



IMPRS UFAST Call for PhD applications 2026/2027



GB - Theory of Exciton-Phonon Coupling and Ultrafast Exciton Dynamics in 2D Materials and Perovskite Quantum Dots

Title of PhD Project	Theory of Exciton-Phonon Coupling and Ultrafast Exciton Dynamics in 2D Materials and Perovskite Quantum Dots
Type	Theory
Supervisor(s)	Prof. Gabriel Bester
Affiliation(s):	Hamburg University
Number of positions:	1
Abstract:	The project focuses on the interplay of excitons, charged excitons, biexcitons, and lattice vibrations in low-dimensional quantum materials. Using ab-initio electronic structure methods together with our screened configuration interaction approach, we aim to describe excitonic complexes and their coupling to phonons in atomically thin materials and perovskite quantum dots. A particular emphasis will be placed on ultrafast processes such as exciton formation, relaxation, decoherence, intervalley scattering, and temperature-dependent recombination dynamics. By combining accurate first-principles calculations with advanced many-body techniques, we will explore how exciton–phonon interactions govern optical spectra, lifetimes, and dynamical response in realistic material environments. This project offers an exciting opportunity to contribute to cutting-edge research in computational materials science, with strong relevance to current experiments in ultrafast spectroscopy and nanoscale optoelectronics. The topic is ideally suited for a motivated candidate interested in many-body theory, light–matter interactions, and emerging quantum materials.
Contact person for scientific questions about the project:	Prof. Gabriel Bester: gabriel.bester@uni-hamburg.de
Research Group Website:	https://www.chemie.uni-hamburg.de/en/institute/pc/arbeitsgruppen/bester.html