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Magnetic phase competition in multiferroic hexagonal $Ho_{1-x}Y_xMnO_3$ JAGATH C. GUNASEKERA, YUAN WANG, TOM HEITMANN, OWEN P. VAJK, University of Missouri — Hexagonal $RMnO_3$ compounds are both ferroelectric and magnetic, a combination known as multiferroic. We have grown single-crystal samples of $Ho_{1-x}Y_xMnO_3$ at a variety of compositions to study the role of the rare-earth ion in $RMnO_3$. Previous neutron scattering measurements of $YMnO_3$ have revealed quasielastic scattering around the (1,0,L) position below T_N with in-plane correlations and no out-of-plane correlations [1]. These results have been attributed to phase competition between a 2D Kosterlitz-Thouless phase and 3D Néel order. We find similar quasielastic scattering in $Ho_{1-x}Y_xMnO_3$ samples, but the quasielastic scattering shows both in-plane and out-of-plane correlations below T_N. Magnetic Bragg scattering occurs at either the (1,0,0) or (1,0,1) positions depending on the phase, and quasielastic scattering is located at either the (1,0,1) or (1,0,0) position at whichever location the Bragg scattering is not. These results suggest that the observed quasielastic scattering may be related to competition not between 2D and 3D order, but between two different 3D orders. Since strong ferroelectric-magnetic coupling in $HoMnO_3$ is observed at the spin reorientation transition between these types of order, the fluctuations which give rise to this quasielastic scattering may give clues to the ferroelectric-magnetic coupling mechanism. [1] Sato et al., Phys. Rev. B 68, 104432 (2003).

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