Annealing Effects in Topological α-Sn/InSb Heterostructures Revealed by Photoemission Spectroscopy

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There has been much interest recently in exploring the electronic structure of novel topological materials due to their exotic underlying physics and great potential for applications. In particular, α-Sn has gained much attention due to its simple elemental structure, non-toxic nature and the diverse tunable topological phases it can reveal ranging from a topological insulator (TI) to a topological Dirac semimetal (TDS) depending on the applied strain [1]. Angle-resolved photoemission spectroscopy (ARPES) has uncovered various aspects of the electronic structure of α-Sn including the predicted linear bands and Dirac cones [2]. However, there is an urging need to explore the stability of this compound under various conditions which is an important requirement for successful use in applications especially in spintronic devices.

In this talk, we will mainly discuss about the annealing effects on the electronic structure of α-Sn/InSb heterostructures as revealed by x-ray photoemission spectroscopy (XPS). Interestingly, our XPS results demonstrate the thermal stability of α-Sn thin films over InSb substrates up to 350 °C. By studying both core-level and valence-band spectra, it was concluded that no dramatic evaporation and no α to β phase transition has occurred in the α-Sn thin films. This presents robust evidence for the reliability of using this compound in devices up to high temperatures.

We will also present an overview on our previous work and our future perspectives for using HiSOR for high-resolution ARPES studies on high-T_c superconductors and other novel materials.

REFERENCES

1. L. D. Anh *et al.*, *Adv. Mater.*, 33, 2021, pp. 2104645.
2. K. H. M. Chen *et al.*, *Phys. Rev. B*, 105, 2022, pp. 075109.