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Atomic Layer-by-Layer Growth of Homoepitaxial $SrTiO_3$ Films by Laser MBE QINGYU LEI, GUOZHEN LIU, KE CHEN, Department of Physics, Temple University, SUILIN SHI, FUQIANG HUANG, CAS Key Laboratory of Materials for Energy Conversion, Shanghai Institute of Ceramics, Chinese Academy of Sciences, XIAOXING XI, Department of Physics, Temple University — Two most effective techniques for oxides film growth are reactive MBE and laser MBE. With alternating monolayer growth, reactive MBE has shown the capacity of stoichiometry control and crystalline perfection in $SrTiO_3$ films on $SrTiO_3$, while most works of laser MBE, using compound targets, often shows non-stoichiometry and lattice defects. In order to control layer-by-layer growth to atomic level, we carried out laser MBE from separate oxide targets, for example, growing $SrTiO_3$ from SrO and TiO_2 targets, such that the SrO and TiO_2 layers were deposited alternatively one atomic layer at a time. X-ray diffraction spectra showed that the stoichiometric $SrTiO_3$ film peak overlapped with and was indistinguishable from the $SrTiO_3$substrate peak, while the off stoichiometric $SrTiO_3$ films, either Sr rich or poor, showed lattice expansion. We conclude that laser MBE from separate oxide targets can achieve the same stoichiometry control as reactive MBE.

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