Crystal growth and characterization of polymorphic $PtBi_2$

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$PtBi_2$ is a polymorphic system with interesting electronic properties. Here we report optimized crystal growth and structural characterization of pyrite-type and trigonal modification of $PtBi_2$. Trigonal $PtBi_2$ crystallizes in the noncentrosymmetric P31m space group, and pyrite-type $PtBi_2$ crystallizes in the $Pa\bar{3}$ space group[1]. Cubic (pyrite) compound $PtBi_2$ is a topological semimetal hosting a sixfold band touching point in close proximity to the Fermi level [2]. Trigonal $PtBi_2$ is a van der Waals material which shows interesting 2D superconductivity at 310 mK [3]. The superconducting and the topological properties can be tuned by various means in the trigonal system. I will discuss in this presentation details of crystal growth and characterization of polymorphic $PtBi_2$ system.

References

[1] G. Shipunov, I. Kovalchuk, B. R. Piening, V. Labracherie, A. Veyrat, D. Wolf, A. Lubk, S. Subakti, R. Giraud, J. Dufouleur, S. Shokri, F. Caglieris, C. Hess, D. V. Efremov, B. Büchner, and S. Aswartham. Polymorphic $PtBi_2$: Growth, structure, and superconducting properties, Phy. Rev. Materials. 4, 124202 (2020).
[2] Setti Thirupathaiah, Yevhen Kushnirenko, Klaus Koepernik, Boy Roman Piening, Bernd Büchner, Saicharan Aswartham, Jeroen van den Brink, Sergey Borisenko and Ion Cosma Fulga. Sixfold fermion near the Fermi level in cubic $PtBi_2$, SciPost Phys. 10, 004 (2021).
[3] Arthur Veyrat, Valentin Labracherie, Dima L. Bashlakov, Federico Caglieris, Jorge I. Facio, Grigory Shipunov, Titouan Charvin, Rohith Acharya, Yurii Naidyuk, Romain Giraud, Jeroen van den Brink, Bernd Büchner, Christian Hess, Saicharan Aswartham, and Joseph Dufouleur, Berezinskii−Kosterlitz−Thouless Transition in the Type-I Weyl Semimetal $PtBi_2$, ACS-Nano Lett. (2023), https://doi.org/10.1021/acs.nanolett.2c04297