



Topological Phases in Transition Metal Chalcogenides

Junwei Liu

Massachusetts Institute of Technology

Time: 10:30am, June 5, 2017 (Monday)

2017 6 5

10:30

Venue: Room W563, Physics building, Peking University

563

Abstract

The discovery of quantum spin Hall effect engendered a new chapter of topological materials research in condensed matter physics and materials science. In this talk, I will introduce some of our recent theoretical works about the topological phases in 2D and 3D transition metal chalcogenides. We predict monolayer MX_2 ($\text{M}=\text{Mo}, \text{W}$; $\text{X}=\text{S}, \text{Se}, \text{Te}$) of 1U structure could realize quantum spin Hall insulator. Moreover, their topology can be easily tuned by external electric field, which motivated us to propose a new type of transistor, called topological field transistor. More recently, we found another new class of transition metal chalcogenides $\text{NN}'\text{U}_4$ ($\text{M}=\text{Nb}, \text{Ta}$; $\text{N}=\text{Ir}, \text{Rh}$) could be quantum spin Hall insulators in 2D and Weyl semimetals in 3D. I will also discuss some recent transport, ARPES and STM experiments on monolayer WTe_2 , where many of the observations are consistent with monolayer WTe_2 being a 2D TI.

Keywords: WTe_2 , quantum spin Hall insulator, transition metal chalcogenides

[1] X. Qian, J. Liu, L. Fu, J. Li Science 346, 1344 (2014)

[2] J. Liu, H. Wang, C. Fang, L. Fu, X. Qian, Nano Lett. 17 467-475 (2017)

About the speaker

Dr. Jun-Wei Liu obtained his PhD in the department of physics, Tsinghua University, in 2014, and then he started his postdoctoral research in Massachusetts Institute of Technology. His research interest includes: 1) Topological materials including quantum anomalous Hall insulators, topological insulators topological crystalline insulators and topological semi-metals; 2) Quantum Monte Carlo simulations of strongly correlated systems; 3) Atomic-layer-thin ferroelectric materials and physics; 4) Two-dimensional quantum materials and phenomena.