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# Magnetic and electron transport properties in $\text{Co}_{0.1}\text{Fe}_{0.9}\text{Cr}_2\text{S}_4$

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## Abstract

Sample of  $\text{Co}_{0.1}\text{Fe}_{0.9}\text{Cr}_2\text{S}_4$  has been studied with Mössbauer spectroscopy, X-ray, SQUID magnetometer and magnetoresistance (MR). The crystal structure was determined to be cubic spinel with its lattice constant  $a_0 = 9.9696 \text{ \AA}$ . The Mössbauer spectra were recorded from 12 K to room temperature. The asymmetric line broadening is observed and considered to be dynamic Jahn–Teller distortion. The unusual reduction of magnetic hyperfine field below 100 K could be explained in terms of cancellation effect between the mutually opposite orbital current field ( $H_L$ ) and Fermi contact field ( $H_C$ ). Isomer shift value of the sample at room temperature was 0.58 mm/s, which means that charge state of Fe ions was ferrous in character. The MR peak was observed at 192 K about 10% at an applied field 16 kOe. The activation energy above the Néel temperature was calculated to be 50 meV. The conduction mechanism in this sample is different from the double exchange mechanism in a point that there were no mixed iron charge valences. © 2002 Elsevier Science B.V. All rights reserved.

*Keywords:* Mössbauer spectroscopy; Magnetoresistance; Dynamic Jahn–Teller effect

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