

Postdoctoral Fellow

« Silicon thin films and silicon nanowires as negative electrodes for lithium-ion batteries »

Silicon negative electrodes are attractive materials for lithium-ion batteries as the capacity of silicon is very high in comparison to graphite. However, a significant capacity fading is observed during charge/discharge cycles due to strong modification of the electrode volume induced by mechanical stress during the intercalation/deintercalation of lithium into silicon. The improvement of the cyclability of these materials can be obtained by using different morphologies of the anode materials (nanowires or thin films) and/or different electrolytes.

In this project, the postdoctoral fellow will investigate the electrochemical behaviour and the surface reactivity of silicon thin films and silicon nanowires negative electrodes towards different types of electrolytes. The cyclability of silicon electrodes with various morphologies will be studied in order to improve the performance of these materials and to understand the mechanisms of capacity fading. The negative silicon electrodes will be elaborated in collaboration with the laboratories of Ecole Polytechnique. The influence of the temperature and the nature of the electrolyte on the performance of the negative electrodes and their surface reactivity (i.e. formation of the SEI layer) will be investigated by classical electrochemical techniques i.e. Cyclic Voltammetry (CV), Electrochemical Impedance Spectroscopy (EIS) as well as by surface analytical techniques i.e. X-ray Photoelectron Spectroscopy (XPS), Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS), and Atomic Force Microscopy, ex situ (AFM) and in situ (EC-AFM).

The postdoctoral position, for a period of 12 months, will be held in the Laboratory of Electrochemistry, Chemistry of Interfaces and Modelling for Energy (LECIME, UMR 7575), Dir. Michel Cassir and in the Laboratory of Physical Chemistry of Surfaces (LPCS, UMR 7045), (<http://www.chimie-paristech.fr/labos/LPCS/francais/accueil.htm>), Dir. Philippe Marcus, ENSCP-Paris, Chimie ParisTech (France), in collaboration with the Ecole Polytechnique (France). This project is granted by Renault S.A.

Prior experience in electrochemistry and physical chemistry is required. The experience in lithium batteries and surface analytical techniques (XPS, TOF-SIMS, AFM) will be highly appreciated. The post-doc will be awarded to the successful applicant according to the local conditions and salary scales. For information please e-mail the contact shown below.

Starting date: between 15 April and 15 May 2010

To apply send CV and cover letter to:

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