Chez Pierre

Presents ...

Monday, February 24, 2020

12:00pm Noon

MIT Room 4-331

Chez Pierre Seminar

Ni Ni – University of California, Los Angeles

"$MnBi_2Te_4.nBi_2Te_3$: from intrinsic antiferromagnetic to ferromagnetic topological insulators"

Magnetic topological insulators provide an important materials platform to explore emergent quantum phenomena. Recently, $MnBi_2Te_4$ was discovered to be the first material realization of a van der Waals antiferromagnetic topological insulator (TI). In its two-dimensional limit, $MnBi_2Te_4$ manifests zero-field quantum anomalous Hall (QAH) effect up to 1.4 K and field-induced QAH effect at a record high temperature of 6.5 K above 7.6 T where all spins enter the forced ferromagnetic state. To realize the QAH effect at lower fields and higher temperatures, it is essential to search for intrinsic antiferromagnetic TIs with lower saturation fields or ferromagnetic TIs. In this talk, I will present our discovery of two new magnetic topological materials $MnBi_2Te_4.nBi_2Te_3$ (n=1 and 3) which consist of alternating $[MnBi_2Te_4]$ and $n[Bi_2Te_3]$ layers. I will show that by reducing the interlayer magnetic coupling with the increasing number of spacer $[Bi_2Te_3]$ layers, $MnBi_2Te_4.nBi_2Te_3$ can be tuned from Z2 antiferromagnetic TIs (n=0,1,2) to ferromagnetic axion insulators.Additionally, the superlattice nature of $MnBi_2Te_4.nBi_2Te_3$ may make various heterostructures of $[MnBi_2Te_4]$ and $[Bi_2Te_3]$ layers possible by exfoliation, providing a rare tunable material platform to investigate various emergent phenomena arising from the interplay between magnetism and band topology.