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EINLADUNG zum IFP-SEMINAR

Electronic and magnetic responses in topological semimetals

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Host: Silke Bühler-Paschen

Termin: Mittwoch, 25. Jänner 2023, 16:00 Uhr

Ort: Institut für Festkörperphysik, TU Wien
Wiedner Hauptstraße 8-10, 1040 Wien
Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

Condensed matter research in general and material science in particular are driven by the hunt for novel materials with potential applications. There is a huge category of materials known and investigated earlier, but their many physical phenomena were not understood clearly. After the introduction of the concept of topology in the field of material science, many phenomena were understood and thus they need to be studied to create a better understanding. While for some phenomena, the researchers developed a better understanding, some were overlooked in topological materials. To understand this phenomena better electronic and magnetic responses in magnetic and non-magnetic topological semimetals were investigated. Magnetic materials from the family of transition metal pnictides (ZrMnP and HfMnP) and half Heusler (NiMnSb and PtMnSb)were investigated for their anomalous transport in Hall resistivity, while in case of non-magnetic materials $ZrTe_5$ and $HfTe_5$ were studied to understand their anomaly in magnetization

We investigated electro-magnetic transports of two ferromagnetic compounds, such as ZrMnP and HfMnP. The abundance of mirror planes in the crystal structure ensures gapped nodal lines at the Fermi energy. Our first principle calculations revealed that these materials are possessing nodal lines near Fermi energy which is gapped after the introduction of spin-orbit coupling resulting in one of the largest anomalous Hall conductivities in the family of nodal lines. (*Adv. Mater.* **2021**, 33, 2104126)

NiMnSb and PtMnSb were investigated in terms of their non-trivial topology and it was found that there are accidental Weyl nodes. Moreover, we also realized that Weyl nodes that are far from Fermi level drag the Berry Curvature to the Fermi level resulting in Berry curvature induced anomalous Hall conductivity.

We investigated magnetic response of non-magnetic topological semimetals. And, it was quite interesting to realize that how magnetization can be used as tool to characterize the nodal crossing. And apart from that ZrTe5 and HfTe5, which are categorized as massive Dirac semimetals shows largest diamagnetic values in the state-of-the-art previously reported topological semimetals. (*J. Phys.: Condens. Matter.* **2022**, 34, 225802)