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Atomically-Resolved In-Situ Studies of Surface Structure Evolution of PLD-Grown $La_{5/8}Ca_{3/8}MnO_3$ Thin Films[1] ALEXANDER TSELEV, RAMA VASUDEVAN, LIANG QIAO, MICHAEL BIEGALSKI, ARTHUR BADDORF, SERGEI KALININ, Oak Ridge National Laboratory, Oak Ridge, TN — Here, we report atomically resolved in-situ Scanning Tunneling Microscopy (STM) studies of $La_{5/8}Ca_{3/8}MnO_3$ (LCMO) thin films grown by RHEED-assisted PLD. Films were grown on TiO_2-terminated (001) $SrTiO_3$ substrates at a substrate temperature of 750 °C and O_2 pressure of 50 mTorr. *In-situ* UHV STM was performed at room temperature. LCMO is known to grow in layer-by layer (LBL) mode. We find that the initial growth does not follow the best physically possible LBL growth (with only three u.c. layers exposed). RHEED oscillations decay during deposition of the first 10-15th unit cells. Subsequently, the RHEED intensity oscillations grow and remain persistent. STM images of 16 u.c.-thick films revealed surfaces with up to five u.c. layers being exposed in a stepped island-like morphology with 1/2 u.c. step heights. Such morphology allowed studies of atomic surface structure of both terminations. 25 u.c.-thick samples were found to be almost single-terminated. The minor termination is ordered and exhibits (1x1) reconstructions; RHEED suggests that this termination is the La/Ca-O termination. A 250 u.c.-thick film was found to be single-terminated with only three u.c. layers exposed.

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