University of Surrey/National Physical Laboratory Studentships

The University of Surrey and the National Physical Laboratory have entered a strategic partnership, with the aim to collaboratively promote and support frontier research. A key feature of the collaboration is the setting up of the NPL Postgraduate Institute, which will support emerging talent in metrology science and engineering. We are now seeking applications from excellent candidates in eleven areas.

PROJECT

- **Optimisation of cathode material and cell performance in Li-air batteries** – Supervisors: Dr Tina Lekakou, Dr Qiong Cai, Prof Robert Slade (Surrey) and Dr Gareth Hinds (NPL)

Project title: **Optimisation of cathode material and cell performance in Li-air batteries**
Proposers: *University of Surrey, Guildford, UK*:
Dr Constantina Lekakou (CL), Dept. Mechanical Engineering Sciences, Materials
Dr Qiong Cai (QC), Dept. Chemical Engineering
Professor Robert C.T. Slade (RCTS), Dept. Chemistry
National Physical Laboratory (NPL):
Dr Gareth Hinds (GH), Electrochemistry Group, NPL Centre for Carbon Measurement
Science priority areas: (i) **Low Carbon.** (ii) **Advanced Manufacturing and Materials**

SUMMARY
Energy storage remains a key technological bottleneck in the UK's transition to a low carbon economy, particularly with increasing penetration of intermittent renewables in the energy mix. Batteries offer a potential solution but practical large scale operation (e.g. electric vehicles, grid storage) requires significantly higher power densities than provided by the current state-of-the-art. The Li-air battery, with an energy density approaching that of gasoline, shows great promise but further material and cell developments are required for the technology to be commercially viable. The goal of this project is to increase the power density of the Li-air cell, while maintaining excellent energy and power density at cell stack level. For this purpose, this project will develop models of battery operation at meso- and device scales to optimise material selection and cell/stack design. These models will be used to develop novel porous cathode materials with increased power density and cycle life. The project has excellent synergies with ongoing research in measurement and modelling of electrochemical energy conversion devices at both Univ Surrey and NPL.

Aims and Objectives
The aim of this project is to develop models across meso- and device- scales for the Li-air battery to maximise energy and power density and improve cycle life, and couple these studies with cathode material development, and fabrication and assessment of the corresponding Li-air cells. The objectives are to: (a) develop a meso-scale, volume-averaged continuum model to optimise the pore size and distribution of the porous cathode. (b) Validate this model with experimental studies and use the conclusions of the parametric studies/simulations as the basis for the development of novel porous cathode materials. (c) Fabricate and test small Li-air cells for >100 cycles and periodically characterise the cathode material. (d) Develop a device- scale model to predict and optimise energy and power density of a stack of cells.

For further information about this project, please contact Dr Tina Lekakou
C.Lekakou@surrey.ac.uk

If you are interested in applying, please email a first draft of your application to Dr Lekakou.

The application shall include

- covering letter
- detailed CV
- selected published work

- copy of your current or most recent academic transcript
- two referees and contact information
- **international students only:** copy of a valid IELTS certificate (from the past 2 years) (6.5 overall with 6.0 minimum in each band)

Further information on application process can be found here

Applications should be sent to fepsinfoadmin@surrey.ac.uk no later than 17.00 on 31st August 2015. The best candidates will be selected for interview (2nd-10th September 2015).

Details of each project may be found here

Out of these eleven projects, we will be recruiting the best **five** candidates both in terms of quality and academic fit with the overall cohort. Successful applicants will be able to start on either 1st October 2015 or 1st January 2016 and will be jointly supervised between NPL and the University of Surrey.

Each studentship covers a PhD stipend of £14,057 per year and the university fees for UK/EU PhD students (ca. £4,050 per year). Candidates from overseas may apply but will have to fund the difference between UK/EU and overseas fees (ca. £12,550 per year).

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