Experimentelle Physik 2

Seminar Festkörperphysik (CMP Seminar)

Aktuelle Probleme der Festkörperphysik für Studenten und Mitarbeiter
020236 Kolloquium/Seminar SS 25
Vorlesungszeit: 10.04.2025 – 24.07.2025

Thursday, 08.05.2025
12:10 – P1-01-306

Floquet engineering in black phosphorus

Changhua Bao

University of Regensburg, Regensburg, Germany
Tsinghua University, Beijing, China

The time-periodic light field has emerged as a control knob for manipulating quantum states in solid-state materials, dubbed as Floquet engineering. In this talk, I will present our progress on the experimental realization of Floquet band engineering in a model semiconductor, black phosphorus, using time- and angle-resolved photoemission spectroscopy. Driven by strong mid-infrared light fields, transient gap opening and band renormalization are directly resolved with exotic pseudospin selectivity. In addition to band-structure engineering, manipulation of symmetry properties through Floquet engineering is also explored, including the manipulation of parity symmetry and spectral distribution of light-dressed states. This series of works provides a comprehensive understanding of Floquet engineering in semiconductors and important guidance for extending Floquet engineering into more materials.

Reference:

C. Bao *et al.,* Nat. Rev. Phys. **4**, 33 (2022).
S. Zhou^{+}, C. Bao^{+} *et al.,* Nature **614**, 75 (2023).
S. Zhou^{+}, C. Bao^{+}, B. Fan^{+}*et al.,* Phys. Rev. Lett. **131**, 116401 (2023).
C. Bao *et al.,* ACS Nano **18**, 32038 (2024).
C. Bao *et al.,* Nat. Commun. **15**, 10535 (2024).
C. Bao *et al.,* Phys. Rev. B **111**, L081106 (2025).