ARPES on Surface of Topological Crystalline Insulator $Pb_{1-x}Sn_xSe$ Epilayers with Transition Metal Adsorbates

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Understanding the band structure of the transition metal/topological insulator (TM/TI) interface is of importance for future TI applications. For example, topological states (TSS) on magnetic TM/TI interface can provide an efficient mechanism for charge-spin interconversion and create a platform for future spintronic devices [1]. Topological crystalline insulators (TCIs) exhibit TSS protected by mirror crystal symmetry that are very sensitive to external perturbations [2, 3]. Here we report ARPES experiments on topological crystalline insulator $Pb_{1-x}Sn_xSe$ epilayers with Fe, Mn transition metal adsorbates of submonolayer thickness. The high-quality epilayers were grown by molecular beam epitaxy in (111) and (001) orientation and were transported to a synchrotron without breaking the ultra-high vacuum, where subsequent in-situ deposition of metals and ARPES measurements were performed. Formation of Rashba split surface states (RSS) was detected in the conduction band for (111) oriented samples (Fig. 1a). Estimated Rashba parameter a_R can be tuned over a wide range from 0 to 1.5 eV·Å as a function of deposited TM. For (001) oriented films, a decrease of separation in *k*-space between Dirac points of the double Dirac cone was observed (Fig. 1b). The reasons for band structure modification with TM deposition will be discussed.

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References

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Figures

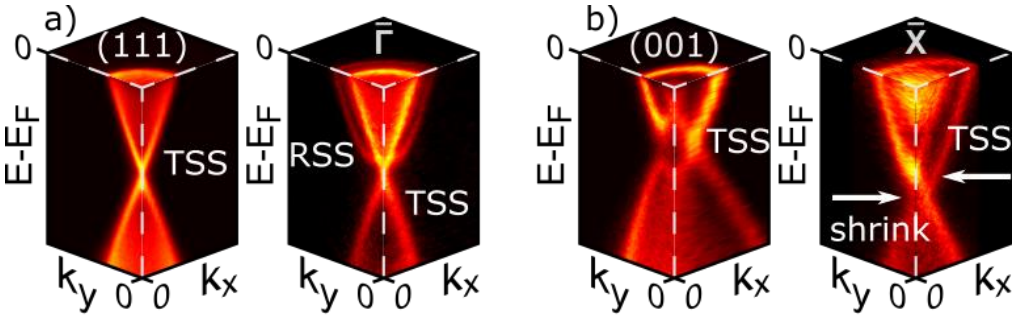

Figure 1: ARPES spectra of a) (111) and b) (001) $Pb_{0.75}Sn_{0.25}Se$ epilayer before and after transition metal deposition.