



## Visiting Researcher Fellowship (VRF) – Chile or Argentina

### Call for applications

**Topic:** Cracking Of Next Generation Advanced Lithium Ion Battery Cathodes

**Location:** Department of Chemical Engineering, Electrochemical Innovation Lab at University College London

**Duration:** up to 6 months, starting between March to September 2024, completing by March 2025.

**Expenses** including travel, housing costs and associated subsistence costs will be funded according to the VRF grant. Indicative values include:

International travel: up to £2500

Bursary: up to £3000 per month for 6 months

**Closing Date:** 29th February 2024

Applications open to researchers from Chile and Argentina ONLY.

[https://www.faraday.ac.uk/opportunities/visiting\\_research\\_fellowships\\_jan2024](https://www.faraday.ac.uk/opportunities/visiting_research_fellowships_jan2024)

### VRF at University College London

University College London (UCL) is a multi-faculty college of the University of London with a population of over 17,000 students, from more than 130 different countries.

The Electrochemical Innovation Lab (EIL) is a world-leading centre of research excellence. One of the largest and most dynamic groups in the world specializing in electrochemical science and technology, our activities continue to expand with a new initiative, the Advanced Propulsion Lab (part of UCL East) and substantial research funding from the Faraday Institution.

This project is highly aligned, and complementary to the goals of the CATMAT project, but also has links to the Degradation and FutureCat projects. The Faraday Institution cathodes projects developing next-generation cathode materials that have increased performance and reduced use of cobalt.

### The Project and Research Team

Lithium-ion batteries are highly advanced technologies that are revolutionising electrification of transport, storage of intermittent renewables and consumer electronics. However, the current state-of-the-art cathode materials both limit the potential improvements in energy density of cells, and contain elements such as cobalt that are problematic from a humanitarian and environmental perspective. There is, therefore, a drive to produce the next generation of cathode materials that will increase the capacity and sustainability of batteries. Two approaches are being considered as part of the Faraday Institution's portfolio of battery research; developing lithium rich materials (where there is more than one Li ion per formula unit of cathode material) and very highNi-content cathodes, ultimately pure Lithium Nickel Oxide (LNO). Although these materials offer increased capacity vs state-of-the-art NMC or NCA, they suffer severe degradation issues such as oxygen loss

and structural rearrangement. These processes are linked to cracking of these materials, which needs to be understood in order to achieve the potential benefits of next generation cathodes.

Our group has developed advanced in situ imaging methodologies to study cracking at the nano-scale as well as image analysis algorithms to detect signs of cracking below the resolution limit - showing for NMC that cracking happens at lower potentials than previously thought, and early in the cycle life. We will extend these methodologies to the Lirich and LNO materials from CATMAT, advancing the understanding of their particular cracking mechanisms (which have different drivers to NMC) and further honing our in-situ imaging methods.

The Fellow will benefit from access to a world leading X-ray characterisation suite in the Electrochemical Innovation Lab (EIL), comprising of nano-, micro- and macro-CT, XRD and SAXS and representing >£4M of investment. The Fellow will also have full access to new state-of-the-art labs at UCL East, including a 100m<sup>2</sup> dry room for preparing in-situ cells and numerous cyclers/electrochemical workstations. Integration with a large group (>70 researchers), working on batteries, but also across the spectrum of electrochemical technologies, will ensure the fellow receives a broad exposure to others' work and has potential for extensive collaboration. Established techniques for imaging and image analysis (supported by high-performance computers and software) will provide the Fellow with new skills with which to characterise battery materials.

Currently, cracking and in-situ investigations are not part of the CATMAT work-plan, though it is obviously important to understand in the materials of interest to the projects. This collaboration will allow us to extend our nascent technique to next-generation materials that have different considerations for cracking.

### Eligibility

To be eligible for the VRF, applicants should be early career researchers (i.e., hold a PhD in a relevant discipline) and not hold an academic (or equivalent) permanent position. Applicants with postdoctoral or equivalent status at the time of application are preferred. In exceptional cases, well-qualified individuals in the final stages of their PhD studies may be considered.

Candidates should be based in Chile or Argentina at the time of application and have funding secured throughout the fellowship period. Individuals who are already living, working, or extensively researching in the UK are not eligible for the Fellowship.

Applicants should possess the ability to travel and hold a valid passport.

Applicants will be responsible for applying for any necessary travel documentation including ATAS certificate and visas. Further information can be found on the UK Government websites:

<https://www.gov.uk/guidance/find-out-if-you-require-an-atas-certificate>

<https://www.gov.uk/standard-visitor/visit-as-an-academic>

Applicants will also need to provide a letter of support from their supervisor. Given universities are closed in February this can be provided in early March 2024.

The letter should contain:

- support of the applicant spending 6 months in the UK,
- the skills and experience of the applicant as a researcher,
- confirm the applicant is employed throughout the funding period,
- the applicant's ability to speak and present research in English.

**To apply, please send your resume (2 pages) and cover letter (500 words) to Dr. Rhodri Jervis at [Rhodri.jervis@ucl.ac.uk](mailto:Rhodri.jervis@ucl.ac.uk) quoting VRF FI Grant in any correspondence.**

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