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Atomic Layer-by-layer Growth of Oxide Thin Films by Laser MBE QINGYU LEI, GUOZHEN LIU, MARYAM GOLALIKHANI, DONGYUE YANG, KE CHEN, ALEXANDER X. GRAY, Department of Physics, Temple University, DARIO ARENA, National Synchrotron Light Source, Brookhaven National Laboratory, ANDREW FARRAR, DMITRI TENNE, Department of Physics, Boise State University, SUILIN SHI, FUQIANG HUANG, CAS Key Laboratory of Materials for Energy Conversion, Shanghai Institute of Ceramics, Chinese Academy of Science, XIAOXING XI, Department of Physics, Temple University — We have established a laser MBE-based atomic layer-by-layer thin film growth technique. By in-situ monitoring the reflection high-energy electron diffraction (RHEED) intensity, oxide binary compound targets, such as SrO, TiO_2, were ablated sequentially to assemble $SrTiO_3$ in an atomic layer-by-layer manner. Stoichiometry and crystal structures of the films are confirmed ex-situ by Rutherford backscattering spectrometry and x-ray diffraction. UV Raman spectroscopy was used to probe the symmetry breaking due to the cation off-stoichiometry. Highly accurate stoichiometry control as shown by reactive MBE has been demonstrated. Similarly, $CaMnO_3$ films were deposited by ablating CaO and MnO_2 targets separately. The strain states and electronic structure of the $CaMnO_3$ films on various substrates were studied via x-ray diffraction and polarization-dependent x-ray absorption spectroscopy. This atomic layer-by-layer growth technique has applications on the growth of a wide range of perovskite thin films and superlattices.

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