

Abstract Submitted
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Lattice and Magnetic Effects on Multiferroic Transitions in Garnets DESPINA LOUCA, K. KAMAZAWA, U of Virginia, Dept. Physics, T. PROF-FEN, Los Alamos National Laboratory — The possible presence of ferroelectricity in a magnetically ordered state has attracted considerable attention particularly in ABO_3 and AB_2O_5 systems with $B = Mn$. Evidence for strong coupling of the two order parameters has been provided in the so-called multiferroics, where the field-induced polarization leads to a giant magnetoelectric effect and a magneto-dielectric effect. It was recently shown that the ferrimagnetic garnet crystal of $Tb_3Fe_5O_{12}$ exhibits a large magnetodielectric response as well when a very small magnetic field is applied (1). To understand the origin of the high sensitivity of the dielectric effect in garnets, we investigated the crystal and magnetic structures of $Tb_3(Fe/Ga)_5O_{12}$ using pulsed neutron diffraction. The garnet crystal appears to be very close to a lattice instability and high-resolution diffraction showed that the lattice gradually changes symmetry from cubic to rhombohedral with cooling over a wide temperature range. At the same time, magnetic diffuse scattering is observed that goes away by 15 K. The role of the lattice and of local distortions in the magnetic polarization and the coupling of the magnetostriction to the dielectric effect will be discussed. (1) N. Hur *et al*, Appl. Phys. Lett. **87**, 042901 (2005).

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