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Investigation and manipulation of the electronic properties of magnetically doped topological insulators[1]

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Topological insulator (TI) is characterized by gapless surface/edge states which are protected by time reversal symmetry (TRS). Magnetic order in or adjacent to a TI can break its TRS, and thus result in various exotic phenomena, e.g. magnetic monopole, quantum anomalous Hall effect, and topological magneto-electric effect. Combining angle-resolved photoemission spectroscopy, scanning tunneling microscopy/spectroscopy, and transport measurement, we have investigated the electronic structures and properties of Bi2Se3 family three dimensional TIs doped with magnetic impurities. Gap opening at the Dirac surface states induced by magnetic impurities has been observed, suggesting the formation of long range magnetic order in the TIs. The Dependences of the gap size on impurity concentration, chemical potential and real space position and the (anomalous) Hall effect of the magnetically doped TIs have been systematically studied, the result of which reveals the nature and mechanism of the magnetic order. The present studies pave the road to the realization of the novel properties predicted in magnet/TI heterostructures.

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