

## ATOMIC MIGRATION IN MIXED FERRITE $Ni_xCo_{1-x}Fe_2O_4$

Seung Wha Lee, Seung Iel Park, Young Rang Um, Young Jong Lee,  
Sung Baek Kim, and Chul Sung Kim  
Department of Physics, Kookmin University, Seoul 136-702, Korea

The mixed ferrite  $Ni_xCo_{1-x}Fe_2O_4$  have been investigated by X-ray and Mössbauer spectroscopy. From the results of X-ray diffraction measurement the structure for this system is spinel, and the lattice constant is in accord with Vegard's law. Mössbauer spectra of  $Ni_xCo_{1-x}Fe_2O_4$  have been taken at various temperature ranging from 13 to 800 K. The isomer shifts indicate that the valence states of the irons at both A(tetrahedral) and B(octahedral) site are found to be in ferric high-spin states. The variation of magnetic hyperfine fields at the A and B sites are explained on the basis on A-B and B-B supertransferred hyperfine interactions. It is found that Debye temperatures for the A and B sites of  $CoFe_2O_4$  and  $NiFe_2O_4$  are found to be  $\theta_A = 734 \pm 5$  K,  $\theta_B = 248 \pm 5$  K and  $\theta_A = 378 \pm 5$  K,  $\theta_B = 357 \pm 5$  K, respectively. Atomic migration of  $Ni_{0.3}Co_{0.7}Fe_2O_4$  starts near 450 K and increases rapidly with increasing temperature to such a degree that 61 % of the ferric ions at the A site have moved over to the B site by 700 K.