

Synthesis and Properties of Au₂₅ cluster protected by semi-fluorinated ligand

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Gold clusters are of considerable interests because of their unique structural characteristics and optical properties. However, it is challenging for them to self-assemble into highly ordered structures due to the large surface energy and rather weak interaction between such clusters.^{1,2} The use of capping ligands with amphiphilic properties is a promising approach to guide the self-assembly of gold clusters. It has been reported that an introduction of a semi-fluorinated ligand (SFL) to 5 nm gold nanoparticles allows the formation of small vesicles with ~60 nm in diameter,³ owing to both solvophilic oligo ethylene glycol unit and solvophobic fluorinated tetraethylene glycol segment of SFL (Figure 1a). However, there were few reports on such well-defined nanostructures composed of ~1 nm gold clusters. Thus, in this work, we utilized the SFL as capping agent to promote Au₂₅ cluster assembly.

We prepared a Au₂₅ cluster protected by the SFL (Figure 1b) in tetrahydrofuran. The cluster was characterized by using ultraviolet-visible (UV-vis) absorption spectroscopy and dynamic light scattering (DLS). The UV-vis spectrum with identical absorption peak at around 675 nm indicated the presence of the SFL-protected Au₂₅ cluster. The DLS analysis suggested the formation of a cluster assembly in solution. We also investigated the effect of the ligand's fluorinated unit.

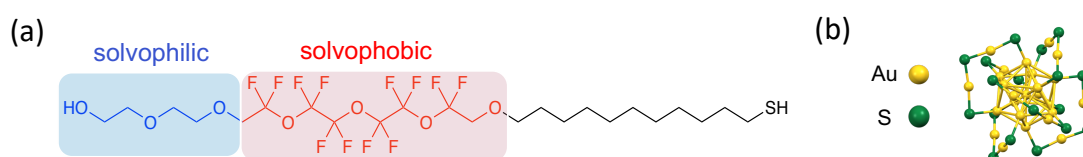


Figure 1. Structures of (a) SFL and (b) Au₂₅(SR)₁₈ (Moieties of R segment are omitted).

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