MnBi2Te4.nBi2Te3: a happy marriage of magnetism and topology

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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 MnBi2Te4.nBi2Te3 (n=1 and 3) which consist of alternating [MnBi2Te4] and n[Bi2Te3] layers [1, 2]. I will show that by reducing the interlayer magnetic coupling with the increasing number of spacer [Bi2Te3] layers, MnBi2Te4.nBi2Te3 can be tuned from Z2 antiferromagnetic TIs (n=0,1,2) to ferromagnetic axion insulators. Furthermore, I will show what we have learned on magnetism and sample defects in this family of materials from the neutron diffraction experiments [3].

[1] C. W. Hu, et.al, Nature Communications, 11, 97 (2020)

[2] C. W. Hu, et.al, Science Advances, 6, eaba4275 (2020)

[3] L. Ding, et.al, J. Phys. D: Appl. Phys. 54 174003 (2021),