

Electronic Supplementary Information

Nanonecklaces assembled from gold rods, spheres, and bipyramids

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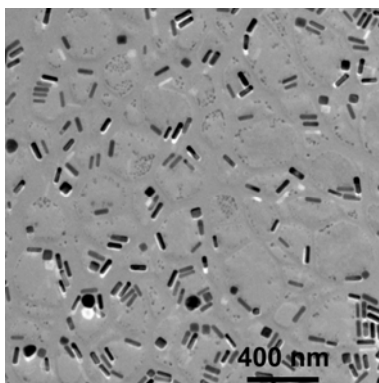


Fig. S1 TEM image of irregularly aggregated Au nanorods in the absence of assembling thiol molecules.

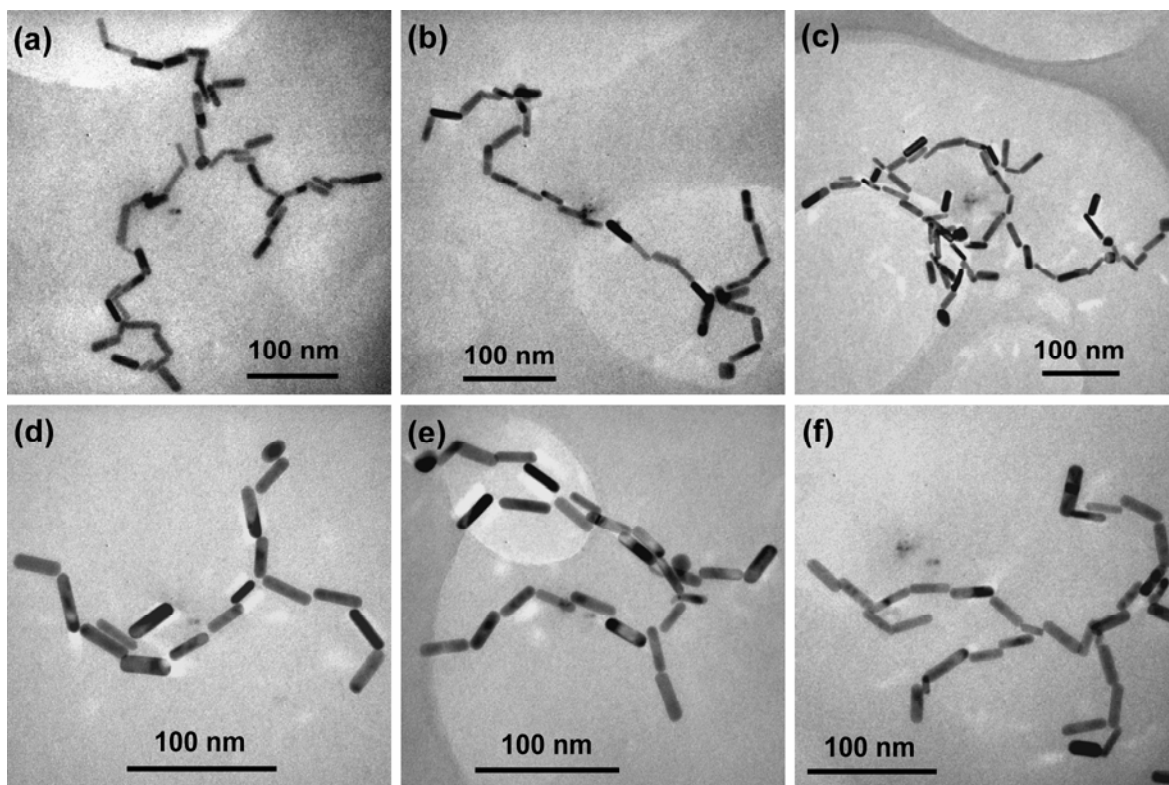


Fig. S2 TEM images of end-to-end assembled Au nanorods. The concentration of glutathione is 150 μM .

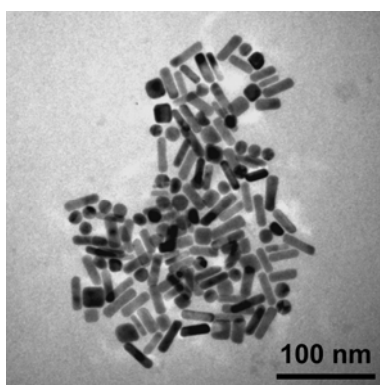


Fig. S3 TEM image of irregularly aggregated Au nanorods and nanospheres.

