Reconstruction of SrRuO$_3$ Films During Pulsed Laser Deposition\textsuperscript{1} ARTHUR BADDORF, JUNSOO SHIN, ALBINA BORISEVICH, VINCENT MEUNIER, SERGEI KALININ, Oak Ridge National Laboratory, E. WARD PLUMMER, Louisiana State University — SrRuO$_3$ (SRO) is a perovskite oxide conductor, widely used as an electrode in thin film systems due to its chemical and lattice compatibility. SRO thin films were grown on SrTiO$_3$ substrates by pulsed laser deposition and monitored with high-pressure reflection high-energy electron diffraction. High quality growth and flat films were confirmed with ex situ atomic force and scanning transmission electron microscopies. Oxygen growth pressures below \textasciitilde10 mtorr produced films that exhibited surface oxygen vacancies seen with scanning tunneling microscopy (STM). Typically, high oxygen pressures are employed to minimize oxygen vacancies, however for growth or post-annealing above \textasciitilde100 mtorr, in situ characterization by STM and low energy electron diffraction (LEED) revealed a surface reconstruction consisting of parallel rows with periodicity doubled in one direction. Density function theory (DFT) has found that additional oxygen can increase stability of a structure in which SrO rows buckle outward with excess oxygen bonding below. Reconstruction will affect film structures, interface properties, and screening.

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