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Self-forming superconducting microstructures from Weyl semimetals MAJA D. BACHMANN, Max-Planck-Institute for Chemical Physics of Solids, NITYAN NAIR, Los Alamos National Laboratory, FELIX FLICKER, RONI ILAN, Department of Physics, University of California Berkeley, NIRMAL J. GHIMIRE, ERIC D. BAUER, FILIP RONNING, Los Alamos National Laboratory, JAMES G. ANALYTIS, Department of Physics, University of California Berkeley, PHILIP J.W. MOLL, Max-Planck-Institute for Chemical Physics of Solids — Topological semi-metals host protected electronic states on their surface where the topology of the bulk bands is broken. By coupling them to a superconducting gap, exotic electronic excitations such as zero-energy Majorana modes can appear on the surface. In non-superconducting topological materials a gap can be induced via the proximity effect. A traditional path towards proximity-induced superconductivity involves growing a superconducting film on the non-superconducting topological material. We present a new way of fabricating superconducting microstructures from the non-superconducting Weyl-semimetal NbAs under Ga ion irradiation from a focused ion beam (FIB). Thereby As is preferentially removed from the surface, while the Nb-rich layer left behind shows robust type-II superconductivity with $T_c \sim 3$K and $H_{c2} \sim 7$T. In this approach the superconducting film self-forms on a single crystal, which may strongly influence the interface and coupling properties. Using this approach, we present a route towards fabricating superconducting topological nanowires.

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