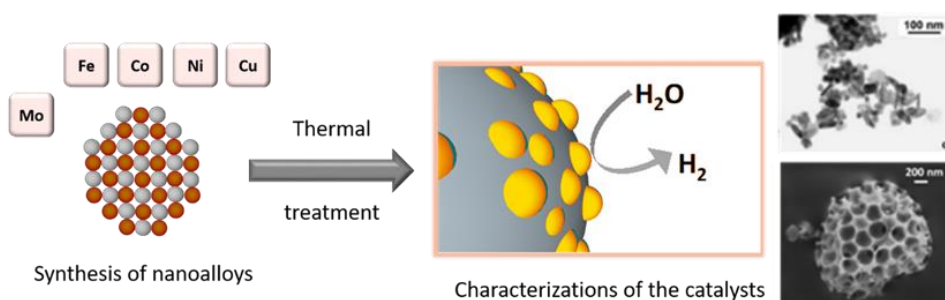


PHD OFFER: Heterofunctional Porous Catalysts for Hydrogen Evolution Reaction (HER) in Alkaline Electrolyzers

Keywords: Electrolysis, hydrogen production, materials synthesis, material characterization

One of the main challenges raised by global warming and climate change is the reduction of greenhouse gas emissions, particularly CO₂. To achieve it, it is essential to decrease our use of fossil fuels and to turn to new energy vectors. Dihydrogen, for instance, could constitute a very promising "carbon-free" alternative but only if it is produced by electrolysis with renewable electricity. In particular, **the emerging Anion Exchange membrane Water Electrolysis technology (AEMWE), based on the use of alkaline solid electrolytes**, has gained interest in the field of electrolysis because it could lower significantly the cost of the produced H₂ from water.¹

In order to make this technology commercially available, some challenges remain and in particular **the development of very active and cheap electrocatalysts for the reduction of water in alkaline medium**.



This PhD project aims at synthesizing and characterizing new electrocatalysts for this reaction, based on earth-abundant transition metals (TMs), for instance TM oxides or sulphides. The strategy consists in obtaining **heterofunctional porous nanoparticles**, with a hierarchical architecture, starting from bi or trimetallic alloys. These architectures will be synthesized by **combining solutions routes² and different thermal treatments**. The PhD candidate will have access to a large range of (nano)materials characterizations techniques such as XRD, X-ray fluorescence, XPS, electronic microscopies (TEM and SEM). This work will be conducted in the framework of the ANR project HYKALIN so the PhD candidate will collaborate with other partners for electrochemical characterizations (Ecole Polytechnique), for material characterizations (LCMCP, Sorbonne Université) and for computational chemistry (ENS Lyon). He/she may also join X-ray Absorption experiments at synchrotron SOLEIL.

Profile: The candidate should be a highly motivated student with a background in material synthesis and characterization techniques. Writing and communication skills as well as team-working abilities are required.

Location: NanoCat Team, Laboratoire ITODYS, Université Paris Cité

How to apply: Starting from September/October 2022

Contact: Marion GIRAUD and Jennifer PERON, e-mail: marion.giraud@u-paris.fr; jennifer.peron@u-paris.fr.

Websites : [Team NanoCat](#) , [ITODYS](#).

1. Miller, H. A., *et al.*, *Sustain. Energy Fuels*, **2020**, 4, 2114-2133. doi: 10.1039/C9SE01240K.

2. Fiévet, F., *et al.*, *Chem. Soc. Rev.*, **2018**, 47, 5187-5233. doi: 10.1039/C7CS00777A.