Impact of tiny Fermi pockets with extremely high mobility on the Hall anomaly in the kagome metal CsV_3Sb_5

Kenichiro Hashmoto[1]

[1]Department of Advanced Materials Science, University of Tokyo

The kagome metal CsV_3Sb_5 exhibits an unusual charge-density-wave (CDW) order, where the emergence of loop current order that breaks time-reversal symmetry (TRS) has been proposed [1]. A key feature of this CDW phase is a non-monotonic Hall effect at low fields, often attributed to TRS breaking. However, its origin remains unclear.

In this presentation, we report comprehensive magnetotransport measurements combined with mobility spectrum (μ-spectrum) analysis [2], which identify the formation of extremely small Fermi pockets with extremely high mobility below the CDW transition. These pockets are found to dominate the low-field Hall response and account for the observed non-monotonic behavior. To further investigate the origin of this Hall anomaly, we introduce nonmagnetic disorder via electron irradiation [3]. While the Fermi surface remains essentially unchanged, the non-monotonic Hall signal is strongly suppressed with irradiation time. This excludes anomalous Hall mechanisms and highlights the role of high-mobility carriers in conventional multiband transport. These results provide new insights into the origin of the Hall anomaly in CsV_3Sb_5 and demonstrate the critical role of small, high-mobility Fermi pockets in the magnetotransport properties of kagome metals.

[1] T. Asaba, KH *et al*., Nature Physics **20**, 40 (2024).
[2] S. Liu, KH *et al*., arXiv:2503.15849.
[3] M. Roppongi, KH *et al*., Nature Communications **14**, 667 (2023).