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Coupling of Lattice and Spin Degrees of Freedom in GdB₆

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Abstract

A detailed x-ray scattering study of the phase transitions in GdB₆ has been performed. For photon energies away from resonance, peaks are observed with two distinct wavevectors of $\mathbf{q}_1=(00\frac{1}{2})$ and $\mathbf{q}_2=(\frac{1}{2}\frac{1}{2}0)$ at low temperatures. These are shown to arise from distortions of the lattice, although an earlier study had attributed them to competing magnetic order parameters [?]. With the photon energy tuned to the Gd L_2 edge, a third set of peaks with $\mathbf{q}_3=(\frac{1}{4}\frac{1}{4}\frac{1}{2})$ was discovered. This is shown to be the true magnetic order parameter. Our results reveal a surprisingly rich interaction between the lattice and spin degrees of freedom in this compound.

Key words: X-ray magnetic scattering, Antiferromagnetism, Lattice distortion

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