
POST-DOCTORAL POSITION (18 MONTHS)

Laboratoire Hétérochimie Fondamentale et Appliquée
CNRS / Université Toulouse 3 – Paul Sabatier
SYMAC team <http://symac.lhfa.fr>



Carbonylative processes enabled via the photocatalytic activation of CO₂

Keywords: Photo-redox catalysis, CO₂ activation, hydroformylation, hydroaminomethylation, carbonylative tandem processes, mechanistic studies

Subject

The development of technologies based on multicomponent catalyzed reactions using CO₂ not only provides new means to increase the diversity of chemical space, but also a solution in terms of greenhouse gas abatement. This project will be devoted to CO₂ upgrading in multicomponent reactions via photoredox catalysis combining first row transition metals (mono- and bimetallic complexes) and non-innocent tridentate photoligands. This project involves three main goals of broad relevance. First, the development of novel photoredox catalysts towards streamlining multicomponent reactions with CO₂ (such as hydroformylation, hydroaminomethylation, alkoxycarbonylation and aminocarbonylation processes). Second, reaction scope studies will be performed aiming at the synthesis of chemical libraries containing diverse functional groups. Third, *ex situ* characterization (by laser flash photolysis, NMR, GC, HPLC, X-ray fluorescence, X-ray diffraction techniques) in combination with operando reaction monitoring studies (via FTIR, UV-Vis) using modular reactors, will be conducted aiming at the elucidation of reaction mechanisms. This post-doctoral position, funded by the PHOTOCO₂ project (EMERGENCE 2025 - INC CHIMIE CNRS), provides an excellent framework for research in catalysis and sustainable chemistry.

Candidate profile and skills

- Doctor in Chemistry, with a strong background in organic synthesis and molecular catalysis, including gas-liquid transformations under pressurized conditions, manipulations under inert atmosphere (Schlenk line and glovebox); good knowledge of organometallic chemistry, and/or photo-chemical processes will be appreciated.
- Good knowledge of English and scientific communication skills, oral and written skills.
- Sense of thoroughness, organization and initiative; capacity of synthesis; reactivity and autonomy.

Context

The LHFA (www.lhfa.fr) is a joint laboratory of the National Center for Scientific Research and the University Toulouse 3 - Paul Sabatier (UMR 5069) in Toulouse (France), constituted by 6 research teams (17 researchers and professors, 9 technical engineers and administrative staff; ca. 40 doctoral students, post-docs and master students per year). Research activities focus on molecular chemistry of p-block elements with transversal actions in the fields of organometallic chemistry, metallic nanoparticles, catalysis and polymers, including mechanistic studies. The SYMAC research team working on the design of metal-based (nano)catalysts for innovative processes, is interested in the application of catalytic materials in synthesis, involving a number of transformations, in particular one-pot multi-step processes (sequential/tandem processes). In the last years, we have developed sustainable catalytic processes, both under molecular regimes and surface-mediated processes involving metal nanoparticles. Understanding the observed reactivity is at the heart of our research, leading us to in-depth mechanistic studies through reaction monitoring using different techniques (ReactIR, InsightMR, GCMS, EPR...). The LHFA offers a very dynamic and international framework (ca. 40% of foreign students and permanent staff), with cutting-edge research. The different teams have (inter)national collaborations, both academic and with industrial partners. The LHFA takes part in the organization of (inter)national conferences as well as Summer Schools, and it is involved in various dissemination activities.

Application

Candidates must submit their applications including a detailed Curriculum Vitae, a motivation letter and the contact of at least two referees via this link: <https://emploi.cnrs.fr/Offres/CDD/UMR5069-DANPLA-005/Default.aspx>
Expected starting date: before April 2025.

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