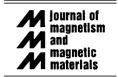


Available online at www.sciencedirect.com





Journal of Magnetism and Magnetic Materials 272-276 (2004) 2161-2162

www.elsevier.com/locate/jmmm

Neutron diffraction and exchange interaction on $CoAl_xFe_{2-x}O_4$ (*x* = 0.1, 0.2)

Sam Jin Kim, Bo Ra Myoung, Chul Sung Kim*

Department of Physics, Kookmin University, 861-1, Chongnung, Song-Buk-Gu, Seoul 136-702, South Korea

Abstract

Magnetic and structural properties of $\text{CoAl}_x\text{Fe}_{2-x}\text{O}_4$ (x = 0.1, 0.2) have been studied with X-ray, neutron diffraction, and Mössbauer spectroscopy. Neutron diffraction pattern at 10 K reveals a cubic spinel of Fd3m with ferrimagnetic order. Debye temperatures of the tetrahedral (A) and octahedral (B) site for $\text{CoAl}_{0.2}\text{Fe}_{1.8}\text{O}_4$ are found to be $\Theta_A = 709$ and $\Theta_B = 197$ K, respectively. The A–B and A–A superexchange interactions of $\text{CoAl}_{0.2}\text{Fe}_{1.8}\text{O}_4$ are antiferromagnetic with the strengths of $J_{A-B} = -21.3$ and $J_{A-A} = -19.6$ k_B, respectively, while the B–B interaction is ferromagnetic with a strength of $J_{B-B} = 4.8$ k_B.

© 2003 Elsevier B.V. All rights reserved.

PACS: 75.30.Et; 76.80.+y; 61.12.-q

Keywords: Mössbauer spectroscopy; Neutron diffraction; Superexchange interaction; Co ferrites