# TERNARY TRANSITION METAL CHALCOGENIDE SUPERCONDUCTORS: $Ta_4Pd_3Te_{16}$ AND $Nb_3Pd_xSe_7$

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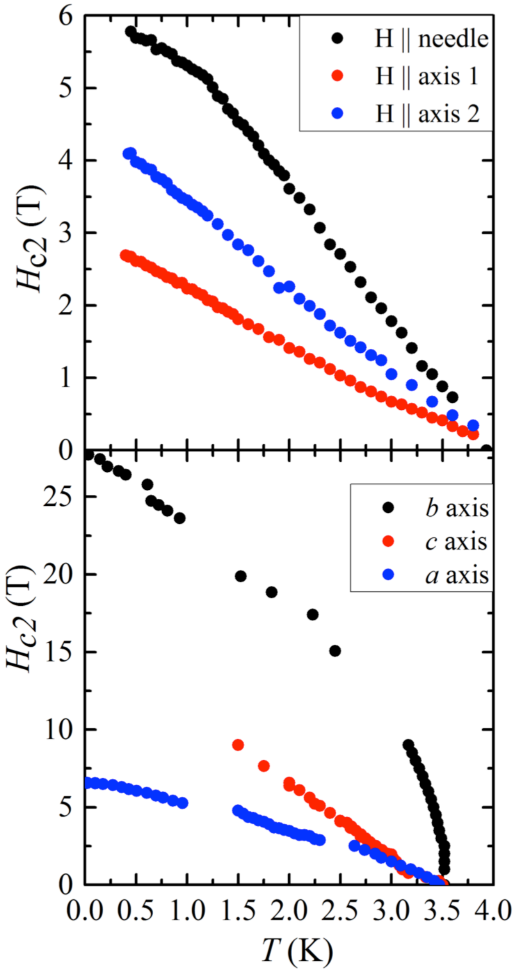


*Fig 1: Upper critical vs Temperature of TPT and NPSe superconductors*

Superconductivity in $Ta_4Pd_3Te_{16}$ was reported by Jiao *et al.* with superconducting transition temperature $T_c$ = 4.6 K.[1] Heat capacity and magnetic susceptibility measurements indicate a 90% superconducting volume fraction. Here we compare the superconducting states of $Ta_4Pd_3Te_{16}$ and $Nb_3Pd_xSe_7$ crystals with very similar $T_c$'s.

The superconducting phase diagrams show linear temperature dependence when magnetic field is applied perpendicular to the needle axis of the crystals for both compounds. However, for fields parallel the needle axis, we see very distinct temperature dependence between the two. $Nb_3Pd_xSe_7$ shows the expected high $H_{c2}^b$ based on our previous study.[2] The small $H_{c2}^b$ of $Ta_4Pd_3Te_{16}$ was unexpected because of the larger spin-orbit coupling associated with Ta and Te relative to Nb and Se, respectively.

[1] W.-H. Jiao, Z.-T. Tang, Y.-L. Sun, Y. Liu, Q. Tao, C.-M. Feng, Y.-W. Zeng, Z.-A. Xu, and G.-H. Cao, J. Am. Chem. Soc. 136, 1284 (2014).
[2] Q. Zhang, D. Rhodes, B. Zeng, T. Besara, T. Siegrist, M. Johannes, and L. Balicas, Phys. Rev. B 88, 024508 (2013).

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