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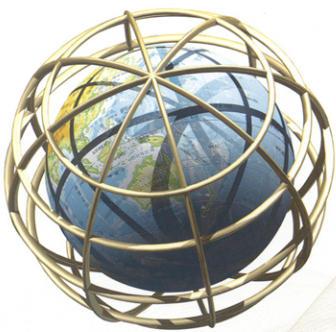

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Magnetic Properties of the Crystalline Phase Transition Included Fe Doped Nickel Chromite

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The chromite system (ACr_2O_4 ; A = Co, Ni etc.) of spinel structure has been studied with many researchers by reason of its multiferroic properties. [1, 2] The $NiCr_{1.7}Fe_{0.3}O_4$ sample was prepared by the sol-gel method. The ultimate single phase samples were obtained for annealed 12 hr in atmosphere at 1000 ℃. The Fe doped nickel chromite system there is a cubic to tetragonal transition below the room temperature. [3] The Crystalline structure of $NiCr1.7Fe_{0.3}O_4$ was spinel cubic (*Fd-3m*) structure with a lattice constant a_0 = 8.317 Å at room temperature. The magnetic Néel temperature (T_N) of the Fe doped nickel chromite sample is determined to be 230 K by zero field cold magnetization curves under the 100 Oe applied field. Mössbauer spectra were measured at various temperatures ranging from 4.2 to 295 K. The Mössbauer spectra exhibit that there are two magnetic phases with the two different sites of the Cr^{3+} ions. [1] The spectrum at 4.2 K was fitted to two magnetic components of the magnetic hyperfine fields H_{hf} = 496 and 486 kOe. The average value curve for temperature dependence of magnetic hyperfine fields agrees with spin 1/2 curve obtained by the Brillouin function with molecular field theory, respectively. The electric quadrupole splittings (ΔE_Q) were found to be nearly zero values below the T_N =230 K. However, as the 295 K, the ΔE_Q are observed with large values. The values of the isomer shifts show that of all temperature ranges the states are ferric. The Mössbauer spectra below the T_N show that the line broadening with the accompanying relaxation effects and the Jahn-Teller distortion due to the crystalline phase transition.

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