PhD Studentships in the
Department of Materials Science
University of Cambridge

This document lists project studentships which are fully funded and usually available immediately, if not then usually they are available from the start of the next academic year. The majority are available to ‘home rate fee’ paying students only.

For other information, please contact:
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Please include a CV and state your project(s) of interest.
PhD Studentships

Fully-funded PhD studentships

PhD Studentship: Crystallography of the FeCo alloys needed for electric aircraft

Supervisor: Professor Howard Stone
Start date: Four year award from October 2022
Closing date for applications: 13 February 2022
Funding: EPSRC Industrial CASE studentship with Rolls Royce plc, includes a tax-free ‘stipend’ of £17,800 per year for living costs
Eligibility: EPSRC Industrial CASE studentships are fully-funded (fees and maintenance) for eligible students who are liable for ‘home rate’ fees. EU and international students may also be considered for these awards, although they may be required to cover the difference in fee level between home and overseas rates.

Applications are invited for a PhD studentship studying the local atomic structure in FeCo soft magnetic alloys. The project will be run in collaboration between the universities of Cambridge and Sheffield, the ISIS neutron source and Rolls-Royce plc.

Electric aircraft will soon revolutionise civil aviation and dramatically reduce emissions. One of the key technologies required to achieve this are new higher-power density electric motors. The latest designs of such motors require high performance FeCo soft magnetic alloys for the motor cores. However, for these alloys to be used safely an improved understanding is required of the origins of their exceptional properties.

In this project, the unusual local atomic structure that occurs in FeCo alloys will be studied using neutron and synchrotron X-ray scattering techniques. This will involve the development of new methods for the analysis of these alloys as well as their application to gain fundamental new insight into the ways in which their atomic structure affects their properties. The work will principally use international neutron and synchrotron facilities, although opportunities will exist to use a wide range of experimental techniques including scanning and transmission electron microscopy, calorimetry, laboratory diffraction, magnetic and mechanical property testing.

The project will be based in the Department of Materials Science and Metallurgy at the University of Cambridge for years 1 and 4 to undertake initial training and carry out the metallurgical research. Years 2 and 3 will be based at the ISIS neutron source to enable the development of the diffraction methods needed and carry out key measurements with direct support from the ISIS scientific team. The project will be continuously supported by Rolls-Royce plc throughout.

Applicants should have (or expect to be awarded) an upper 2nd or 1st class honours degree at the level of MSci, MEng (or overseas equivalents) in a relevant science subject (Physics, Chemistry, Materials Science).

Informal enquiries may be made by email to Prof Howard Stone (hjs1002@cam.ac.uk), Dr Lewis Owen (lewis.owen@sheffield.ac.uk) or Dr Helen Playford (helen.playford@stfc.ac.uk).
Applications should be made through the Postgraduate Application Portal at https://www.graduate.study.cam.ac.uk/. Further information on the application process in general is available from Rosie Ward (remw2@cam.ac.uk).

**PhD Studentship: Development of ferroelectric nanocomposites for solar energy devices**

This studentship is jointly supervised by Professor Judith Driscoll. This award is administered by Queen Mary University of London School of Engineering and Materials, and applicants should follow the instructions at http://www.qmul.ac.uk/postgraduate/research/subjects/materials.html, and NOT apply to the University of Cambridge. Full studentship information: https://www.sems.qmul.ac.uk/research/studentships/393development-of-ferroelectric-nanocomposites-for-solar-energy-devices

**Supervisor:** Dr Joe Briscoe and Prof Judith Driscoll  
**Start date:** January 2022  
**Closing Date for applications:** 25 November 2021  
**Eligibility:** Home students including settled status in the UK  
**Funding:** The studentship arrangement will cover home tuition fees and provide an annual stipend for up to three years

This studentship forms part of a recently-awarded project in Dr Briscoe’s group funded by the European Research Council (ERC). The project aims to develop new routes to high efficiency solar energy conversion – both for PVs and PEC for solar fuels – by producing nanocomposite thin films of ferroelectric and photoactive materials. Ferrolectrics contain a permanent electric dipole, and have been shown to convert sunlight to electricity via a mechanism known as the bulk photovoltaic effect (BPVE). This differs from the mechanism in conventional PVs, and therefore is not subject to the same efficiency limits. In the project ferroelectric nanostructures will be developed that demonstrate a BPVE, which will then be coupled to high efficiency light absorbers to form a new type of solar energy device.

