ABSTRACTS

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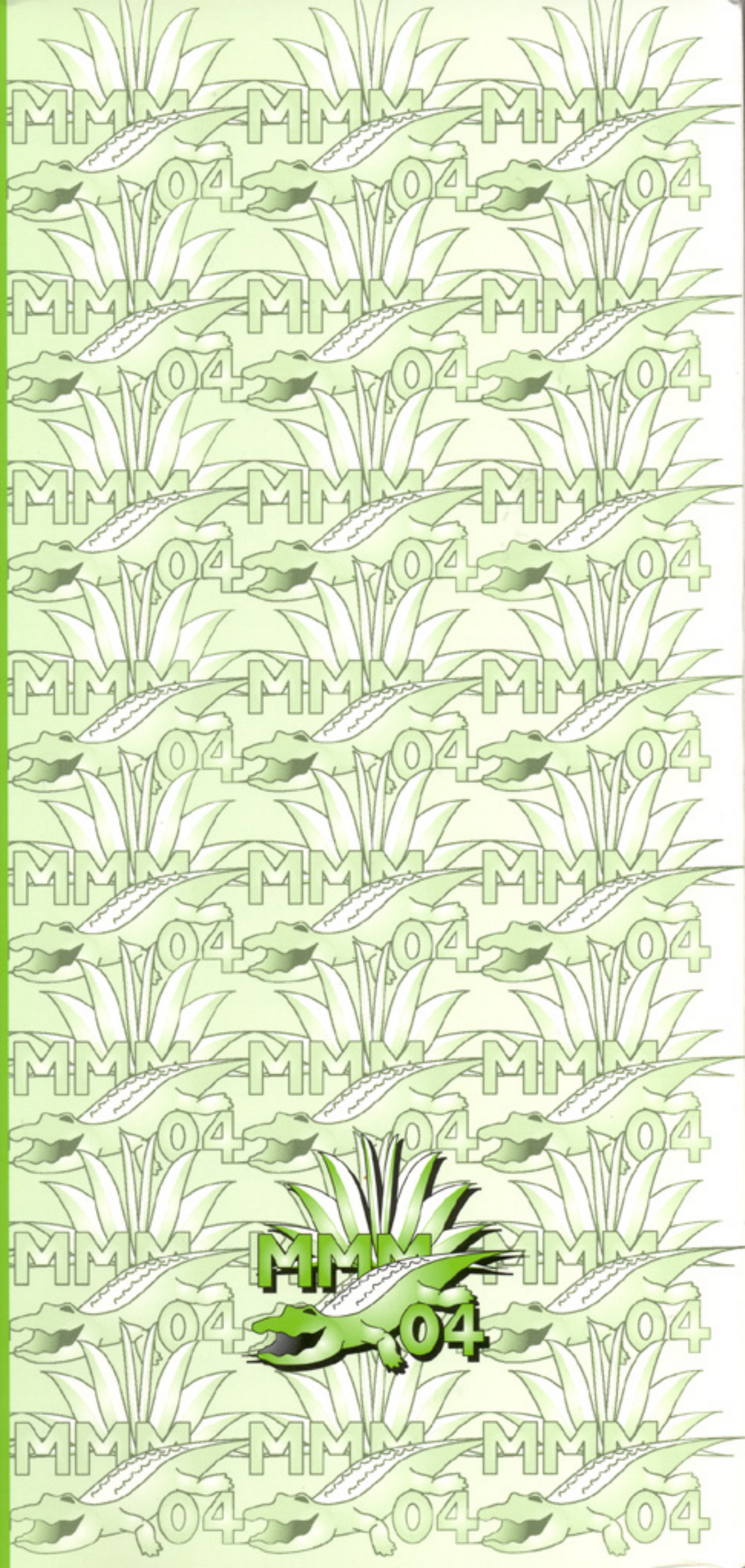

HP-15. MÖossbauer spectroscopy and neutron diffraction studies of the ferrimagnetic semiconductor on Ga-substituted $FeGa_xCr_{2-x}S_4$.

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Ga doped sulphur spinel $FeGa_xCr_{2-x}S_4$ (x=0.1 and 0.3) have been studied with MÖossbauer spectroscopy, neutron diffraction, x-ray diffraction, magnetization, and magnetoresistance (MR) measurements. Neutron diffraction patterns were obtained at various temperature ranges from 10 K to room temperature. Neutron diffraction on $FeGa_xCr_{2-x}S_4$ (x=0.1) above 10 K shows that

there is no crystallographic distortion and reveals antiferromagnetic ordering, with the magnetic moment of Fe+2(3.45 μ_B) aligned antiparallel to Cr+3 (-2.89 μ_B). It is concluded that Fe ions migrate from the tetrahedral (A) site to the octahedral (B) site with increase of Ga ions, by Rietveld refinement of X-ray diffraction and MÖossbauer measurement. The MÖossbauer spectra of the samples consist of the two doublets at room temperature. The electric quadrupole splitting of the A and B sites in Mossbauer spectra of the sample x=0.1, at 295 K, are 0.30 and 2.93 mm/s, respectively, While, they are 0.83 and 2.94 mm/s for the sample x=0.3, respectively. It gives a direct evidence that Ga ion stimulate 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 $FeGa_xCr_{2-x}S_4$ (x=0.1 and 0.3). The magnetoresistance exhibits a strong dependence on Arrhenius model at temperature below 100 K, probably due to an activated energy, while it shows a strong correlation on small polaron model at temperature above 200 K. The temperature dependence of quadrupole interaction leads to the conclusion that orbital angular contribution plays an important role in $FeGa_xCr_{2-x}S_4$.