

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

The group for Functional Nanomaterials investigates chemical and structural dynamics of functional surfaces such as small oxide-supported metal clusters with state-of-the-art spectroscopy and microscopy surface science techniques. Located in the Department of Chemistry of the Technical University of Munich, we offer a stimulating research environment in a multidisciplinary laboratory in one of the highest-ranked universities in Europe. We are now seeking an exceptional doctoral candidate to join our ERC-funded project on cluster catalysts under ambient conditions.

Project Description

Oxide-supported clusters (≤ 100 atoms) exhibit attractive properties for industrial catalysis which can change non-linearly, often with the addition of a single atom. Nanoparticles (> 100 atoms) have been shown to become encapsulated by reducible oxides at elevated temperatures, which influences their activity significantly, but for small clusters, little is known about this effect. In this project, encapsulation in dependence of cluster size and support material will be investigated, with a special focus on its effect on catalytic activity. Using near ambient pressure X-ray photoelectron spectroscopy (NAP-XPS), we will follow the encapsulation process in situ to identify any chemical changes, and subsequently investigate the stability and composition of the encapsulation layer in different gas environments.

As the successful candidate, you will perform temperature- and gas composition-dependent NAP-XPS experiments and in-depth data analysis. You will prepare single crystal (e.g. $\text{TiO}_2(110)$) or thin film (e.g. Al_2O_3) supports and generate size-selected metal clusters using a cluster source. NAP-XPS experiments will predominantly be performed at synchrotrons around the world (e.g. Berkeley, Lund, Trieste), and you will also be involved in the installation of a new lab-based NAP-XPS at TUM. In addition, you will have the opportunity to learn about scanning tunneling microscopy which will provide complementary information about the structural changes of clusters at the same conditions.

Required qualifications

Prospective candidates have a degree in physics, chemistry or a related field and are highly motivated to work on sophisticated physicochemical 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 XPS, ultrahigh vacuum technology, surface chemistry, NAP studies, synchrotron techniques and basic programming skills (Matlab, Python, LabVIEW, ...) 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 two letters of reference to Prof. Dr. Barbara A. J. Lechner (recruitment.lechner@tum.de) by November 30th 2021. Only complete applications will receive full consideration. Further information on our research group is available at www.department.ch.tum.de/nanomaterials.