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: Oxidation chemistry and defect formation in narrow-bandgap tin–lead perovskites

Project description:

Partially replacing lead with tin lowers the bandgap of halide perovskites to about 1.2–1.3 eV, making Sn–Pb perovskites a scientifically interesting class of narrow-gap semiconductors. Their properties are dominated by the chemistry of Sn^{2+}, which is easily oxidized to Sn^{4+}. This creates tin vacancies, strong p-type self-doping and short carrier lifetimes. In addition, Sn-containing films crystallize much faster than their pure-lead counterparts, which makes film formation difficult to control.

The project investigates where and how oxidation occurs, from the precursor solution through film formation to surfaces and interfaces, and how it can be suppressed. The doctoral researcher will study precursor and solvent chemistry, the role of reducing and coordinating additives, and crystallization kinetics. Films will be characterized by X-ray photoelectron spectroscopy, X-ray diffraction, steady-state and time-resolved photoluminescence, and electrical measurements to quantify doping and defect densities.

Simple solar cells serve only as a test platform to relate chemical and defect properties to carrier collection; the focus is on understanding, not on device optimization. The expected outcome is a mechanistic picture of Sn^{2+} oxidation and defect formation, together with chemical strategies to control them.

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:

Dr. Erkan Aydin, Physical Chemistry, LMU Munich
Butenandtstr. 5–13, 81377 München, Germany
E-mail: erkan.aydin@cup.uni-muenchen.de · Web: https://aydin.cup.uni-muenchen.de

To applicants:

➢**please attach resume and research motivation letter**