Highlights

Other Materials —2017

Giant Rashba Splitting in $Pb_{1-x}Sn_xTe$ (111) Topological Crystalline Insulator Films Controlled by Bi Doping in the Bulk

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We show by means of Angle Resolved Photoemission (ARPES) that Bi and Sb-doped topological crystalline insulator (TCI) $Pb_{1-x}Sn_xTe$ (111) films represent a giant Rashba system that features record Rashba coupling constant. Contrary to most other systems, the strength of the Rashba effect is effectively controlled by the bulk doping. Our detailed theoretical analysis reveals that it originates from a large upward band bending at the surface due to electron surface traps whose occupancy is controlled by the bulk Fermi level. Doping also allows compensating the intrinsic p-type character of TCI materials, resulting in high carrier mobilities that enable optical and topological quantum transport investigations otherwise screened by the bulk contribution.

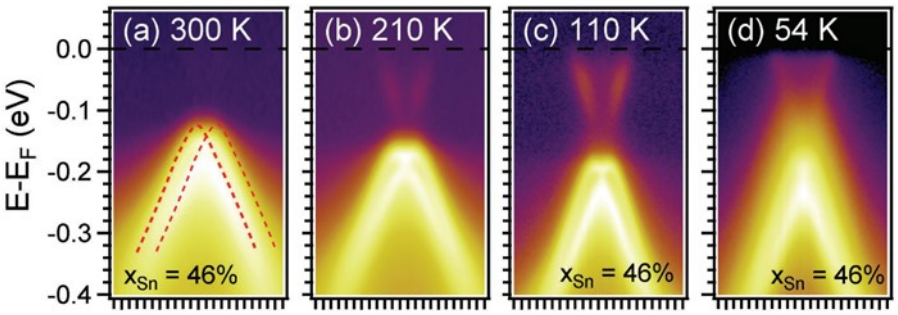

Fig.1: Topological phase transition characterized by ARPES. a–d) Temperature-dependent E(k) maps of a $Pb_{0.54}Sn_{0.46}Te$ (111) epilayer with 0.25% Bi measured around Gamma-bar of the surface Brillouin Zone using a photon energy of 18 eV. The topological transition occurs at about 110 K.