

**PhD thesis title :** Synthesis of electrodeficient cyclotribenzylidenes and associated molecular cages.

**Period:** 36 months, starting 1st October 2025

**Laboratory:** CERMN, Centre d'Etudes et de Recherche sur le Médicament de Normandie, UR 4258

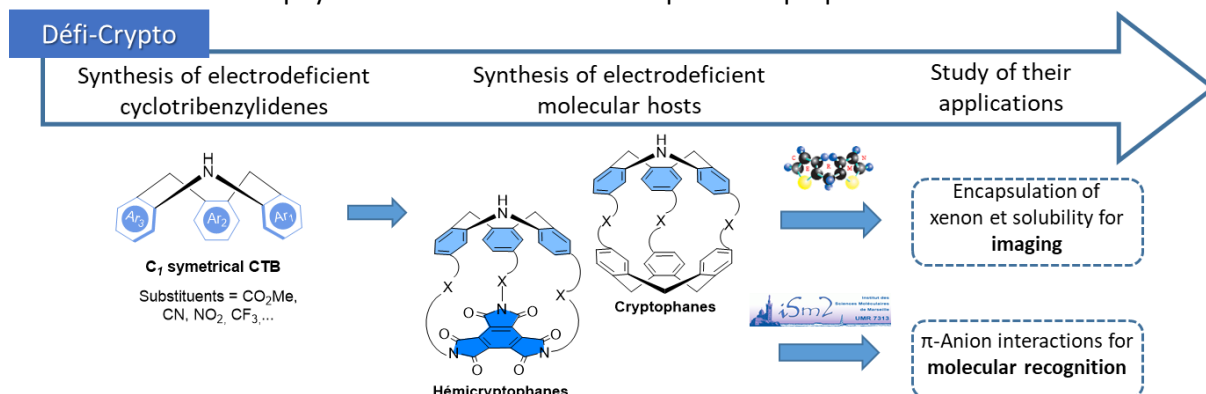
**Research group:** Synthetic Methodologies and Radiochemistry

#### Background and objectives of the project:

Cyclotribenzylidenes (CTBs) are chiral macrocyclic trimers with rigid bowl-shaped cavities, ideal for the complexation and selective detection of various substrates,<sup>1</sup> as well as for the construction of cryptophane<sup>2</sup> and hemicryptophane molecular cages.<sup>3</sup> However, their synthesis remains limited to CTBs with electron-rich cavities, due to the synthetic methodologies currently available in the literature.

The aim of the DEFI-CRYPTO project is to develop a synthetic route, based on the previous works of our team,<sup>4,5</sup> for obtaining electron-deficient cryptophanes and hemi-cryptophanes molecular cages. The purpose of this work is to study their molecular recognition properties in relation to different substrates, in collaboration with Dr. Y. Cotelle from l'institut des sciences moléculaires de Marseille (iSm2).

The recruited student will be involved in the design and the application of a new synthetic route to produce electron-deficient CTB, and the preparation of the corresponding cryptophanes and/or hemi-cryptophanes. He/ she will perform their structural characterisation using NMR, as well as the determination of their physico-chemical and their encapsulation properties.



References : (1) *J. Mol. Struct.* **2023**, 134330. doi 10.1016/j.molstruc.2022.134330.; (2) *European J. Org. Chem.* **2023**. doi 10.1002/ejoc.202301050.; (3) *Chem. Rev.* **2017**, 4900–4942. doi 10.1021/acs.chemrev.6b00847.; (4) *Adv. Synth. Catal.* **2021**, 3756–3761. doi 10.1002/adsc.202100547.; (5) *Angew. Chemie Int. Ed.* **2022**. doi 10.1002/anie.202208580.

#### Qualification requirements:

We are looking for a candidate who is motivated, rigorous, dynamic, able to work in a team, interested in organic chemistry at the interface with biology. The candidate should have:

- Master's degree in organic chemistry or related area
- Good theoretical knowledge and practical skills in organic chemistry
- Good knowledge in classical analytic experiments, (NMR <sup>1</sup>H, <sup>13</sup>C, 1D and 2D ; MS)
- Good knowledge in Excel, Word and PowerPoint softwares
- Good communication skills (oral and written) in French and/or English

Please send a detailed CV with at least the name of one reference and a cover letter to [emmanuelle.dubost@unicaen.fr](mailto:emmanuelle.dubost@unicaen.fr) and [frederic.fabis@unicaen.fr](mailto:frederic.fabis@unicaen.fr) before 5<sup>th</sup> of may 2025.