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ICAMD 2009

The 6th International Conference on
Advanced Materials and Devices

December 9 ~11, 2009
Ramada Plaza Jeju Hotel, Jeju, Korea

Program and Abstracts

Organized by

Applied Physics Division, The Korean Physical Society
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Sponsored by

Korean Ministry of Education, Science and Technology
National Research Foundation of Korea
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External field induced studies on Ni-Co doping ferrite

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We have studied the changes in crystallographic and hyperfine properties on $\text{Ni}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ ($x=0, 0.5, 1$). The samples were prepared by a solid state reaction method. XRD patterns of the samples were analyzed by Rietveld refinement method, which determined to be cubic spinel with space group of $Fd\bar{3}m$ and well fitted with below 5 % Bragg R_B -factor and R_I -factor. We could determined that the corresponding lattice constant a_0 increases from 8.3415 to 8.3849 Å with increasing Co doping ratio, according to the ionic radius of Ni^{2+} (0.69 Å) and Co^{2+} (0.74 Å) ions. The values of magnetization and the coercivity of $\text{Ni}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ ($x=0, 0.5, 1$) at room temperature (RT) increased from 46.5 emu/g and 149.6 Oe to 78.5 emu/g and 564.5 Oe, respectively, with increasing Co doping ratio. The Mössbauer spectra of all samples with external applied field 48 kOe at 4.2 K show that the values of isomer shift (δ) for the tetrahedral (A) and octahedral (B) sites are consistent with the Fe^{3+} valence state. The area ratio between A and B sites for $x=0$ and 0.5 doping samples was 1:1, respectively, while the one for $x=1$ doping sample was 4:6, which has the same results of Rietveld refinement for XRD patterns.

[1] M. Gajek et al., *Nature Mater.*, **6**, 396 (2007)

[2] D. H. Wang et al., *Appl. Phys. Lett.*, **88**, 212907 (2006)