Fall 2022 Joint Colloquium
Materials Department & Materials Research Laboratory

Ni Ni, PhD

Physics & Astronomy
University of California, Los Angeles

Friday, November 4, 2022
11:00 am | ESB 1001

Tuning the interplay of magnetism and band topology in intrinsic topological insulators MnBi2nTe3n+1

Magnetic topological material provides a great platform for discovering new topological states, such as the axion insulators, the Chern insulators, and the 3D quantum anomalous Hall (QAH) insulators. Recently, MnBi2Te4 was discovered to be the first material realization of an intrinsic antiferromagnetic topological insulator (TI) where the QAH effect was observed at a record high temperature in its two-dimensional limit. Since the interplay of the magnetism and band topology determines their topological natures, understanding and manipulating the magnetism inside magnetic TIs will be crucial. In this talk, I will present our discovery of two new magnetic topological materials MnBi4Te7 and MnBi8Te13, with the former being an intrinsic antiferromagnetic TI and the latter being the first intrinsic ferromagnetic axion insulator [1, 2]. I will then show how chemical doping and external pressure can lead to continuous fine control of the magnetism and band topology in MnBi4Te7 [3, 4, 5], revealing the important role that chemical defects play. Our study provides a rare van der Waals material platform with great structural, magnetic, and topological tunability to realize various magnetic topological states and investigate emergent phenomena arising from the interplay of magnetism and band topology.

[1] C. W. Hu, et.al, Nature Communications, 11, 97 (2020)
[2] C. W. Hu, et.al, Science Advances, 6, eaba4275 (2020)
[3] C. W. Hu, et.al, Phys. Rev. B 104, 054422 (2021)
[4] T. M. Qian, et. al, Nano Lett., 22, 5523 (2022)
[5] T. M. Qian, et. al, Phys. Rev. B 106, 045121 (2022)

Bio

Prof. Ni got her Ph.D. degree in Physics from Iowa State University in 2009. She worked on rare earth intermetallics and Fe pnictide superconductors during her Ph.D. study. From 2009 to 2012, she was a postdoctoral researcher working on layered magnets and superconductors at Princeton. She was a Marie-Curie distinguished postdoctoral fellow at Los Alamos National Lab, working on heavy fermion materials before she starts her professorship at UCLA in 2013. At UCLA, her research focuses on the design, synthesis, and characterization of bulk topological, superconducting and magnetic materials with emergent phenomena.

https://nilab.physics.ucla.edu/

Hosted by John Harter.