Synthesis and Encapsulation Properties of Porphyrin Cages Assembled from N-heterocyclic Carbene-Metal Bonds

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N-heterocyclic carbenes (NHCs) and porphyrins have become ubiquitous ligands in the fields of organometallic chemistry and catalysis.[1] Over the last decade, NHCs have also emerged as promising ligands for the synthesis of metallosupramolecular architectures featuring M−CNHC bonds.[2] For this purpose, numerous poly-NHC ligands were reported in the literature allowing the formation of discrete assemblies of various sizes and shapes. Here, we show that porphyrins equipped with imidazolium salts on the para positions of the four meso aryl groups can be used as NHC precursors for the synthesis of porphyrin cages assembled from eight M−CNHC bonds.[3] Silver(I) was used as assembling metal ions because they form labile bonds with NHC ligands enabling the formation of thermodynamic products which are self-assembled porphyrin dimers with a face-to-face orientation. Moreover, the lability of Ag(I)−CNHC bonds offers the possibility to generate new structures by transmetalation reactions forming more stable bonds like Au(I)−CNHC with retention of the metallosupramolecular structures. Host-guest chemistry is feasible with porphyrin cages incorporating flexible linkers between porphyrins and NHC ligands. Indeed, the inner space between the two porphyrins of these cages expands enough to allow the encapsulation of guest molecules like water molecules or 1,4-diazabicyclo[2.2.2]octane (DABCO).[4]

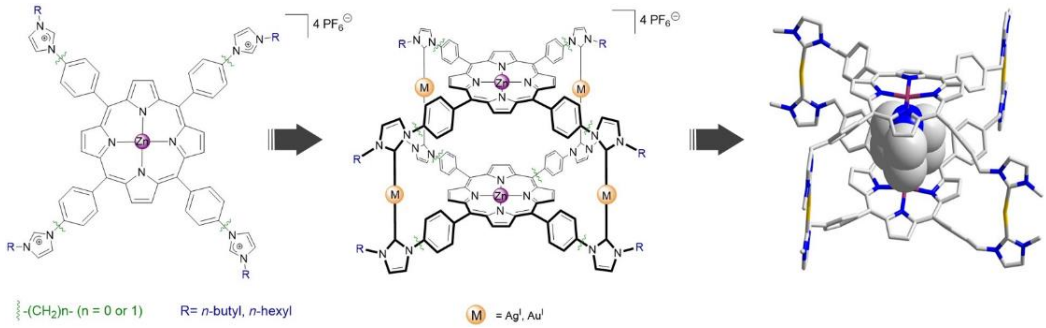

Figure: *Left: porphyrin-NHC precursors. Middle: cofacial porphyrin dimers. Right: DABCO molecule encapsulated in a cofacial porphyrin dimer.*

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