



Ircelyon

INSTITUT DE RECHERCHES
SUR LA CATALYSE
ET L'ENVIRONNEMENT

PhD position on electrocatalysis

Location: IRCELYON/CNRS (Villeurbanne, France)

Starting date: 09/2024

Salary: 2135 € gross monthly

The Institute of Researches on Catalysis and Environment of LYON (**IRCELYON**, <http://www.ircelyon.univ-lyon1.fr/>) is the largest CNRS department devoted for fundamental and applied research in Catalysis. The work will be carried out in the framework of the FURFUN project (Furanic derivatives functionalization for bioproducts synthesis) of the national “programme et équipement prioritaire de recherche B-BEST” in collaboration with IFPEN.

Context: Furanic derivatives, stemming from the treatment of biomass, are of huge interest in the chemical industry for the manufacture of a large range of bio-based and relevant chemicals with main application in the field of solvents and polymers. Among them, 5-hydroxymethylfurfural (HMF), derived from the dehydration of hexoses, stands out for its adding-value potential. The objective of this project is to selectively oxidize HMF into added value chemicals such as FDCA (FuranDiCarboxylic Acid) and DFF (DiFormylFurane) since they are key intermediates for the production of PEF (PolyEthyleneFuranoate) and diamines, respectively. The challenge encountered in HMF electrooxidation lays in the finding of efficient, selective and stable catalytic systems capable of working under industrially viable reaction conditions. Indeed, the presence of large amounts of base (from 1 and up to 20 equivalents) is almost ubiquitous in most of the examples found in the related literature. The research activities of the PhD student will be focus on the development of electrocatalysts for the selective electrooxidation of HMF into FDCA and/or DFF under different electrolytes, pH and HMF concentrations.

Work description: The PhD student will be responsible for synthesizing and characterizing electrocatalysts, including analyzing their structure, texture, and electronic properties. He/She will also evaluate the electrochemical performance of these catalysts for HMF electrooxidation, using a combination of electrochemical techniques such as cyclic voltammetry and impedance spectroscopy, as well as analytical tools like liquid and gas chromatography, and mass spectrometry. Additionally, operando techniques such as Raman spectroscopy, FTIR spectroscopy, and XAS spectroscopy will be employed. The PhD student will be responsible for synthesizing and characterizing electrocatalysts, including analyzing their structure, texture, and electronic properties. He/She will also evaluate the electrochemical performance of these catalysts for HMF electrooxidation, using a combination of electrochemical techniques such as cyclic voltammetry and impedance spectroscopy, as well as analytical tools like liquid and gas chromatography, and mass spectrometry. Additionally, operando techniques such as Raman spectroscopy, FTIR spectroscopy, and XAS spectroscopy will be employed.

Education value: The student will receive training in electrocatalysis, materials science, and analytical chemistry.

Profile required: Master or Engineering diploma in physicochemistry or chemistry with expected skills in electrochemistry, catalysis and physicochemical characterization techniques. Very high level of English, motivation and autonomy

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