

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 collaborative project *Connect – Catch – Couple* we offer a

## PhD Position (66% TV-L E13) for Studies on Metal-Molecule Interactions in Catalytic Coupling at the Solid-Liquid-Interface

### Project Description

This project seeks for a fundamental understanding of the chemical interaction between organic molecules and metallic Pd nanostructures during C–C coupling. Scanning Tunneling Microscopy (STM) in vacuum and in solution will provide detailed insight into the metal-molecule interaction at the atomic scale, by studying individual molecules in combination with a systematic variation of structure and size of the metal. The coupling process will be investigated along the three main steps: (i) CONNECT: Formation of metal-molecule bonds to the Pd nanostructures; (ii) CATCH: Impact of the metal-molecule interaction on the nanostructure morphology and dynamics; (iii) COUPLE: Formation of reaction products, concomitant to the release of the Pd nanoparticles for further catalytic cycles. We want to answer various key questions: How do molecules interact with Pd surfaces of different morphology? How are the reactants activated? How is the catalyst stability affected by single reaction steps? How can the Pd particle size, support, oxidation state and solvent systematically be tuned to increase the catalyst stability?

As a successful candidate, you will perform Electrochemical STM at the solid/liquid interface for a direct insight into the role of solvation and the influence of the redox state of Pd nanostructures under realistic mild coupling conditions. You will implement the FAST imaging technique to address local particle dynamics, crucial to understand deactivation mechanisms. You will collaborate strongly with our partner at the university in Graz who performs complementary experiments with a low temperature STM to study the metal-molecule bond with high spatial resolution, giving local insight into favorable molecule-metal arrangements and transformations.

### 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, electrochemistry, scanning probe microscopy, and/or basic programming skills (Matlab, Python, ...) are advantageous.

### Our offer

The position is funded as part of a DACH grant, 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 Friedrich Esch (friedrich.esch@tum.de) by October 1<sup>st</sup> 2020. Further information on our research groups is available at [www.department.ch.tum.de/pc](http://www.department.ch.tum.de/pc).