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Properties of $LuFe_2O_4$ Films Grown by Molecular-Beam Epitaxy R. MISRA, C.M. BROOKS, The Pennsylvania State University, University Park, PA, J.A. MUNDY, T. HEEG, Cornell University, NY, J. SCHUBERT, Peter Grunberg Institute (PGI 9-IT), Julich, Germany, Z.K. LIU, The Pennsylvania State University, University Park, PA, D. MULLER, D.G. SCHLOM, Cornell University, NY, P. SCHIFFER, The Pennsylvania State University, University Park, PA
— $LuFe_2O_4$ is an exotic material with a simultaneous existence of ferroelectricity and ferrimagnetism at the highest temperature (240 K) of any known material [1]. 25 nm thick films of this unusual multiferroic were grown by MBE on $MgAl_2O_4$, MgO, and SiC substrates. XRD shows that the $LuFe_2O_4$ films are single-phase and epitaxial. Film stoichiometry was regulated using an adsorption controlled growth process by depositing $LuFe_2O_4$ in an iron rich environment at pressures and temperatures where the excess iron desorbs from the film surface during growth. STEM images reveal the layered structure of $LuFe_2O_4$ and a clean substrate-film interface free of second phases. The magnetization data exhibits a rapid increase in magnetization below 240 K consistent with the bulk paramagnetic to ferrimagnetic phase transition. On further cooling, the zero field cooled (ZFC) branch of the magnetization displays a peak at 205 K that is suggestive of a glassy transition, which is also seen in bulk samples. At 100 K and 70 kOe, we observe a saturation magnetization of 2.4 μ_B/ f. u. (theoretical value of 3 μ_B/ f. u.)

[1] Ikeda *et. al.*, Nature **436** (2005) 1136–1138.

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