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Effect of Polar Discontinuity on the Growth of Epitaxial $LaNiO_3$ Ultrathin Films I.-CHENG TUNG[1], Department of Materials Science and Engineering, Northwestern University, G. LUO, D. MORGAN, Department of Materials Science and Engineering, University of Wisconsin-Madison, J.H. LEE[2], H. HONG, Advanced Photon Source, Argonne National Laboratory, S.H. CHANG, J.A. EASTMAN, D.D. FONG, Materials Science Division, Argonne National Laboratory, M.J. BEDZYK, Department of Materials Science and Engineering, Northwestern University, J.W. FREELAND, Advanced Photon Source, Argonne National Laboratory — We have conducted a detailed microscopic study of epitaxial $LaNiO_3$ ultrathin films grown on (001) $SrTiO_3$ as a function of thickness by using oxide molecular beam epitaxy with in-situ surface x-ray diffraction and soft x-ray absorption spectroscopy at the Advanced Photon Source to explore the influence of polar mismatch on the resulting structural and electronic properties. Our data demonstrate that the initial layers on the nonpolar $SrTiO_3$ surface exhibit a smaller than expected out-of-plane lattice-spacing with a Ni valence of 2+. As the film becomes thicker, the lattice constant expands to its elastic limit, and the Ni valence approaches 3+. We will also discuss the energetics for vacancy formation during the initial growth as determined by density functional theory calculations. 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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