Job description

1 POSTDOCTORAL POSITION

ELECTRODEPOSITION AND NANO-ELECTROCHEMISTRY

CHEMISTRY OF SURFACES, INTERFACES AND NANOMATERIALS (CHEMSIN)

UNIVERSITÉ LIBRE DE BRUXELLES (ULB)

A fully funded 3-year postdoctoral position (1-year contract, renewable for 2 additional years*) is available with Prof. Jon Ustarroz at the Chemistry of Surfaces, Interfaces and Nanomaterials (ChemSIN) of the Université Libre de Bruxelles (ULB). The project – NDIAMO aims at studying electrochemical nucleation & growth and electrochemical degradation of nanomaterials using **electron diffraction methods** during ***in-situ*** **electrochemical transmission electron microscopy** (***in-situ*** **EC-TEM**). The project, funded by Innoviris, will be carried out by 3 researchers, in collaboration between the ChemSIN and 4MAT research groups of the ULB and Nanomegas SPRL, a Brussels-based company leader in electron diffraction hardware and software solutions for TEM.

TEM is a unique technique that has significantly contributed these last decades to a wide range of scientific fields. With achievable spatial resolutions down to subnanometer scale, it has allowed the observation of key subnanometric phenomena and thus has leveraged the understanding of macroscopic properties and behaviours. The study of specimens in liquid environment under electrochemical control (Electrochemical TEM: EC-TEM), is highly sought after. In fact, this emerging approach is highly relevant for a wide range of electrochemical material synthesis (electrodeposition) or energy conversion (fuel cells, electrolyzers, batteries) technologies. For example, *in-situ* EC-TEM characterization has shown to be crucial to understand inhibition mechanisms during copper metallization, catalyst degradation during fuel cell operation, or failure mechanisms caused by dendritic growth during battery charge/discharge.

However, the method is limited by the interaction of accelerated electrons with the electrodes and species in solution, altering the (electro)chemical processes and a correct interpretation of EC-TEM data. These effects can be mitigated using lower dose rates, integrating EC-TEM to direct electron detectors and fast imaging techniques.

In this project, you will study the early stages of **electrochemical nanocrystal nucleation & growth**, and **nanomaterial degradation** processes during relevant electrochemical reactions (ORR, HER, CO_2RR) by employing **advanced electron diffraction methods *in-situ***. You will work with a recently acquired in-situ EC-TEM holder, together with experts in electron diffraction and TEM. You will be responsible for generating and analyzing reliable electrochemical data. Your research will also be supported by local electrochemical methods (scanning electrochemical cell microscopy - SECCM), ongoing collaborations on EC-TEM, and ongoing projects on numerical modelling of nanoscale electrochemical processes.

ChemSIN is a dynamic international and multicultural research group with recognized expertise in a wide range of domains across surface science. The successful candidate will also benefit from electrochemical workstations and surface analytical methods such as XPS, FESEM, TEM, or AFM. Brussels, the Capital of

Europe, is one of the most cosmopolitan cities of the world. A vibrant and charming city, which combines history, modernity, arts and gastronomy.

Profile

- You hold a PhD degree in chemistry, physics, materials science, engineering or a related field.
- You are independent and self-motivated, quality-oriented, creative and cooperative.
- You are committed to write post-doctoral grant applications through one of the following granting schemes: *H2020-MSCA Individual Fellowship*, *FNRS Chargé de Recherches*, or similar.
- You have high-level experimental skills and demonstrated experience in fundamental experimental electrochemistry, including electrodeposition and electrochemical nucleation, growth & dissolution.
- You have demonstrated experience in analyzing TEM (or other microscopy) data to understand electrochemical phenomena.
- Experience with *in-situ* EC-TEM is a strong plus.
- You have skills in software for data processing and analysis (Python, Matlab, IgorPro, etc.).
- Programming skills in LabVIEW for data acquisition are strongly appreciated.
- Language skills: excellent English (oral and written) is mandatory.
- Scientific communication skills: excellent at communicating orally and writing scientific results.
- You have at least 4 peer-reviewed publications as first author.

Interested ?

Applications should be sent by email to jon.ustarroz@ulb.be no later than the **5th of October 2022** and should include **a single pdf file** containing:

- 1 cover letter motivating the application and describing how the applicant meets the selection criteria
- the CV, including a list of publications and contact details of two persons who can provide a reference
- 2 samples of your previous scientific activities that most represent your skills (i.e., full text of first author peer-reviewed manuscripts, or copy of PhD thesis).

*The postdoctoral fellow will be hired for a one-year period, subject to renewal depending on performance. The net salary is between 2.500 and 2.900 euros, based on seniority level. The salary will be offered by Innoviris, the research fund from the Brussels-Capital-Region (https://innoviris.brussels/). The starting date is envisaged from January 1st 2023 to February 1st 2023, according to the availability of the successful candidate.

EURAXESS SPECIFIC INFORMATION

Main Research Field : ELECTROCHEMISTRY

Required educational level: PhD in chemistry, physics, materials science, engineering or a related field.

Required Languages :

English : excellent

Type of contract : temporary

Hours per week : 38

Researcher profile : Recognized Researcher – R2
Established Researcher – R3

Additional requirements: demonstrated experience in electrochemistry and skills in software for data processing and analysis.