



Coexistence of superconductivity and weak ferromagnetism at the interface of twisting bicrystals of 3D topological insulator $\text{Bi}_{1-x}\text{Sb}_x$ ($0.07 < x < 0.2$)

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Abstract

In the normal state the 3D topological insulator $\text{Bi}_{1-x}\text{Sb}_x$ is diamagnetic and does not show superconductivity because of the extremely low carrier density. Despite this, we have found that the small crystallite disorientation angle (SDA) interfaces of bismuth-antimony bicrystals, which consist of a solitary central part (thickness of about 60 nm) and two similar adjacent layers (~ 20 nm) on both sides of it, exhibit two superconducting transitions with critical temperature $T_{c\sim}$ (3.7–4.6) K and $T_{c\sim}$ (8.3–21) K, while large crystallite disorientation angle (LDA) interfaces with a higher structural disorder show ferromagnetic hysteresis loops and specific characteristics of a single superconducting layer with a thickness comparable with the entire interface.