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Spatially ordered transit through a canonical Mott transition revealed by cryogenic nano-imaging A.S. MCLEOD, University of California San Diego, 9500 Gilman Dr, La Jolla, CA 92093, E. VAN HEUMEN, University of Amsterdam, Sciencepark 904, 1098 XH Amsterdam, Netherlands, J.G. RAMIREZ, S. WANG, T. SAERBECK, S. GUENON, M. GOLDFLAM, L. ANDEREGG, P. KELLY, A. MUELLER, M.K. LIU, I.K. SCHULLER, D.N. BASOV, University of California San Diego, 9500 Gilman Dr, La Jolla, CA 92093 — We report on temperature-dependent (24K-300K) near-field infrared (IR) imaging of the canonical Mott insulator V_2O_3 across its temperature-driven metal-insulator transition. This was accomplished using a home-built s-SNOM (scattering-type scanning near-field optical microscope) affording unprecedented spatial resolution ($\sim$ 20 nm) to surface optical properties with simultaneously acquired AFM topography at *cryogenic temperatures*. Our V_2O_3 thin film is found to exhibit extreme nano-scale electronic heterogeneity near the Mott transition (170K) from paramagnetic metal to antiferromagnetic insulator. A sequence of nano-IR images acquired across the transition provides a direct probe of the metal/insulator fill fraction in accord with an observed percolation-driven resistive transition. We resolve dynamic evolution of electronic phases and a crossover from long- to short-range spatial correlations. Identification of the attendant V_2O_3 structural transition by X-ray diffraction reveals an unexpected decoupling of Mott and structural transitions. Supported by nano-IR imaging of remnant metallic puddles below the Mott transition, these observation point towards a novel low-temperature metallic phase.

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