



Investigation of extremely small sub-nano particles

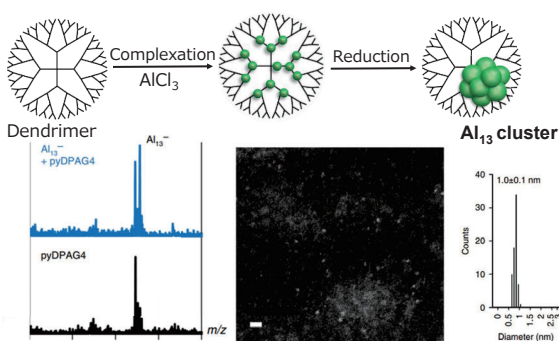
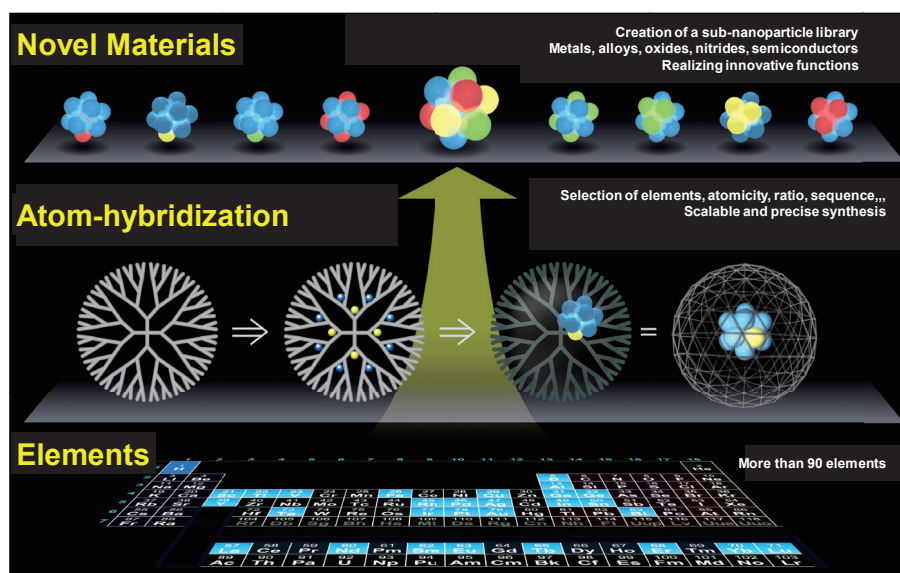
Hybrid Materials Unit

Molecular Functions Divisions, Laboratory for Chemistry and Life Science

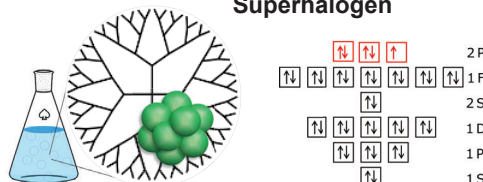
<http://www.res.titech.ac.jp/~inorg/>

- Precise control of atomicity in a sub-nano metal particle
- Controlled blending of multi-elements in a particle
- Investigation of noble and high performance catalysts
- Finding of innovative functions of the sub-nano sized materials

As an extreme form of metal particles, sub-nano particles with the size of less than 1 nm are of great interest due to the specific functions and physical properties toward applications for catalysts, sensors, optical materials, etc. Our laboratory has extensively studied the precisely controlled synthesis of the sub-nano particles, observation and analysis at atomic level, application as functional material of catalyst and so on. We can provide the advanced materials and analytical technology.

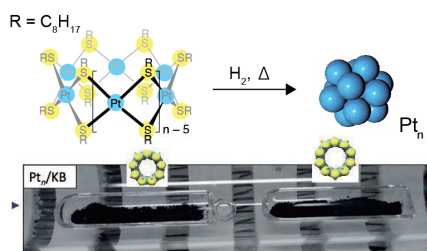


Superhalogen

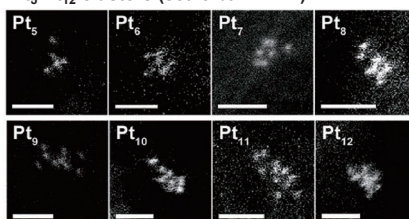


Synthesis of superatoms

- Solution-phase synthesis of Al_{13}^{-} superatom
- Precise control of metallic nanoparticles at the atomic level
- Unique physical and chemical properties of Al_{13}^{-} superatom

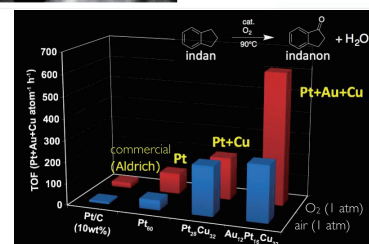
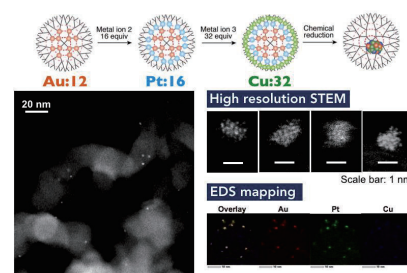


Pt_5 - Pt_{12} clusters (scale bar: 1 nm)



Mass synthesis of platinum cluster catalysts with precise numbers of atoms

- Applicable to flask level reactions
- Reusable catalysts
- High catalytic activity of Pt_{10} cluster



Alloying three metals into 1 nanometer particles

- Noble method to precisely alloy three kinds of metals into a 1 nm particle
- High catalytic activity by the combination of Cu, Pt, and Au