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Unique metal to insulator transition in a rare earth nickelate observed using near field microscopy KIRK POST, A.S. MCLEOD, Univ of California - San Diego, M. HEPTING, M. BLUSCHKE, Max-Planck-Institut fur Festkorperforschung, YIFAN WANG, Purdue University, G. CRISTIANI, G. LOGVENOV, E. BENCKISER, Max-Planck-Institut fur Festkorperforschung, E.W. CARLSON, Purdue University, B. KEIMER, Max-Planck-Institut fur Festkorperforschung, D.N. BASOV, Columbia University — Using scanning near-field optical microscopy (SNOM), in conjunction with resonant x-ray scattering, and far-field ellipsometry, we have uncovered unique optical behavior through the insulator-to-metal transition of the rare earth nickelate, $NdNiO_3$. Our experiments indicate that $NdNiO_3$ transitions directly between the high temperature metallic and low temperature insulating end phases, without any obvious intermediary phase in the SNOM images. Our nano-optical images also resolve the emergence of distinct real-space textures through the transition, including metallic percolation, a long-range stripe in addition to persistent nano-scale metallic puddles, with transition temperatures in the latter two structures, suppressed relative to the overall sample. Furthermore, SNOM images show nuanced differences between warming and cooling branches of the transition, suggestive of distinct physics underlying the transition in these two regimes.

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