colloidal $CoFe_2O_4$ and $FeFe_2O_4$, approximately spherical aggregates were observed in the case of $MgFe_2O_4$. The behavior of this kind of ferrites is in accordance with its soft magnetic nature. In all cases, the surface modification resulted in decreased dipole-dipole interactions between magnetic cores, and consequentially less precipitates were noticed. All citrate coated nanoparticles have shown stronger magnetic response in comparison to the oleate modified samples. The aggregation of nanoparticles potentially increases cytotoxicity although it is still unknown how aggregates formed in external magnetic field affect biological responses when ferrites are used in biomedical applications. Regarding non-linear clustering of $MgFe_2O_4$ suspensions, it can be concluded that its excretion from the organism could be likely easier and faster when used in diagnosis and/or therapy. Therefore, more attention should be paid to the low toxic $MgFe_2O_4$ for its medical application.

Keywords: ferrofluid aggregation, external magnetic field, light transmitting measurements.

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