

北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Massive Dirac surface states in topological insulator/magnetic insulator heterostructures

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Time: 2:00pm, May 24, 2013(Friday) 时间: 2013年5月24日(周五)下午2:00 Venue: Conference Room 607, Science Building 5 地点: 理科五号楼607会议室

Topological insulators are new states of matter with a bulk gap and robust gapless surface states protected by time-reversal symmetry. When time-reversal symmetry is broken, the surface states are gapped, which induces a topological response of the system to electromagnetic field -- the topological magnetoelectric effect. In this talk I present our recent study of the topological surface states in heterostructures formed by a topological insulator (TI) and a magnetic insulator (MI). Several MIs with compatible magnetic structure and relatively good lattice matching with TIs are identified, and the best candidate material is found to be MnSe, an anti-ferromagnetic insulator. We perform first-principles calculations in Bi2Se3/MnSe superlattices and obtain the surface state bandstructure. The magnetic exchange coupling with MnSe induces a gap of 54 meV at the Dirac surface states of Bi2Se3. In addition we tune the distance between Mn ions and TI surface to study the distance dependence of the exchange coupling. Finally, we study the band bending effect at the Bi2Se3/MnSe interface, and propose possible solutions to the problem.

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