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A new method for in situ calibration of cation stoichiometry during perovskite growth by RHEED (Reflection High-Energy Electron Diffraction) KANISHKA WIJESEKARA, QINGYU LEI, MARYAM GOLALIKHANI, BRUCE DAVIDSON, XIAOXING XI, Temple University, Department of Physics, Philadelphia PA 19122 — Reflection High-Energy Electron Diffraction (RHEED) is used in situ in the growth of epitaxial oxide perovskite (ABO_3) thin films by Atomic Layer-by-Layer Laser MBE (ALL-Laser MBE). Complete layer coverage of a single AO layer or a BO_2 layer is independently determined by observing the intensity of the diffracted RHEED spot. As the AO and BO_2 layers are deposited separately, the chemical structure factor and surface roughness is reflected in the intensity. For routine control of film growth, the diffracted intensity is monitored to peak or to bottom by the flux of an elemental oxide source, creating an oscillation of the intensity where one complete cycle is represented by one-unit cell of film growth. To calibrate growth rates, we use a novel method which is more sensitive to the film stoichiometry. An excess A site flux is first provided such that the subsequent growth of stoichiometric unit cells is observed as a split-peak oscillation. Since there are more sharp features in the split peak, this allows for an accurate stoichiometry calibration. This technique was first successfully used by Davidson et al. for Reactive Oxide MBE. Our results further demonstrate that it is a powerful tool for the ALL growth of epitaxial perovskite thin films.

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