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Studies of the interfaces of polar perovskites grown on SrTiO₃

CARL J. STOLLE, MARK C. MONTI, JOHN T. MARKERT, Physics Department, University of Texas at Austin — We report on our methods used for growth and characterization of epitaxial oxide thin films, such as LaAlO₃ (LAO) grown on single crystal SrTiO₃ (STO) substrates. We have deposited epitaxial thin films on STO using a KrF (248 nm) pulsed excimer laser with a typical fluence of 3.3 J/cm² and a pulse repetition rate of 5 Hz incident on a polycrystalline LAO target. The deposition takes place under low oxygen pressures (0.1-10 mtorr) and on a heated substrate (700-900°C). We performed a systematic study of the chemical etch and anneal process used to create uniform TiO₂ terminated STO substrates. Two different chemical etchants were studied for a variety of etch times, a 6:1 mixture of NH₄F:HF and a 3:1 mixture of HCl:HNO₃. Substrates were then annealed in either air or oxygen for two hours at 750-950°C. An atomic force microscope was used to characterize the chemical etch and final film topography. X-ray diffraction rocking curves and θ - 2θ scans of deposited films demonstrate an epitaxial growth of LAO. Four-wire resistivity measurements of the interface were made via ohmic chromium contact pads created by thermal evaporation through a contact shadow mask. This work was supported by: Texas Advanced Research Program 003658-0126, The Robert A. Welch Foundation F-1191, and the National Science Foundation DMR-0605828.

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