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Analysis of layer-by-layer thin-film oxide growth using RHEED and Atomic Force Microscopy[1] ELI ADLER, M.C. SULLIVAN, Ithaca College, Department of Physics and Astronomy, ARACELI GUTIERREZ-LLORENTE, H. JORESS, A. WOLL, J.D. BROCK, Cornell High Energy Synchrotron Source, Cornell University — Reflection high energy electron diffraction (RHEED) is commonly used as an *in situ* analysis tool for layer-by-layer thin-film growth. Atomic force microscopy is an equally common *ex situ* tool for analysis of the film surface, providing visual evidence of the surface morphology. During growth, the RHEED intensity oscillates as the film surface changes in roughness. It is often assumed that the maxima of the RHEED oscillations signify a complete layer, however, the oscillations in oxide systems can be misleading. Thus, using only the RHEED maxima is insufficient. X-ray reflectivity can also be used to analyze growth, as the intensity oscillates in phase with the smoothness of the surface. Using x-ray reflectivity to determine the thin film layer deposition, we grew three films where the x-ray and RHEED oscillations were nearly exactly out of phase and halted deposition at different points in the growth. Pre-growth and post-growth AFM images emphasize the fact that the maxima in RHEED are not a justification for determining layer completion.

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Eli Adler
Ithaca College

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