

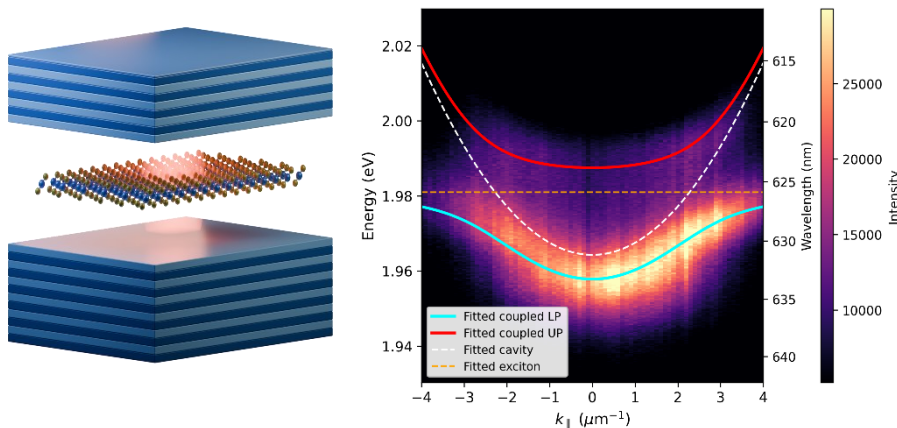


Masterarbeiten an der Technischen Physik

Tuning Light-Matter Interactions in 2d materials

Project Description:

We offer Bachelor's and master's research projects that investigate interactions between excitons, exciton-polaritons, and superconductivity in van der Waals (vdW) heterostructures. The long-term goal is to understand whether and how strong light-matter coupling can influence superconducting behaviour in 2D hybrid systems. Individual projects may focus on sample fabrication, optical characterisation, superconducting transport, or developing experimental techniques that combine optics and electrical transport to probe these interactions.



Conceptual illustration of light-matter coupling of a 2D semiconductor integrated into an optical microcavity (left). Alternating blue layers represent the DBR mirrors, which confine the cavity field (red glow). The vdW TMD structures are embedded in this cavity and strong coupling between excitons and cavity photons can produce exciton-polaritons (right).

What you can learn:

- Sample preparation: Mechanical exfoliation, dry transfer, and fabrication of TMDC heterostructures.
- Nanofabrication and characterisation: AFM, Lithography, metal contacts, and microcavity distributed Bragg Reflectors (DBRs) deposition in a state-of-the-art cleanroom.
- Low-Temperature Transport: Four-probe resistance measurements, current-voltage characterisation at low (4K and mK) temperatures, and magnetic field measurements.
- Optical Spectroscopy: Photoluminescence (Real and Fourier space), reflectance, and characterisation of exciton-polaritons in optical microcavities.
- Data Analysis: Python-based analysis of transport and optical spectroscopy measurements.

Contact:

Name: Ankur Arora, Prof. Dr. Sven Höfling
E-Mail: ankur.arora@uni-wuerzburg.de, Raum: AU23;
sven.hoefling@uni-wuerzburg.de, Raum: AU26