Supporting Information

Two-step synthesis of nanoflowers with a narrow size distribution using a tree-type multi-amine head surfactant as a template

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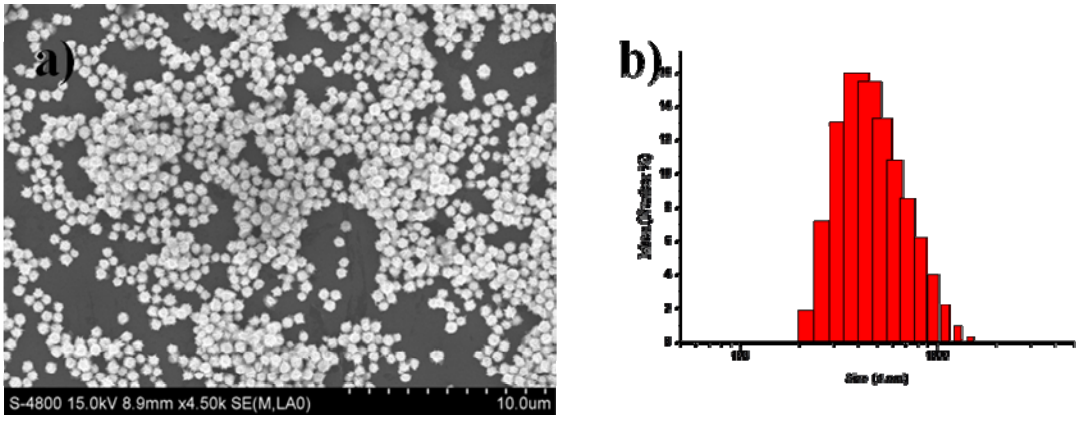

Figure S1. (a) SEM images, (b) Histograms indicating the particles size distribution

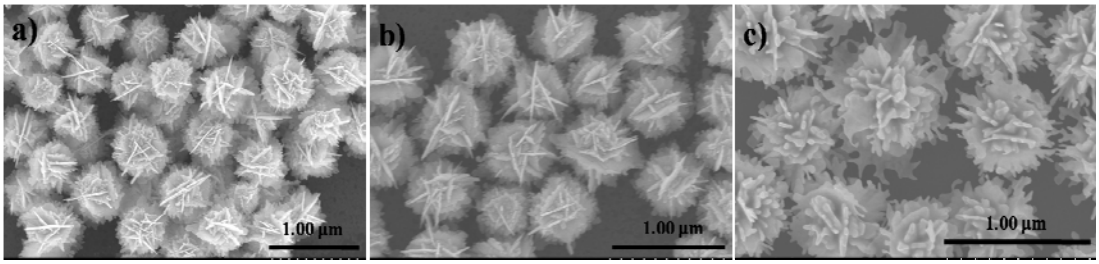

Figure S2. (a) SEM images of Au nanostructures were obtained under optimal conditions: (a) normal Au nanostructures, (b) after three months, (c) after absorbing R6G.

