

## Topology-Driven Magnetic Quantum Phase Transition in Topological Insulators

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A three-dimensional (3D) topological insulator (TI) has its bulk band gapped at Fermi level but hosts Dirac-type gapless surface states protected by time-reversal symmetry (TRS) [1]. Novel magnetoelectric phenomena are expected in 3D TIs with their Dirac surface states gapped by ferromagnetic order, which can be realized by doping magnetic impurities in them [1,2]. Combining angle-resolved photoemission spectroscopy, transport measurements, and first principle calculations, we systematically studied the surface band structure, magnetism and transport properties of Cr-doped  $\text{Bi}_2(\text{Se}_x\text{Te}_{1-x})_3$  ternary 3D TI films grown by means of molecular beam epitaxy [3]. We observed a magnetic phase transition by varying Se:Te ratio of the films. Across the critical point, a topological quantum phase transition is revealed through both angle-resolved photoemission measurements and density functional theory calculations. We present strong evidences for that the bulk band topology is the fundamental driving force for the magnetic quantum phase transition. The tunable topological and magnetic properties in this system are well suited for realizing the exotic topological quantum phenomena in magnetic topological insulators.

[1] X. L. Qi and S. C. Zhang, *Rev. Mod. Phys.* **83**, 1057 (2011).

[2] C. -Z. Chang et al., *Science*, published online March 14, 2013.

[3] J. Zhang et al., *Science* (to be published).