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Infrared and Visible Dielectric Properties of LSAT J.A. COOKE, T.N. NUNLEY, T. WILLETT-GIES, S. ZOLLNER, NMSU — LSAT stands for the chemical formula $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.35}$ and is a common substrate for epitaxial growth of complex metal oxides. Precise knowledge of the optical constants is useful to investigate the properties of epitaxial films grown on LSAT. We investigate the band gap and the infrared-active phonons as well as determine the dielectric function of LSAT, from the mid-IR to the deep UV (0.03 to 6.5 eV). Between 0.8 and 6.5 eV, we measured the normal-incidence transmission and the ellipsometric angles from 60 to 80 degree incidence in 2 degree steps on a J.A. Woollam variable angle of incidence ellipsometer. We also measured in the mid-IR on a rotating compensator FTIR ellipsometer. Transmission measurements show a steep rise of the absorption coefficient (α) between 4.6 and 4.8 eV where LSAT becomes opaque. Plotting α^2 versus photon energy yields a direct band gap of 5.8 eV. An Urbach tail extends towards lower energies. The resulting dielectric function is in agreement with previous ellipsometry and minimum-deviation prism measurements. The mid-IR dielectric function shows four ε peaks due to TO phonon absorption. The loss function shows four LO peaks. A fifth TO phonon was seen at 155 cm^{-1} in far-IR ellipsometry. The presence of FCC ordering was also confirmed with x-ray diffraction. We will also discuss temperature dependent ellipsometry and transmission measurements.

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