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SFB 1242 Nichtgleichgewichtsdynamik kondensierter Materie in der Zeitdomäne

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

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Understanding and controlling quantum materials on ultrafast timescales

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The continued drive toward smaller, faster, and more energy-efficient electronic devices demands a microscopic understanding of how charge carriers and band structures evolve on ultrafast timescales. In particular, novel quantum materials - whose properties are governed by strong electronic correlations - offer new opportunities for functionality beyond conventional semiconductors, provided their nonequilibrium behavior can be controlled and understood.

In this talk, I will demonstrate how time- and angle-resolved photoemission spectroscopy (trARPES) serves as a powerful ultrafast probe of carrier dynamics and transient band structures. I will present three representative case studies. First, I will discuss ultrafast charge transfer in van der Waals heterostructures, where efficient light absorption via excitons is followed by rapid charge separation relevant for light harvesting and detection. Second, I will present evidence for hybridization between highly itinerant Dirac electrons and strongly localized flat-band states, indicating the emergence of hybrid quasiparticles with possibly exotic properties. Finally, I will present how driving specific phonon modes allows ultrafast manipulation of lattice structure and electronic bands, exemplified by the transient band structure of WS_2 under resonant excitation of its in-plane bond-stretching phonon.

Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

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