Magnetic Structure of $\text{Ga}_{2-x}\text{Fe}_x\text{O}_3$

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High-magnetic-field-Mössbauer and magnetic-moment experiments have been performed with $\text{Ga}_{2-x}\text{Fe}_x\text{O}_3$. This magnetic system is of considerable interest because it is piezoelectric, weakly magnetic,¹ and magnetoelectric.² The crystal structure has been determined³ and a magnetic ordering inferred.³ The magnetic-moment measurements were made using a vibrating sample magnetometer in fields up to 75 kOe. The samples used for the Mössbauer absorption experiments consisted of ⁵⁷Fe enriched powders, grown from a flux, embedded in lucite, and having $x=0.8$ and 1.2. A mosaic absorber made of small x-ray oriented single crystals was also studied. Measurements were made over the temperature range 4.2° to 320°K and in external magnetic fields up to 130 kOe. At low temperatures the zero-external field-absorption spectra indicate that there are at least two magnetically nonequivalent sites. In a large external field the hyperfine spectrum lines corresponding to $\Delta m=0$ vanish, while each of the outer lines (corresponding to $\Delta m=\pm 1$) splits into two well-resolved components of unequal intensity. Detailed analysis of the experimental results for both the single crystal and polycrystalline absorbers indicates that at zero external field all spins lie in the a - c plane ($c < a < b$), that the observed moment is due to ferrimagnetism⁴ rather than to a canted spin structure, and that the spins are unequally divided between the two sublattices.

A detailed account of these measurements will be published elsewhere.

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