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Drive the Dirac Electrons into Cooper Pairs in $Sr_xBi_2Se_3$ GUAN DU, Nanjing University, JIFENG SHAO, High Magnetic Field Laboratory, CASHIPS, XIONG YANG, ZENGYI DU, DELONG FANG, JINGHUI WANG, KEJING RAN, JINSHENG WEN, Nanjing University, CHANGJIN ZHANG, High Magnetic Field Laboratory, CASHIPS, HUAN YANG, Nanjing University, YUHENG ZHANG, High Magnetic Field Laboratory, CASHIPS, HAI-HU WEN, Nanjing University, HIGH MAGNETIC FIELD LABORATORY, CASHIPS COLLABORATION, DEPARTMENT OF PHYSICS, NANJING UNIVERSITY TEAM
— Topological superconductor is a very interesting and frontier topic in condensed matter physics. Despite the tremendous efforts in exploring topological superconductivity, its presence is however still under heavy debates. The Dirac electrons have been proven to exist on surface of a topological insulator. It remains unclear whether and how the Dirac electrons fall into Cooper pairing in an intrinsic superconductor with the topological surface states. Here we present the systematic study of scanning tunneling microscope/spectroscopy on the possible topological superconductor $Sr_xBi_2Se_3$. We first show that only the intercalated Sr atoms can induce superconductivity. Then we show the full superconducting gaps without any abnormal in-gap density of states as expected theoretically for a bulk topological superconductor. Finally, we find that the surface Dirac electrons will simultaneously condense into the superconducting state within the superconducting gap. This vividly demonstrates how the surface Dirac electrons are driven into Cooper pairs.

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