

Poster-2-9

Electronic structure of the correlated van der Waals metal MoOCl₂

Dario Marchiani,¹ Harrison LaBollita,² Honey Boban,¹ Yann Alexanian,¹ Salony Mandloi,¹
Andres Bareño,¹ Michael Straub,¹ Tanguy Prongué,¹ Timur K. Kim,³ Matthew Watson,³
Xavier Roy,⁴ Emma Lian,⁴ Andrew J. Millis,^{2,5} Antoine Georges,^{1,2,6,7} Anna Tamai,¹ and Felix
Baumberger^{1,8}

¹ *Department of Quantum Matter Physics, University of Geneva, Geneva, Switzerland*

² *Center for Computational Quantum Physics, Flatiron Institute, New York, USA*

³ *Diamond Light Source, Harwell Campus, Didcot, UK*

⁴ *Department of Chemistry, Columbia University, New York, USA*

⁵ *Department of Physics, Columbia University, New York, NY, USA*

⁶ *CPHT, CNRS, École Polytechnique, IP Paris, France*

⁷ *Collège de France, 11 Place Marcelin Berthelot, Paris, France*

⁸ *Swiss Light Source, Paul Scherrer Institut, Villigen, Switzerland*

MoOCl₂ is a van der Waals material characterized by a pronounced in-plane anisotropy in its electronic and optical properties. Recent transport studies reported a high room-temperature resistivity deep in the bad-metal regime and a Kadowaki-Woods ratio exceeding that of heavy fermions, typical signatures of strongly correlated metals [1]. At the same time, MoOCl₂ was recently shown to sustain long-lived collective excitations, including hyperbolic plasmon polaritons, modes typically associated with coherent charge dynamics in metals [2]. In this talk, I will present a detailed investigation of the electronic structure of MoOCl₂ using micro-focused ARPES. Our measurements confirm the pronounced electronic anisotropy. However, a comparison with DFT shows compelling evidence for weak to moderate electronic correlations, in direct contrast to the interpretation of transport measurements. Interestingly though, the renormalization of the quasiparticle dispersion varies strongly along the Fermi surface. Our analysis shows that this implies non-local interactions, which we attribute predominantly to the strong dimerization of Mo.

[1] Wang et al., Phys. Rev. Materials 4, 041001 (2020).

[2] Ruta et al., Science 387, 786–791 (2025).