SES08-2008-000026

Abstract for an Invited Paper
for the SES08 Meeting of
the American Physical Society

Microstructure and Transport properties of epitaxial VO_2 thin films on TiO_2 substrates[1]

JIWEI LU, University of Virginia

Vanadium oxides are paradigms of strongly correlated oxides and have attracted attention because of the metal insulator transitions (MIT) that several of the oxides and sub-oxides exhibit. In particular, VO2 has a metal–semiconductor transition at 340 K. This transition in VO2 combines the properties of a pure Mott Hubbard electronic transition with those of a Peierls structural transition. The Mott transition is responsible for the extreme speed of the optical switching that has been observed (faster than 100 fs). Understanding this transition and how to control it remains a challenge for both theory and experimental physics. We used a novel deposition technique, Reactive Bias Target Ion Beam Deposition, to grow 40 nm epitaxial VO2 thin films on rutile TiO2 substrates with various crystal orientations. X-ray diffraction (XRD) was used to explore the epitaxy of VO2 and we found that all VO2 thin films on TiO2 substrates showed tetragonal symmetry at room temperature due to the constrain from rutile substrates. We also characterized the metal-insulator transition of VO2 films as the function of the crystal orientation of rutile TiO2. We also characterized the anisotropy of VO2 thin films. In collaboration with Kevin West and Stuart Wolf, University of Virginia.

[1]This project is funded by DARPA through ARO.