PhD/PostDoc position

Operando Electrochemical STM

Structural Evolution of Electrocatalyst Surfaces in Action

In order to realize the energy transition, fundamental electrochemical research is of uttermost importance. We have to address not only the economic feasibility and thus the activity and stability of a certain process, but also to invent completely new strategies and solutions for certain applications. Examples are electrolyzers, fuel cells, catalysts, and batteries to name only a few.

As the processes of interest take place on the atomic scale at the surface, the next steps can only be set, when deep fundamental understanding is acquired thereby shedding a light and gaining insight on the underlying atomic scale processes. Until now both researchers and engineers are often surprised by the few discovered atomic details rendering new progress, at the moment, still to trial-and-error research. The problem lies in the complexity of the systems, which combine fundamental surface science and nanotechnology on the atomic scale with thermodynamics (rate equations and production), electronics (charging, screening and impedances), and chemistry (reactions, acids/bases, and additives).

You will work on one of the most dedicated, homebuilt electrochemical setups that is rather unique in the entire world: an electrochemical scanning tunneling microscope (ECSTM) that is capable of measuring in full operando conditions!

With this ECSTM, it is possible to run the electrochemical reaction, to measure at the same time the standard electrochemical currents (in the uA range), to change the potential of the surface (working electrode), while imaging the surface at the same time with atomic resolution using a tunneling current (in the pA range) and measuring in strong acids/bases.

The power of this instrument is the full operando capability. We can see what is happening with and on the surface...thus we do have the possibility to understand, see the below literature as well as the movies at https://www.youtube.com/user/DrMRost for examples.

This type of research is only possible due to a beautiful collaboration between Prof. M.T.M. Koper (chemistry: electrocatalysis and electrochemical surface science, LIC) and Dr. M.J. Rost (physics: surface science, nanotechnology, and STM/AFM technology, LION), both two experts in their fields. Indeed it is a challenge to run this instrument, but you will be educated and supported by students from both the electrochemical as well as the physics side next to the two staff experts ensuring exciting, new groundbreaking, and timely research.

We are looking for a handy experimentalist with knowledge, or at least deep interest/affinity, in technical aspects, like mechanics (for nm resolution microscopes), electronics, computer control, and programming. As the research is at the complete border between two fields, a physicist with openness or interest in electrochemistry is equally well suited as a electrochemist with interest in surface physics.

The contract will be on the basis of a full time employment for 4 years (PhD student 1+3) coming with a decent salary and secondary benefits. 

Contact: Please send your application with a complete CV and a motivation letter to Dr. M.J. Rost: rost@Physics.LeidenUniv.nl / www.physics.leidenuniv.nl/rost