Analysis of dendrimer template effect in ligand-protected Au cluster synthesis

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Metal clusters, which consist of several to dozens of metal atoms, have discrete electron configurations, unlike bulk bodies. Therefore, metal clusters may exhibit properties different from those of bulk states or nanoparticles. In recent years, Au clusters have attracted attention as superatoms that can be synthesized not only in the gas phase but also in the liquid phase. In particular, various reports of Au clusters have been reported since Brust and Schiffrin et al. reported a liquid phase synthesis method for thiol-protected Au clusters.[1] Furthermore, many examples of combinations of different elements have been studied, and various combinations of different elements, mainly noble metals such as Pd, Pt, Cu, Ni, Ag, Cd, and Hg, have been reported. Though Au clusters and those with different elements can be synthesized with high-yields, those require many steps and a lot of derived from etching and exchange reactions. [2,3]

On the other hand, there is a method for liquid phase synthesis of metal clusters that uses dendrimers as templates. This method allows direct synthesis because the elements clustered into the dendrimer can be collected in advance. Recently, $Au_{25}(SR)_{18}$ has been synthesized using the dendrimers (TPM G4)[4].

We verified the effect of the dendrimer by changing the number of Au salts accumulated in TPM G4 (Fig.1). It was suggested that the tendency may differ depending on the number of imine generations in the dendrimer. In the case of different element combinations, the $MAu_{24}(SR)_{18}$ synthesis was confirmed from MS spectra and STEM/EDS for many of the elements studied. Details of the results will be reported on the day.

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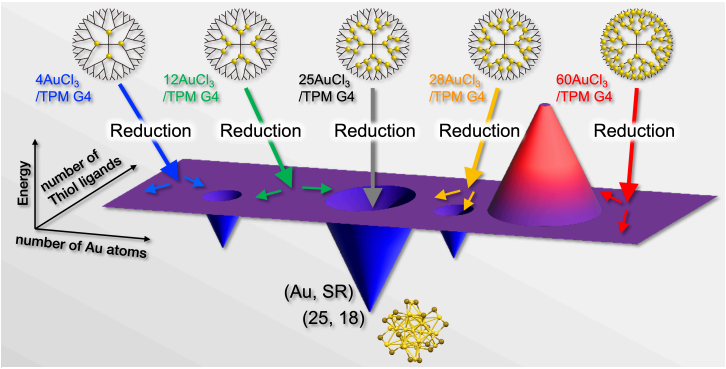

Fig. 1. Image of the difference in the number of clusters produced by the number of nuclei of Au precursors that accumulate in TPM G4. (Note: This image differs from the actual one.)