

Research Associate in Solid Oxide Fuel Cells Device for Novel Gas Sensing applications – Natural Gas composition sensor (2 positions) Fixed-term until 31 May 2019

REQ180392

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

Project Description

Solid Oxide Fuel Cells (SOFC) are increasingly emerging as high efficiency devices for the generation electricity and heat from a wide range of fuels. Considerable progress has been made on the development of materials, cells and stacks in recent years, but scope exists to diversify the technologies for new applications. SOFCs exhibit desirable properties and are able to leverage their sensitivity to gas composition/concentrations to perform the niche role for high temperature sensing functions. Sensing hydrocarbon species is of great interest and utility, and thus we endeavour to advance our understanding of the behaviour of nano-composites, electrode and electrolyte materials to attain, monitor and tailor output signals according to the gas species concentration. The project aims to develop a prototype of a natural gas sensor that is to be specifically engineered to work with common variable rates of commercial natural gas. The project will focus on tracking methane and hydrogen detection, within targeted accuracy limits, from which we aim to generate further commercial opportunities and viabilities.

Applications are invited to join this exciting new research project on “**SOFC Device for Novel Gas Sensing applications – Natural Gas composition sensor**”. This is a fixed-term position which will persist until 31st May 2019. Based on the findings from the preliminary stage, there is prospective scope to apply for further funding to extend the project duration for further two years. The research project will be performed in concert with an industrial partner with expertise in electronics (hardware and software), digital signal processing, control and data analytics

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose:

The project calls for a research associate (Grade 6) to guide the study, development and integration of the disparate components comprising the sensor system into a working prototype capable of being a feasibility/technical demonstrator for the proposed natural gas sensing function.

In order to facilitate the study, development and testing of these cells, with their unique requirements, this project proposes a position to (i) perform a study on the available mechanisms and materials to facilitate the electrochemical sensing functions (ii) work in conjunction with a systems level researcher to narrow down the best combinations/permutations of electrochemical mechanism, materials selection, fabrication, operational parameters and system design and (iii) fabricate, accommodate and test the performance of the cells in the stipulated conditions for the range of gas compositions.

The post holder will be responsible to conduct a study/review of the available mechanisms and materials comprising the electrochemical/solid state domain; in concert with a systems level senior researcher, he/she will provisionally determine the desired combination of materials and operating parameters to establish the prototype in its physical layout. Following this, the researcher will transition into developing and fabricating the prototype, which may include consideration of the testing environment/methodologies needed to evaluate the sensor device. This will build on the existing framework laid out by LU's SOFC group in developing the testing facilities (furnaces, sample holder, gas delivery and mass control systems, electrochemical testing stations) for both conventional and Single Chamber (mixed gas) devices.

Finally, the researcher is expected to test at least one tangible working prototype sensor with the range of natural gas compositions to be sensed, at the conditions and parameters deemed most conducive to the viable sensor performance.

Job Duties

- Undertake generic research and literature reviews into in-situ electrochemical and solid state sensing devices, pertaining particularly to Solid Oxide Electrolyte cells (SOFC-type cells)
- Perform comparative appraisals for the available sensing devices and their mechanisms
- Classify and collate the available material combinations and their dependencies on the operating parameters such as temperature, oxygen partial pressure etc.
- To coordinate the above with a senior systems level researcher in order to finalise design and operational parameters for prototype sensing device(s) to be fabricated and tested
- To ensure the testing methodologies and necessary equipment are procured/fabricated/integrated
- To carry out experimental performance tests (accuracy, response time etc) for the prototype sensor, and discern its performance and electrochemical mechanisms of operation
- To deliver experienced and analytical views on SOFC/sensor performances and their characterisations, such as EIS, polarisations, cyclic voltammetry etc.
- System integration and building new test rigs to accommodate various size/shape and configuration of cells/stacks.
- To carry out SOFC modelling tasks using COMSOL or other commercial packages, particularly for the stack's analysis.
- To maintain detailed records of results and to report on progress verbally, in writing, and through other appropriate media.
- Delivery of sensor prototypes for characterisations and demonstrations for the industrial collaborative partners
- To assist the Principal Investigator in the preparation of agreed publications and deliverables arising from the work.
- Present research at internal and external meetings.
- Complete milestones agreed with line manager in an organized and timely fashion.
- To attend project meetings and present technical information and results using appropriate media.
- To contribute to the development of dissemination, and educational material arising from the project for use within the project partners, academic community and industry as appropriate.

Other

- To be mindful of and respect the commercial sensitivities in the project
- To participate in relevant professional activities
- To comply with appropriate health and safety requirements
- To be fully conversant with the tools used throughout the project
- To engage in training programmes in the University (e.g. through Staff Development) and elsewhere as required
- Supervisory responsibility for laboratory and its equipment
- To undertake such other duties as may be reasonably requested and that are commensurate with the nature and grade of the post
- Any other duties as may be reasonable required by the line manager
- To conduct all of the above activities to the standards and timescales specified by the School of Aeronautical, Automotive, Chemical and Materials Engineering and the University.

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

Academic Principle Investigator - Dr Jung-Sik Kim

Person Specification

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
Experience	Knowledge and understanding of SOFCs and related electrochemical devices	1,3
	Knowledge and understanding of gas sensors	1,3
	Experience in SOFC performance testing	1,3
	Experience in handling flammable gases, e.g. H ₂ , CH ₄ etc.	1,3
Skills and abilities	An appreciation and understanding of operational requirements and constraints in SOFCs sensing and their performance tests	1,3
	Operational skills of a SOFC test rig with various fuel types	1,3
	Ability to work independently and as part of a cross-disciplinary team	3
	Ability to communicate complex technical concepts and requirements	3
Training	Willingness to undertake training when necessary	3
Qualifications	A 2.1 or higher first degree in engineering, chemistry, mathematics, or material science	1
	A PhD in such discipline or near completion of PhD	
Other	Evidence a good working knowledge of equal opportunities and understanding of diversity in the workplace	1,3
	Willing to travel in the UK and liaise with industrial partners	3

Desirable Criteria

Area	Criteria	Stage
Experience	Experience in modelling/analysis of SOFCs	1,3
	Experience in instrumentation or conducting experiments on SOFC tests, preferably EIS	1,3
	Revising or redesigning of SOFC test rig to accommodate variable experimental conditions	1,3
	Understanding electrochemical sensors operational conditions and their dependencies and operating mechanisms	1,3
	Experience in heat treatment and ceramics processing	1,3
Skills and abilities	Strong experimental skills at high temperature environment	1,3
	Ability in performing SOFC modelling	1,3
	Ability to carry on SOFC performance tests & their characterisations	1,3
	Skills for programme coding to deal with large amount of data samples	1,3
Qualifications	An appropriate post graduate qualification in a subject related to SOFCs and SOFC's performance tests	1

Conditions of Service

The positions are FULL TIME and FIXED TERM until 31 May 2019. Salary will be on Specialist and Supporting Academic Grade 6 £29,799 per annum. Subject to annual pay award.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Grade 6 and above staff, 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 are available at <http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html>.

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/>

Informal Enquiries

Informal enquiries should be made to Dr Jung-Sik Kim by email at J.Kim@lboro.ac.uk or by telephone on 01509 227219

Applications

The closing date for receipt of applications is **15 June 2018**.