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Topological edge states in ultra thin Bi(110) puckered crystal lattice BAOKAI WANG, Northeastern University, CHUANGHAN HSU, GUOQING CHANG, HSIN LIN, National University of Singapore, ARUN BANSIL, Northeastern University — We discuss the electronic structure of a 2-ML Bi(110) film with a crystal structure similar to that of black phosphorene. In the absence of Spin-Orbit coupling (SOC), the film is found to be a semimetal with two kinds of Dirac cones, which are classified by their locations in the Brillouin zone. All Dirac nodes are protected by crystal symmetry and carry non-zero winding numbers. When considering ribbons, along specific directions, projections of Dirac nodes serve as starting or ending points of edge bands depending on the sign of their carried winding number. After the inclusion of the SOC, all Dirac nodes are gapped out. Correspondingly, the edge states connecting Dirac nodes split and cross each other, and thus form a Dirac node at the boundary of the 1D Brillouin zone, which suggests that the system is a Quantum Spin Hall insulator. The nontrivial Quantum Spin Hall phase is also confirmed by counting the product of parities of the occupied bands at time-reversal invariant points.

Baokai Wang
Northeastern University

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