During the PhD the successful candidate will develop ferroelectric nanostructures and nanocomposite thin films, and study and optimise the BPVE effect within them. This will include deposition of thin films via pulsed-laser deposition (PLD) in collaboration with Prof Judith Driscoll at the University of Cambridge. Therefore, some travel between London and Cambridge (<1 hour by train) will be required. The materials will be characterised using the wide range of excellent characterisation facilities across SEMS, and wider Materials Research Institute, including X-ray diffraction, scanning and transmission electron microscopy, X-ray photoelectron spectroscopy, as well as using a brand-new, dedicated atomic force microscope (with piezoresponse force microscopy and photoconductive AFM) in Dr Briscoe’s lab. Finally, the structures will be tested for their PV and/or PEC performance in device applications.

Applications are invited from outstanding candidates with or expecting to receive a first or upper-second class honours degree in Materials Science, Physics, Chemistry, or related subjects. Experience or knowledge of functional materials or devices such as semiconductors, ferroelectrics or piezoelectrics, PVs or photocatalysis would be desirable. A master’s degree is also desirable.

For informal enquiries about this position, please contact Dr Joe Briscoe. E-mail: j.briscoe@qmul.ac.uk

**PhD Studentship: Structural Changes in Metal-Organic Framework Materials**

**Supervisor:** Dr Thomas Bennett  
**Closing Date for applications:** 31 December 2021  
**Eligibility:** EPSRC Doctoral Training Partnership studentships are fully-funded (fees and maintenance) for eligible students who are liable for ‘home rate’ fees. EU and international students may also be
considered for these awards, although they may be required to cover the difference in fee level between home and overseas rates.

Metal–organic frameworks (MOFs) are hybrid materials comprised of metal nodes connected via organic linkers. Systematic substitution of metal nodes and linkers, a practice known as crystal engineering, has afforded a diverse family of materials that have found potential applications in catalysis, gas sorption, separations and drug delivery. This has led to the discovery of materials with specific surface areas in excess of 5,000 m² g⁻¹, which are currently applied in water harvesting, CO₂ separation and toxic gas storage settings. Structural transitions within the family are of great importance given (i) the requirement for thermal stability in gas sorption applications, (ii) the possibility of obtaining new functional glasses by melting and (iii) interest in barocaloric applications using MOFs which undergo phase changes near room temperature and pressure.

This project will use differential scanning calorimetry in particular, combined with X-ray diffraction, pair distribution function and gas sorption measurements to investigate the phase change behaviour of a variety of MOFs, and their impact upon applications in environmental remediation, haptic, light emitting and refrigeration technologies.

Potential applicants are strongly encouraged to look at the research group website (https://tdbennettgroup.wordpress.com/) and to contact Dr Thomas Bennett (tdb35@cam.ac.uk, @thomasdbennett) for further information about the project, before making an application to the University thorough the Postgraduate Application Portal at https://www.graduate.study.cam.ac.uk/.

Further information on the application process in general is available from Rosie Ward (remw2@cam.ac.uk).

Applicants should have (or expect to be awarded) an upper second- or first-class UK honours degree at the level of MSci, MEng (or overseas equivalents).

**PhD projects for which funding is available from the Department on a competitive basis**

**No projects listed at present**

*The University of Cambridge and the Department of Materials Science & Metallurgy value diversity and are committed to equality of opportunity.*