Abstract Submitted
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Tuning the Surface States of Ultra-thin Topological Insulator Films[1] JIANXIN ZHONG, Xiangtan University — In this talk, I will introduce our recent progress on tuning the surface states of ultra-thin topological insulator films. Using first-principles methods, we explain the puzzling band-topology difference between Sb_2Se_3 and Bi_2Se_3 and propose an approach to tuning the topological phase by strain [1]. We demonstrate that Sb_2Se_3 can be converted into a topological insulator by applying compressive strain while the tensile strain can turn Bi_2Se_3 into a normal insulator. I will also show that the separation distance between quintuple layers (QL) in ultra-thin Bi_2Se_3 and Bi_2Te_3 films have a large increase after relaxation, leading to gap-opening at the surface Dirac cone, in good agreement with the experimental observation [2]. I will further show that Pb adlayers on Bi_2Se_3 result in splitting of the Dirac cones and large Rashba spin splitting of the quantum well states [3]. Most importantly, the quantum size effect of Pb adlayers leads to an oscillatory behavior of the Rashba splitting.

[1] W. L. Liu et al., Phys. Rev. B 84, 245105 (2011);
[2] W. L. Liu et al., Phys. Rev. B 87, 205315 (2013);
[3] H. Yang et al., Phys. Rev. B 86, 155317 (2012).

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