

Interference of Magnetic and ATS Reflections in Resonant X-ray Scattering of GdB₄

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Resonant X-ray scattering experiments at the Gd L₃ absorption edge show interference between magnetic and anisotropic tensor susceptibility (ATS) reflections in GdB₄. The interference behavior is manifested with the phase shift, $\phi(\mathbf{Q}, \mathbf{x})$, in the azimuthal rotation ($\mathbf{y} \parallel \mathbf{Q}$) of the (2n+1 0 0) superstructure reflections; $I \sim \cos^2[\phi(\mathbf{Q}, \mathbf{x})]$. The phase shift depends on reflection planes (\mathbf{Q}) and the relative strength (\mathbf{x}) of magnetic and ATS scattering.

Further, the energy profiles are obtained from the magnetic and ATS resonances exhibiting ~10 eV separation between the maximum resonance energies. The findings show that the Gd 5d band experienced hybridization giving rise to a significant split into isotropic lower energy band and distorted upper band states that account for the magnetic and ATS scattering, respectively.

References

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