Department of Chemistry
School of Science

Loughborough University

Research Associate in Heterogeneous Catalysis and X-ray Spectroscopy

Job Ref: REQ241134

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

Department of Chemistry

Project Description

We invite applications for a 36-month postdoctoral research associate position in heterogeneous catalysis and X-ray spectroscopy. The post is part of a multi-disciplinary EPSRC project, led by Dr. Simon Kondrat at Loughborough University, which aims to understand the role of alkali and alkaline earth metal (AAEM) compounds in heterogeneous catalysis through advanced operando X-ray absorption, emission and non-resonant inelastic scattering techniques. The successful candidate will join a collaborative team, including Diamond Light Source and the University of Leeds, with expertise in advanced spectroscopy, catalyst and spectroscopic simulation, and catalyst synthesis and testing. The primary objective of the project is to identify the relevant local structure of AAEMs and their influence on the electronic properties of catalysts for sustainable fuel production. This understanding will enable the rational design of new catalysts formulations, that optimise catalytic performance, using earth abundant and affordable AAEM compounds.

Building on our recent research into potassium X-ray absorption spectroscopy for energy storage and catalysis, the project aims to:

- Synthesise model and applied powder-based potassium and calcium promoted catalysts.
- Comprehensive characterisation of these catalysts using laboratory and synchrotron techniques.
- Kinetic and catalytic stability testing of these materials in water-gas shift and alcohol coupling reactions.
- Develop and construct spectroscopy cells to perform operando X-ray spectroscopic measurements under realistic catalytic reaction conditions.
- Integrate experimental findings with theoretical mechanistic studies and state-of-the-art simulation of X-ray spectra.

The position is ideally suited for an ambitious early career researcher with a strong background in X-ray spectroscopy and heterogeneous catalysis. You will be proficient in the detailed characterisation of catalysts, including XPS and XAS, and be comfortable in the safe handling of reactive species and hazardous materials. Experience in advanced X-ray spectroscopic techniques (e.g. soft X-ray, X-ray Raman and/or emission techniques) and data analysis is advantageous. The successful candidate will be motivated to advance fundamental catalytic research and collaborate with a skilled team to translate fundamental understanding of AAEMs to applied application in net-zero enabling reactions and technologies with our industrial advisory team.

This is a full-time 36-month position to commence on or after 1st April 2025.

For relevant publications please see: *J. Mat. Chem. A,* **2023**, 11, 19900-19913; *ACS. Catal.*, **2023**, 13, 6862-6872; *PCCP.*, **2020**, 22, 18976-18988.
For further details contact Dr Simon Kondrat at s.kondrat@lboro.ac.uk

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose: As part of this EPSRC project the job requires the candidate to be responsible for the development of X-ray spectroscopic techniques for the characterisation of potassium and/or calcium promoters in heterogeneous catalysts, applied in water-gas shift and alcohol coupling chemistry. The job requires the synthesis and catalytic testing of a range of supported catalytic materials, which will then be investigated by X-ray spectroscopic techniques, coupled with diffraction, microscopy and other supporting vibrational spectroscopies. Following this the candidate will lead the development of operando/ in-situ measurements of lead catalysts, including the design of spectroscopic cells, developing scientific methodologies and analysing relevant data.

Job Duties

RESEARCH AND SCHOLARSHIP

- To design and synthesise heterogeneous catalysts and other model materials with controlled loadings and structures of alkaline or alkaline earth promoters and/or active sites
- To fully characterise the synthesised catalysts using available characterisation techniques to verify, optimize or redesign materials according to a detailed research plan.
- To design and implement catalyst testing for water-gas shift, alcohol coupling and other relevant reactions.
- Collaborate effectively with academic partners, as well as national facilities, to develop Operando cells and methodologies to measure AAEM edge spectra alongside those of noble and transition metals.
- To undertake in-situ/operando spectroscopic measurements, both within Loughborough and at relevant international facilities, using a range of X-ray and vibrational spectroscopies.
- Collaborate effectively with academic partners on the project undertaking theoretical investigation of reaction mechanism and X-ray spectroscopic simulation.
- Plan and manage research activities to meet objectives and deadlines, keeping accurate scientific records.
- Contribute to the preparation of research articles and patent applications.
- Engage in project promotion and engagement activities by traveling to attend and present at meetings/conferences/workshops.
- Build external contacts and participate in knowledge exchange to strengthen relationships for future collaboration.
- Assist in preparing research proposals, beamline proposals and applications for external funding.
- Write up regular progress reports and present outcomes to all Investigators and Collaborators.

TEACHING AND LEARNING

- To assist the academic staff in the project team with the supervision of undergraduate MSc and PhD project work and day-today supervision and support of other researchers.
- Engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Department.

OTHER ACTIVITIES

- Assist with the management and smooth operation of equipment and instrumentation within the research group.
- Undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

Special Conditions

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

Organisational Responsibility

Reports to Dr Simon A. Kondrat, Senior Lecturer in Chemistry.

Person Specification

Your application will be reviewed with respect to meeting the essential and desirable criteria listed below. Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

1 – Application
2 – Test/Assessment Centre/Presentation
3 – Interview

Essential Criteria

Area	Criteria	Stage
Qualifications	Holds (or about to obtain) a PhD in one of the following areas: Inorganic/Physical Chemistry. Chemical Engineering. Applied Physics and Spectroscopy.	1
Experience	Experience in catalyst testing and characterisation	1,3
	Experience in X-ray spectroscopy (XPS/XAS, etc)	1,3
	Preparation of research publications and/or patents	1,3
Skills and abilities	Working knowledge of catalytic data analysis	1
	Working knowledge of spectroscopic data analysis	1,3
	Excellent written and oral communication skills	1,3
	Excellent interpersonal, and organisational skills	1
	Ability to write project reports and make technical presentations to industrial and academic research groups	1,3
	Ability to share responsibility for the supervision and training of undergraduate and postgraduate students in the laboratory	1,3
Training	Willingness to travel to collaborators to undertake appropriate training in techniques and instrumentation	1,3
	Willingness to undertake appropriate further training (e.g. IP protection)	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	1
	Travel / Able to travel Independently / Working patterns	1

Desirable Criteria

Area	Criteria	Stage
Experience	Experience in operando/in situ spectroscopy	1,3
	Experience designing catalytic and operando reactors	1,3
	Experience in working with catalyst promoters	1,3
	Developing proposals for access to beamline/ central facilities	1
	Experience working with air sensitive compounds	1
	Experience in advanced X-ray emission and/or X-ray Raman	1
	Postdoctoral or industrial research experience	1
Skills and abilities	Ability to synthesise heterogeneous catalysts	1,3

Conditions of Service

The position is full time and fixed term for a period of 36 months. Salary will be on research grade 6, between £34,866-£45,163 , at a starting salary to be confirmed on offer of appointment.
The appointment will be subject to the University's Terms and Conditions of Employment for STAFF GRADES 6 AND ABOVE, details of which can be found here.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which can be found here.

The University offers a wide range of employee benefits which can be found here.

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html

In addition, the University is supportive, wherever possible, of flexible working arrangements.
We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see http://www.lboro.ac.uk/services/hr/athena-swan/