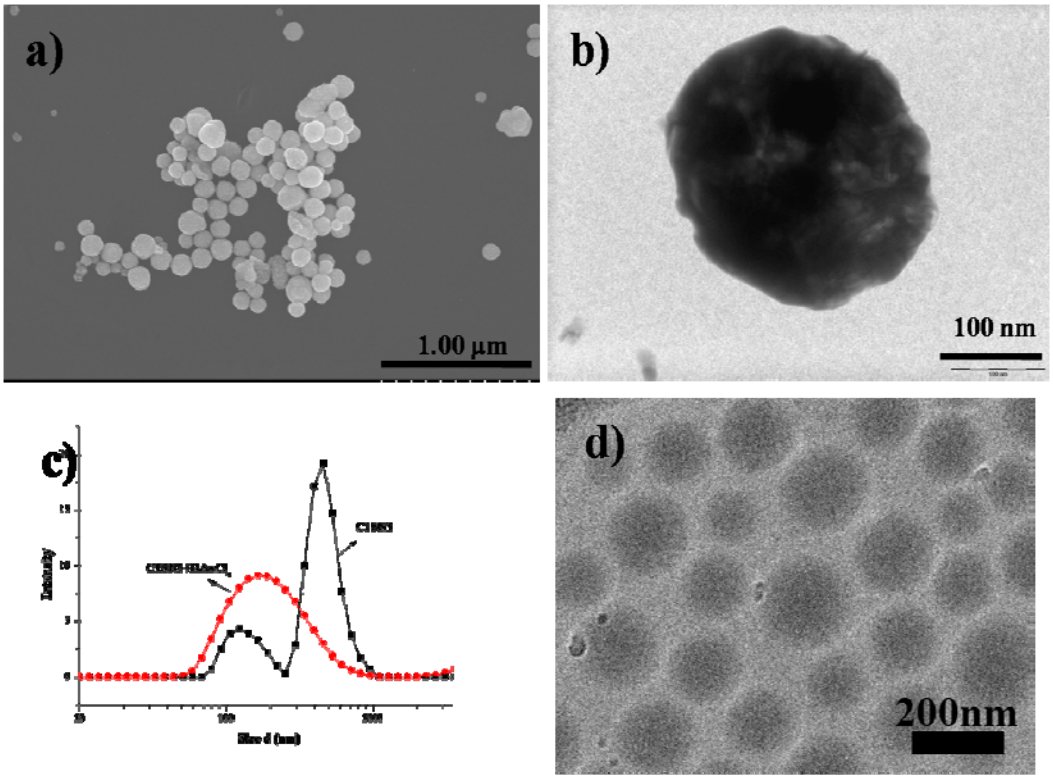

Figure S3. Representative SEM (a) and TEM (b) images of particles with $HAuCl_4$ (0.54 mM) and C18N3 (0.5 mM), reduced by AA (0.2 mL, 20 mM); (c) DLS of C18N3 and C18N3-$HAuCl_4$ complexes, respectively; (d) a cyro-TEM image of the vesicles of C12N3, a molecule has shorter hydrophobic chain in the CXN3 family.

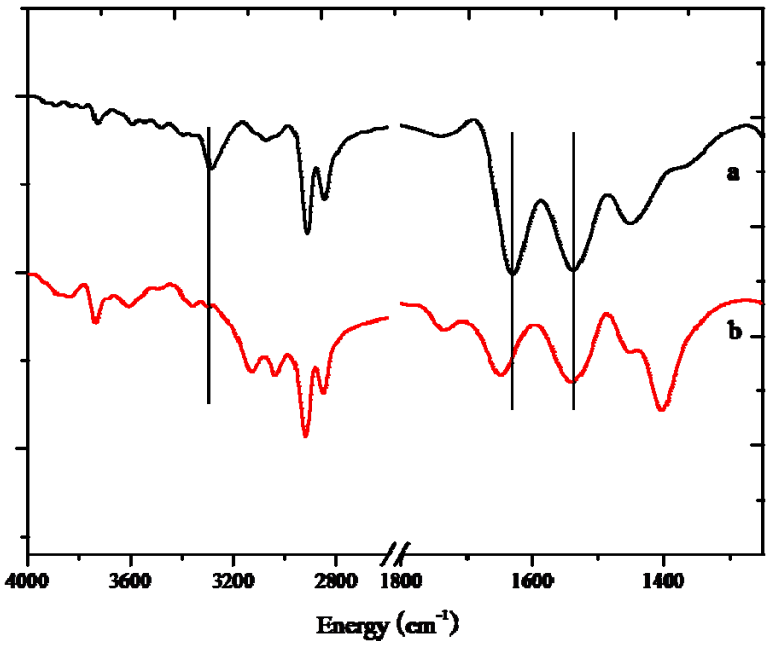

Figure S4. (a) C18N3; (b) C18N3/$HAuCl_4$ complexes. The 3300 cm^{-1} peak assigned to –NH_2 and 1640^{-1} peak assigned amide group has been moved after complexation.

