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Polarity and the Metal-Insulator Transition in ultrathin $LaNiO_3$ on $SrTiO_3$ J.W. FREELAND, I.C. TUNG, Advanced Photon Source, Argonne National Laboratory, G. LUO, University of Wisconsin, Madison, H. ZHOU, Advanced Photon Source, Argonne National Laboratory, J.H. LEE, Korea Atomic Energy Research Institute, S.H. CHANG, Materials Science Division, Argonne National Laboratory, D. MORGAN, University of Wisconsin, Madison, M.J. BEDZYK, Northwestern University, D.D. FONG, Materials Science Division, Argonne National Laboratory — Dimensionality and strain control of nickelates has been shown as a route for control of interesting electronic and magnetic phases. However, little is know about the evolution of atomic structure in these layered architectures and the interplay with these states. Here we present, a detailed study of lattice structures measured real time during the layer-by-layer growth of LaNiO3 on SrTiO3. Using hard X-rays coupled with oxide MBE, we have tracked the lattice structure evolution as a function of depth across the regime where transport shows a clear metal to insulator transition. At the same time X-ray absorption shows the films are closer to $LaNiO_{2.5}$ when thin and evolve to $LaNiO_3$ by 10 unit cells thickness. Analysis of the structure during growth displays a very complex evolution throughout the film of the lattice parameter and displacement of the B-site from the unit cell center, which theory connects with pathways of compensating the polar mismatch at the surface and interface. Work at the APS, Argonne is supported by the U.S. Department of Energy, Office of Science, and Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

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