Termination-dependent Superconducting Topological Surface States in Non-centrosymmetric $PbTaSe_2$

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The search for topological superconductors (TSCs) is one of the most exciting subjects in condensed matter physics. TSCs are characterized by a full superconducting gap in the bulk and topologically protected gapless surface or edge states. Within each vortex core of TSCs, there exist the zero energy Majorana bound states, which are predicted to exhibit non-Abelian statistics and to form the basis of the fault-tolerant quantum computation. So far, PbTaSe2 is the only stoichiometric bulk material exhibits the required topological surface states at EF combined with fully gapped bulk superconductivity [1]. Interestingly, two distinct and stable terminations have been identified to be Pb- and Se-surface by using spectroscopic imaging-scanning tunneling microscope. Two terminations exhibit striking difference in both atomic and electronic structure above Tc while both exhibit a full superconducting gap and zero energy bound state in the superconducting vortex core [2]. Our results show PbTaSe2 is a great platform for the study of 2D TSC.

REFERENCES:
[1] S.Y. Guan et al., *Sci. Adv.* 2, e1600894 (2016)
[2] S.Y. Guan et al., *in preparation*.