



Postdoctoral position at CEA Grenoble

## **Advanced characterization of materials and buried interfaces in solid-state batteries & perovskite solar cells**

Processes in materials and especially at interfaces greatly impact the performances of novel energy devices including Li-ion solid-state batteries and perovskite solar cells and their analysis is key to develop more efficient and stable systems. The candidate will join a team dedicated to the analysis of materials, their interfaces and their evolution during device cycling and ageing. He/she will develop innovative methodologies using state-of-the-art interconnected tools to gain access to buried interfaces allowing their morphological, structural and chemical interrogation.

Keywords: focused ion beam FIB, laser, perovskite, Li-ion battery, interfaces, characterization

**Project description:** In the frame of French national research programs "PEPR" we are looking for postdoctoral researcher to join the advanced characterization lab of LITEN. Our lab is part of the CEA-Grenoble nano-characterization platform (PFNC), which gives us access to a wide range of state-of-the-art facilities for investigating the morphological, physical and chemical properties of innovative materials and components to support technological and materials developments in the field of new energies. The PFNC is a unique characterization tool in Europe which brings together the most efficient equipment such as electron microscopes (FEG-SEM, FIB-SEM, HR-TEM), X-rays diffractometers, secondary ionization mass spectrometers, X-ray photoelectrons (SIMS, XPS) and optical spectroscopy.

This post-doctoral fellowship will be focused on developing and optimizing methodologies enabling the characterization of buried features (interfaces or areas of interest) in new generation of solid-state batteries and in innovative devices used as solar cells. The solid electrolyte replacing the liquid one is a major breakthrough that makes even more critical the battery components preparation before their characterizations. It is no longer possible to proceed as usual by disassembling the components. Well-thought-out and well-optimized steps are now mandatory in order to prepare the sample prior to their advanced characterizations by TEM, XPS, SIMS and Raman techniques.

The methodologies to be developed will be based on the use of various preparation techniques, including FIB-SEMs (Ga-FIB-SEM, Xe-Plasma FIB-SEM), and a (Cryo)Ga-FIB-SEM equipped with a femtosecond laser. They will be combined to avoid modifying the internal structure of the devices and great care will be taken to avoid, limit as much as possible and quantify the damage induced by preparation as well as artefacts for example due to redepositing phenomena. Depending on the candidate's skills and tastes, he/she will also be able if desired to perform the subsequent characterizations.

**Profile:** We are looking for a candidate who has preferentially a good experience in performing FIB-SEM experiments linked to sample preparation or micromachining. Ideally, the candidate will also have knowledge of beam-induced damage and will be experienced in advanced characterization by microscopy.

**Location and duration:** The position is funded for three years. This position is based on the nanocharacterisation platform at Minatec. The lab is located near the city center of Grenoble, which offers an exceptional working environment as well as a very good quality of life, in the heart of the French Alps.

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