Chemical Aspects of Self-Assembly and Application to Molecular Electronics

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Chemical design and synthesis has tremendous power to create new molecules that have information written into their structure that encodes their own self-assembly. Self-assembly is a tool that uses relatively weak forces such as van der Waals contacts, hydrogen bonds, π-overlap, and salt bridging to predictably create one, two, and three-dimensional nanoscale objects. The plasticity and reversibility of these weak forces provides rapid access to complex assemblies from informationally-rich but relatively simple building blocks.

Through molecular design – an inherently bottom-up approach – new types of complex nanoscale electronic devices can be formed through self-assembly. A key aspect of this approach is in finding general methods to assemble and interconnect *complex* molecular structures with metallic and semi-conducting surfaces. This presentation will address the current methods utilized by our group and others involving self-assembly and molecular recognition as a means to create individual nanostructures and to measure their electrical properties. The underlying concepts of chemical assembly and their limitations in nanoelectronics will be discussed. Within this context, incorporation of some aspects of biological self-assembly will be presented as a possible direction for future study.