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Fully gapped topological surface states in Bi_2Se_3 films induced by a d-wave high-temperature superconductor[1] ERYIN WANG, HAO DING, WEI YAO, XI CHEN, QI-KUN XUE, SHUYUN ZHOU, State Key Laboratory of Low Dimensional Quantum Physics and Department of Physics, Tsinghua University, HONG YAO, Institute for Advanced Study, Tsinghua University, ALEXEI V. FEDOROV, Advanced Light Source, Lawrence Berkeley National Laboratory — Topological insulators are a new class of materials which are insulating in bulk but exhibit robust conducting surface states protected by time-reversal symmetry. The coupling between such symmetry-protected surface states and symmetry-broken states (for example, superconductivity) may lead to novel quantum phenomena, such as Majorana zero modes which are crucial for fault-tolerated quantum computation. Using molecular beam epitaxy, we have successfully grown high quality topological insulator Bi_2Se_3 films on high temperature superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$. In this talk, I will present our recent work on superconducting proximity effect in Bi_2Se_3 films induced by high temperature superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$. Using angle-resolved photoemission spectroscopy, we observe a proximity-induced gap up to 15 meV on the topological surface states of Bi_2Se_3 [1]. $Bi_2Se_3/Bi_2Sr_2CaCu_2O_{8+\delta}$ heterostructure not only provides new opportunities for investigating the intriguing coupling between a topological insulator thin film and a d-wave superconductor, but also may be a new system for realizing Majorana zero modes.

[1] Eryin Wang et.al, *Nature Physics*.**9**, 621 (2013).

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