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Magnetic properties of hexagonal $HoFeO_3$ thin films[1] ZHUYUN XIAO, XIAO WANG, Department of Physics, Bryn Mawr College, YAOHUA LIU, Argonne National Laboratory, XIAOSHAN XU, University of Nebraska-Lincoln, WENBIN WANG, Fudan University, DAVID KEAVNEY, Argonne National Laboratory, X.M. CHENG, Department of Physics, Bryn Mawr College — Multiferroic materials exhibit multiple ferroic orders simultaneously and have potential applications in information technology. Hexagonal $HoFeO_3$ (h-HFO) is a promising candidate for a multiferroics with room temperature ferromagnetism because of the expected enhanced Fe moment due to the exchange interaction between magnetic Ho^{3+} and Fe^{3+} ions. We report study of magnetic properties of epitaxial (001) h-HFO thin films deposited on (111) yttria-stabilized zirconia substrates via laser molecular beam epitaxy. X-ray diffraction of h-HFO thin films shows a six-fold symmetry. X-ray magnetic circular dichroism (XMCD) spectra for the Fe $L_{2,3}$ edges and Ho M_5 edge were measured with the magnetic field applied parallel to the x-ray propagation direction and 60° away from the film normal. Temperature dependence of the XMCD spectra shows ferromagnetic ordering of Fe^{3+} ions up to 200 K and paramagnetic behavior for Ho^{3+} ions above 10 K. The saturation magnetic moment for Fe^{3+} is determined by the sum rules to be 0.26 μ_B/Fe cation at 10 K and 0.064 μ_B/Fe cation at 200 K, which is about 10 times larger than the reported saturation Fe^{3+} magnetic moment in h-$LuFeO_3$. The SQUID magnetometer results agree with the XMCD results.

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