

Imperial College London

Department of Chemistry

NPL-Imperial iCASE studentship: Characterising the performance of low loading electrodes for hydrogen technologies

Application deadline: 7 January 2024

Start date: September-October 2024 (flexible)

Supervisors: Professor Anthony Kucernak (Imperial College London), Dr Graham Smith (NPL)

This project is an **Industrial-Case studentship** based in the Chemistry department at Imperial College London, and with partners at the National Physical Laboratory (NPL) and the company RFC Power, which is a spinout of Imperial College London.

This project will focus on improving the understanding of the operation and performance of electrochemical electrodes used in electrolyzers, flow batteries, and fuel cells. These devices allow the efficient capture of renewable electricity and its interconversion with hydrogen. Deployment of such electrochemical systems is growing at a tremendous pace but significant improvements to cost performance and longevity are still required.

Such improvements can only be achieved through a deeper understanding of performance of the electrochemical interface at which reactants, electrons and ions must be efficiently transported to the catalytic interface. The project will assess the performance and impact of morphological changes to electrode structure in order to improve their performance. This will be achieved through a combination of making, testing and modelling with the aim of:

- Developing techniques to deconvolute the electrokinetic, electronic, ionic and mass transport effects in these electrodes;
- Using experimental data to create electrokinetic models and uses these to assess routes to optimise performance and develop more efficient electrodes;
- Understanding long term degradation by assessing the effect of device operating conditions and environment (e.g. water quality) on electrocatalysts.

The post-holder will gain experience in:

- Electrochemistry with specific emphasis of the electrocatalysis of reactions involving gaseous reactants or products;
- Development of ultra-low catalyst loading electrodes for high performance electrocatalytic system;
- Electrochemical assessment of performance under a wide range of conditions;
- Computational assessment of electrocatalytic performance of reactions

The studentship will include at least a 3 month placement with NPL (Teddington, London) and benefits from membership of NPL's post-graduate institute, accessing training, expertise on metrology and participation of cohort activities and networking events.

Applicants should have a strong background in Physical Chemistry, Thermodynamics and Computation. Applications are invited from candidates who possess (or expect to gain) a first-class honours MSci or higher degree or equivalent in Chemistry, Physics, Materials Science, Chemical or Mechanical Engineering or related areas.

Imperial College is consistently ranked as one of top universities in the world in various rankings; for instance, it ranked 6th in the world in the QS World University Rankings for 2023. It has also been ranked as the most innovative university in Europe.

Funding is available for **UK citizens**. The studentship is for **up to 4 years** and will provide **full coverage of tuition fees** and an annual tax-free stipend of **£22,000**.

If you are interested in applying, I will be happy to address any initial informal enquiries you may have (Anthony Kucernak, anthony@imperial.ac.uk). Please send applications including a CV, the names and addresses of two academic referees and a short statement (200 words or less) as to why you think you would be an appropriate candidate. Applications should be emailed to Anthony Kucernak (anthony@imperial.ac.uk) with the subject line "NPL-Imperial iCase".

Further details of the Imperial Chemistry Department is here:

<https://www.imperial.ac.uk/chemistry/> and details for the Kucernak group is available here:

<https://www.imperial.ac.uk/kucernak-group/>

Further details of the NPL Electrochemistry group and PGI are available here:

<https://www.npl.co.uk/electrochemistry> and [Postgraduate Institute for Measurement Science - NPL](#)

Further details of RFC Power is available here: <https://www.rfcpower.com>

Imperial College is committed to equality and valuing diversity. The Chemistry department is an Athena Gold SWAN Award winner and a Stonewall Diversity Champion.