

Electronic Structure Study on the Intrinsic Magnetic Topological Insulator Mn-Bi-Te family

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The layered $\text{MnBi}_{2n}\text{Te}_{3n+1}$ family represents the first intrinsic magnetic topological insulator ever discovered, providing an ideal platform to explore novel areas of physics such as the quantum anomalous Hall effect at elevated temperature and axion electrodynamics. In this talk I will present our recent studies on the electronic structure, especially the topological surface state Dirac cone of $\text{MnBi}_{2n}\text{Te}_{3n+1}$ family, including:

1. Discovery of gapless surface states in antiferromagnetic topological insulator MnBi_2Te_4 [1]
2. The origin of gapless surface state in Mn-Bi-Te family: surface-bulk band hybridization [2]
3. Discovery of “half-magnetic topological insulator” with magnetic gap opening of surface state [3]
4. Realization of tunable surface gap in doped MnBi_2Te_4 [4]

These works have established a solid electronic platform for realizing quantum anomalous hall effect at elevated temperature.

REFERENCES

1. Yu-Jie Hao, Pengfei Liu, Yue Feng, Xiao-Ming Ma, Eike F. Schwier, Masashi Arita, Shiv Kumar, Chaowei Hu, Rui'e Lu, Meng Zeng, Yuan Wang, Zhanyang Hao, Hong-Yi Sun, Ke Zhang, Jiawei Mei, Ni Ni, Liusuo Wu, Kenya Shimada, Chaoyu Chen, Qihang Liu & Chang Liu. Gapless Surface Dirac Cone in Antiferromagnetic Topological Insulator MnBi_2Te_4 . *Physical Review X* 9, 041038, doi:10.1103/PhysRevX.9.041038 (2019).
2. Xiao-Ming Ma, Zhongjia Chen, Eike F. Schwier, Yang Zhang, Yu-Jie Hao, Shiv Kumar, Ruie Lu, Jifeng Shao, Yuanjun Jin, Meng Zeng, Xiang-Rui Liu, Zhanyang Hao, Ke Zhang, Wumiti Mansuer, Chunyao Song, Yuan Wang, Boyan Zhao, Cai Liu, Ke Deng, Jiawei Mei, Kenya Shimada, Yue Zhao, Xingjiang Zhou, Bing Shen, Wen Huang, Chang Liu, Hu Xu & Chaoyu Chen. Hybridization-induced gapped and gapless states on the surface of magnetic topological insulators. *Physical Review B* 102, 245136, doi:10.1103/PhysRevB.102.245136 (2020).
3. Ruie Lu, Hongyi Sun, Shiv Kumar, Yuan Wang, Mingqiang Gu, Meng Zeng, Yu-Jie Hao, Jiayu Li, Jifeng Shao, Xiao-Ming Ma, Zhanyang Hao, Ke Zhang, Wumiti Mansuer, Jiawei Mei, Yue Zhao, Cai Liu, Ke Deng, Wen Huang, Bing Shen, Kenya Shimada, Eike F. Schwier, Chang Liu, Qihang Liu & Chaoyu Chen. Half-Magnetic Topological Insulator with Magnetization-Induced Dirac Gap at a Selected Surface. *Physical Review X* 11, 011039, doi:10.1103/PhysRevX.11.011039 (2021).
4. Xiao-Ming Ma, Yufei Zhao, Ke Zhang, Shiv Kumar, Ruie Lu, Jiayu Li, Qiushi Yao, Jifeng Shao, Fuchen Hou, Xuefeng Wu, Meng Zeng, Yu-Jie Hao, Zhanyang Hao, Yuan Wang, Xiang-Rui Liu, Huiwen Shen, Hongyi Sun, Jiawei Mei, Koji Miyamoto, Taichi Okuda, Masashi Arita, Eike F. Schwier, Kenya Shimada, Ke Deng, Cai Liu, Junhao Lin, Yue Zhao, Chaoyu Chen, Qihang Liu & Chang Liu. Realization of a tunable surface Dirac gap in Sb-doped MnBi_2Te_4 . *Physical Review B* 103, L121112, doi:10.1103/PhysRevB.103.L121112 (2021).