STRONG SPIN-ORBIT COUPLING AND NODAL SUPERCONDUCTIVITY IN TOPOLOGICAL NONCENTROSYMMETRIC SUPERCONDUCTOR YPtBi.

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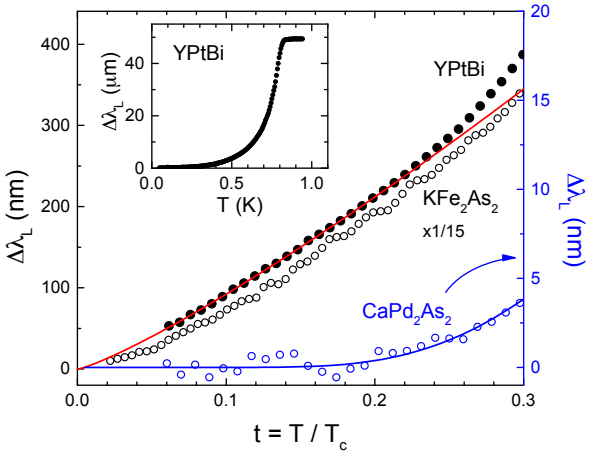
Semimetallic half-Heusler compounds (RTBi, R = rare earth, T = Pd, Pt) have been attracting much attention because multiple theoretical calculations predicted the topologically non-trivial band structure as a result of strong asymmetric spin-orbit coupling. Moreover, a handful of half-Heusler compounds undergo a superconducting phase transition at low temperatures, which makes them a topological noncentrosymmetric superconductor. Here we present our studies of the superconducting energy gap in YPtBi via London penetration depth measurements by using a precision tunnel diode resonator technique. Low-temperature penetration depth exhibits an almost linear-temperature variation which is consistent with existence of lines of node in the superconducting energy gap. In order to elucidate the origin of the observed node, we probe the spin-split Fermi surfaces by measuring the angle-dependent Shubnikov-de Haas oscillations. The quantum oscillation data reveal the spin-split Fermi surfaces by more than $3k_BT_c$, which strongly supports a realization of nodal superconducting gap in YPtBi as a consequence of mixing a conventional pairing state with higher angular momentum paring states. We will discuss possible superconducting pairing states based on our experimental results.



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