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Atomic Layer-by-Layer Growth of Homo-epitaxial SrTiO₃ Films by Laser MBE MARYAM GOLALIKHANI, 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 — A precise customization of oxide hetero-structures at the atomic layer level became possible with layer-by-layer growth of oxide thin films by laser MBE from separate oxide targets. In situ characterization during growth helps to optimize the composition of these superlattices. In this work we focused on the reflection high energy electron diffraction (RHEED) spot analysis for in situ growth control of stoichiometric SrTiO₃ thin films in an atomic layer-by-layer manner from separate SrO and TiO₂ targets. We have shown that both stoichiometry and full monolayer dose can be controlled using RHEED diffraction spot intensity oscillations. Observations of a single sharp peak in x-ray diffraction spectra confirm the same composition of the films as that of the stoichiometric SrTiO₃ substrate. We have successfully demonstrated that this new approach of laser MBE can achieve the same precise stoichiometry control as shown by reactive MBE.

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