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FRI-SP-P26

Thermal properties for $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles

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We have fabricated $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles by a high temperature thermal decomposition process.[1,2] The prepared sample was determined to be cubic spinel with space group *Fd-3m* and the lattice constant (a_0) of 8.41 Å from Rietveld refinement analysis. Based on the Scherrer equation, the average size of nanoparticles was determined to be 11 nm The saturation magnetization (M_s) and coercivity (H_c) of the nanoparticles were 81.0 emu/g and 34.6 Oe, respectively at 295 K. From the distribution probability, we analyzed Mössbauer spectra of the nanoparticles as 3 sets of six-line. Hyperfine fields of the nanoparticles at A, B_1 and B_2 sites were H_A = 427 Oe, H_{B1} = 458 Oe, and H_{B2} = 384 Oe at 4.2 K without external field. To separate A, $B_{1,}$ and B_2 sites, the Mössbauer spectra of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles were obtained at 4.2 K with applied field of 5 T. From the detailed analysis of Mössbauer spectra, the spin canting angles and the anisotropy energies at A, B_1 and B_2 sites were determined. The canting angle between the applied field and hyperfine field at A, $B_{1,}$ and B_2 sites were obtained by Mössbauer spectrometer with external magnetic field of 5 T. To characterize the thermal properties of the samples, $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles were measured by magneTherm device at 50 kHz and 25 mT. The self-heating temperature of the nanoparticles determined 124.33 ^{o}C in $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles.

[1] P. Guardia, R. Di Corato, L. Lartique et al., ACS Nano. ***6****, 4 (2012)*
[2] R. Hao , R. Xing, Z. Xu, et al., Advanced Materials. ***22****, 25 (2010)*