**Exciting** [**Faraday Undergraduate Summer Experience (FUSE)**](https://www.faraday.ac.uk/fuse-2022/) **paid internship opportunities for summer 2023.**

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 number of internships, for undergraduate students to spend 8 weeks working on battery related projects.

Three projects are available in Professor Mauro Pasta’s group at Oxford:

**1)**

**Project title:** Fabrication and testing of new glassy electrolytes

**Project description:**

Glassy lithium ion conductors are an under-researched class of solid electrolyte which could offer

advantages over the crystalline ceramic electrolytes more commonly studied for application in all-solid-state batteries. Despite several investigations showing remarkable mechanical and

electrochemical stability in certain glassy systems over the past three decades, understanding of

the processing-structure-properties relationships pertaining to these materials is very limited, and

a series of fundamental studies must be performed to address this. The student will have the

opportunity to explore the synthesis of various glass compositions using a range of processing

routes, which is likely to include physical vapour deposition (PVD) and melt-quenching.

Characterisation of the glasses will be performed by techniques such as scanning electron

microscopy (SEM), X-ray photoelectron spectroscopy (XPS), differential scanning calorimetry (DSC),

electrochemical impedance spectroscopy (EIS) and nanoindentation. Promising compositions and

processing routes will be identified and studied in greater detail.

**Supervisors:** Dr. Stephen Turrell and Professor Mauro Pasta

**2)**

**Project title:** Role of grain boundaries on solid electrolyte conductivity

**Project description:**

Solid-state lithium metal batteries (SSLMBs) are promising for high energy density and high power

applications [Pasta et al. *J. Phys. Energy* 2020], however they currently demonstrate poor

performance and lifetimes, with recent evidence suggesting grain boundaries in solid electrolytes

may be a contributing factor [Milan, Pasta *Mater. Futures* 2023]. In some cases, grain boundaries

are ionically resistive, reducing rate capability, and it has been proposed that they have enhanced

electronic conductivity, enabling preferential intergranular lithium deposition.

In this project, the student will investigate the influence of grain boundaries on the ionic and electronic conductivities of solid electrolytes using conductive atomic force microscopy (C-AFM) [Shen, Liu et al. *Energy Storage Mater.* 2021]. C-AFM can provide coupled morphological, mechanical, and electrical information, allowing the role of grain boundaries to be uncovered.

**Supervisors:** Mr. Ben Jagger and Professor Mauro Pasta

**3)**

**Project title:** Li-ion transport in the solid-electrolyte interphase

**Project description:**

The practical implementation of metallic lithium anodes is limited by its inefficient plating and stripping behavior [[Liu et. al. *Nat. Energy* (2019)](https://www.nature.com/articles/s41560-019-0338-x)]. A deeper understanding of lithium-ion transport through the solid-electrolyte-interphase (SEI) is necessary to guide future electrolyte design and ultimately enable a high cycling reversibility [[Maraschky, Alkolklar,](https://iopscience.iop.org/article/10.1149/2.0601814jes/pdf) *[JECS](https://iopscience.iop.org/article/10.1149/2.0601814jes/pdf)* [(2018](https://iopscience.iop.org/article/10.1149/2.0601814jes/pdf))].

In this project, the student will investigate the formation and evolution of the SEI during open circuit and galvanostatic conditions, using an in-house designed test setup, and electrochemical impedance spectroscopy (EIS). EIS is a powerful characterization technique to study electrode surface processes occurring at different time scales. Different electrolyte concentrations and operation temperatures will help to deconvolute multilateral contributions to lithium-ion transport through the SEI.

**Supervisors:** Mr. Lorenz Olbrich and Professor Mauro Pasta

**Details for all three projects**

**Location:** Energy Storage Research Centre, University of Oxford

**Start date:** The internship is a full-time role for 8 weeks – flexible, June – September 2023.

**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 £11.95/hour will be provided. The funding is provided by the [Faraday Institution](https://www.faraday.ac.uk/).

**Additional activities:**

During the FUSE internship you will be able to attend Faraday Masterclasses and 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.

**Application:**

In order to apply for a Faraday Undergraduate Summer Experience (FUSE) 2023 internship, you need to send your Personal Statement (including an explanation of which project you are applying for and why you would like to embark on this internship opportunity, and some information about your background) and CV to the SOLBAT project manager, Neil Cadman neil.cadman@materials.ox.ac.uk

 The deadline date for applications is **April 7th 2023**.

**Diversity**

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

**Equality, diversity and inclusion concerns every member of our community at the University of Oxford.** 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.

For more information, go to our dedicated Diversity and Inclusion webpages <https://edu.admin.ox.ac.uk/home>