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Interband Spin-Orbit Coupling in Topological Surface States Explored by Photoemission Spectroscopies ANDREW WEBER, STEFAN MUFF, MAURO FANCIULLI, J. HUGO DIL, (1) Ecole Polytechnique Federale de Lausanne (2) Swiss Light Source, Paul Scherrer Institute, QUINN GIBSON, HUI-WEN JI, IVO PLETIKOSIC, ROBERT CAVA, Department of Chemistry, Princeton University, ALEXEI FEDOROV, Advanced Light Source, Lawrence Berkeley National Laboratory, ANTHONY CARUSO, Department of Physics, University of Missouri-Kansas City, JUREK SADOWSKI, Center for Functional Nanomaterials, Brookhaven National Laboratory, ELIO VESCOVO, National Synchrotron Light Source, Brookhaven National Laboratory, TONICA VALLA, Condensed Matter Physics Materials Science Department, Brookhaven National Laboratory — Three-dimensional crystals with a topologically non-trivial band gap in the bulk Brillouin zone are typically classified by either Z2 topological invariants or by Chern number topological invariants. The Z2 topological band insulators are said to possess surface states protected by time-reversal-symmetry and topological crystalline insulators possess surface states protected by mirror-symmetry. Here we provide evidence, through spin- and angle-resolved photoemission spectroscopy and first-principles calculations of layered $(Bi_2)_m(Bi_2X_3)_n$ (X = Se, Te) materials, that surfaces of Z2 strong topological insulators can possess states protected by mirror-symmetry alone. The role of interband coupling in producing mirror-protected surface states with novel Fermi contours and spin-textures will be discussed, and an argument for the unification of Z2 and Chern number invariant classifications will be made.

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