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Realization of topological phase transition in $Pb_{1-x}Sn_xTe$ (111) films[1] CHENHUI YAN, Institute of Metal Research, Chinese Academy of Sciences, JUNWEI LIU, YUNYI ZANG, ZHENYU WANG, JIANFENG WANG, Department of Physics, Tsinghua University, ZHIDONG ZHANG, Institute of Metal Research, Chinese Academy of Sciences, LILI WANG, XUCUN MA, SHUAIHUA JI, KE HE, Department of Physics, Tsinghua University, LIANG FU, Department of Physics, Massachusetts Institute of Technology, WENHUI DUAN, QI-KUN XUE, XI CHEN, Department of Physics, Tsinghua University — Recently, it was confirmed that the single crystal SnTe is a Topological crystalline insulator (TCI) by theoretical calculations and experiments. It is well known that the (001) surfaces of SnTe are the natural cleavage planes and therefore all the previous experiments for the TCI phase were performed on the (001) surfaces. The (111) surface, which is a polar surface with unpaired electrons, is very difficult to obtain by traditional crystal growth method. Here we present the epitaxial growth of high quality $Pb_{1-x}Sn_xTe$ (111) films and observation of TCI phase by in-situ angle-resolved photoemission spectroscopy. The $Pb_{1-x}Sn_xTe$ (111) films undergo a topological phase transition from trivial insulator to TCI via increasing the Sn/Pb ratio,accompanied by a crossover from n-type to p-type doping in the films. In addition, a sizeable Rashba effect is clearly seen in the PbTe (111) film. Our work demonstrates the manipulation of topological properties of TCI, which is crucial for future fundamental research and applications. C. Yan et al., Phys. Rev. Lett., 112, 186801 (2014).

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Chenhui Yan
Institute of Metal Research, Chinese Academy of Sciences

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