

Crystallographic and Magnetic Properties of $\text{CuRh}_2\text{Se}_4 - \text{FeRh}_2\text{Se}_4$ Series

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The mixed series $\text{CuRh}_2\text{Se}_4 - \text{FeRh}_2\text{Se}_4$ has been synthesized and studied by x-ray, Mossbauer, and magnetic measurements at temperatures between 4.2 and 300 K. We found that the crystal structure of $\text{Fe}_x\text{Cu}_{1-x}\text{Rh}_2\text{Se}_4$ is transformed from spinel to monoclinic structure as iron concentration increases. The isomer shift measurements indicated that the charge state of the Fe ions undergoes gradual change from ferric to ferrous iron as x is increased. The origin of this transition seems to be in the change of ionic radius of iron ions from smaller one of Fe^{3+} to large one of Fe^{2+} . All the samples become antiferromagnets. FeRh_2Se_4 has been synthesized and the crystal structure is found to be monoclinic with the lattice parameter: $a = 6.310 \text{ \AA}$, $b = 3.643 \text{ \AA}$, $c = 11.14 \text{ \AA}$, $\beta = 92.42^\circ$. The structure is characterized by ordered vacancies in alternate metal layers. The iron ions are found to be ferrous in charge state and occupy the metal layers which are without vacancies, which is "inverse" to the site distributions reported for similar structures.