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Mössbauer Studies of the Spinel Phase for $Ni_xFe_{1-x}Cr_2S_4$*

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$Ni_xFe_{1-x}Cr_2S_4$ is found to crystallize with a pure spinel structure in the composition range $0 \leq x \leq 0.4$. Mössubauer spectra of $Ni_xFe_{1-x}Cr_2S_4$ have been taken at various temperatures ranging from 13 K to room temperature. The absence of quadrupole shift above the magnetic ordering temperature T_N indicates that the Fe ions occupy only the tetrahedral sites. The isomer shifts indicate that the valance states of the Fe ions have a ferrous character.

It is notable that, as the temperature decreases below T_N, both quadrupole shift and asymmetrical line-broadening appear and increase with decreasing temperature, suggesting the presence of an electric field gradient and accompanying relaxation effects.