Contribution ID: **10** Type: **Oral talk**

Viscoelastic response and anisotropic hydrodynamics in Weyl semimetals

Wednesday, 11 June 2025 10:20 (20 minutes)

We study viscoelastic response in Weyl semimetals with broken time-reversal symmetry. The principal finding is that topology and anisotropy of the Fermi surface are manifested in the viscoelasticity tensor of the electron fluid. In the dynamic (interband) part of this tensor, the anisotropy leads to a qualitatively different, compared with isotropic models, scaling with frequency and the Fermi energy. The components of the viscosity tensor determined by the Fermi-surface properties agree in the Kubo and kinetic formalisms; the latter, however, misses the anomalous Hall viscosity originating from filled states below the Fermi surface. The anisotropy of the dispersion relation is also manifested in the acceleration and relaxation terms of the hydrodynamic equations providing means to probe the anisotropy in transport experiments.

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Session Classification: Condensed Matter and Statistical Theory of Many-body Systems

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