Abiological Self-Assembly: Predesigned Metallacycles and metallacages via Coordination

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The use of just two types of building blocks, linear and angular, in conjunction with symmetry considerations allows the rational design of a wide range of metallocyclic polygons and polyhedra via the coordination motif.[1-3] We have used this approach to self-assemble a variety of 2D supramolecular polygons such as triangles, rectangles, squares, hexagons, etc. as well as a number of 3D supramolecular polyhedra: truncated tetrahedra, triginal prisms, cubooctahedra4 and dodecahedra.[5] An example of the methodology is illustrated in Figure 1. More recently we have functionalized these rigid supramolecular scaffolds with different electroactive, host-guest, dendritic (Figure 2), and hydrophobic/hydrophilic moieties and have investigated the properties of these multifunctionalized supramolecular species.[6] Additionally, we have begun to explore the self-assembly of 2D polygons and 3D polyhedra on a variety of surfaces with the aim of developing their potential to be used in device settings.[7-12] These novel, supramolecular ensembles are characterized by physical and spectral means. The design strategy, formation, characterization and potential uses of these novel metallocyclic assemblies will be discussed, along with our very recent results.

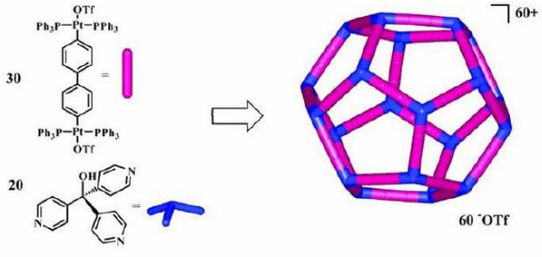

Figure 1: Self-assembly of a nanoscale dodecahedron.

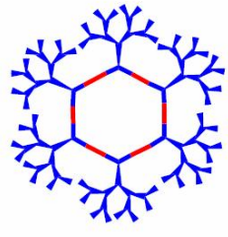

Figure 2: A cavity-cored dendritic hexagon.

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