Pressure induced superconductivity in Topological Compounds

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Topological insulator forms a very interesting new materials category since theory has predicated many novel physics [1]. Right after the theoretically predication of 3 dimensional topological insulators of Bi_2Se_3, Bi_2Te_3, Sb_2Te_3, ARPES experiments show strong evidences of Dirac cone at surface electronic structure. Among the many prospective novel properties predicated by theory, topological superconductivity is one of most excited since its surface supports Majorana fermions[1] since it can support new conception quantum computing. Princeton group reported the observation of superconductivity by intercalating Cu into the Van de Waals gap between Bi_2Se_3 quintuple layers. Comparing to chemical doping, pressure can be a direct physical measure to modify the electronic structure with the advantages of free defects or impurities. Here we report superconductivity can be realized in the topological no trivial ambient phase of Bi_2Te_3 induced via pressure where the surface remains gapless Dirac cone. We provide a systematic phase diagram of Bi_2Te_3 as function of pressure based on investigations of superconductivity versus structures.
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[1]B. A. Bernevig, T. L. Hughes, S.-C. Zhang, Science **314**, 1757 (2006).