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Title: **Growth and Optical Properties of YFe_2O_4 Thin Films**

Thin films of functional materials are of great importance to building future technologies. One such promising material, that is the focus of this research, is Yttrium-Iron-Oxide (YFe_2O_4). What makes this material special is its optical and electrical properties, in particular how the thin films respond to electrical stimuli. YFe_2O_4 (in short YFO) has a triangular lattice structure occupied by the mixed valence states of Fe with equal number of Fe^{2+} and Fe^{3+} ions. We deposited 100 nm YFO thin films on single crystal (0001) sapphire substrates using the electron-beam deposition. In order to collect data the sample was connected in a circuit with the voltage source, then a combination of liquid nitrogen and a heating element were used to achieve equilibrium at different temperatures. All of this was done inside of an optical cryostat so that the transmittance and reflectance could be measured using a spectrometer in order to see how the thin film sample responded to the applied voltages. The optical spectra of YFO show several electronic excitations in the energy range 1 – 6.0 eV, and temperature dependence of the electronic excitations display an anomaly at 200 K, indicating a structural distortion. Furthermore, the YFO film showed significant changes in both transmittance and reflectance in response to applied voltages particularly at temperatures 200K and below. The observed electro-optical responses could arise from the electric-field-induced changes in the charge order state of YFO. More investigation is needed to determine the full story of what is going on, but from the data it seems that there may be a potential use for YFO films in devices.

Keywords: YFe_2O_4 thin films, optical properties, electron-beam deposition, electro-optical effects