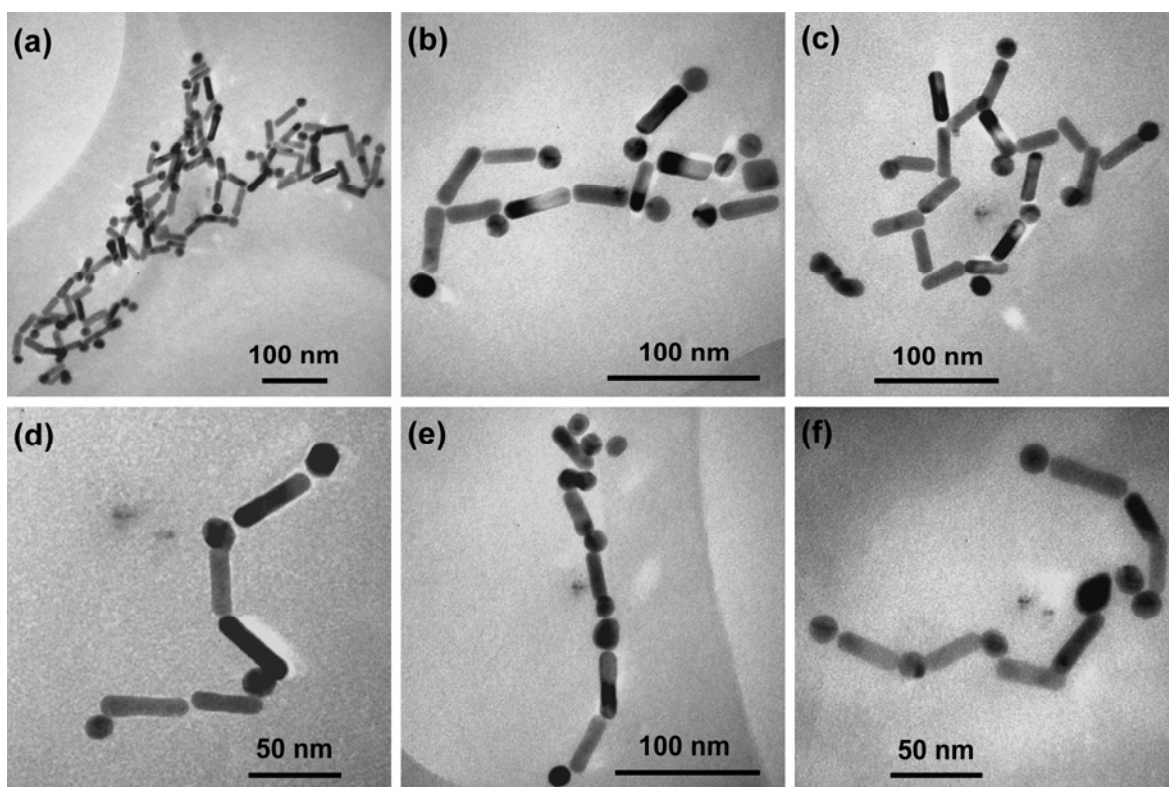


Fig. S4 TEM images of assembled Au nanorods and nanospheres, showing that Au nanospheres are preferentially assembled to the ends of Au nanorods. The concentration of glutathione is 150 μM .

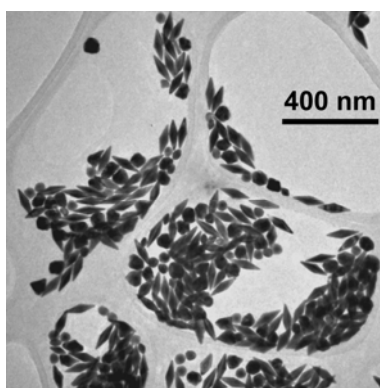


Fig. S5 TEM image of irregularly aggregated Au bipyramids and nanospheres in the absence of assembling thiol molecules.

