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Electrically tunable spin polarization of chiral edge modes in a quantum anomalous Hall insulator RUI-XING ZHANG, HSIU-CHUAN HSU, CHAO-XING LIU, Department of Physics, The Pennsylvania State University —
In the quantum anomalous Hall effect, chiral edge modes are expected to conduct spin polarized current without dissipation and thus hold great promise for future electronics and spintronics with low energy consumption. However, spin polarization of chiral edge modes has never been established in experiments. In this work, we theoretically study spin polarization of chiral edge modes in the quantum anomalous Hall effect, based on both the effective model and more realistic tight-binding model constructed from the first principles calculations. We find that spin polarization can be manipulated by tuning either a local gate voltage or the Fermi energy. We also propose to extract spin information of chiral edge modes by contacting the quantum anomalous Hall insulator to a ferromagnetic (FM) lead. The establishment of spin polarization of chiral edge modes, as well as the manipulation and detection in a fully electrical manner, will pave the way to the applications of the quantum anomalous Hall effect in spintronics.

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