

The STM team at the Chair of Physical Chemistry of the Technical University of Munich focuses on fundamental dynamics in catalytic processes on small supported metal clusters and in functional surfaces. For our new ERC-funded project on real space observations of dynamic changes in catalysts under gas atmospheres we offer a

PhD Position (66% TV-L E13) for Studies on the Dynamics of Oxide-Supported Cluster Catalysts in Action

Project Description

A heterogeneous catalyst – often oxide-supported metal clusters – is an inherently dynamic system: its structure and chemical composition change continuously during a reaction. Indeed, the high dynamic structural fluxionality of clusters is often what makes them such excellent catalysts, but dynamics can also decrease their durability. This project aims at tackling the fundamental mechanisms guiding cluster stability and dynamics. We want to answer fundamental questions like: In which temperature and pressure range are supported clusters stable? Does the stability of clusters vary with their size and shape? And what about oxide supports – do they restructure as well? How does this change their stoichiometry? Can we improve the sintering-resistance of clusters by tuning the support? Once sintered, how do we re-disperse clusters? Can we influence dynamic structural fluxionality by cluster-support interaction?

As the successful candidate, you will perform variable temperature scanning tunneling microscopy (STM) measurements at video frame rates and under near-ambient pressures (NAP). You will be involved in setting up and calibrating a newly purchased NAP-STM. You will have the opportunity to learn about state-of-the-art video rate STM techniques and experiments under NAP-conditions. Catalytic activity will be tested using our new pulsed-valve setup for temperature programmed reaction (TPR). In addition, you will have the opportunity to travel to synchrotrons around the world (e.g. to Berkeley, Oxford, Lund, Trieste) to perform complementary NAP X-ray photoelectron spectroscopy (NAP-XPS) measurements which will provide information about the chemical changes occurring in the oxide support and clusters catalysts and to collaborate with international groups.

Required qualifications

Prospective candidates have a degree in chemistry, physics or a related field and are highly motivated to work on sophisticated experimental setups. They show a strong interest in method development and solving technical challenges and bring along good communication skills in English. The successful candidate will further show a willingness to learn about new techniques and scientific fields and contribute their own ideas to the project. We are looking for a team player who collaborates closely with other team members while also working independently on their own project. Experience in surface chemistry, UHV methods, scanning probe microscopy, synchrotron techniques and/or basic programming skills (Matlab, Python, ...) are advantageous.

Our offer

The position is funded as part of an ERC Starting Grant ("TACCAMA"), available immediately and will be limited to three years. Payment will be based on the Collective Agreement for the Civil Service of the Länder (TV-L). TUM strives to raise the proportion of women in its workforce and explicitly encourages applications from qualified women. Applications from disabled persons with essentially the same qualifications will be given preference.

Application

Please send your CV, letter of motivation (max. 1 page) and contact details of two potential references to Barbara A. J. Lechner (bajlechner@tum.de) and/or Friedrich Esch (friedrich.esch@tum.de) by October 1st 2020. Further information on our research groups is available at www.department.ch.tum.de/pc and www.barbaralechner.com.