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Growth kinetic of perovskite oxide monolayers on $SrTiO_3$(100) studied with reflection high energy electron diffraction (RHEED) and oblique-incidence optical reflectivity difference measurements. XU WANG, YIYAN FEI, XIANGDONG ZHU, Department of Physics, University of California at Davis — Using a combination of RHEED and an oblique-incidence optical reflectivity difference technique (OI-RD, a form of polarization modulated ellipsometry), we studied the growth of 5% doped Nb:$SrTiO_3$ monolayers on $SrTiO_3$(100) under pulsed laser deposition condition (PLD) in a molecular oxygen ambient. By interrupting the deposition at the completion of one monolayer and continuing the RHEED and OI-RD measurement during post-deposition annealing, we can separate contributions to the optical reflectivity difference signal from kinetics of growth and oxidation. Based on a mean-field theory of optical reflectivity difference off an atomically rough and yet optically smooth film, we find that a growth-dependent part of the reflectivity difference signal is proportional to the step edge density or equivalently the root-mean-square (rms) of the roughness of a growth surface. We show that the surface roughness during the interrupted deposition of Nb:$SrTiO_3$ monolayers on $SrTiO_3$(100) can be analyzed with a 8-level growth model with two adjustable parameters. The parameters obtained by fitting the model to the OI-RD signal during the *interrupted* deposition can be used subsequently to predict the growth behaviour of Nb:$SrTiO_3$ on $SrTiO_3$(100) in a *continuous* pulsed laser deposition as reported earlier by Fei and co-workers.

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