UNIVERSITY OF LEEDS

CANDIDATE BRIEF

Research Fellow in Materials Degradation in Carbon Capture, Utilisation & Storage, Faculty of Engineering and Physical Sciences

Salary: Grade 7 (£41,064 – £48,822 p.a.)

Reporting to: Dr. Yuvaraj Dhandapani

Reference: EPSME1214

Fixed term (For up to 30 months, starting from 01 August 2026 and to end by 31 December 2028 - to complete specific time limited work)

Location: Leeds main campus

We are open to discussing flexible working arrangements

Research Fellow in Materials Degradation in Carbon Capture, Utilisation & Storage,
Institute of Functional Surfaces,
School of Mechanical Engineering.

Are you interested in safeguarding the integrity of CO_2 storage infrastructure? Do you have a strong technical background in Corrosion assessment? Are you interested in working with the industry to develop testing methodologies and protocols to assess the steel-cement interface characteristics required to deliver resilient, safe CO2 storage infrastructure?

Overview of the Role

Capture and Storage (CCS) is critical to achieving net-zero targets. However, the long-term integrity of wells remains a major challenge, particularly in ensuring the reliability of storage infrastructure. Geological CO_2 storage is typically implemented through injection wells comprising steel casing and cementitious barriers. These materials are exposed to complex environments involving supercritical CO_2 and CO_2-saturated brines containing impurities, which can significantly influence corrosion processes, material degradation, and the performance of cement–steel interfaces. Such effects may ultimately compromise the long-term sealing of CCS systems.

As part of this role, you will join a major European consortium (SPECS) investigating the effects of CO_2 stream impurities on storage systems, working alongside leading universities, research organisations, and industry partners, including major energy companies across the UK and EU.

This role focuses on the experimental investigation and mechanistic understanding of degradation processes in cement–steel systems, directly contributing to the definition of safe impurity limits and material selection strategies for CCS wells. The project addresses the critical challenge of ensuring the durability and integrity of cementitious seals and cement–steel interfaces exposed to supercritical CO_2 containing impurities.

You will:

- Investigate degradation of steel-cement systems and study the interface with various steels and corrosion-resistant alloys (CRAs);

- Evaluate corrosion performance of steel-cement systems exposed to both clean and impure CO_2 compositions;
- Assess the integrity of cement–steel interfaces in CO_2–brine environments to help define safe impurity thresholds for CCS well materials.

Main duties and responsibilities

- Designing and conducting high-pressure, high-temperature exposure experiments of cement and cement-steel systems exposed to Supercritical CO_2 (clean and impure compositions) and CO_2-saturated brines;
- Preparing and curing cementitious materials (API Class G and enhanced systems) under representative conditions;
- Characterising degradation using SEM, microCT, mineralogical and chemical analysis;
- Monitoring corrosion using Electrochemical techniques (EIS, LPR, OCP);
- Quantifying the role of CO_2 impurities on corrosion and material degradation;
- Conducting mechanical testing to determine interface strength and degradation before/after exposure;
- Contributing to guidelines on safe impurity ranges and material selection strategies for CCS wells;
- Generating and pursuing independent and original research ideas in the appropriate subject area;
- Developing research objectives and proposals and contributing 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 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.

Qualifications and skills

Essential

- A PhD (or have submitted your thesis before taking up the role) in Engineering, Materials Science, Chemistry, Corrosion Science, or related field;
- Strong experience in characterisation of cementitious materials and/or steel corrosion;
- Experience with experimental research under aggressive aqueous environment;
- Knowledge of CO_2–brine–cement–steel interactions or similar systems;
- Experience in Electrochemical techniques (EIS, LPR, OCP);
- Experience in Microstructural characterisation (SEM, XRD, microCT) and Mechanical testing of materials/interfaces;
- Ability to design and manage complex experimental campaigns;
- 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;
- 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.

Desirable

- Experience of pursuing external funding to support research;
- Experience with experimental testing of high-pressure/high-temperature systems;
- Strong interest in working on durability or extending the service life of infrastructure;

- Knowledge of CCS, oil & gas well integrity, or subsurface environments or materials in demanding environments;
- Experience in industry collaboration projects.

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. Yuvaraj Dhandapani, Lecturer, Institute of Functional Surfaces
Email: Y.Dhandapani@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 Mechanical Engineering within the Institute of Functional Surfaces.

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.