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Spin-texture of three-dimensional topological insulators: Bi_2Te_3, Bi_2Se_3 and Sb_2Te_3 SUSMITA BASAK, HSIN LIN, Northeastern University, L.A. WRAY, S.-Y. XU, M.Z. HASAN, Princeton University, A. BANSIL, Northeastern University — We have investigated the nature of surface states in the Bi_2Te_3, Bi_2Se_3 and Sb_2Te_3 family of 3D topological insulators using first-principles calculation as well as $k \cdot p$ scheme [1]. Recent spin-resolved photoemission experiments suggest that electrons on the surface of a topological insulator behave as massless relativistic particles with an intrinsic angular momentum (spin) which is locked to their translational momentum [2,3]. We have computed the in-plane spin-textures of all three aforementioned compounds to demonstrate the 'spin-helical' nature of the 2D fermions. In addition, the spin must acquire a finite out-of-the-plane component to preserve the bulk topological invariant [1]. We study this quantity in particular since there are possibilities of observing new quantum effects. Work supported by the US DOE.

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