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Construction of Polycationic Nanostructures with Well-Defined Polyaromatic Cavities

Abstract

A variety of three-dimensional nanostructure with well-defined cavities have been designed and synthesized by using neutral organic frameworks. However, the incorporation of cationic moieties into the neutral frameworks of hollow structures has been seldom explored so far. This thesis reports the preparation of polycationic hollow nanostructures from bent pyridine ligands containing anthracene or acridinium rings. A tetra-cationic bowl-shaped compound was constructed by using two bispyridine ligands linked with two methylene spacers. The bowl bound carbonyl compounds in a 1 nm-sized cavity in water. A di-cationic tubular compound was prepared by Zincke reaction. The tube has a rigid cylindrical cavity capable of binding long hydrocarbons in aqueous media. A polycationic coordination capsule and tube were constructed by using di-cationic ligands containing acridinium panels. Furthermore, a dumbbell-shaped coordination capsule was prepared from tripyridine ligands and metal ions. The capsule encapsulated a variety of neutral molecules in the two spherical cavities.