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Search for a structural intermediate phase accompanying the metal-insulator transition of vanadium dioxide thin films JOYEETA NAG, RICHARD HAGLUND, Vanderbilt University, ANDREW PAYZANT, KARREN MORE, Oak Ridge National Laboratory, STEPHAN PAULI, PHIL WILLMOTT, Paul Scherrer Institute — Recent studies have shown evidence for the formation of a strongly correlated metal (SCM) phase in the metal-insulator transition (MIT) in vanadium dioxide; the spectral signatures of the SCM are distinct from the rutile metallic phase observed once the MIT is complete around 67C. We describe a search for a corresponding intermediate in the structural phase transition (SPT) from monoclinic to tetragonal, using both high-temperature X-ray diffraction (HTXRD) and synchrotron radiation experiments. The HTXRD experiments, with both epitaxial and highly ordered VO_2 films on c-cut sapphire, showed that the hysteresis in the VO_2 dielectric function derived from a Bruggeman effective-medium treatment was not congruent in temperature with that known from optical studies of the MIT. However, there was no evidence for anything other than a mixed tetragonal-monoclinic phase as the temperature was varied from below to above the critical temperature. The synchrotron experiments, carried out with samples prepared by in situ pulsed laser deposition on a-, c- and r-cut titania, on the other hand, do not rule out the existence of an intermediate structural phase, and may provide some support for such a strongly correlated structural phase.

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