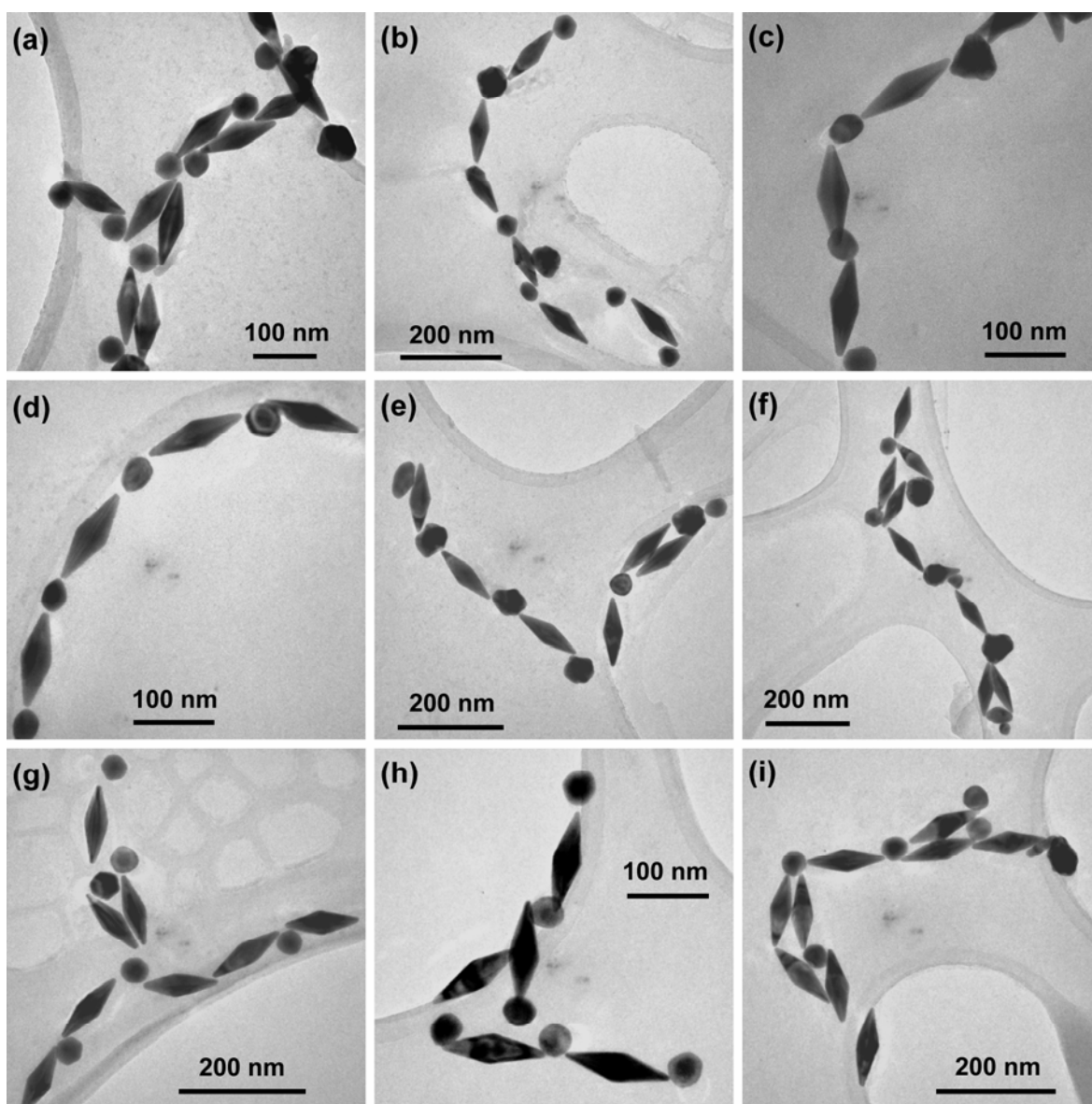


Fig. S6 TEM images of assembled Au bipyramids and nanospheres, showing that Au nanospheres are preferentially assembled to the ends of Au bipyramids. The concentration of glutathione is 180 μ M.

