

Internship subject

Bulk Silicon nanowire growth for energy storage devices

Confidential subject: Yes		
Subject open to M2: Yes	to M1-Research Intensive Track: Yes	to M1: No
Summary SYMMES recently patented a bulk synthesis of silicon nanowires allowing for industrial scale-up. In the course of optimizing the process, a deep understanding of the reactivity at play has to be built in parallel. Depending on her/his skills and interest, the student will examine in detail either organic silicon reactivity, controlled doping for conductivity tuning, or nanostructure tuning for battery performance. She/he will work in collaboration with a start-up company.		
Detailed subject Lithium-ion batteries are presently limited in their energy capacity by the lithium absorption in the electrodes. At the anode, silicon is a promising material to replace the current graphite as it can absorb as much as 10 times more lithium. Due to severe mechanical constraints during Si lithiation, only nanostructured Si provide long-standing anodes in batteries. Silicon nanowires (SiNW) are particularly interesting thanks to their forming long, conductive networks. Our lab develops a novel SiNW synthesis, based on a high-yield chemist's approach of thin film CVD growth, producing SiNWs as a pure powder. A start-up company has been founded on this discovery. To allow for process optimization, we are studying the chemical reaction in detail to unravel new ways of control on the SiNW structure, conductivity and life-time in electrochemical cycling. Depending on the student's skills, the internship will be focused either on reaction mechanism investigation to reduce side reactions, exploratory doping strategies for higher conductivity in the SiNW network, or tuning the electrochemical response in battery. She/he will perform extensive nanocharacterization on her/his samples, as well as complementary electrical or electrochemical or Raman spectroscopy analysis. Creativity and ability to cross-analyse data from separate sources will be required. Young Sherlock Holmes' type researcher welcome...		
Related Publications Patent application « Procédé de préparation de nanofils de silicium », WO 2015189827 A1		
Background and skills expected Organic/inorganic synthesis or electrochemistry, Nanocharacterization (microscopy, spectroscopy of nanomaterials)		
Supervisor(s) : Pascale Chenevier Laboratory : SYMMES UMR 5819 CEA-CNRS-UGA, INAC, CEA-Grenoble Team/Group : STEP Contacts - E-mail : pascale.chenevier@cea.fr Tel : +33 4 38 78 07 21 Web-page : http://inac.cea.fr/symmes/		
This Master internship could be followed into a PhD within the same research area: Yes		