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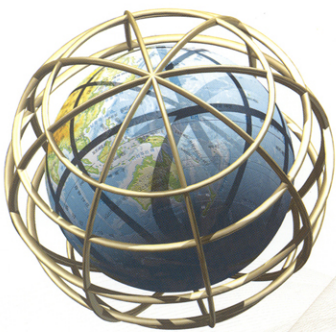

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PE02

Superexchange Interactions in Various Spinel Ferrites

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Spinel ferrites, MFe_2O_4 (M=Ni, Mg, Co, Li) samples were prepared by sol-gel method. It has been studied by x-ray diffraction, Mössbauer spectroscopy. X-ray diffraction patterns were analyzed by the Rietveld refinement. The samples have been cubic spinel structure with the lattice constant (a_0) is 8.326 ~ 8.390 Å. The temperature dependence of the magnetic hyperfine field is analyzed by the Néel theory of ferrimagnetism. The intersublattice A-O-B and intrasublattice A-O-A superexchange interactions are found to be antiferromagnetic while the intra-sublattice B-O-B superexchange interaction is ferromagnetic for the MFe_2O_4 (M=Ni, Mg, Co) samples as shown in Table I. On the other hand, the intersublattice superexchange interaction is found to be antiferromagnetic while the intrasublattice superexchange interactions are ferromagnetic for the Li-ferrite sample.

Table 1. The intersublattice JA-B and intrasublattice $J_{A\text{-}A}$ and $J_{A\text{-}B}$ superexchange interactions for the MFe_2O_4 (M=Ni, Mg, Co, Li) samples.

	$J_{A\text{-}B}$ (kB)	$J_{A\text{-}A}$ (kB)	$J_{B\text{-}B}$ (kB)	T_N (K)	a_0 (Å)
$NiFe_2O_4$	-25.7	-4.0	4.2	860	8.326
$MgFe_2O_4$	-10.0	-0.7	1.4	710	8.390
$CoFe_2O_4$	-25.0	-18.9	3.9	870	8.381
$Li_{0.5}Fe_{2.5}O_4$	-10.7	16.5	20.6	912	8.334