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Preparation and investigation of magnetic properties of pure MnFe_2O_4 ferrite nanoparticles and those dispersed in SiO_2 matrix

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Abstract

In this study, the pure manganese ferrite nanoparticles and those dispersed in silica were prepared by the sol-gel method. The average size of particles, which is estimated from Scherrer formula, is about 6 nm for pure sample and 5 nm for silica dispersed sample. The particles size values are in agreement with the TEM results. Results of magnetization measurements showed that these samples have zero coercivity and are superparamagnet at room temperature. Using the results of ac magnetic susceptibility measurements and analysis by different models, superparamagnetic behavior of magnetic nanoparticles was studied. The behavior of pure sample is interacting superparamagnet and in the silica dispersed sample, the interaction between nanoparticles decreases and the behavior of this sample is non-interacting superparamagnet. It seems that by dispersing the nanoparticles in silica, the distance of particles increases and interaction between ferrite nanoparticles decreases.

Keywords: manganese ferrite nanoparticles, superparamagnetic, interaction

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