Master research internship offer

Environmentally friendly Single Atom Catalysts

General information

Work location : Jean Lamour Institute laboratory, Campus Artem, 2 Allée André Guinier 54000 Nancy, France
Duration : 5-6 month
**Expected starting date :** february-march 2024
Payment : ~ 600 euros/month

Activities

This internship will consist of several phases:
• Synthesis of graphene oxide and self-assembly to produce 3D porous aerogels
• In-depth characterization using spectroscopy, electron microscopy, thermogravimetry analysis
• stays in Lyon to take part to the metal deposit step and the catalysis reactions

Scientific context
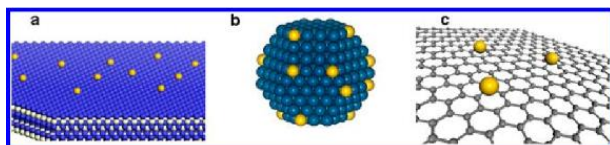
Since its first conceptualization in 2011, single-atom catalysis has been an ever-growing field as it promises unprecedented catalytic performances while saving significant amounts of expensive metals, as compared to conventional supported nanocatalysts. In principle, single-atom catalysts (SACs) cumulate the advantages of homogeneous catalysts including enzymes (high activity and selectivity) and heterogenous catalysts (easy handling and recovery).

In this project, the developed SACs will be used for hydrocarbon (acetylene, butadiene) and oxygenate (levulinic and succinic acids) selective hydrogenation reactions which are involved in industrial polymer synthesis and other fine chemistry. The current industrial processes which use noble metals have to be urgently modified towards efficient low-amount and non-noble metal-based catalysts.

Graphene which has demonstrated exceptional characteristics will be used as support to design these SACs. In this project, graphene oxide will be used as the starting materials. Its self-assembly by a simple reduction-based process will allow to produce 3D graphene multi-porous macrostructures with remaining functional groups. These latter will serve as anchoring sites to deposit cobalt by Atomic Layer Deposition without any additives or doping stage.

The present internship work will be focused on the fundamental characterization of the obtained graphene-cobalt hybrid materials by several complementary methods: electron microscopy, spectroscopy and thermogravimetric analysis. The reduction in size of the deposited cobalt particles will be searched and the produced SAC hybrids will be tested for their catalysis performances in collaboration with the laboratory IRCELYON (Université Lyon 1).

Desired skills

> Autonomy

> Scientific curiosity

> Sense of communication

> Ability to work in a team

> Rigor and sense of organization

> Interest in multidisciplinary subjects

About the Jean Lamour Institute

The Jean Lamour Institute (IJL) is a joint research unit of the CNRS and the University of Lorraine. It is attached to the CNRS Institute of Chemistry.

Specializing in the science and engineering of materials and processes, he covers the following fields: materials, metallurgy, plasmas, surfaces, nanomaterials, electronics.

The IJL has 170 researchers and teacher-researchers, 90 research support staff, 150 doctoral students and 25 post-docs.

It collaborates with more than 150 industrial partners and its academic collaborations are deployed in around thirty countries.

Its exceptional instrumental park is spread over 4 sites, the main one of which is located on the Artem campus in Nancy.

To apply

Send your motivation letter and CV to : Dr. Brigitte Vigolo brigitte.vigolo@univ-lorraine.fr