4 years PhD / 3 years PostDoc position:

Operando Electrochemical STM

(Leiden, The Netherlands)

The Faculty of Science and the Leiden Institute of Physics is looking for a PhD student (or PostDoc),

"*Operando* Electrochemical STM:
Towards Cyclic Voltammograms with nm Resolution"

Description:
In order to prevent our children inheriting a huge environmental problem in the future, we quickly have to realize the energy transition to renewable sources, which requires devices like electrolyzers, fuel cells, catalysts, and batteries, to name only a few. However, many of these devices suffer from its economic feasibility, due to low activity, low selectivity, or even deterioration.
Further improvements require a bottom-up approach with fundamental research at the atomic scale to gain full insights on the involved atomic processes at the electrode surface under operating conditions. To contribute to this cause, we have developed a unique Electrochemical Scanning Tunneling Microscope (ECSTM) that is capable of measuring in *full operando* conditions!
This allows observing the electrode, and its changes, on the atomic scale, while running e.g. a real electrochemical reaction, see the examples under https://www.youtube.com/@DrMRost

Project: *Towards Cyclic Voltammograms with nm Resolution*
One of the holy grails in electrochemistry is the identification of atomic active sites on the surface, which can be extracted on average from cyclic voltammograms. Until now the best lateral resolution has been achieved using a scanning electrochemical microscopy (SECM). However, this resolution is still as large as ~50nm, which smears out all atomic details. The project aims on pushing this (technical) boundary to the extreme, by applying an ECSTM to extract local CV information.
The identification of single atomic active sites on the surface surely would have an enormous impact.

The ideal candidate has scanning tunneling microscopy (STM) experience as well as a physical surface science and electrochemistry background.
However, we explicitly invite also physicist with an openness and interest in electrochemistry as well as electrochemist with interest in fundamental surface physics to apply to this position.

Employed at LION (physics), you will greatly benefit from a beautiful collaboration between Prof. M.T.M. Koper (chemistry - LIC: electrocatalysis and electrochemical surface science), Prof. J.M. van Ruitenbeek (physics: atomic and molecular conductors, tunneling junctions, electronic noise), and Dr. M.J. Rost (physics: surface science, nanotechnology, and STM/AFM technology), three experts in their fields, which ensures exciting, new groundbreaking, and timely research.
The daily supervision will be performed by Dr. M.J. Rost.

Key responsibilities:

- Design, Preparation, and Execution of Experiments
- Operation (and Maintenance) of the Electrochemical Scanning Tunneling Microscope
- Interpretation of the Results and Quantitative Data Analysis

- Correlation of the Results to Existing or Self-Developed Theory Implying Literature Research
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- Preparation and Contribution to Publications in High-Quality Journals

Essential selection criteria:

- Masters Degree in Physics, Nano-Science, Materials Science or Electrochemistry
- Background in Electronics (OpAmps, Amplifiers, PreAmps, FeedBacks, Control...)
- Programming Experience (like C++, Python, Mathlab,..) and Computer Skills
- Affinity for Technology & "*handy*" Experimentalist (skilled to work with small precious parts)
- Perseverance & Ability to Work Individually as well as in a Team

Desirable selection criteria:

- STM (Scanning Tunneling Microscopy) or SPM experience
- Electrochemical Lab & Characterization Experience (CV's, Potentiostat, Electrochemical Cell..
- Background in Mechanics for Instrument Design (mechanical filter, stability, drift,…)
- Surface Science Background in either Condensed Matter Research or Electrochemistry
- Atomic Scale Surface Science Background (Energetics, Diffusion, Phase Transitions, …)

Terms and conditions

For the PhD student, we offer a full-time, 4 (1+3) year term position with salary range from € 2.770,- to € 3.539,- gross per month (in accordance with the Collective Labour Agreement for Dutch Universities). For a PostDoc the maximum contract will be 3 years (1+2) and the salary depends on the experience (minimal € 3.877,-).

Leiden University offers an attractive benefits package with additional holiday (8%) and end-of-year bonuses (8.3 %), training and career development and sabbatical leave. Our individual choices model gives you some freedom to assemble your own set of terms and conditions. Candidates from outside the Netherlands may be eligible for a substantial tax break.

Leiden University is strongly committed to diversity within its community and especially welcomes applications from members of underrepresented groups.

Applications:

To apply for this vacancy, please send an email to Dr. M.J. Rost (rost@Physics.LeidenUniv.nl / www.physics.leidenuniv.nl/rost) mentioning "Application PhD: nm CV" in the title.
Please ensure that you attach the following documents:

- a complete, detailed, and updated CV in reverse chronological order,
- which includes a list of your skills (experimental, computer, miscellaneous, languages), a short list of personal interests, and 6 single adjectives describing your character
- a personal motivation letter, in which you address also the selection criteria
- explain in the body of the email why you are interested in this position
- all academic transcripts with grades and a translation such that we can understand the subjects and marks

We start reviewing applications immediately and until the positions are filled. The starting date is autumn/winter 2023. A PhD program in the Netherlands takes 4 years.

Research at the Leiden Institute of Physics (LION):

Research at the Leiden Institute of Physics (LION) is foundational and curiosity driven. All our scientists share a desire to increase the knowledge of the world around us, in an open atmosphere of inquiry from which innovative ideas emerge that provide applications and value for society.

At LION we embrace the full breadth of physics, addressing questions from the smallest to the largest scales, and from extremely fast to very slow processes. We study a broad range of systems and phenomena, from cosmic strings to DNA strands, from granular materials to quantum dots and from protein assemblies to socio-economic networks.

Our research efforts focus on Quantum Matter and Quantum Information, Biological and Soft Active Matter, and in Cosmology. One of our strengths is a close interaction between theory (at the Lorentz Institute) and experiment (in the Huygens-Kamerlingh Onnes Laboratory), with advanced theoretical modeling going hand in hand with the development of novel, world-class instrumentation.

Research at our faculty:

The Faculty of Science is a world-class faculty where staff and students work together in a dynamic international environment. It is a faculty where personal and academic development are top priorities. Our people are committed to expand fundamental knowledge by curiosity and to look beyond the borders of their own discipline; their aim is to benefit science, and to make a contribution to addressing the major societal challenges of the future.

The research carried out at the Faculty of Science is very diverse, ranging from mathematics, information science, astronomy, physics, chemistry and bio-pharmaceutical sciences to biology and environmental sciences. The research activities are organised in eight institutes. These institutes offer eight bachelor's and twelve master's programmes. The faculty has grown strongly in recent years and now has more than 2,200 staff and almost 4,200 students. We are located at the heart of Leiden's Bio Science Park, one of Europe's biggest science parks, where university and business life come together.

For more information, see www.universiteitleiden.nl/en/science and http://workingat.leiden.edu/