



UNIVERSITY OF LEEDS

CANDIDATE BRIEF

Research Fellow in Advanced Characterisation of Metal–Organic Framework Composites, Faculty of Engineering and Physical Sciences



Salary: Grade 7 (£39,355 – £46,735 p.a.)

Reference: EPSPE1123

Location: Leeds main campus (with scope for hybrid working)

Closing date: Monday 28 April 2025

Fixed-term for 3 years

We are open to discussing flexible working arrangements

Research Fellow in Advanced Characterisation of Metal–Organic Framework Composites, School of Chemical and Process Engineering & School of Chemistry.

Are you interested in the microscopic structure of composites and membrane materials? Would you like to develop new electron microscopy or focused ion beam microscopy approaches for spatially resolved analysis of metal–organic frameworks? Are you interested in host–guest interactions in membranes?

Metal–organic framework (MOF) materials in both crystalline and glass forms exhibit exceptional characteristics needed for membrane applications from energy-efficient chemical separations to proton and ion conducting membranes for fuel cells and batteries. Composite formation is often required for these membrane applications as crystalline powders do not have the necessary form factor. The interface between filler and matrix materials then becomes a defining feature in determining performance. Yet the structural variation across such internal interfaces remains a key characterisation challenge. These materials require advances in microscopic analysis of multiple amorphous phases as well as strained interfaces. The addition of molecular guests, whether in the form of chemicals involved in a separation or ions, water, or other solvent molecules in membranes, further alters the structure and functional properties. Critically, these changes are heterogeneous, depending on the guest loading or state of hydration (as in polymer membrane swelling).

In this post, you will explore the changes in structure at interfaces in MOF-based membranes using advanced electron microscopy and focused ion beam microscopy methods. You will work to apply electron pair distribution function analyses to questions in host–guest interactions in crystalline and glassy MOFs and polymer-MOF composites, drawing on cryogenic microscopy techniques needed to freeze molecular guests within these porous solids. You will use microscopy facilities at the [Leeds Electron Microscopy and Spectroscopy Centre \(LEMAS\)](#) as well as national and international facilities for microscopy and structural characterisation. You will join a wider team in advanced electron microscopy at Leeds and the [Bragg Centre for Materials Research](#) as well as a network of academic and industrial collaborators in the UK and internationally.



What does the role entail?

As a Research Fellow, your main duties will include:

- Leading creative and independent research on metal–organic framework based composite materials, drawing in particular on electron microscopy and focused ion beam techniques, including four-dimensional scanning transmission electron microscopy (4D-STEM), scanning electron pair distribution function analysis, and precession electron diffraction, in consultation with [Dr Sean Collins](#);
- Designing, carrying out, and analysing experiments at Leeds and at national and international electron microscopy facilities;
- Carrying out simple chemical syntheses and membrane fabrication and property evaluation to support advanced characterisation research;
- Contributing to a working environment supporting equity and inclusion;
- Generating and pursuing independent and original research ideas in the appropriate subject area;
- Developing research objectives and proposals and contribute to setting the direction of the research project and team including preparing proposals for funding in collaboration with colleagues;
- Evaluating methods and techniques used and results obtained by other researchers and to relate such evaluations appropriately to your own research;
- Making a significant contribution to the dissemination of research results by publication in leading peer-reviewed journals and/or other recognised forms of output, e.g. software or code, published datasets, and by presentation at national and international meetings;
- Working independently and as part of a larger team of researchers, both internally and externally, to develop new research links and collaborations and engage in knowledge transfer activities where appropriate;
- Maintaining your own continuing professional development and acting as a mentor to less experienced colleagues as appropriate;
- Contributing to the training of both undergraduate and postgraduate students, including assisting with the supervision of projects in areas relevant to the project.

These duties provide a framework for the role and should not be regarded as a definitive list. Other reasonable duties may be required consistent with the grade of the post.



What will you bring to the role?

