



Seminar

Massive Dirac surface states in topological insulator/magnetic insulator heterostructures

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地点: 理科五号楼607会议室

Abstract

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.

About the Speaker

罗卫东, 毕业于北京大学物理系本科, 2004年在美国加州大学伯克利分校获得物理学博士学位。其后在美国范德比尔特大学和橡树岭国家实验室从事研究工作, 期间在加州大学伯克利分校合作访问。2011年起在美国斯坦福大学先进材料实验室工作。2012年入选中组部第三批“青年千人”计划, 加入上海交通大学物理系及自然科学研究院, 担任特别研究员。近几年的研究兴趣集中在凝聚态物理和材料科学的几个领域: 复杂氧化物、纳米结构、拓扑绝缘体, 基本研究方法是用第一性原理计算来理解并预测凝聚态物质体系的晶格结构、电子结构、自旋和光学性质。