Giant Polyhedra based on Nano-atoms STEPHEN CHENG, Univ of Akron, STEPHEN CHENG TEAM — In order to create new functional materials for advanced technologies, both Precisely control over functionality and their hierarchical structures and orders are vital for obtaining the desired properties. Among all the giant molecules, giant polyhedra are a class of materials which are utilized via deliberately placing precisely functionalized polyhedral oligomeric silsesquioxane (POSS) and fullerene (C60) molecular nano-particles (MNPs) (so-called "nano-atoms") at the vertices of a polyhedron. These giant polyhedra capture the essential structural features of their small-molecule counterparts in many ways but possess much larger sizes, and therefore, they are recognized as size-amplified versions of those counterparts. One of the most illustrating examples is a series of novel giant tetrahedral which possessing precisely-defined amphiphilic MNPs with different geometric combinations. With both geometrical and chemical symmetry breakings, these tetraphedra perform as building blocks to construct When specific interactions are introduced, these polyhedral are functioned as building blocks to construct into hierarchical ordered structures. A range of ordered super-lattice structures of this class of materials have been investigated in the condensed bulk state. The study has also expanded to other types of giant polyhedra to identify the general role in their assembly processes.

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