

833rd ASRC Seminar

Date: 3月 2日(木), 15:00 ~ 16:00

Location: 先端基礎研究交流棟 第1センター会議室(103号室)

Speaker: 江口 学 氏

(ウィーン工科大学 固体物理学研究所)

Title: Study of topological semimetals and insulators across the correlation spectrum

Abstract:

The past decade has seen a wealth of investigations on materials that are considered as topological semimetals and insulators. Their electronic structures harbor band crossings that are stabilized by certain symmetries. The relevant bulk or surface excitations are Dirac or Weyl quasiparticles as opposed to Schrodinger quasiparticles in “normal” (topologically trivial) solids. In the by far best studied regime of noninteracting or weakly interacting topological materials, key characterization tools are ARPES and quantum oscillation experiments together with density functional theory. In the recently evidenced strong correlation regime, by contrast, these tools fail and new ones have been put forward such as specific heat and giant spontaneous Hall effect [1-3].

In this talk, thermodynamic and transport signatures of the Weyl Kondo semimetal $\text{Ce}_3\text{Bi}_4\text{Pd}_3$, the 3D topological insulator $\text{TlBi}(\text{Se},\text{S})_2$, and other topological semimetals and insulators will be presented [1-5]. Small deviations from the ideal stoichiometry lead significant changes in physical properties.

We discuss in detail the preparation of high-quality single crystals, as well as the specific properties of real topological materials and the effects of electronic correlations. If time permits, the study of topological bands in areas close to applications, such as giant thermoelectric performance and macroscopic nonequilibrium transport, will also be presented [5,6].

参考文献:

- [1] L. Chen et al., Nature Physics 18, 1341-1346 (2022).
- [2] S. Dzsaber et al., Nature Commun. 13:5749 (2022).
- [3] S. Dzsaber et al., Proc. Natl. Acad. Sci.U.S.A. 118, e2013386118 (2021).
- [4] F. Le Mardele et al., arXiv:2301.06389v1 (2023).
- [5] M. Taupin et al., arXiv:2010.10620v1 (2020).
- [6] B. Hinterleitner et al., Nature 576, 84-90 (2020).

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