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Proximity-effect-induced superconductivity in Bi_2Se_3 and Bi_2Te_3
LI LU, JIE SHEN, YUE DING, FANMING QU, FAN YANG, JUN CHEN, ZHONGQING JI, GUANGTONG LIU, JIE FAN, XIUNIAN JING, CHANGLI YANG, Daniel Chee Tsui Laboratory, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China — In this talk I will present our experimental investigations on the proximity effect between conventional superconductors such as Sn, Pb and the strong spin-orbit coupling materials Bi_2Se_3 or Bi_2Te_3 [1-3]. Several types of hybrid devices were fabricated, and their electron transport properties were measured down to ∼10 milli-Kelvin temperatures. The results show that a superconducting phase can be easily induced in Bi_2Se_3 and Bi_2Te_3 single crystals by superconducting Pb electrodes that are deposited on the surface of the former. The induced superconducting phase can be regarded as a true superconducting phase, i.e., it has an energy gap of the order 0.1 meV, and carries a Josephson supercurrent over a distance as far as several microns. The conductance spectrum of the interface between the induced superconducting phase and the normal phase of Bi_2Se_3 or Bi_2Te_3 exhibits a zero-bias peak. Based on the induced superconducting phase, single Josephson junction devices and superconducting quantum interference devices (SQUIDs) were constructied, and their critical supercurrent were investigated as a function of applied magnetic flux. We will discuss the implication of the results in terms of the pairing symmetry of the induced superconducting phase.

[1] F. Yang, et al., Phys. Rev. B 85, 104508 (2012).
[2] F. M. Qu, et al., Scientific Reports 2, 339 (2012).
[3] F. Yang, et al., Phys. Rev. B 86, 134504 (2012).

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