CRYSTOLLOGRAPHIC AND MAGNETIC STRUCTURE IN SPINEL SYSTEM $FeGa_xCr_{2-x}S_4$ BY NEUTRON DIFFRACTION

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The samples of $FeGa_xCr_{2-x}S_4$ (x = 0.1, 0.3) were prepared by solid reaction method. The crystallographic structure and the magnetic properties of the obtained compounds were investigated by X-ray and neutron powder diffraction, vibrating sample magnetometer (VSM), and Mössbauer spectroscopy. The Cr ions occupy 16(a) site exclusively, while mixed spinel behaviors are developed with increase of Ga ions. Finally, it induces a large quadrupole splitting in octahedral (16d) sites. Neutron diffraction on $FeGa_xCr_{2-x}S_4$ above 10 K shows that there is no crystallographic distortion and reveals antiferromagnetic ordering. The magnetic moment of Fe^{2+}(3.45 μ_B) are found to be aligned antiparallel to Cr^{3+} (-2.89 μ_B), in the sample x=0.1. Below Néel temperature, magnetic peaks exist on the crystal diffraction peaks. It proves that spin structure of the same species are aligned parallel. From temperature dependent neutron diffraction patterns, magnetic position peaks disappeared at Néel temperature, this result is an agreement with VSM and Mössbauer results.

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