

PhD Position (66% TV-L E13) for the Spectroscopic Investigation of Oxide-Supported Clusters under Ambient Conditions

The group for Functional Nanomaterials at the Technical University of Munich investigates chemical and structural dynamics of functional surfaces such as small oxide-supported metal clusters with state-of-the-art microscopy and spectroscopy surface science techniques. We offer a stimulating research environment in a multidisciplinary laboratory in one of the highest-ranked universities in Europe. This advertised PhD position is funded within our ERC project on cluster catalysts under ambient conditions.

Project Description

Oxide-supported clusters (≤ 100 atoms) exhibit attractive properties for industrial catalysis which can change even with the addition of a single atom. In this PhD project, size-selected metal clusters on reducible and non-reducible oxide supports will be compared regarding their stability, reactivity and structure. Specifically, we will use near ambient pressure X-ray photoelectron spectroscopy (NAP-XPS) to probe changes in the oxidation state of the clusters, monitor whether they become encapsulated (as for larger nanoparticles), investigate the influence of cluster charge state on reactivity, and study the stability window with regards to sinter resistance in different gas environments.

As the successful candidate, you will perform temperature- and gas composition-dependent NAP-XPS experiments and in-depth data analysis at synchrotrons around the world (e.g. Berkeley, Lund, Trieste). To this purpose, you will prepare single crystal (e.g. $\text{TiO}_2(110)$) or thin film (e.g. Al_2O_3) supports, generate size-selected metal clusters using a cluster source and characterize these systems under ambient conditions. Later, you will also participate in writing new beamtime proposals that reflect the progress of your thesis project. You will also be involved in the installation and operation of a new lab-based NAP-XPS at TUM. In addition, you will have the opportunity to learn about scanning tunneling microscopy to obtain complementary information about structural changes of clusters.

Required qualifications

Prospective candidates have a degree in chemistry, physics or a related field and are highly motivated to work on sophisticated physicochemical experimental setups. They show a strong interest in scientific questions within physical chemistry, enjoy 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 XPS, ultrahigh vacuum technology, surface chemistry, NAP studies, synchrotron techniques and programming skills (Matlab, Python, LabVIEW, ...) is 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 two letters of reference to Prof. Dr. Barbara A. J. Lechner (recruitment.lechner@tum.de). Only complete applications will receive full consideration. The position is open until 31/10/2022 or until filled. Further information on our research group is available at www.ch.nat.tum.de/nanomaterials.