Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Prediction of Near-Room-Temperature Quantum Anomalous Hall Effect on Honeycomb Materials[1] BINGHAI YAN, SHU-CHUN WU, GUANGCUN SHAN, Max Planck Institute for Chemical Physics of Solids, Dresden — Recently, this long-sought quantum anomalous Hall effect was realized in the magnetic topological insulator. However, the requirement of an extremely low temperature ($\sim$ 30 mK) hinders realistic applications. Based on honeycomb lattices comprised of Sn and Ge, which are found to be 2D topological insulators, we propose a quantum anomalous Hall platform with large energy gap of 0.34 and 0.06 eV, respectively. The ferromagnetic order forms in one sublattice of the honeycomb structure by controlling the surface functionalization rather than dilute magnetic doping, which is expected to be visualized by spin polarized STM in experiment. Strong coupling between the inherent quantum spin Hall state and ferromagnetism results in considerable exchange splitting and consequently an ferromagnetic insulator with large energy gap. The estimated mean-field Curie temperature is 243 and 509 K for Sn and Ge lattices, respectively. The large energy gap and high Curie temperature indicate the feasibility of the quantum anomalous Hall effect in the near-room-temperature and even room-temperature regions. Ref: S.-C.Wu, G. Shan, B. Yan, arXiv:1405.4731 (2014).

[1]We thank the helpful discussions with C. Felser, S. Kanugo, C.-X. Liu, Z. Wang, Y. Xu, K. Wu, and Y. Zhou.

Binghai Yan
Max Planck Institute for Chemical Physics of Solids, Dresden

Date submitted: 22 Oct 2014 Electronic form version 1.4