

Open position for LMU-CSC scholarship candidates 2027

Department/Institute: Chemistry

Subject area: Physical Chemistry

Name of supervisor: PD Dr. Evelyn Ploetz

Number of open position: 1

Project title: Molecular Transport and Sensing in Porous Materials

Project description:

Metal–organic frameworks (MOFs) are a versatile class of porous materials with tunable structures and host–guest interactions, making them attractive for many applications like molecular sensing, gas capture / storage, or water harvesting.(1-3) Yet, realizing this potential requires a molecular-level understanding of how guest molecules interact with these materials, how they are transported through individual crystals, and how these processes can be controlled. Building on recent work (4-6), this PhD project will investigate the dynamics of sorption and transport in porous materials, with a particular focus on MOFs.

The central concept is to combine advanced spectroscopy and imaging with well-defined environmental conditions to follow molecular uptake, transport and release with high spatial and temporal resolution. By correlating local structure and molecular interactions with transport dynamics, the project aims to identify the mechanisms governing uptake, diffusion, selectivity and response. External stimuli such as light and temperature will be used to actively modulate sorption and molecular mobility, complemented by quantitative and data-driven analysis, including machine-learning approaches.

The PhD candidate will work at the interface of **physical chemistry, porous materials, advanced spectroscopy, imaging and data science**. The work will range from method development to mechanistic studies of molecular transport and its active control, with applications in **molecular sensing, selective sorption, separation, gas capture and storage**.

1. R. Freund, et al. *Angew. Chem. Int. Ed.* **60**, 23946-23974 (2021); 2. S. Canossa, et al. *Nat. Rev. Mater.* **8**, 331-340 (2023); 3. J. Tittel, et al. *Adv. Funct. Mater.* **34**, 2307518 (2024); 4. A. Fuchs, et al. *Adv. Mater.* **34**, 2104530 (2022); 5. A. Fuchs, et al. *J. Am. Chem. Soc.* **145**, 14324-14334 (2023); 6. J. Tittel, et al. *Small*, e73636 (2026).

Project time plan:

➤ Full Doctoral Study-Model: 48 months

Language requirements: English

Academic requirements:

Master's degree in physics, chemistry, material science or similar with excellent performance

Contact information of supervisor:

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To applicants:

➤ please attach resume and research motivation letter