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Experimental realization of a Superconductor-Topological Insulator (HfTe3/HfTe5) layered heterostructure YELIANG WANG, YUQI WANG, XU WU, YAN SHAO, SHI-YU ZHU, HONG-JUN GAO , Institute of Physics, Chinese Academy of Sciences, HONG-MING WENG COLLABORATION, XI DAI COLLABORATION, ZHONG FANG COLLABORATION — We fabricated a superconductor–topological insulator–normal metal heterostructure with a layered configuration of HfTe3/HfTe5/Hf for the first time. This heterostructure can indeed form spontaneously by tuning the experimental parameters. The atomic structure of the heterostructure has been determined by in situ STM and XPS. STS measurements directly reveal a bandgap as large as 60 meV in HfTe5 film and a superconducting spectrum in HfTe3/HfTe5 film. Unlike the artificial film lift-transfer-stacking technique, our current method of making desired heterostructures is based on a spontaneous formation process of surface reaction and epitaxial growth and significantly simplifies the fabrication process. This method may offer new routes for the development of other related functional heterostructures and nanodevices. The generated hybrid structure HfTe3/HfTe5/Hf has potential applications in both quantum-spin Hall effect-based and Majorana-based devices for novel technological applications like high-efficiency quantum computation. [Adv. Mater. 28, 5013 (2016).]

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