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Manipulation of topological states in a topological-insulator heterostructure YUSUKE TANAKA, KOSUKE NAKAYAMA, TAKAFUMI SATO, Department of Physics, Tohoku University, SEIGO SOUMA, WPI-AIMR, Tohoku University, TAKASHI TAKAHASHI, Department of Physics, Tohoku University, KAZUMA ETO, SATOSHI SASAKI, KOJI SEGAWA, YOICHI ANDO, ISIR, Osaka University — The Dirac fermions in the Topological insulators (TIs) are immune to backward scattering by nonmagnetic impurities or disorder. While experimental realizations of novel topological phenomena depend crucially on the inherent robustness of the topological surface states against perturbations, it turned out to be difficult to maintain stable surface properties under ambient atmosphere. This situation has been a hindrance for realizing novel topological phenomena and device applications of TIs. We present a novel approach to solve this problem- the heterostructure engineering where one can alter the stacking sequence of layers or insert different building blocks into the crystal. We have performed angle-resolved photoemission spectroscopy on $(PbSe)_5(Bi_2Se_3)_{3m}$, which forms a natural multilayer heterostructure consisting of a TI and an ordinary insulator. For $m = 2$, we observed a gapped Dirac-cone state within the bulk-band gap, suggesting that the topological interface states are effectively encapsulated by block layers. These results demonstrate that utilization of TI heterostructures is a new promising strategy for manipulating the topological states and realizing exotic quantum phenomena.

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