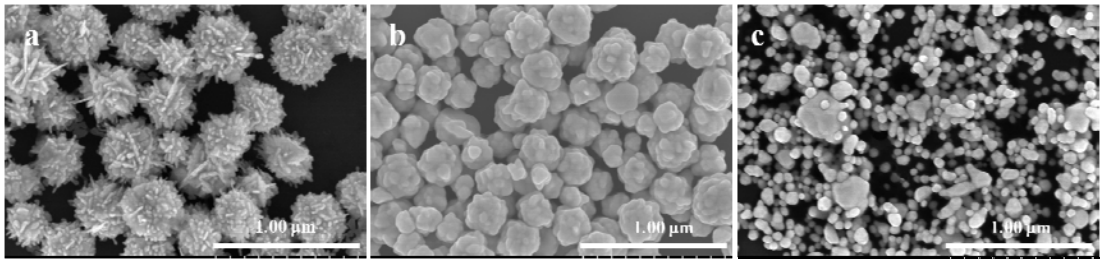

Figure S5. SEM images of Au nanostructures were obtained from an aqueous solution of $HAuCl_4$ (1.6 mM) and AA (0.2 mL, 20 mM) with varying C18N3 concentrations: (a)0.05 mM, (b) 0.01 mM, (c) 0 mM.

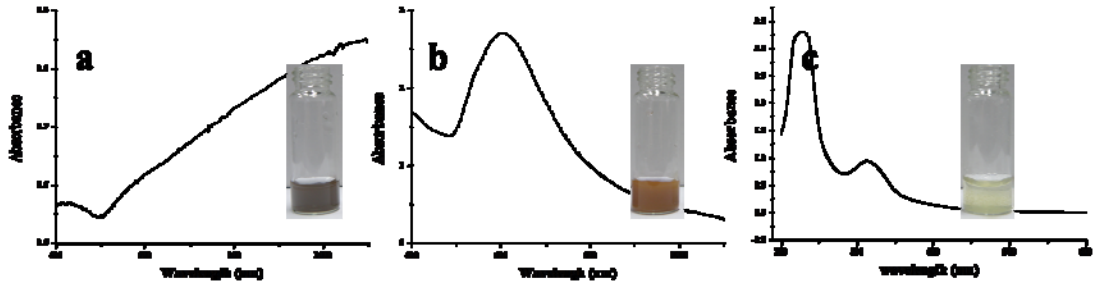

Figure S6. UV-vis spectra of (a) flower-like gold particles synthesized by the reduction of $HAuCl_4$ (1.45 mM) in an aqueous C18N3 solution (0.5 mM), with AA (0.2 mL, 20 mM), (b) nanoparticles prepared by $HAuCl_4$ (1.45 mM) in an aqueous solution of AA (0.2 mL, 20 mM), and c) complexes of $HAuCl_4$ (1.45 mM) and C18N3 (0.5 mM).

Table S1. The pH of different concentrations of C18N3 with a constant $HAuCl_4$ (1.45 mM) concentration in aqueous solutions.

C/ mM	0	0.1	0.3	0.5	0.7	0.9
pH	2.4	2.6	2.6	2.6	2.6	2.6

The calculation of enhancement factor (EF) is as follows:

To determine the enhancement effect of R6G on the self-assembled film and single particles, the (EF) values of R6G were calculated by following expression:[1]

$$\mathrm{EF} = \left(I_{SERS} / N_{ads}\right) / \left(I_{bulk} / N_{bulk}\right)$$

Where I_{SERS} is the intensity of a vibrational mode in the surface enhanced spectrum, I_{bulk} is the intensity of the same mode in the Raman spectrum, N_{ads} is the number of molecules adsorbed and sampled on the SERS-active substrate, and N_{bulk} is the number of molecules sampled in the bulk.

The EF of flower-like particles can be calculated to be about 10^5-$10^{6.}$

(1) Guo, S.; Dong, S.; Wang, E. *Cryst Growth Des* **2008**, *9*, 372.