

MÖSSBAUER STUDY OF $\text{Fe}_{0.01}\text{Ni}_{0.99}\text{Cr}_2\text{S}_4$

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Abstract- $\text{Fe}_{0.01}\text{Ni}_{0.99}\text{Cr}_2\text{S}_4$ has been studied by Mössbauer spectroscopy and X-ray diffraction. The crystal structure is found to be monoclinic with the lattice parameters: $a = 5.910 \text{ \AA}$, $b = 3.410 \text{ \AA}$, $c = 11.11 \text{ \AA}$ and $\beta = 91.50^\circ$. Magnetic hyperfine and quadrupole interactions in the antiferromagnetic state at 81 K have been studied, yielding the following results: $H = 156 \text{ kOe}$, $1/2eQq(1+1/3\eta^2)^{1/2} = -2.15 \text{ mm/s}$, $\theta = 59^\circ$, $\phi = 90^\circ$, and $\eta = 0.9$. Electronic energy levels of $\text{Fe}_{0.01}\text{Ni}_{0.99}\text{Cr}_2\text{S}_4$ can be explained in terms of a Hamiltonian involving crystal field energy, spin-orbit couplings, and exchange interactions.