THE FARADAY INSTITUTION 3D-CAT

ACCELERATED CATHODE MATERIALS DEVELOPMENT

Exciting Faraday Undergraduate Summer Experience (FUSE) paid internship opportunities for summer 2026.

Studying a STEM degree? Wondering what career to pursue? Interested in finding out more about the battery sector? Keen to spend time with a dynamic community of pioneering battery researchers seeking to find solutions to support a fully electric future?

The Faraday Institution is offering a total of 48 internships, for undergraduate students to spend 8-weeks working on battery related projects.

University: University of Oxford

Location: In person, Centre for Energy Materials Research, Department of Materials.

Start date: The internship is a full-time role for 8 weeks over Summer 2026. The exact start date is negotiable provided the project finishes by 28th August 2026.

Projects offered: Four fully funded internship projects across the Bruce and House Groups as part of the 3D-CAT project. Please list in order of preference when making an application. Further details in Annex at end of document.

A. Moving to d^0-free Li-rich disordered rocksalt cathodes
B. Influence of Li content on short-range order in 3D cathodes
C. High energy density Li-rich oxysulfide cathode
D. Modulating the bulk electronic conductivity for Li-rich disordered rocksalts

Eligibility:

- Be registered full-time undergraduate student from a UK university.
- Undertake the internship within the years of their undergraduate study (i.e., not in final year or during a subsequent Masters' programme).
- Not have been a FUSE intern in a previous year

Funding:

A salary of **£14.21/ hour** will be provided in line with the Oxford Living Wage. The funding is provided by the Faraday Institution and the 3D-CAT project.

Additional activities:

During the FUSE internship you will be able to attend Faraday Institution cohort events which will focus on a variety of topics to further develop your understanding of career opportunities in battery sector. At the end of the programme, you will be invited to to share a poster about your work and prizes will be awarded.

Diversity:

The Faraday Institution is committed to creating a dynamic and diverse pool of talent for the fields of battery technology and energy storage.

The University of Oxford is committed to fostering an inclusive culture which promotes equality, values diversity and maintains a working, learning and social environment in which the rights and dignity of all its staff and students are respected. We recognise that the broad range of experiences that a diverse staff and student body brings strengthens our research and enhances our teaching, and that in order for Oxford to remain a world-leading institution we must continue to provide a diverse, inclusive, fair and open environment that allows everyone to grow and flourish. The University of Oxford's complete diversity statement can be found here.

How to Apply:

In order to apply for a Faraday Undergraduate Summer Experience (FUSE) 2026 internship, you will need to complete the application survey via the link below by **12pm** on **Thursday 30th April 2026**. Interviews will be held during the week beginning 4th May 2024.

Apply here for the FUSE internship.

Please also complete this survey so we can keep you informed about future Faraday opportunities, including other FUSE internships that may need additional support with recruitment.

Annex

Project A

Project title: Moving to d^0-free Li-rich disordered rocksalt cathodes

Project description: Li-rich disordered rocksalt (DRX) cathodes, such as $Li_{1.2}Nb_{0.2}Mn_{0.6}O_2$, are promising candidates for next-generation Li-ion batteries owing to their high energy density, compositional flexibility and reliance on earth-abundant elements. However, their practical application is limited by voltage hysteresis, capacity fade, and structural degradation during cycling. In many DRX materials, d^0 cations are believed to facilitate the formation and stability of the Li-rich disordered rocksalt phase. Nevertheless, they *do not directly contribute to capacity through cationic redox, overall lowering the energy density of the cathode material. Moreover,* several commonly used d^0 elements raise ecological and sustainability concerns.

This project aims to shift from d^0 transition metal chemistries and investigate Li-rich DRX cathodes that utilise non-d^0 earth-abundant elements such as Mn, Fe, and Cu. The study will examine how eliminating d^0 species influences structural degradation. By directly comparing d^0-free DRX materials with conventional d^0-containing counterparts, this work will clarify the role of the d^0 in Li-rich disordered rocksalt cathodes. The project will involve the synthesis and structural characterisation of new cathode compounds, together with cell testing to examine the electrochemical performance of these novel cathodes.

Project B

Project title: Influence of Li content on short-range order in 3D cathodes

Project description: Lithium-rich cathodes with a three-dimensional rocksalt structure (3D cathodes) are a new generation of low-cost, high energy density cathode materials for Li-ion batteries which do not depend on Ni or Co. By ordering the local arrangement of Li and transition metal ions on the cation sites in specific ways (short-range order) it is possible to realise faster Li-ion motion and therefore higher rate performance.

Lithium content in Li-rich 3D cathodes has been strongly correlated with Li+ ion mobility. The more lithium there is, the more interconnected the lithium sites are with each other and therefore the faster they move through the structure. However, this simple logic does not account for the possible role of short-range order which influences the distribution of Li sites relative to each other. This project will investigate the relationship between Li content, short-range order and rate performance in a novel class of Li-rich 3D cathodes being developed through the 3D-CAT project to uncover the extent to which Li content can be used to control short-range order.

Project C

Project title: High energy density Li-rich oxysulfide cathode

Project description: Next-generation cathode materials are critical for increasing the energy density of Li-ion batteries. Li-rich disordered rocksalt oxides have attracted significant interest due to their high energy density (exceeding 300 mAh g^{-1} with average operating voltages above 3 V) and remarkable compositional flexibility. However, their practical application is hindered by limited cycling reversibility and severe voltage fade, which are largely associated with the instability of oxygen redox (O-redox) upon cycling. Li-rich disordered rocksalt sulfides, which utilise the oxidation of sulfur (S-redox), have emerged as promising alternatives, as they mitigate many of the above degradation behaviours. Nevertheless, the lower redox potential of sulfides constrains the achievable energy density.

This project aims to investigate a new class of Li-rich cathode materials—Li-rich oxysulfide disordered rocksalts, which can potentially combine the reversibility of S-redox and energy density of O-redox. The project will involve the synthesis and characterisation of new cathode compounds, alongside cell testing to evaluate their electrochemical performance

Project D

Project title: Modulating the bulk electronic conductivity for Li-rich disordered rocksalts

Project description: Li-rich disordered rocksalt cathodes, such as $Li_{1.2}Ti_{0.4}Mn_{0.4}O_2$, are promising candidates for next-generation Li-ion batteries owing to their high energy density. However, their practical application is limited by poor rate capability (i.e., how fast the battery can be charged). In addition to ensuring sufficient Li^+ ion conductivity, enhancing the bulk electronic conductivity of disordered rocksalts to enable efficient electron transport is also critical to improve their rate performance.

This project aims to investigate and improve the bulk electronic conductivity of disordered rocksalt cathodes by systematically varying the transition metal (TM) species and tuning the Li:TM ratio. The project will involve the synthesis and structural characterisation of new cathode compounds, together with measurements of electronic conductivity and cell testing to examine the electrochemical performance of these novel cathodes.