

The Chair of Physical Chemistry (Prof. U. Heiz) at the Technical University of Munich is specialized in the study of size-selected metal clusters for catalysis under very well defined conditions. One of the focuses are the properties and the reactivity of these clusters at the solid-liquid interface in order to obtain atomic-scale insight into the local electrochemistry. For this project we offer a

PhD Position (66% TV-L E13) for Studies on Cluster Electrochemistry at the Atomic Scale

Project Motivation:

Current catalytic challenges such as water splitting or carbon dioxide reduction might be driven in a material-efficient way when using size-selected clusters, due to their high surface area and size-specific properties. While size can control reactivity in gasphase reactions, much less is known on the reactivity in liquids. At the solid-liquid interface fascinating new questions arise: How does the solvation and the presence of adsorbates trigger the reaction and dissolution propensity? Can we prepare size-selected cluster-assembled materials by combining advanced Inorganic Synthesis with highly-controlled deposition on structured supports? Can we play kinetic tricks to overcome thermodynamic stability limits? These fundamental questions shall be investigated at the atomic scale.

Description of Work:

In our electrochemical laboratory we combine local and integral investigation methods, in particular an Electrochemical Scanning Tunneling Microscope (ECSTM) and a Rotating Disk Electrode (RDE). We prepare novel, size-controlled nanocluster structures, e.g. by deposition of gasphase clusters or steered decomposition of polynuclear inorganic complexes, and investigate their stability and eventual dissolution properties. With the ECSTM the cluster structures are investigated in situ and under reaction conditions while controlling electrochemical potentials and electrolyte composition. The implementation of video-rate imaging and of local reactivity measurements on single clusters is envisaged.

Requirements:

Prospective candidates have a degree in chemistry, physics or related fields and are highly motivated to work on sophisticated experimental setups. A willingness to learn about new techniques and scientific fields is mandatory. While not required, experiences in one or more of the following topics are advantageous:

electrochemistry, scanning tunneling microscopy, or cluster science.

The group of physical chemistry at TU Munich offers excellent research opportunities in a stimulating and friendly environment. The laboratories are located in the newly built Catalysis Research Center, which offers an interdisciplinary exchange and state-of-the-art infrastructure. The position is available from now on, for a duration of three years.

Interested applicants shall send their application letter together with a CV to Friedrich Esch (friedrich.esch@tum.de) as soon as possible.

More information is available at the group's website: www.pc.ch.tum.de/.