Superconductivity Emerging from a Weyl Semimetal Candidate $NbIrTe_4$ under Pressure

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The topological properties have received strong interest both theoretically and experimentally in recent years. Insulators can be classified into conventional insulators and topological insulators with protection by time-reversal symmetry. By analogy from insulator to metal, semimetal can be topologically classified as trivial and nontrivial in terms of electronic structure, including Weyl, Dirac, and node-line semimetal [1]. Weyl fermion have been observed experimentally in Weyl semimetal as low-energy excitation, exhibiting a host of quantum phenomena such as topological Fermi arc and chiral anomaly. Remarkably, Weyl fermion is robust while carrying currents, giving rise to exceptionally high mobility [2].

Turning a Weyl semimetal into a superconducting state is a viable pathway towards unconventional superconductor which could potentially be topologically nontrivial and host exotic Majorana modes. Transition metal dichalcogenides have attracted tremendous research interest due to pressure-enhanced superconductivity in Weyl semimetal candidate WTe2 and MoTe2. The ternary transition metal tellurides NbIrTe4, an ordered variant of the WTe2 is a newly predicted time-reversal invariant type-II Weyl semimetal [3].

Here we report that superconductivity emerges in $NbIrTe_4$ with a critical transition temperature of 2.5 K at a critical pressure of ca. 2 GPa, which is enhanced up to 5.75 K at 16 GPa. Hall coefficient measurements demonstrated that elevating pressure increases the population of electron carriers and triggers superconducting transition. Significantly, a sign change of the Hall coefficient was observed near the critical pressure of superconducting transition, which may due to the tilt of the Weyl cone tuned by strain on crystal lattice. Our discovery of superconductivity in $NbIrTe_4$ under high pressure will stimulate further investigations on superconductivity and Majorana fermions in Weyl semimetals.

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