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Hedgehog spin texture and competing orders on the surface of strained topological crystalline insulators CHENG-YI HUANG, WEI-FENG TSAI, Department of Physics, National Sun Yat-sen University, Kaohsiung 80424, Taiwan., YUNG JUI WANG, Department of Physics, Northeastern University, Boston, Massachusetts 2115,USA., HSIN LIN, Graphene Research Centre and Department of Physics, National University of Singapore, Singapore 117542., ARUN BANSIL, Department of Physics, Northeastern University, Boston, Massachusetts 2115,USA. — We discuss spin reorientation phenomena, which may or may not yield gap formation, on the surface of topological crystalline insulators $Pb_{1-x}Sn_x$(Te, Se) under various applied strains. The low-energy surface electrons on the (001) surface behave like massless Dirac particles with four Dirac points centered along the intersection of the mirror (xz or yz) plane and the surface plane. We use a four-band k.p model, which captures the spin and orbital texture of the surface states around surface X (or Y) point up to the energy around the Lifshitz transition, and systematically study effects of the applied strain. In contrast to the case without any strain, where the absence of the out-of-the-plane spin component is guaranteed by both the mirror and the time-reversal symmetries, we find that without time-reversal symmetry breaking, the hedgehog-like spin textures associated with a gap formation can be induced by the strain only, breaking the xz mirror symmetry. The other cases cannot induce a gap at Dirac points. We also investigate interaction-driven competing orders under the strain and obtain a phase diagram at the mean-field level to reveal the possible novel surface states in the system.

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