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Electronic structure of H_xVO_2 probed with *in-situ* spectroscopic ellipsometry SO YEUN KIM, LUKE J. SANDILANDS, TAEDONG KANG, JAE-SEOK SON, Center for Correlated Electron Systems, Institute for Basic Science (CCES, IBS), C. H. SOHN, Materials Science and Technology Division, Oak Ridge National Laboratory, HYOJIN YOON, JUNWOO SON, Department of Materials Science and Engineering, Pohang University of Science and Technology, S. J. MOON, Department of Physics, Hanyang University, T. W. NOH, CCES, IBS — Vanadium dioxide (VO_2) undergoes a metal-to-insulator transition (MIT) near 340K. Despite extensive studies on this material, the role of electron-electron correlation and electron-lattice interactions in driving this MIT is still under debate. Recently, it was demonstrated that hydrogen can be reversibly absorbed into VO_2 thin film without destroying the lattice framework. This H-doping allows systematic control of the electron density and lattice structure which in turn leads to a insulator (VO_2) - metal (H_xVO_2) - insulator (HVO_2) phase modulation [Yoon *et al.*, Nat. Mat. **15**, 1113-1119 (2016)]. To better understand the phase modulation of H_xVO_2, we used *in-situ* spectroscopic ellipsometry to monitor the electronic structure during the hydrogenization process, i.e. we measured the optical conductivity of H_xVO_2 while varying x. Starting in the high temperature rutile metallic phase of VO_2, we observed a large change in the electronic structure upon annealing in H gas at 370K: the low energy conductivity is continuously suppressed, consistent with reported DC resistivity data, while the conductivity peaks at high energy show strong changes in energy and spectral weight. The implications of our results for the MIT in H_xVO_2 will be discussed.

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