

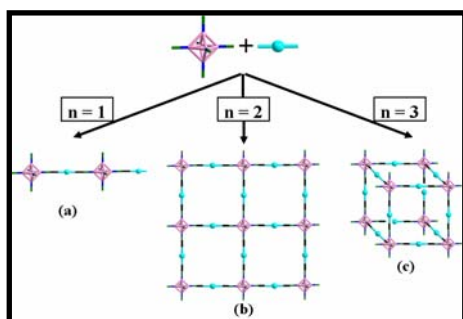
Self-assembly of Multifunctional Cluster Based Metal Organic Hybrid Materials

Abdou Lachgar and Lei Chen

Department of Chemistry, Wake Forest University

The spontaneous assembly of molecular building blocks into supramolecular and giant molecular assemblies occurs in nature as for instance in cells with the assembly of lipid bilayer membranes. Taking advantage of these bio-synthesis strategies to create novel self-assembled multifunctional nanostructured in which pre-designed and functionalized molecules are self-assembled into supramolecular assemblies is an important synthesis technique in nanotechnology. In contrast to traditional “top-down” synthesis techniques, such as lithography, in which the desired structure is carved out from larger block of matter, self-assembly is a “top-down” approach in which the target structure and function of the material obtained is encoded in the molecules used as building blocks.

Our group investigates and applies bioinspired self-assembly techniques to the synthesis of cluster-based hybrid inorganic-organic materials. The approach has been widely applied to the assembly of cyano-bridged materials with diverse structural and physical properties. Among these compounds, the most widely investigated are Prussian blue and its analogues, which have properties that can be affected through the judicious choice of their molecular building blocks components. Octahedral metal clusters are being investigated as building blocks for a variety of frameworks owing to their large size (~1 nm), their atom-like behavior and their physical properties arisen from the presence of metal-metal bonds. The presentation will describe our approach and give a few examples of materials recently synthesized and structurally characterized in our group. Scheme 1 describes the overall strategy used for the synthesis and functionalization of the building blocks, and Figure one gives an example of structures obtained by this approach.



Scheme 1: Schematic representation of the formation of 1D (a), 2D (b) and 3D (c) metal organic frameworks. The octahedral metal cluster is functionalized and connected to each other via a prefabricated metal complex.

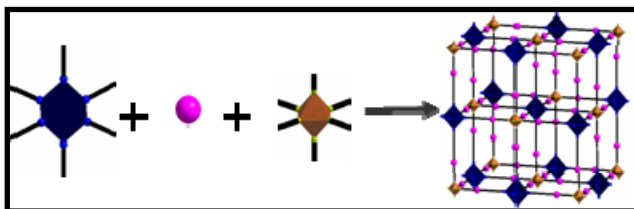


Figure 1: An example of a 3D superexpanded trimetallic Prussian blue analogue synthesized and characterized using our strategy