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# MAGNETIC AND ELECTRON TRANSPORT PROPERTIES IN $Co_{0.1}Fe_{0.9}Cr_2S_4$

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Sample of $Co_{0.1}Fe_{0.9}Cr_2S_4$ has been studied with Mössbauer spectroscopy, x-ray, SQUID magnet ometer and magnetoresistance (MR). The crystal structure was determined to be cubic spinel w ith its lattice constant $a_0$=9.999 Å. The Mössbauer spectra were recorded from 4.2 K to room t emperature. The asymmetric line broadening is observed and considered to be dynamic Jahn-Te ller distortion. The unusual reduction of magnetic hyperfine field below 100 K may be explain ed in terms of cancellation effect between the mutually opposite orbital current field ($H_L$) and F ermi 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 Curie temperature ($T_C$) was 178 K. The MR peak was observed at 192 K about 10 % at an applied field 2 T. The a ctivation energy above the Curie temperature was calculated to be 50 meV. The conduction me chanism of Mn perovskites is accompanied with electron hopping between heterogeneous $Mn^{3+}$ and $Mn^{4+}$ but in this sample there is no heterovalance in iron ions.[1] The three strengths of sup erexchange interactions $J_{A\text{-}B}$, $J_{A\text{-}A}$, and $J_{B\text{-}B}$ were calculated to be –10.5, 4.5, and 7.6 $k_B$, respecti vely. The conduction mechanism in this sample was completely different from double exchang e which was characteristic of Mn perovskites.

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[1]A. P. Ramirez, R. J. Cava, and J. Krajewski, Nature 386, 156 (1997).

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