Pergamon

0038–1098(95)00331-2

SUPEREXCHANGE INTERACTIONS IN $Cu_{0.5}Fe_{0.5}Rh_{0.5}Cr_{1.5}S_4$

Hang Nam Ok, Kyung Seon Baek and Byung Chul Cho

Department of Physics, Yonsei University, Seoul 120-749, Korea

and

Chul Sung Kim

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

$Cu_{0.5}Fe_{0.5}Rh_{0.5}Cr_{1.5}S_4$ has been studied by Mössbauer spectroscopy, X-ray diffraction, and magnetization measurement. The crystal is found to have a cubic spinel structure with the lattice constant $a_0 = 9.859 \pm 0.005$ Å. The iron ions are in ferric states and occupy the tetrahedral sites. The temperature dependence of both the magnetic hyperfine field and magnetization is explained by the Néel theory of ferromagnetism using three exchange integrals: $J_{Fe-Cr}/k_B = -13.76$ K, $J_{Fe-Fe}/k_B = -8.08$ K, and $J_{Cr-Cr}/k_B = 8.53$ K. Néel temperature and Debye temperature are found to be 288 ± 2 K and 533 ± 5 K, respectively.