Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Photoinduced structural dynamics and transformation pathway of sapphire-supported ultrathin vanadium dioxide[1] DING-SHYUE YANG, XING HE, NAPAT PUNPONGJAREORN, Univ of Houston, CHONGLIN CHEN, Univ of Texas, San Antonio, YUAN LIN, University of Electronic Science and Technology of China — The complex phase-transition behaviors of vanadium dioxide (VO_2) have drawn continual attention because of their strong dependence on a wide range of factors including temperature, strain, doping, photoexcitation, and voltage. Dynamically, ultrafast electron diffraction (UED) with atomic-scale spatial and temporal resolution has been used to unravel the transformation pathway in the photoinduced structural phase transition of VO_2, using bulk and nearly strain-free specimens. In this presentation, we report the UED results from 10-nm-thick crystalline VO_2 supported on $Al_2O_3(0001)$ and examine the influence of surface strain on the ultrafast structural transformation. It becomes clear that a complete conversion from the monoclinic phase to the tetragonal lattice does not take place on the time scale of few hundred picoseconds unless a fluence multiple times higher than the thermodynamic enthalpy threshold is used. For some crystalline domains, structural transformation may not be seen even after 1 ns following an intense photoexcitation. The implications of the present and previous observations as well as the transformation pathway will be discussed.

[1]We gratefully acknowledge the support from the R. A. Welch Foundation (Grant No. E-1860) and the University of Houston.

Ding-Shyue Yang
Univ of Houston

Date submitted: 10 Nov 2016 Electronic form version 1.4