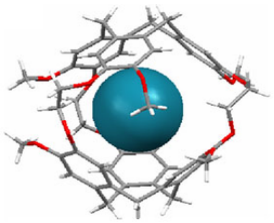
Cryptophanes: Hollow Molecules with Original Binding and Chiroptical Properties

BROTIN Thierry
(Directeur de Recherche CNRS à l'ENS de LYON)

Laboratoire de chimie de l'ENS LYON (CNRS, UMR 5182). École Normale Supérieure de Lyon, 46 Allée d'Italie, 69364 Lyon Cedex 07, FRANCE
tbrotin@ens-lyon.fr

Cryptophane is the common name to describe a particular class of macrocyclic compounds (see figure), which was first studied by Collet and his collaborators. These compounds consist of two cyclotribenzylene units linked by at least three linkers whose length and nature can vary. These molecules have attracted much attention because they can establish, in solution, strong interactions with neutral molecules or charged species depending on the substituents attached to the aromatic rings. For example, cryptophanes with small cavities can encapsulate xenon in solution. The resulting complexes are easily characterized by ^{129}Xe-NMR spectroscopy due to a strong modification of the magnetic properties of the encapsulated xenon. Furthermore, the overwhelming majority of cryptophanes are chiral. Thus, the binding properties of the cryptophane derivatives can also be studied by chiroptical techniques such as ECD, VCD or ROA spectroscopy.

In this presentation, we will provide an overview of the synthesis and molecular recognition properties of cryptophanes. We will briefly describe the different approaches used to prepare cryptophanes in their racemic or enantiopure form. Through several examples, we will show how cryptophanes modify the NMR properties of encapsulated species. Then we will also describe the chiroptical properties of enantiopure cryptophanes and their complexes by different chiroptical techniques.



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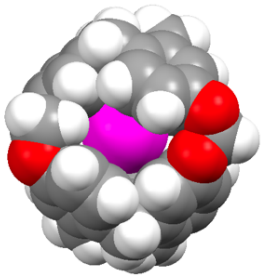

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