

## Master Thesis Project

# Dynamic Catalysts under the Scanning Tunneling Microscope

The group of 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 spectroscopy and microscopy surface science techniques. We offer a stimulating research environment in a multidisciplinary laboratory in one of the highest-ranked universities in Europe. The advertised Master thesis project is embedded within our ERC project on the dynamics of cluster catalysts under reaction conditions.

### Project Description

Size-dependent structural and electronic effects make sub-nm clusters extremely interesting for highly selective, mild, sustainable catalysis. We investigate model catalysts of clusters, produced with atomic size selection, in reactive gas environments using a sophisticated near-ambient pressure scanning tunneling microscope (NAP-STM). By recording videos, we can follow catalyst restructuring *in situ* upon heating, due to adsorbates, or during a reaction, obtaining unique insight into the elusive dynamics of a working catalysts. X-ray photoelectron spectroscopy (NAP-XPS) complements microscopy with information on the chemical composition and oxidation state of the system. These measurements are performed both at synchrotrons and with our on-site lab-based instrument.

As the Master student on this project, you will prepare the single crystalline samples, deposit metal particles, perform and analyze NAP-STM experiments and participate to the maintenance of the UHV apparatus. You will participate in meetings within the group and department, as well as with international collaborators and get the opportunity to gain experience presenting your own results.

### Required Qualifications

Prospective candidates pursue Master studies in Chemistry or a related field and are highly motivated to work with 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 candidate will have the opportunity to contribute their own ideas to projects. We are looking for a team player who collaborates closely with other researchers while also working independently. Technical skills and an interest in understanding and maintaining state-of-the-art ultra-high vacuum (UHV) instrument, experience in STM, UHV technology, surface chemistry, NAP studies and/or programming skills (Matlab, Python, LabVIEW, ...) are advantageous but not a prerequisite. Curiosity and a willingness to learn are the most important thing!

### Application

Please send your CV and transcript to Prof. Dr. Barbara A. J. Lechner ([bajlechner@tum.de](mailto:bajlechner@tum.de)) or come by one of our labs to speak to a PhD student or postdoc. Further information on our research group is available at [www.ch.nat.tum.de/nanomaterials](http://www.ch.nat.tum.de/nanomaterials).