

X-ray Scattering Study of the Low-temperature Commensurate-Incommensurate Phase-transition in TbMn_2O_5

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Comprehensive x-ray scattering studies, including resonant scattering at Mn L -, Tb L - and M -edges, were performed on single crystals of TbMn_2O_5 for crystallographic data to elucidate the nature of its commensurate and incommensurate phases. The scattering results provide direct evidences of symmetry lowering to the ferroelectric phase driven by magnetically induced lattice modulations, and show the presence of multiple magnetic orders. The competing orders under spin-frustrated geometry are believed to cause discommensuration and result in the commensurate-incommensurate phase transition around 24 K. It is proposed that low temperature incommensurate phase consists of commensurate domains separated by anti-phase domain walls which change both signs of spontaneous polarizations and x-ray scattering amplitudes for forbidden reflections.