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Interfacing 2D and 3D Topological Insulators: Bi(111) Bilayer on Bi_2Te_3 TORU HIRAHARA, Department of Physics, University of Tokyo, GUSTAV BIHLMAYER, Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich and JARA, YUSUKE SAKAMOTO, MANABU YAMADA, Department of Physics, University of Tokyo, HIDETOSHI MIYAZAKI, SHIN-ICHI KIMURA, UVSOR Facility, Institute for Molecular Science, STEFAN BLÜGEL, Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich and JARA, SHUJI HASEGAWA, Department of Physics, University of Tokyo — Topological insulators (TI) are insulating materials but have metallic edge states that carry spin currents and are robust against nonmagnetic impurities [1]. While there have been a large number of reports on three-dimensional (3D) TI, only few works have been done in terms of two-dimensional (2D) TI. In the present paper, we report the successful formation of bilayer Bi, which was theoretically predicted to be a 2D TI [2]. We deposited bilayer Bi on a 3D TI Bi_2Te_3, which the lattice mismatch is very small. From angle-resolved photoemission spectroscopy measurements and *ab initio* calculations, the electronic structure of the system can be understood as an overlap of the band dispersions of bilayer Bi and Bi_2Te_3. Our results show that the Dirac cone is actually robust against nonmagnetic perturbations and imply a unique situation where the topologically protected one- and two-dimensional edge states are coexisting at the surface [3].
[1] M. Z. Hasan and C. L. Kane, Rev. Mod. Phys. **82**, 3045 (2010).
[2] S. Murakami, Phys. Rev. Lett. **97**, 236805 (2006).
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