Strained $\alpha$-Sn Thin Films on Highly Lattice-Mismatched GE Substrates

Abstract

With the demonstration of strained $\alpha$-Sn as a topological insulator (TI) in 2013, strained $\alpha$-Sn thin films have attracted significant attentions. Most of the $\alpha$-Sn thin films reported to date were deposited on nearly lattice-matched InSb or CdTe substrates, using molecular beam epitaxy (MBE). We deposited Sn thin films on highly lattice-mismatched Ge substrates through physical vapor deposition (PVD) of solid Sn sources. X-ray diffraction (XRD) characterization indicated that $\alpha$-Sn thin films with high crystalline quality were formed on Ge substrates. Dielectric force microscopy (DFM) measurement revealed that our $\alpha$-Sn thin films were n-type semiconductors. We also observed a zero-bias anomaly (ZBA) in the DFM responses of our samples which could be a signature of the gapless metallic surface state of a TI. These $\alpha$-Sn thin films therefore might be promising candidates for low-dissipation next generation electronics.