

Mössbauer studies of dynamic Jahn-Teller relaxation on the Cu-substituted sulfur spinel

Sam Jin Kim and Bae Soon Son

Department of Physics, Kookmin University, Seoul 136-702, Korea

Bo Wha Lee

Department of Physics, Kookmin University, Seoul 136-702, Korea and Department of Physics, Hankuk University of Foreign Studies, Yongin, Kyungki 449-791, Korea

Chul Sung Kim^{a)}

Department of Physics, Kookmin University, Seoul 136-702, Korea

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Samples of $\text{Fe}_{1-x}\text{Cu}_x\text{Cr}_2\text{S}_4$ ($x=0.0, 0.1, 0.3, \text{ and } 0.5$) have been studied with Mössbauer spectroscopy, x-ray diffraction, magnetization, and magnetoresistance. A cusp-like anomaly is observed for the sample $x=0.1$ in the both field-cooled and zero-field-cooled magnetization curves near 130 K under an applied field $H=100$ Oe. The charge state of iron ions are ferrous for the samples $x=0.0$ and $x=0.1$, whereas they are ferric for the samples $x=0.3$ and $x=0.5$. The Mössbauer spectra for the sample $x=0.1$ show asymmetric line broadening, and it is considered to be dynamic Jahn-Teller relaxation. The unusual reduction of magnetic hyperfine field below 110 K can be interpreted in terms of cancellation effect between the mutually opposite orbital current field H_L and Fermi contact field H_C . © 2004 American Institute of Physics. [DOI: 10.1063/1.1687551]