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Searching for better magnetic topological insulator materials for the quantum anomalous Hall effect[1]

KE HE, Department of Physics, Tsinghua University

The recent experimental observation of the quantum anomalous Hall (QAH) effect in thin films of magnetic topological insulators (TIs) paves the ways for practical applications of dissipationless quantum Hall edge states and for realizations of the novel quantum phenomena such as chiral topological superconductivity and axion magnetoelectric effect. Further studies in these directions require magnetic TI materials that are able to show the QAH effect at higher temperature and with conduction channels of lower dissipation. We have performed systematic study on the QAH effect in magnetically doped TI films with different thicknesses, magnetic dopants and compositions. The results clarify the relations between the QAH effect and energy band structure, electronic localization and ferromagnetism, which not only give a comprehensive understanding on the nature of the QAH effect but also provide insights into designing and fabrication of superior QAH materials.

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