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Electrically tunable multiple Dirac cones in thin films of (LaO)2(SbSe2)2 family of materials XIAOYU DONG, JIANFENG WANG, Department of Physics and State Key Laboratory of Low-Dimensional Quantum Physics, Tsinghua University, Beijing 100084, China, RUIXING ZHANG, Department of Physics, The Pennsylvania State University, University Park, Pennsylvania 16802-6300, USA, WENHUI DUAN, BANGFEN ZHU, Department of Physics and State Key Laboratory of Low-Dimensional Quantum Physics, Tsinghua University, Beijing 100084, China, JORGE SOFO, CHAOXING LIU, Department of Physics, The Pennsylvania State University, University Park, Pennsylvania 16802-6300, USA
— Two-dimensional Dirac physics has aroused great interests in condensed matter physics due to its importance in both fundamental physics and device applications. The ability to control the properties of Dirac cones is essential for the occurrence of various new phenomena and the development of next-generation electronic devices. Based on first-principles calculations and an analytical effective model, we propose a new Dirac system with eight Dirac cones in thin films of the $(LaO)_2(SbSe_2)_2$ family of materials with an external gate voltage. The advantage of this system lies in its tunability: the existence of gapless Dirac cones, their positions, Fermi velocities and anisotropy all can be controlled by an experimentally feasible gate voltage. We identify the layer dependent spin texture induced by spin-orbit coupling as the underlying physical reason for the tunability of Dirac cones in this system. As a consequence, we show that the electrically tunable quantum anomalous Hall effect with a high Chern number can be induced by introducing magnetization into this system.

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