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Abstract (600 word limits)

Synthesis of Pt Subnano Catalyst Using a Dendrimer Reactor

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Dendrimers are highly branched organic macromolecules with successive layers or "generations" of branch units surrounding a central core. Organic inorganic hybrid versions have also been produced, by trapping metal ions or metal clusters within the voids of the dendrimers. Their unusual, tree-like topology endows these nanometer-sized macromolecules with a gradient in branch density from the interior to the exterior, which can be exploited to direct the transfer of charge and energy from the dendrimer periphery to its core.

We show that tinchloride, SnCl2 and FeCl3 complexes to the imines groups of a spherical polyphenylazomethine dendrimer in a stepwise fashion according to an electron gradient, with complexation in a more peripheral generation proceeding only after complexation in generations closer to the core has been completed. By attaching an electron-withdrawing group to the dendrimer core, we are able to change the complexation pattern, so that the core imines are complexed last. By further extending this strategy, it should be possible to control the number and location of metal ions incorporated into dendrimer structures, which might and uses as tailored catalysts, building blocks, or fine-controlled clusters for advanced materials. The metal-assembly in a discrete molecule can be converted to a size-regulated metal particle with a size smaller than 1 nm as a molecular reactor. Due to the well-defined number of metal particles in the subnanometer size region, its property is much different from that of bulk or general metal nanoparticles.

Keywords—Subnano Metal Particles, Dendrimer Reactor, Catalysis

Biography (200 word limit)

Kimihisa Yamamoto received PhD degrees from Waseda University in Polymer Chemistry in 1990. He joined the Department of Chemistry at Keio University from 1997 as professor. Currently, he is a professor in the Laboratory for Chemistry and Life Science, Tokyo Institute of Technology since 2010. He is a project leader for Yamamoto Atom Hybrid Project adopted as a Japan Science and Technology Agency (JST), Strategic Basic Research Program (ERATO) started in October, 2015.

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