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High-field studies of the Pd-based Superconductor $Ta_4Pd_3Te_{16}$

TONI HELM[1], Lawrence Berkeley National Laboratory, PHILIP J.W. MOLL, ROBERT KEALHOFER, JAMES G. ANALYTIS, University of California — The layered Pd-based ternary chalcogenide $Ta_4Pd_3Te_{16}$ (TPT) has not gotten much of attention since its first synthesis in 1997. Recently, TPT was found to turn superconducting (SC) below a critical temperature of $T_c = 4.5\,\mathrm{K}$ and up to $6.5\,\mathrm{K}$ under pressure. The layered material has an orthorhombic crystal structure and the main conduction channel is suspected to run along one dimensional (1D) PdTe-chains. Band structure calculations find multiple bands at the Fermi level including 1D sheets. One of the striking features in the family of $M_2Pd_xQ_5$ (M=Nb and Ta, Q=S and Se) is a very enhanced upper SC critical field H_{c2}. To understand the mechanism behind this enhancement TPT is of special interest since it has a similarly complex structure but much lower H_{c2}. Anomalous thermal transport properties and a significant anisotropy in H_{c2} have been interpret in terms of an unconventional SC ground state present in TPT. Here we report studies of normal-state magnetotransport and magnetic torque in high fields that disclose details of TPT's electronic structure enabling us to speculate about the origin of SC in this compound.

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