Nanocomposites and nanomaterials

Determination of magnetic parameters of maghemite (γ-Fe_2O_3) core-shell nanoparticles from nonlinear magnetic susceptibility measurement

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There are a number of applications of biocompatible magnetic nanoparticles in biomedical technologies [1]. Almost all of them require small size particles having superparamagnetic properties. However, such particles are prone to agglomeration. To avoid their agglomeration the synthesis of composite particles of the core-shell type is usually used. On the other hand for determination of magnetic parameters of their core there is a necessity of simple and easy to use express methods. We are developing such a method that is based on measuring dependencies of magnetic susceptibility $\chi(H)$ and its derivative $\partial\chi(H)/\partial H$.

Experimental setup for measuring the nonlinear magnetic susceptibility was generally described in [2]. Obtained experimental dependencies were fit using the first and second field derivatives of the Langevin function. Using log-normal distribution of the nanoparticles core magnetic moment the fitting accuracy increases significantly. The attempt to take into account in the used model an influence of magnetic core surface on the saturation magnetization reducing in their smallest particles and estimate its quantitative parameter is studied and discussed as well in this work.

1. *Amstad E., Textora M. and Reimhult E.* Stabilization and functionalization of iron oxide nanoparticles for biomedical applications // Nanoscale.- 2011.- **3**, P. 2819-2843.
2. *Ubizskii S., Bury O., Pavlyk L., Syvorotka I., Kravchuk O., Savytskyy R., Demchenko P., Navrotskyi S., Mitina N. and Zaichenko O.* Determination of Superparamagnetic Nanoparticles Size Distribution from Magnetic Measurements // OMEE 2014 - Book of Conference Proceedings, **P**.87-88.