Open position for LMU-CSC scholarship candidates 2027

Department/Institute: Department of Chemistry, Physical Chemistry (Faculty of Chemistry and Pharmacy)

Subject area: Physical Chemistry / Materials Chemistry – metal halide perovskite semiconductors

Name of supervisor: Dr. Erkan Aydin

Number of open position: 1

Project title: Polymorphism and phase stabilization of formamidinium lead iodide ($FAPbI_3$) as a mid-bandgap absorber

Project description:

Formamidinium lead iodide ($FAPbI_3$) has a bandgap of about 1.5 eV and excellent optoelectronic properties. This makes it a reference material among halide perovskites and a natural mid-bandgap absorber, for example in multijunction concepts. Its photoactive cubic α-phase is, however, thermodynamically metastable at room temperature and tends to transform into the non-perovskite hexagonal δ-phase, especially in the presence of moisture, heat or lattice strain.

This project studies the thermodynamics and kinetics of this phase transition and how it can be controlled with minimal changes to the bandgap. The doctoral researcher will investigate the influence of small amounts of cation and anion alloying, residual lattice strain, surface ligands and processing conditions on phase formation and phase retention. Methods include temperature- and humidity-dependent X-ray diffraction, photoluminescence spectroscopy, thermal analysis and microscopy.

Simple solar cells serve only as a test platform to verify how structural stability affects device-relevant properties; the focus is on understanding, not on device optimization. The expected outcome is a quantitative understanding of the factors that stabilize the α-phase of $FAPbI_3$ while preserving its near-ideal bandgap.

Project time plan: Both models are possible.

- Full Doctoral Study-Model: 36 or 48 months
- Sandwich-Model: 12 or 24 months

Language requirements: English: IELTS Academic 6.5 (no module below 6.0) or TOEFL iBT 95. German is not required.

Academic requirements:

- Research-oriented Master's degree (completed or in progress) in chemistry, physics, materials science or a closely related field.
- Bachelor's and Master's degree with a score of 80 or above in the Chinese grading system.
- Solid background in physical chemistry, solid-state chemistry or semiconductor physics; hands-on experience with thin-film preparation or optical/structural characterization is an advantage.
- Curiosity about fundamental structure–property questions, careful experimental work, and the ability to work in an international team.
- Formal eligibility according to the LMU-CSC program (citizen of the PR of China, age limit 35 years).

Contact information of supervisor:

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To applicants:
➢**please attach resume and research motivation letter**