Creating New Functions through Self-assembled Cavities

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Molecular self-assembly has recently undergone on explosive development, making possible the synthesis of many fascinating and complex structures using only relatively simple procedures. Over the last fifteen years, we have been showing that the simple combination of palladium's square planer geometry (a 90 degree coordination angle) with pyridine-based bridging ligands gives rise to the quantitative self-assembly of nano-sized, discrete organic frameworks. Representative examples include square molecules, linked-ring molecules, cages, tubes, and capsules that are self-assembled from simple and small components. A focus will be on a molecular sphere (4 nm in diameter), consisting of 36 small components (12 metals and 24 organic ligands), that can be featured as a molecular nano-particle. Both peripheral and endhedral functionalization of the molecular nanoparticle as well as the development of new properties and reactions in the self-assembled cavities will be discussed.

Selected publications related to the present paper: *Angew. Chem. Int. Ed.* **2005**, *44*, 1810; **2005**, *44*, 1962; **2005**, *44*, 2151; **2005**, *44*, 4896; **2005**, *44*, 5322; **2006**, *45*, 241; **2007**,*46*, 5717; *J. Am. Chem. Soc.* **2005**, *127*, 2798; **2005**, *127*, 4546; **2005**, *127*, 10800; **2005**, *127*, 11950; **2005**, *127*, 13456; **2006**, *128*, 6558; **2007**, *129*, 7000; *Science*, **2006**, *312*, 251; **2006**, *313*, 1273.