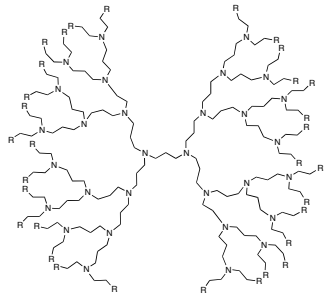
Synthesis of Novel Rigid-Core Dendrimer Nanostructures

Dendrimers are synthetic macromolecules that have a highly branched nanoscale three-dimensional structure. They contain symmetric branching units built around a small core. There physical and chemical properties are highly dependent on the nature of their molecular components. A small representative dendrimer structure is shown below

In rigid core dendrimers, the core and first generation components are structurally rigid, while the subsequent generations can be flexible. A similar structure is found in a forest, with rigid tree trunks and a flexible branching canopy, the area in the "shade" in a dendrimer creates a defined nanocavity that can host a similarly sized guest molecule. The potential applications of such molecules are wide ranging, from medicine (drug delivery, and sensor design) to light harvesting and polymer synthesis. Indeed, as the field of nanotechnology expands, new applications of these well defined, yet highly modifiable structures are likely to grow.

While many dendrimers have been created, the vast majority have been synthesized via relatively simple addition and substitution chemistry. In our work, we hope to explore the use organometallic coupling reactions to create novel trunks and branches. Advances should allow the creation of more sophisticated molecular architectures, and allow for dendrimer design to be tailored to a specific function.



A simple example of a dendrimer