Journal of the Korean Physical Society, Vol. 70, No. 1, January 2017, pp. 85∼88

# Crystallograhic and Magnetic Properties of $Fe_{1-x}Ni_xGa_2O_4$

Bo Ra Myoung, Jung Tae Lim and Chul Sung Kim*
*Department of Physics, Kookmin University, Seoul 02707, Korea*

(Received 30 November 2016, in final form 9 December 2016)

We report the crystallographic and magnetic effects on inverse spinel $Fe_{1-x}Ni_xGa_2O_4$ ($0.0 \leq x \leq 0.9$) due to doped Ni cations. The crystalline structures of $Fe_{1-x}Ni_xGa_2O_4$ ($0.0 \leq x \leq 0.9$) were examined by using a Philips X'Pert diffractometer with a Cu $K\alpha$ radiation ($\lambda = 1.5406$ Å) source and analyzed with the Rietveld refinement method. The crystal structures were found to be inverse spinel with space group *Fd-3m*. From the Rietveld analysis, with increasing Ni concentration, the ratio of magnetic $Fe^{2+}$ cations, compared to the total number of $Fe^{2+}$ cations on A-site (tetrahedron) decreased from 43 to 7%, and that on B-site (octahedron) increased from 57 to 93%. The lattice constants $a_0$, and bond length $d_{Ga^{3+}-Fe^{2+}[Ni^{2+}]}$ on A-site and B-site decreased linearly with increasing Ni concentration. From the temperature dependence of susceptibility $\chi$ in zero-field-cooled and field-cooled magnetization under 400 Oe, with increasing Ni concentration, the sample showed a decrease in the freezing temperature $T_f$. Mössbauer spectra of all samples at room temperature showed 2-sets (A-site, and B-site) with large electric quadrupole splitting. The Mössbauer absorption area ratio of A-site decreased, while that of B-site increased with increasing Ni concentration, which is accord with the Rietveld refinement analysis of the XRD results.

PACS numbers: 61.10.Nz, 76.80.+y, 75.60.Ej, 75.10.Nr
Keywords: $Fe_{1-x}Ni_xGa_2O_4$, Mössbauer spectroscopy, Freezing temperature
DOI: 10.3938/jkps.70.85