

Anomalous magnetic properties of the ferrimagnetic semiconductor on Ga-doped sulphur spinel

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(Presented on 7 January 2004)

$\text{FeGa}_x\text{Cr}_{2-x}\text{S}_4$ ($x=0.1$ and 0.3) have been studied with Mössbauer spectroscopy, x-ray diffraction, magnetization, and magnetoresistance. Fe ions migrate from the tetrahedral (*A*) site to the octahedral (*B*) site with an increase of Ga substitutions. The electric quadrupole splitting of the *A* and *B* sites in Mössbauer spectra of the sample $x=0.1$ at 295 K, are 0.30 and 2.93 mm/s, respectively, whereas, for the sample $x=0.3$ they are 0.83 and 2.94 mm/s, respectively. It gives a direct evidence that Ga ions stimulate the asymmetric charge distribution of Fe ions in the *A* site. The temperature dependence of quadrupole interaction leads to the conclusion that orbital angular contribution plays an important role in $\text{FeGa}_x\text{Cr}_{2-x}\text{S}_4$ ($x=0.1$ and 0.3). © 2004 American Institute of Physics.

[DOI: 10.1063/1.1676095]