# B2 -Tunable Polaritonics in Atomically Thin Semiconductors Integrated with Photonic Metasurfaces

## Shape the future of active light control

Join an international research team developing next-generation optical metasurfaces that can dynamically manipulate light. This PhD project combines 2D materials, exciton-polariton physics, valleytronics, and chiral optical metasurfaces to explore new routes toward ultrafast, valley-selective control of light at the nanoscale.

The position is hosted at the **Institute of Solid State Physics, Friedrich Schiller University Jena (Germany)** and is part of the International Research Training Group **Meta-Active – Tailored Metasurfaces and Metasystems for Active Light Control,** funded by DFG.

**Your Research Project**

In this project, you will investigate exciton-polaritons in two-dimensional transition metal dichalcogenides (TMDs) integrated with structured high-Q photonic environments. The goal is to develop actively tunable polaritonic systems in which the valley degree of freedom of 2D semiconductors can be controlled through tailored nanophotonic architectures.

Key research topics include:

- Development and optical characterization of high-Q dielectric metasurfaces and open microcavities hybridized with monolayer semiconductors to achieve strong light–matter coupling between 2D valley excitons and photonic modes
- Momentum-, polarization-, and time-resolved spectroscopy of hybrid 2D-material nanophotonic systems at liquid-helium temperatures
- Exploration of valley-selective polariton emission, dispersion, dynamics, and coherence
- Implementation of pump-probe optical control schemes based on the valley-selective optical Stark effect

**What You Will Gain**

During your PhD, you will develop expertise in:

- Exciton-polariton physics and strong light-matter coupling
- Optical properties of atomically thin semiconductors
- Valleytronics, spin-valley physics, and chiral nanophotonics
- Design and simulation of dielectric metasurfaces and microcavities
- Advanced optical spectroscopy, including polarization- and momentum-resolved measurements
- Ultrafast pump-probe spectroscopy and optical Stark control
- Nanophotonic device integration and collaboration with international partners for metasurface design and fabrication
- Scientific communication, interdisciplinary teamwork, and international collaboration

# Job Description
*Doctoral Position*

**Supervisory Team**

Main Supervisor
Dr. Zlata Fedorova (Friedrich Schiller University Jena)

Co-Supervisors / Collaborators
Prof. Elena Ostrovskaya (Australian National University)
Dr. Falk Eilenberger (Friedrich Schiller University Jena)
Dr. Duk-Yong Choi (Australian National University)

**What We Offer**

- Fully funded 3-year PhD position
- Salary according to TV-L E13 (75%)
- Joint supervision by leading researchers in Germany and Australia
- Minimum 12-month research stay at the Australian National University (Canberra)
- Access to world-class nanofabrication and optical characterization facilities
- International training workshops and networking opportunities
- Participation in a highly interdisciplinary and collaborative research environment
- A jointly supervised international PhD experience

**Who Should Apply?**

We welcome applications from candidates with a Master's degree in Physics, Photonics, Electrical Engineering, Materials Science, Optical Engineering or related disciplines.

Experience in optics, nanophotonics, numerical simulations, micro- and nanofabrication, or experimental physics is advantageous but not required.

**Diversity and Inclusion**

Meta-Active and Friedrich Schiller University Jena are committed to equal opportunities and fostering an inclusive and family-friendly research environment. We particularly encourage applications from women and other underrepresented groups in science.

**Application Information**

Start Date: July 2026 or as soon as possible thereafter.

Application Deadline: 20 July 2026

For detailed information about the research project, eligibility requirements, and the application procedure, please visit:

https://www.meta-active.uni-jena.de/apply

**Ready to Apply?**

Join an international team at the forefront of active nanophotonics and help develop the next generation of tunable optical devices.