605d Synthesis and Characterization of Cage-like Nanostructures

Young-Woong Suh, Wenmei Xue, Mayfair C. Kung, and Harold H. Kung

One area of rapid development in nanotechnology is the ability to synthesis a wide variety of nanostructures, which, in turn, is a consequence of the availability of a large number of macromolecules of various sizes, shapes, and functionalities. Cage-like nanostructures are particularly interesting because of their potential uses in storage of molecules for targeted delivery, separation and purification, and molecule-specific catalysis and chemical transformations. In addition, if the cage-like nanostructures have functional groups at specific locations, it becomes possible to effect chemistry that requires cooperative effects of various groups as in the case of enzyme catalysis. To our knowledge, however, there are few reports on the synthesis of cage-like nanostructures in a controlled manner. Here, we report our synthesis of nano-size cage-like structures for such purposes. In one example, we synthesized internally functionalized siloxane nano-net. The functional groups can be used as binding sites or as sites for chemical transformations and catalysis. The concept behind this synthesis is to make use of micelles of a surfactant as template for the formation of the siloxane net. A proper choice of the surfactant that could be activated afterwards would result in interior functional groups. In the second example, we synthesized cage-like bicylicsiloxanes. The unit-by-unit synthetic procedure permits introduction of pro-functional groups at specific positions of the molecule, which can be converted to functional groups in a later step. The details of these synthetic methods and the characterization results of the structures obtained are described.