As a Research Fellow you will have:

- A PhD (or have submitted your thesis before taking up the role) in materials science, chemistry, physics, materials engineering or a closely allied discipline;
- A strong background in advanced materials characterisation;
- Experience in **one** or more of the following techniques:
 - four-dimensional scanning transmission electron microscopy (4D-STEM), scanning electron diffraction, or nanobeam electron diffraction;
or
 - high resolution transmission electron microscopy (TEM or STEM);
or
 - focused ion beam (FIB) methods for imaging (cross-sectional analysis or three-dimensional imaging) or for sample preparation for TEM/STEM;
or
 - pair distribution function (PDF) analysis (X-rays, neutrons, or electrons);
or
 - crystallographic structure determination (single-crystal or powder);
- Good time management and planning skills, with the ability to meet tight deadlines and manage competing demands effectively without close support;
- A developing track record of peer-reviewed publications in international journals, published data, software/code, intellectual property, or similar outputs;
- Excellent communication skills both written and verbal, and the ability to communicate your research at national and international conferences;
- A proven ability to work well both independently and in a team;
- A strong commitment to your own continuous professional development.

You may also have:

- Experience of pursuing external funding to support research;
- Experience in the preparation or characterisation of MOF or polymer composites;
- Experience in membrane materials research;
- Data science skills, e.g. for data processing of total scattering data, phase identification, orientation, and/or strain analysis, or HyperSpy, Python or similar packages, Digital Micrograph scripting, or machine learning tools;
- Experience in TEM of beam-sensitive materials or cryo-microscopy.



How to apply

You can apply for this role online; more guidance can be found on our [How to Apply](#) information page. Applications should be submitted by **23:59** (UK time) on the advertised [closing date](#).

Contact information

To explore the post further or for any queries you may have, please contact:

[Dr Sean Collins](#), University Academic Fellow

Tel: +44 (0)113 343 2798

Email: S.M.Collins@leeds.ac.uk

Additional information

Faculty and School Information

Further information is available on the research and teaching activities of the [Faculty of Engineering & Physical Sciences](#), and the [School of Chemical and Process Engineering](#).

Working at Leeds

We are a campus-based community and regular interaction with campus is an expectation of all roles in line with academic and service needs and the requirements of the role. We are also open to discussing flexible working arrangements. To find out more about the benefits of working at the University and what it is like to live and work in the Leeds area visit our [Working at Leeds](#) information page.

A diverse workforce

As an international research-intensive university, we welcome students and staff from all walks of life and from across the world. We foster an inclusive environment where all can flourish and prosper, and we are proud of our strong commitment to student education. Within the Faculty of Engineering and Physical Sciences we are dedicated to diversifying our community and we welcome the unique contributions that individuals can bring, and particularly encourage applications from, but not limited to Black, Asian and ethnically diverse people; people who identify as LGBT+; and people with disabilities. Candidates will always be selected based on merit and ability.



The Faculty of Engineering and Physical Sciences are proud to have been awarded the Athena SWAN [Silver](#) Award from the Equality Challenge Unit, the national body that promotes equality in the higher education sector. Our [equality and inclusion webpage](#) provides more information.

Information for disabled candidates

Information for disabled candidates, impairments or health conditions, including requesting alternative formats, can be found under the 'Accessibility' heading on our [How to Apply](#) information page or by getting in touch by emailing HR via hr@leeds.ac.uk.

Criminal Record Information

Rehabilitation of Offenders Act 1974

A criminal record check is not required for this position. However, all applicants will be required to declare if they have any 'unspent' criminal offences, including those pending.

Any offer of appointment will be in accordance with our Criminal Records policy. You can find out more about required checks and declarations in our [Criminal Records](#) information page.

Salary Requirements of the Skilled Worker Visa Route

Please note that this post may be suitable for sponsorship under the Skilled Worker visa route but first-time applicants might need to qualify for salary concessions. For more information, please visit [the Government's Skilled Worker visa page](#).

For research and academic posts, we will consider eligibility under the Global Talent visa. For more information, please visit [the Government's page, Apply for the Global Talent visa](#).

