PH D POSITION IN NANOMATERIALS CHEMISTRY AND CATALYSIS

ELABORATION OF NON-NOBLE BIMETALLIC NANO-ALLOYS WITH CONTROLLED MORPHOLOGIES FOR CATALYTIC APPLICATIONS

INSTITUTION AND LABORATORY

UNIVERSITÉ PARIS CITÉ, INTERFACES, TRAITEMENTS, ORANISATION ET DYNAMIQUE DES SYSTÈMES (ITODYS LAB), NANOCAT TEAM

JOB DESCRIPTION

Nano-alloys are an exciting class of materials with many applications in different important technological fields. This is particularly true in catalysis where synergetic effects are expected, compared to their mono-metallic counter-parts. The aim of this thesis is twofold: i) to develop soft-chemistry synthetic routes for the formation of non-noble bimetallic nano-alloys with well-controlled compositions, sizes and morphologies, and ii) to implement original catalytic routes, preferably under solvent-free conditions, using these unsupported nanocatalysts. This Ph D is funded by the French National Research Agency in the framework of the project ANR GLYNANO, gathering two other laboratories in Poitiers (IC2MP) and in Lyon (ENS Lyon), renowned respectively in the fields of catalysis and theoretical chemistry.

The recruited Ph D student at ITODYS will have first to prepare bimetallic particles and characterize them using relevant physico-chemical techniques before performing preliminary catalytic tests to assess their reactivity and recyclability. At ITODYS, they will be tested for an important reaction: the acceptor-less dehydrogenation of alcohols (ADA). Besides the generation of the desired carbonyl product (aldehyde or ketone), highly valuable hydrogen is also formed. As-generated hydrogen can be used directly in the same catalytic system to promote the *in situ* hydrogenation of another molecule, for instance the hydrogenation of an imine. The as-synthesized nanoparticles will be transferred in a second time to IC2MP in order to evaluate the catalytic properties for the amination of alcohols, using preferentially bio-sourced poly-alcohols such as glycerol. In order to decipher the mechanisms accounting for the formation of the different reaction products on the exposed crystal facets, and obtain a complete picture of the catalytic system, theoretical calculations will be performed by theoricists at the ENS Lyon.

KEY WORDS

NANOMATERIALS, SYNTHESIS, ALLOY, ACCEPTORLESS DEHYDROGENATION OF ALCOHOLS, TANDEM CATALYSIS, HYDROGEN

REQUIRED SKILLS

A Master in physico-chemistry or materials chemistry is required. An experience in the synthesis of nano-objects will be appreciated but is not mandatory.

TIMESCALE

Start date of the thesis: 1st October 2023

CONTACT

JEAN-YVES PIQUEMAL (JEAN-YVES.PIQUEMAL@U-PARIS.FR)
LORETTE SICARD (LORETTE.SICARD@U-PARIS.FR)