Master 2 internship at ENS Lyon, France

Design of new chiral molecular receptors for redox photocatalysis in confined space

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Key words: multi-steps organic synthesis, chirality, host-guest chemistry, photocatalytic properties.

This project, supported by the National Research Agency (*Agence Nationale de la Recherche - CE07 - Projet AtropoPhotoCat, Edition 2023)* aims **to the enantioselective synthesis of atropisomers using supramolecular photocatalysis**.[1] This is a multidisciplinary field involving four laboratories in Lyon, Strasbourg and Marseille.

Photocatalysis allows the synthesis of important molecules with high added value, under mild, metal-free and eco-compatible conditions, using light as an energy source.[2] To this end, it is necessary to have a stable photoactive molecule to allow electrons transfers to the substrate of interest. The substrates targeted here are chiral atropisomeric bi-aryls involved in the synthesis of numerous bioactive compounds.[3]

Here, we propose a **supramolecular approach for the enantioselective and catalytic synthesis of these bi-aryls**. Supramolecular chemistry allows association and spatial organization of different entities via reversible chemical bonds.[4] One of the best-known examples is host-guest chemistry where a molecular cage can reversibly encapsulate a substrate, which can then be transformed with control of reactivity and selectivity by pre-organizing the substrates and stabilizing the transition state.

The main objective of the internship proposed as part of the Master 2 will include the **multi-steps organic synthesis and characterization of new cavitand type molecules for the design of molecular cages associating a chiral molecular cavity** (recognition site) **and a porphyrin moiety** (photocatalytic site).[5] More precisely, in a first step the strategy for synthesizing achiral cavitands will be studied ; secondly, chirality will then be introduced by modifying the molecular structure of these cavitands (Figure 1).[6] This will constitute a crucial step in **the design of chiral supramolecular catalysts associating molecular cavity and porphyrin unit via adequate functionalization of the cavitand unit**.

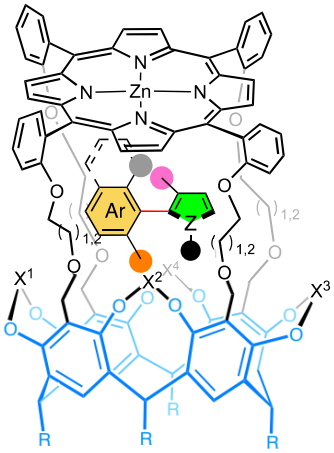

Figure 1. Schematic view of the supramolecular cavitand·porphyrin catalyst and chiral bi-aryl atropisomer (X1-X4: bridging units inducing chirality)

Profile: We look for a highly motivated **synthetic organic chemist** with an interest for **supramolecular chemistry** and **photocatalytic properties studies**. The Master 2 candidate will take the full advantage of the stimulating environment of the Chemistry Laboratory of ENS Lyon and the strong experience of the research team in cavitands design

Duration: 5 – 6 months.

Starting date: January or February 2024.

References:

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