Magnetic and Thermodynamic Properties of $Fe_2Cr_2Se_4$

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Transport and magnetic properties of a seleno compound $FeCr_2Se_4$ have been investigated. Electric resistivity $\rho(T)$ shows insulator-type temperature dependence defined as $\partial\rho(T)/\partial T < 0$ in the range 2.5 $< T <$ 300 K. At T_N = 200 K, $\rho(T)$ has an inflection point associated with antiferromagnetic order. A cusp-like anomaly appears at T_N in temperature dependence of magnetization $M(T)$. $M(T)$ above T_N can be reproduced by Mean field approximation of ferrimagnet, and an effective Bohr magneton $\mu_{eff} = 7.19$ is obtained from Curie constant C. This value is close to the calculated one ($\mu_{eff} = 7.35$) from Fe^{2+} (spin quantum value $S = 2$) and Cr^{3+} ($S = 3/2$). In $T <$ 125 K, $M(T)$ increases with decreasing T. This behaviour makes us expecting that other magnetic phase transition occurs at low temperature. Below 20 K, between the values of zero-field-cooled magnetization $M_{ZFC}(T)$ and field-cooled magnetization $M_{FC}(T)$ show differences. This might be come from spin-glass freezing. A discontinuity which indicates magnetic phase transition is not observed in the temperature dependence of specific heat $C_P(T)$ in the range $1.5K < T < T_N$, although λ-type anomaly appears at T_N.