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Electronic and structural transformations near the insulator-to-metal transition in vanadium dioxide M. M. QAZILBASH[1], A. TRIPATHI, A. FRENZEL, O. G. SHPYRKO, D. N. BASOV, Department of Physics, University of California, San Diego, M. V. HOLT, J. M. MASER, Center for Nanoscale Materials, Argonne National Laboratory, BYUNG-GYU CHAE, BONG-JUN KIM, HYUN-TAK KIM, Electronics and Telecommunications Research Institute (ETRI), Daejeon, Korea — Vanadium dioxide (VO_2) undergoes an insulator-to-metal transition (IMT) at $T \approx 340$ K accompanied by a change in the lattice structure. Numerous studies of this phase transition in VO_2 have focused either on the electronic change or on the structural change. The interplay between the electronic and lattice degrees of freedom has been relatively unexplored. In previous work using scanning near-field infrared microscopy (SNIM), we showed that the electronic IMT in VO_2 films proceeds via nucleation and percolation of nanoscale metallic domains [1,2,3]. Here we present nanoscale X-ray diffraction measurements that image the structural changes in a VO_2 film with 40 nm spatial resolution. In addition, local resistivity and SNIM measurements of the electronic IMT in the VO_2 film allow us to present a coherent picture of this complex phase transition. 1. M. M. Qazilbash et al., Science 318, 1750 (2007). 2. M. M. Qazilbash et al., Phys. Rev. B 79, 075107 (2009). 3. A. Frenzel et al., Phys. Rev. B 80, 115115 (2009).

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