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Anisotropic lattice anomalies and the pressure effect on the ferroelectricity in multiferroic $HoMn_2O_5$ CLARINA DELA CRUZ, FEI YEN, BERND LORENZ, CHING-WU CHU, Texas Center for Superconductivity at the University of Houston, MARIN GOSPODINOV, Institute of Solid State Physics, Bulgarian Academy of Sciences, WILLIAM RATCLIFF, JEFFREY LYNN, NIST Center for Neutron Reserach — Distinctive anomalies in the linear thermal expansivities along all principal axes were observed in multiferroic $HoMn_2O_5$ at the magnetic (T_{N1} and T_{N2}) and ferroelectric (T_{C1} and T_{C2}) transitions with a notable negative thermal expansivity along the *c*-axis for T<25K. These measurements provide a clear evidence of significant coupling between the magnetic and lattice orders in this material. Two main anomalies were observed, one at the onset of ferroelectricity (T_{C1}) and the other at T_{C2} where another sharp change in the dielectric order was seen. The lattice anomalies were highly anisotropic where the *a*and *b*-axes expand as the *c*-axis shrinks upon cooling through T_{C1} and T_{C2}. The incommensurate AFM ordering of the Mn^{3+} spins has been associated with T_{N1}. This is characterized by a high degree of frustration that subsequently drives the ferroelectric displacements at the lock-in transition to a commensurate magnetic structure. The second magnetic anomaly at T_{N2} was shown via neutron diffraction to be due to a spin-reorientation phase transition. Dielectric measurements under isotropic pressure revealed that the two ferroelectric transitions are correlated and that the pressure stabilizes the ferroelectricity below T_{C2}.

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