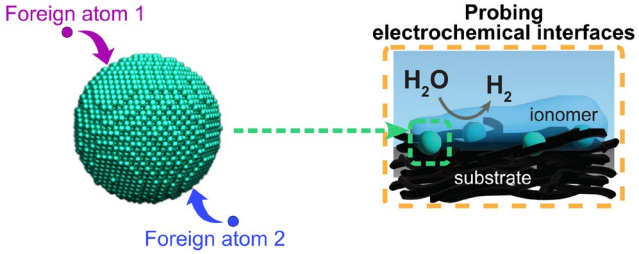
Lab. Chimie de la Matière Condensée de Paris (LCMCP) & Lab. Interfaces et Systèmes Électrochimiques (LISE)

PhD CONTRACT OFFER AT SORBONNE UNIVERSITÉ

The role of interfaces on silicon-based electrocatalysts during the alkaline hydrogen evolution reaction

3 years PhD contract: (October 01, 2026 - September 30, 2029)
Location: Sorbonne Université, Campus Jussieu – Pierre et Marie Curie (Paris, FRANCE)
PhD supervisor: David PORTEHAULT (david.portehault@sorbonne-universite.fr)
Co-supervisor: Sheena LOUISIA (sheena.louisia@sorbonne-universite.fr)
Monthly income: 2300 Euros gross salary
Application deadline: 24 avril 2026



Project summary

Project summary: The scalability and sustainability of green H_2 production relies on the development of affordable, yet catalytically active and durable materials. This project proposes to synthesize and study the electrochemical properties of silicon-based non-platinum group metal (PGM) nanomaterials, as catalysts for the alkaline hydrogen evolution reaction (HER) based on Earth-abundant elements. The materials will be synthesized through original methods coupled to *ex situ* characterization of the atomic-scale structure, the composition, the particle size and morphology, through X-ray fluorescence, diffraction and electron microscopy. The electrochemical properties will be evaluated using electrochemical impedance spectroscopy (EIS) and the rotating disc electrode (RDE), coupled to *in situ/operando* X-ray absorption spectroscopy (XAS). We will focus on understanding not only the origin of the electrocatalytic properties of the nanomaterials, but also on probing the role played by the polymer binders (ionomers) used during electrode processing and the supporting electrolyte in tuning the properties of the electrochemical interface. The acquired knowledge will then be used to implement the materials in an anion exchange membrane water electrolyzer (AEMWE), a first step towards the transferability of the electrocatalytic properties from the lab scale to the industrial scale. Overall, this project aims to comprehensively determine how an original Si-based electrocatalyst, together with coexisting ionic species, can modulate the reaction rate of alkaline HER.

Host teams

At LCMCP we are developing basic and applied research in materials science addressing societal challenges, including the energy crisis. We focus on designing and processing new materials with specific functions. At LISE, we center our work around understanding electrochemical interfaces and how to rationally optimize high-performing interfaces. You will work in the Novel Advanced Nano-Objects (NANO) team at LCMCP, gathering chemists and materials scientists to perform cutting-edge research in nanochemistry, and in the Functional Materials Reactivity for Electrochemical Devices team at LISE. Our labs are affiliated to the CNRS and Sorbonne Université, two prestigious French institutions. They are located in the center of Paris on the campus of Sorbonne Université.

Some related **references** from the host teams: **[1]** D. Janisch, D. Portehault et al. *J. Am. Chem. Soc.*, 2024, **146**, 21824. **[2]** Y. Song, D. Portehault et al., *J. Am. Chem. Soc.*, 2025, 147**,** 20878. **[3]** A. Goyal, S. Louisia et al. *J. Am. Chem. Soc.,* 2024, **146**, 7305. **[4]** Y. Yang, S. Louisia et al., *Nature*, 2023, **614**, 262.

Candidate profile

Master's degree or engineering degree in physical chemistry or material sciences. Theoretical and experimental experience in electrochemistry and/or nanomaterials synthesis will be appreciated. French and/or English written and spoken fluency is mandatory. The work will be shared between two labs, so requires appeal for collaborative work.

emails:
sheena.louisia@sorbonne-universite.fr
david.portehault@sorbonne-universite.fr

Laboratoire Interfaces et Systèmes Électrochimiques
Laboratoire de Chimie de la Matière Condensée de Paris,