Protecting Topological Surface State by Organic Monolayer

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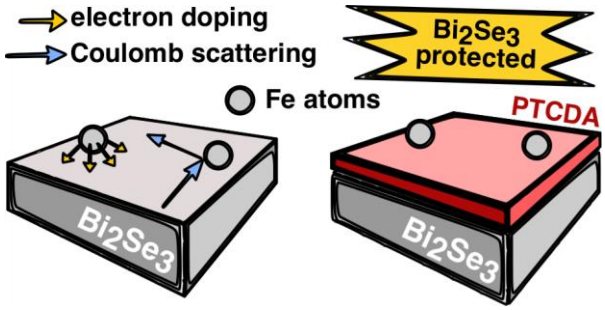
Topological insulator (TI) devices have turned into an attracted research field for their use in spintronics exploiting the spin-momentum locked metallic surface states. Fabricating smooth interfaces and isolations between TI surfaces and electrodes are key issues for conserving the spin-momentum locked metallic surface states in TI devices [1, 2]. In this work [3], we demonstrate a new method using organic monolayer as a tunneling barrier which provides a smooth interface as well as a buffer layer to prevent disturbances in the topological surface states (TSS) upon metal deposition. Scanning tunneling microscopy and spectroscopy (STM and STS) are used to study perylene-3,4,9,10-tetracarboxylic-dianhydride (PTCDA)/Bi_2Se_3 and Fe/PTCDA/Bi_2Se_3 systems. Resulting from weak interactions between the PTCDA molecules and the Bi_2Se_3 surface, the TSS of Bi_2Se_3 is conserved on top of well-ordered PTCDA assembly layer. Our findings indicate that the PTCDA layer can prevent interactions between Fe atoms and the Bi_2Se_3 surface state, such as doping effect and Coulomb scattering.



References
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