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PROJECT FOR PhD THESIS

Synthesis of Enantiopure Cryptophane Having *Syn*-Configuration: Study of the Chiroptical Properties of these Derivatives and their Complexes.

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Cryptophane derivatives are artificial receptors that show interesting binding properties towards a large range of substrates. Interestingly, the overwhelming majority of these derivatives shows an inherent chiral structure. Thus, the chiroptical properties of the optically active cryptophanes can be exploited to study these molecules and their complexes by different techniques (ECD, VCD, ROA). So far, most of these studies concerned cryptophane derivatives having the *anti*-configuration. Herein, the *anti*-configuration originates from the helicoidal arrangement of the three linkers that connect the two cyclotribenzylene (CTB) units. Recently, we have reported the synthesis of new optically active cryptophane derivatives having a *syn* configuration. The inherently chiral structure of these derivatives is different as the two CTB now possess different substituents. We can thus expect different chiroptical effects depending on the *syn* or *anti* configuration of these derivatives especially when water is used as a solvent. To date, the *syn* derivatives have been scarcely described in literature and only very few chiroptical studies have been reported. Interestingly, the *syn* precursor (figure 1), recently prepared, offers the opportunity of extending this study for designing new optically active derivatives with new properties.

The primary goal of this PhD work will be to optimize some of the synthetic steps, which have been already reported. Using this procedure, the applicant will develop the synthesis of new optically active cryptophane derivatives and will study their binding properties with different guest molecules. Xenon will be the guest of choice due to the strong affinity of these hosts for this noble gas. After testing different approaches to isolate the enantiomers of each cryptophane derivatives, the applicant will focus on a detailed study of the chiroptical properties of the new derivatives and their complexes.

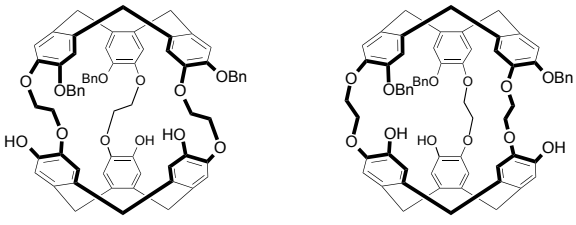

Figure 1: Chemical structures of *anti* (left) and *syn* (right) cryptophanes. Both structures are chiral.

This experience will allow the PhD candidate to develop strong skills, knowledge and autonomy in several disciplinary fields such as organic synthesis, supramolecular chemistry, spectroscopic characterization and analysis. We are thus looking for a strongly motivated student that would like to get a strong experience in practical organic chemistry and that would be interested to study original organic compounds with chiroptical techniques.