Electronic structure of encapsulated mono-, bi- and trilayer T_d-$MoTe_2$

Julia Issing, Ignacio Gutiérrez-Lezama, Fabian von Rohr, Alberto Morpurgo, Anna Tamai, and Felix Baumberger

Department of Quantum Matter Physics, University of Geneva

Bulk orthorhombic T_d-$MoTe_2$ is a type-II Weyl semimetal with topological Fermi arc surface states and becomes superconducting at a critical temperature of $T_c = 0.1\,\mathrm{K}$. Remarkably, superconductivity becomes far more robust in the 2D limit, contrary to generic models and the established trend in ultrathin metal films. Recent transport measurements reported a gradual increase in T_c as the thickness is reduced with T_c reaching $7.6\,\mathrm{K}$ in the monolayer [1]. The reasons for the strong increase in T_c as well as the nature of the superconducting state remain unknown. Here, we present the electronic structure of exfoliated mono-, bi- and trilayer T_d-$MoTe_2$ probed by micro-focused angle resolved photoemission. Our thickness-dependent measurements reveal that mono-, bi- and trilayer $MoTe_2$ are compensated metals. The electron pocket of monolayer $MoTe_2$ shows signatures of strong coupling to optical phonons with a mass enhancement $\lambda \approx 1.5$. In bi- and trilayer $MoTe_2$ electron-phonon coupling is weaker consistent with thickness dependence of T_c.

[1] D. A. Rhodes et al., Nano Lett. 2021, 21, 6, 2505-2511.