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Anisotropic Superconducting Gap and Elongated Vortices with Caroli-De Gennes-Matricon States in the New Superconductor $Ta_4Pd_3Te_{16}$[1] HUAN YANG, ZENGYI DU, DELONG FANG, ZHENYU WANG, YUFENG LI, GUAN DU, XIYU ZHU, HAI-HU WEN, Department of Physics, Nanjing University — The superconducting state is formed by the condensation of a large number of Cooper pairs. The normal state electronic properties can give significant influence on the superconducting state. For usual type-II superconductors, the vortices are cylinder like with a round cross-section. For many two dimensional superconductors, such as Cuprates, 2H-$NbSe_2$ etc., albeit the in-plane anisotropy, the vortices generally have a round shape. In this paper we report the scanning tunneling microscopy/spectroscopy measurement results of a recently discovered new superconductor $Ta_4Pd_3Te_{16}$. The chain like conducting channels of $PdTe_2$ in $Ta_4Pd_3Te_{16}$ make a significant anisotropy of the in-plane Fermi velocity. We suggest at least one anisotropic superconducting gap with gap minima or possible node in this multiband system. In addition, elongated vortices are observed with an anisotropy of about $\xi_{\parallel b}/\xi_{\perp b} \approx 2.5$. Clear Caroli-de-Gennes-Matricon states are also observed. Our results will initiate the study on the elongated vortices and superconducting mechanism in the new superconductor $Ta_4Pd_3Te_{16}$.

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