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Tuning the spatial location of topological surface states via proximity effects[1] GUANGFEN WU, Univ. of Sci. & Tech. of China, Southeast Univ., China, YAN SUN, Shenyang National Lab for Materials Science, China, HUA CHEN, Univ. of Tennessee, Univ. of Texas at Austin, XIAOGUANG LI, Fudan Univ., Univ. of Sci. & Tech. of China, PING CUI, Univ. of Sci. & Tech. of China, JINLAN WANG, Southeast Univ., China, XINGQIU CHEN, Shenyang National Lab for Materials Science, China, ZHENYU ZHANG, Univ. of Sci. & Tech. of China, Harvard University — In order to exploit promising applications of topological insulators in quantum computing, spintronics, and catalysis, one prerequisite is to gain effective manipulation of the spatial distribution of the topological surface states (TSS). We use first-principles calculations to investigate the interfacial proximity effects on the TSS for hybrid systems consisting of semiconducting thin films with different bandgaps, spin-orbital coupling (SOC) strengths, and lattice mismatches grown on the TI substrate of Bi_2Se_3. Our results show that the spatial location of the robust TSS can be tuned by the interplay of the effects associated with the SOC strength and the band gap size of the semiconductor. Potential experimental confirmations of these strong predictions are also discussed.

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