New quantum anomalous Hall platform for chiral topological superconductivity

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Dissipationless transport of charge is one of the most consequential manifestations of quantum mechanics on macroscopic scales. It is an essential property of two remarkable states of quantum matter: superconductivity and quantized Hall effects. The first state emerges from strong electron correlations and the second from nontrivial band topology — both extremely challenging to unpack on a fundamental level and both with a tremendous technologically-transformative potential in energy transfer, quantum information processing, and quantum electronics. Superconductivity paired with nontrivial band topology can lead to exotic chiral superconducting state carrying non-Abelian Majorana zero modes that harbor at vortex cores. It has been proposed that a quantum anomalous Hall (QAH) state near the plateau transition and in proximity to a fully gapped *s*-wave superconductor may realize the chiral topological superconducting state. Here I will report on the previously unknown Berry-phase-driven QAH regime at above-Kelvin temperatures [1] with dissipationless edge currents we uncovered in a dilute intrinsically-proximal magnetic Bi_2Te_3 where Mn ions self-organize into a superlattice of ferromagnetic monolayers. The eminently tunable topological electronic bandstructure of this system by the high energy electron beams [2] and thermal redistribution of vacancies provides a realistic platform for chiral superconducting state.

References

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[2] L. Zhao, M. Konczykowski, H. Deng, I. Korzhovska, M. Begliarbekov, Z. Chen, E. Papalazarou, M. Marsi, L. Perfetti, A. Hruban, A. Wołoś, and L. Krusin-Elbaum, *Nature Comm*. **7**, 10957 (2016).

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