北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Tailoring and manipulating the topological order in thin-film topological insulators

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Time: 2:00pm, Dec. 28, 2016 (Wednesday)

时间：2016年12月28日 （周三）下午2:00

Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

By introducing ferromagnetic, antiferromagnetic, or superconducting orders in thin-film topological insulators (TIs), it is experimentally shown that the topological order can be tailored and manipulated to induce non-trivial spintronic behaviors. The topological phase change induced by the intricate interface physics leads to many experimental indications of novel topological orders.

The first part of this seminar demonstrates the use of AFMs to manipulate the topological order in (magnetic) TIs. By constructing heterostructures exhibiting Néel order in an AFM, CrSb, and ferromagnetic order in a magnetic TI, Cr-doped $(Bi,Sb)_2Te_3$, emergent interfacial magnetic effects were realized, which can be tailored through artificial structural engineering [1]. In the undoped TI/AFM heterostructures, the AFM allows an independent control of the topological order in the top and the bottom TI surfaces, showing different spin configurations [2].

The second part includes the transport measurement to ascertain the one-dimensional chiral Majorana fermion in the hybrid system of a quantum anomalous Hall thin film coupled with a conventional superconductor [3]. A series of topological phase transitions are controlled by the reversal of the magnetization, where the half-integer quantized conductance plateau ($0.5e^2/h$) is observed as a compelling signature of the Majorana fermion as theoretically predicted. Another heterostructure system with interfacial superconductivity, Bi_2Te_3/FeTe, will be another material platform for hosting Majorana fermions [4].

[1] Q. L. He, X. Kou, et al. K. L. Wang, Nature Materials (2016) doi:10.1038/nmat4783

[2] Q. L. He, G. Yin, L. Yu, et al. K. L. Wang, arXiv:1612.01661 (2016)

[3] Q. L. He, L. Pan, et al. K. L. Wang, arxiv:1606.05712 (2016)

[4] Q. L. He, H. Liu, et al. I. K. Sou, Nature Communications 5, 4247 (2014)

About the speaker

Qinglin He received his BS degree from Sun Yat-sen University in 2011 and PhD degree from the Hong Kong University of Science and Technology in 2015. After that, he joint Prof Kang Wang's group in University of California, Los Angeles, as a postdoc researcher. His main research interests lie in the studies of molecular beam epitaxial growth and characterization of topological (crystalline) insulators, magnetic materials, and superconductor. He also devotes to the optoelectronic and magnetoelectric studies of metallic and semiconductor thin films and nanostructures, including quantum dots, nanowires and nanoribbons, as well as structural and chemical analysis of hetero-interfaces.