

## PhD Position in homogeneous catalysis – October 2023

### Iron-based catalysts for light-driven cascade synthesis of cyclic amines from nitroarenes, primary amides or nitriles under mild conditions

**Key-words:** iron catalysis; light driven processes; reduction; sustainable transformations; low energy transformations

#### Context and project

The chemical industry is one of the essential cornerstones of our society as it permits to produce crucial needs in main of the areas of our daily life. However, the impact of our industrial recent developments on the future of our planet with the crucial consequences on the climate change, and associated consequences forced us to radically change our way to develop modern sustainable chemistry. In this precise context, catalysis has to play pivotal role in terms of selectivity control in order to avoid wastes, and in terms of energy consumed (and thus the global CO<sub>2</sub> emission of chemical processes) by lowering the energy barriers of reactions, with a main target of room temperature processes.

Thus, the development of catalytic reactions at lower temperatures is one of the cornerstone of the ECOCHEM program. The aim is the coupling of catalysts with auxiliary promotional tools such as light in a synergetic fashion. The main objectives of this PhD research will be the design of original iron catalysts able to perform catalytic reactions under different light sources (UV, visible, blue, etc.) at ambient temperatures. Notably reactions which are currently performed at temperatures higher than 100 °C will be targeted. Such light-driven iron catalysis will be applied more specifically to reduction area, notably for the production of cyclic amines starting from nitro, amide or nitrile derivatives in a cascade fashion.

#### Description of the OMC team in ISCR laboratory:

The Organometallics: Materials & Catalysis team, composed of 43 researchers, professors and lecturers, 14 engineers and technicians, gathers a unique expertise in the domain of organometallic and coordination chemistry for innovative developments in homogeneous catalysis & green chemistry and molecular materials. Notably, the team has a strong expertise in homogeneous catalysis using non-noble metals, in C-H activation, biomass valorization.

#### Profile

The candidate will hold a M2 degree or equivalent in molecular chemistry. A previous experience in inert atmosphere and gloveboxes, as well as in (homogeneous) catalysis or in photochemistry will be appreciated. Enthusiasm, autonomy, scientific curiosity and ability to communicate are required qualities.

**Funding:** The PhD will be funded by **ANR-France 2030 PEPR project SPLEEN-ECOCHEM**.

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#### Application for a PhD

Send by E-mail (i) a cover letter, (ii) a full list of transcripts for higher education, (iii) a list of 1 to 3 persons that can be contacted for recommendation.

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## Selected references

- D. Wei, C. Darcel, *Chem. Rev.* **2019**, *119*, 2550-2610.
- D. Wei, C. Netkaew, C. Darcel, *Eur. J. Inorg. Chem.* **2019**, 2471-2487.
- D. Wei, C. Netkaew, C. Darcel, *Adv. Synth. Catal.* **2019**, *361*, 1781-1786.
- D. Wei, C. Netkaew, V. Carré, C. Darcel, *ChemSusChem* **2019**, *12*, 3008-3012.
- D. Wei, C. Netkaew, J. Wu, C. Darcel, *ChemCatChem* **2020**, *12*, 5449-5455.
- J. Wu, C. Darcel, *J. Org. Chem.* **2021**, *86*, 1023-1036.
- J. Wu, C. Darcel, *ChemCatChem* **2022**, *14*, e202101874.