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Infrared nano-imaging of metallic and insulating domains in single crystalline vanadium dioxide nanowires ANDREW JONES, JIANG WEI, DAVID COBDEN, MARKUS RASCHKE, University of Washington — Correlated electron systems are often associated with heterogeneous electronic and structural phase transitions with ordering and domain formation on nanometer length scales. Vanadium Dioxide (VO_2) has long been a material of research focus due to behavior associated with its temperature induced metal-insulator transition (MIT) occurring around 340K. The underlying mechanism of this transition is thought to be the result of a complex interplay between the lattice and electronic degrees of freedom as the material passes through the MIT, whose origin is as of yet poorly understood. We study the nanometer scale formation of insulating and metallic domains of single crystal VO_2 nanowires bonded to silica substrate using infrared scattering-scanning near field optical microscopy (s-SNOM). Imaging contrast is obtained due to the distinct optical dielectric properties of the respective metallic and insulating phases. A hierarchy of domain sizes is observed, suggesting two distinct insulating phases in addition to the metallic phase as the material moves through the MIT.

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