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Infrared micro-spectroscopy of strained VO_2 micro-crystals M.M. QAZILBASH, T. HUFFMAN, E.J. WALTER, H. KRAKAUER, Department of Physics, College of William and Mary, JIANG WEI, D.H. COBDEN, Department of Physics, University of Washington, Seattle, H.A. BECHTEL, M.C. MARTIN, Advanced Light Source, Lawrence Berkeley National Laboratory, G.L. CARR, National Synchrotron Light Source, Brookhaven National Laboratory, D.N. BASOV, Department of Physics, University of California, San Diego — The temperature-driven insulator-to-metal transition (IMT) in vanadium dioxide (VO_2) is accompanied by a structural instability (SI). The IMT and SI lead to a drastic change in the electronic properties, crystal structure, and lattice dynamics. We performed infrared micro-spectroscopy on single crystal platelets of VO_2 deposited on oxidized silicon substrate by physical vapor deposition. The firm attachment of these micro-crystals to the substrate causes strain which can alter their properties compared to bulk samples. We report infrared data on these micro-crystals and demonstrate both their electronic and phonon properties in the monoclinic M1 phase and the rutile phase. We also compare their infrared conductivity to that of bulk single crystals and thin films. Finally, we compare infrared-active phonon features to first-principles density functional theory calculations.

M. M. Qazilbash
Department of Physics, College of William and Mary

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