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Transport Anisotropy of Epitaxial VO_2 films grown on (100) TiO_2
SALINPORN KITTIWATANAKUL, Department of Physics, University of Virginia, JIWEI LU, Department of Materials Science and Enginieering, University of Virginia, STUART WOLF, Department of Physics, University of Virginia — Vanadium dioxide (VO_2) exhibits a metal semiconductor transition (MST) at 340 K. This transition is accompanied by the abrupt change in the electrical conductivity, optical transmittance and reflectance in infrared region, which can be used in the electronic devices such as temperature sensors and electric switches. In this study, Reactive Bias Target Ion Beam Deposition was used for epitaxial VO_2 thin film growth on TiO_2 (100) substrates. The out-of-plane and the in-plane XRD scans have been performed to confirm the single phase VO_2 and the epitaxial relationship between the film and the substrate. The hall bars along the in-plane c-axis and b-axis of R-VO_2 were fabricated via the photolithographic process. It is found that the maximum conductivity was parallel to c-axis, while the minimum conductivity was parallel to b-axis. The conductivity anisotropy persisted through the metal semiconductor transition. The conductivity anisotropy ratio σ_c/σ_b was found to be $\sim$16.2 at 300 K, much larger than that of single crystal VO_2. The temperature dependent anisotropy of the carrier concentration and the mobility is to be discussed.

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