

Abstract Submitted
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Field driven insulator-semimetal crossover in ultrathin 3D topological insulator $BiSbTeSe_2$ YANG XU, Department of Physics and Astronomy, Purdue University, IRENEUSZ MIOTKOWSKI, Retired, YONG CHEN, Department of Physics and Astronomy, Purdue University, PURDUE UNIVERSITY TEAM — Three dimensional topological insulators (3D TIs) are characterized by an insulating bulk while maintaining gapless surface states that are topologically robust against nonmagnetic impurities. However a hybridization gap would be opened in an ultrathin film of 3D TIs due to the quantum tunneling between the top and bottom surfaces. Experimentally, we observed such gap opening in very thin flakes (≈ 10 nm) of an intrinsic 3D TI material $BiSbTeSe_2$ by transport measurements. When the gap size small (less than a few millielectronvolts), it is controllable with applying magnetic field or out-of-plane electric field, and can even be closed, indicating an insulator-semimetal crossover. Our work paves the way to explore the application of topological electronics.

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