

Fully Funded Faraday Undergraduate Summer Experience (FUSE) Internship Program: Operando characterisation of Na-ion battery electrode materials

Project Description and Goals

Most current rechargeable batteries for transportation are based on the use of lithium. However, the relatively high cost, the somewhat limited global abundance of lithium, and environmental concerns around the sourcing of lithium mean that there is a demand for a lower-cost alternative that would increase the uptake of energy storage technologies in a number of sectors. Sodium-based batteries could be such an option, particularly for static storage, where cost is a more important factor than weight or performance.

The Faraday Institution's Nexgenna project is accelerating the development of sodium-ion battery technology by taking a multi-disciplinary approach incorporating fundamental chemistry right through to scale-up and cell manufacturing. Its aim is to put on the path to commercialisation a sodium-ion battery with high performance, low cost, that has a long cycle life and is safe.

Part of this development is to improve our understanding of the processes that occur inside batteries as they are charged and discharged repeatedly over time, and how these affect performance degradation during the lifetime of a commercially-relevant cell. In this project, you will learn how to analyse X-ray diffraction data – but not any old standard laboratory data. This data will have been collected *during cell cycling*, without pausing the cell, using our state-of-the-art facilities at the University of Sheffield. We will provide high level training on how to analyse diffraction data, and then the successful candidate will get to work in interpreting real research '*operando*' data to understand the phase and/or structural changes involved in the active electrochemical processes in leading candidate electrode materials for the next generation of batteries.

The successful candidate would benefit from being computer literate and used to working with some level of scientific software. Prior experience of X-ray diffraction would be beneficial but by no means essential as you will work alongside an experienced team who can provide training in all aspects necessary to complete the project successfully.

Due to the ongoing COVID-19 situation, the entire project has been designed to run remotely, unless the existing restrictions are removed.

Supervisory Team

Dr Nik Reeves-McLaren (Nexgenna Investigator, Senior Lecturer in Energy Materials)
Materials Science & Engineering, University of Sheffield ([link](#))

Dr Robert Moorehead (Advanced Characterisation Research Fellow, Royce Discovery Centre)
Materials Science & Engineering, University of Sheffield ([link](#))

Eligibility

In order to partake in the project you must be:

- A full-time registered undergraduate student at a UK university
- Undertake the internship within the years of undergraduate study (i.e. not be currently in your final year)

Funding

A salary of £9.30 / hour across the UK or £10.75 / hour in London will be provided. This will be determined by the working address of the appointee, not the university's location. The internship is a full-time role for 8 weeks beginning in early June. The funding is provided by [The Faraday Institution](#).

Opportunities

During the term of the project, you'll also be able to attend Faraday Masterclasses, and FUSE cohort events focusing on a variety of topics to further develop your understanding of career opportunities in battery research. At the end of the programme, you'll be invited to participate in a Faraday Institution event to share a poster on your work with UK battery researchers and industry partners. Prizes will be awarded.

The proposed start date is **1st June** with a potential end date mid-August, but there is flexibility and the exact dates can be agreed with the supervisory team.

Next steps

If you have any queries contact Dr Nik Reeves-McLaren at n.reeves@sheffield.ac.uk. To apply, please complete the Google Form at http://bit.ly/nexgenna_fuse2021.

For Project information please go to www.nexgenna.org

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