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Electronic Excitations and Optical Properties of $RFeO_3$ (R = Lu and Yb) Thin Films[1] RAM RAI, DEVLIN MCKENNA, CAITLIN HORVATITS , JULIANNA DU HART , Physics Department, SUNY Buffalo State, 1300 Elmwood Ave, Buffalo, NY 14222 — We present structural, electronic, and optical properties of multiferroic $RFeO_3$ (R = Lu and Yb) thin films, deposited on single crystal sapphire and YSZ substrates under the various growth conditions using RF Magnetron Sputtering. Growth temperature and annealing are found to be critical to stabilize hexagonal $RFeO_3$ thin films. Based on the X-ray diffraction data, annealing above ~900 ^{0}C has been found to change the crystal structure of $RFeO_3$ from a metastable hexagonal to an orthorhombic structure. Optical spectroscopy in the 0.5-6.5 eV range has been used to study the optical and electronic excitations of the $RFeO_3$ thin films. The electronic excitations dominated by Fe d to d on-site as well as O 2p to Fe 3d, R 6s, and R 5d charge-transfer transitions for hexagonal and orthorhombic $RFeO_3$ are distinctly different, consistent with the excitations from the FeO_5 and FeO_6 building blocks for hexagonal and orthorhombic $RFeO_3$, respectively. Further, the optical spectra exhibit strong temperature dependence with an anomaly at the magnetic transition, indicating a structural distortion. We'll also present the magnetic measurements data on the $RFeO_3$ thin films.

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