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Anisotropic Electronic Properties of a-Axis Oriented Sr_2IrO_4 Epitaxial Thin Films[1] J. NICHOLS, O.B. KORNETA, J. TERZIC, L.E. DE LONG, J.W. BRILL, G. CAO, S.S.A. SEO, Dept. of Physics and Astronomy, University of Kentucky — We have successfully synthesized a-axis oriented Sr_2IrO_4 epitaxial thin films on $LaSrGaO_4$ (100) substrates by pulsed laser deposition. The tetragonal structure of the substrate allows for the film to grow with compressive strain along both in-plane directions (b- and c-axes). This results in the c-axis of the film being in-plane. We will present the anisotropic structural, electronic, and optical properties of these a-axis oriented thin films along both the b- and c-axes. X-ray diffraction confirms these films are of high quality and are fully strained along the c-axis while the b-axis undergoes strain relaxation. The c-axis resistivity is approximately one order of magnitude larger than that of the ab-plane. Optical absorption spectra with E$\perp c$ polarization show both Ir $5d$ intersite transitions and charge-transfer transitions (O $2p$ to Ir $5d$), while E$//c$ spectra show only the latter. The structural anisotropy created by biaxial strain in a-axis-oriented thin-films also changes the electronic structure and gap energy. These a-axis-oriented, epitaxial thin-films provide a powerful tool to investigate the highly anisotropic electronic properties of Sr_2IrO_4.

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