3D Printing of Lithium Ion Battery Chemistries
PhD

Funding: DST Innovations and EPSRC
Start Date: October 2016
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Industrial Supervisor: Dr Neil Vyas (DST Innovations)

Project overview:
The 3D printing of Lithium Ion Batteries (LIB) would enable niche applications such as micro or thin film batteries (as shown in Fig 1), which are needed to support new technologies such as microdevice and wearable electronics.

A Lithium Ion Battery electrode is a four-part composite system comprising the electrochemically active material, a binder, a conductivity enhancer, and interconnected porosity to let the liquid electrolyte permeate the electrodes. The cell also requires current collectors on one side of the electrodes, and an ion-permeable membrane that separates the electrodes, allows Li-ion diffusion, and prevents shorting. The role of manufacturing is to arrange these materials into the required composite structure.

In practice, this provides a wide possible design space of the chemistry, morphology, and size of the electrodes. The proposed approach involves the optimization of composition and rheology of cathode inks suitable for the printing.

The scope of this project is not just limited to Li-ion based chemistries, but also include emerging alternative chemistries.

Figure 1: A packaged thin film microbattery

You will be working within WMG’s Electrochemical Engineering research group, at the University of Warwick.

Objectives:
- To create cathode inks capable of being printed. This will involve optimising the composition and rheology of the ink.
- To use 3D printing technologies to create electrodes and batteries
- Complete electrochemical and physical characterisation of the printed batteries

Entry requirements:
Applicants should have a First Class UK honours degree or equivalent, in a relevant discipline such as Chemistry, Chemical Engineering or Material Science.
Experience of ink formulation, electrodes for batteries or an MSc in a relevant subject is highly desirable.

**Funding:**
For funding requirements you must be a UK national or resident for at least 3 years.

This position provides a tax-free stipend of £14k plus £3k top up, per annum (for UK nationals) and all fees paid are paid for UK/EU nationals for up to 3.5 years.

**To apply:**

To submit your application, please complete our [online enquiry form](#).