

Magnetic properties of the spinel phase for $\text{Fe}_x\text{Cu}_{1-x}\text{Rh}_2\text{Se}_4$

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$\text{Fe}_x\text{Cu}_{1-x}\text{Rh}_2\text{Se}_4$ is found to crystallize with a pure spinel structure in the composition range $0 < x < 0.3$. Mössbauer spectra of $\text{Fe}_x\text{Cu}_{1-x}\text{Rh}_2\text{Se}_4$ have been taken at various temperatures ranging from 4.2 K to room temperature. Analysis of Mössbauer spectra at 4.2 K indicate that the effective hyperfine field increases with increasing iron concentration x and that the quadrupole splitting is negligible. The absence of quadrupole splitting above the magnetic ordering temperature T_N indicates that iron ions occupy only the tetrahedral sites. The isomer shifts indicate that the charge states of the Fe ions have a ferric character. Magnetic susceptibility measurements by dc SQUID magnetometry show that long-range superexchange interactions on the tetrahedral sites are antiferromagnetic.