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Resonant magnetic scattering of multiferroic $HoMnO_3$ S. NANDI, A. KREYSSIG, L. TAN, J.-W. KIM , J.Q. YAN, R.J. MCQUEENEY, P.C. CANFIELD , A.I. GOLDMAN , Dept. of Physics, Iowa State University, IA 50011, A. BARCZA, Institute for Phy. Chem., University Vienna, Austria — The multiferroic material $HoMnO_3$displays electrical polarization below the Curie temperature $T_C = 875$ K and antiferromagnetic Mn^{3+} ordering at Néel temperature, $T_N = 75$ K. The ferroelectric phase possesses hexagonal $P6_3cm$ symmetry with polarization $P_c = 5.6$ μC cm^{-2} along the hexagonal c axis. In order to shed further light on the magnetic order in this compound, element specific X-ray resonant magnetic scattering was performed at the Ho L_{III} absorption edge. Resonance enhancement was observed in both quadrupole and dipole channels below 40 K. Measurement of $(00l)$ and $(h0l)$(l odd) reflections have resolved contradictions present in the literature regarding the magnetic order of Ho^{3+} moments. From 40 K down to 6 K, Ho^{3+} moments order according to magnetic space group $P6_3^{'}cm^{'}$ with different values for the ordered moment on the Wyckoff sites 2a and 4b. According to this space group, Ho moments are ferromagnetically correlated in the **a-b** plane and antiferromagnetically correlated in the **c**-direction. The coincidence of the transition temperature (40 K) for Ho^{3+}moment ordering, spin rotation for Mn^{3+} moments, and sharp anomaly in dielectric constant indicates that the interplay between ferroelectricity and magnetism is strongly related to the Ho magnetic order.

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