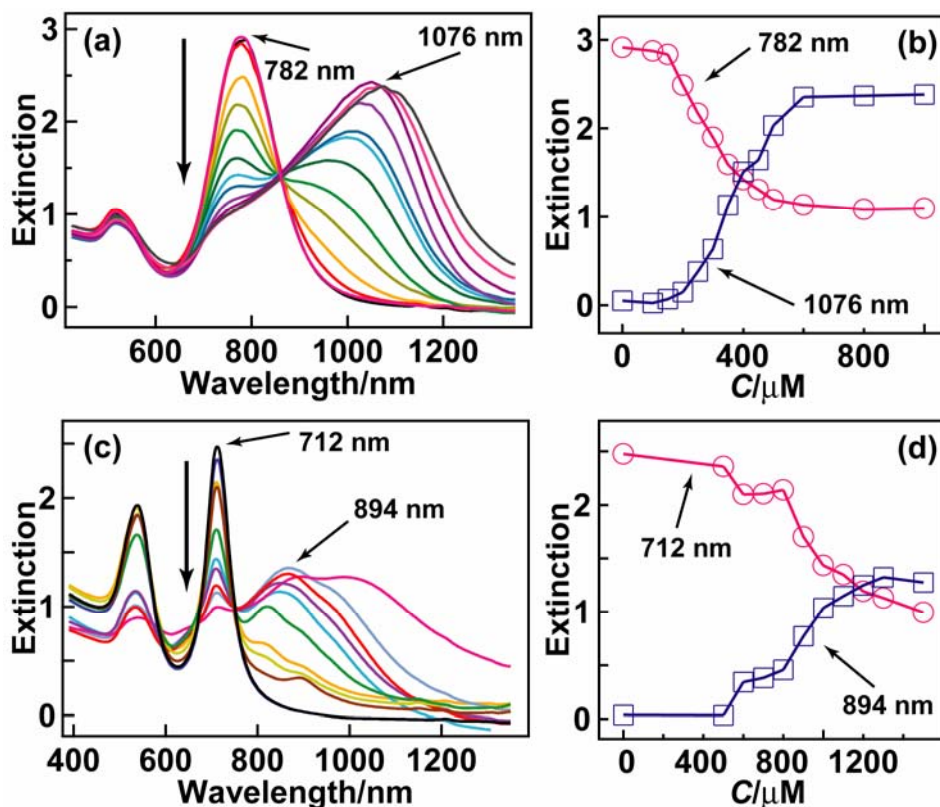


Fig. S7 (a) Extinction spectra of Au nanorod solutions after the addition of DL-cysteine at the concentrations of 0, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 800, and 1000 μ M, respectively. (b) Changes of the extinction values at the wavelengths of 782 and 1076 nm extracted from (a). The concentration of Au nanorods in the solutions is estimated to be 0.6 nM. (c) Extinction spectra of aqueous solutions containing approximately equal concentrations of Au bipyramids and nanospheres after the addition of DL-cysteine at the concentrations of 0, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, and 1500 μ M, respectively. (d) Changes of the extinction values at the wavelengths of 712 and 894 nm extracted from (c). The stock DL-cysteine solution was prepared at the concentrations of 0.01 and 0.1 M so that the concentrations of the Au nanorod and bipyramid solutions after the addition of DL-cysteine stayed approximately constant. The concentrations of Au bipyramids and nanospheres are estimated to be 0.7 and 0.5 nM, respectively.

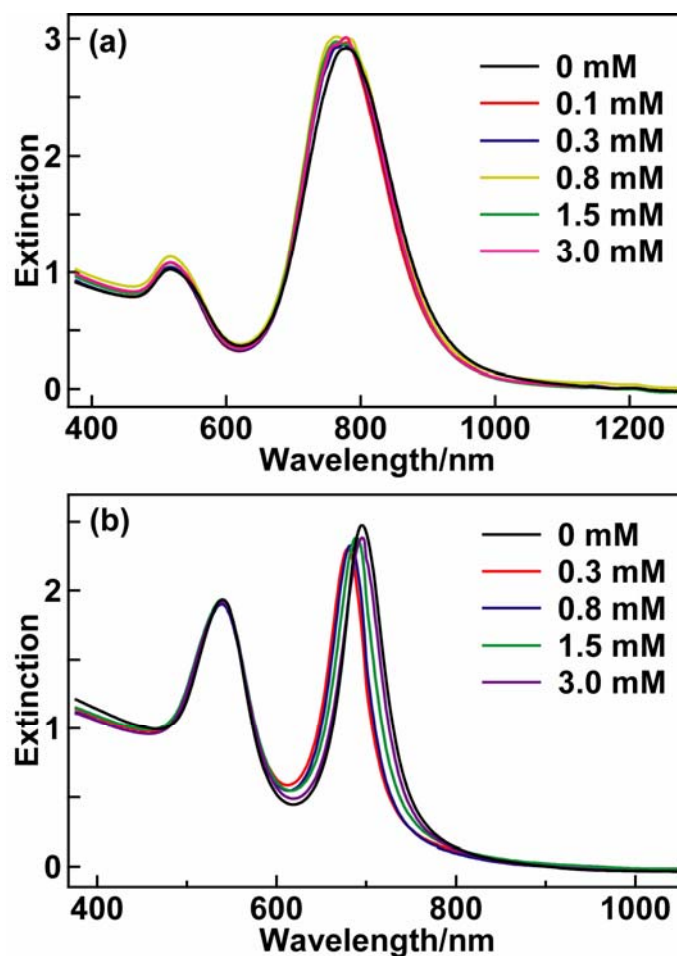


Fig. S8 (a) Extinction spectra of Au nanorod solutions after the addition of glycine at the concentrations of 0, 0.1, 0.3, 0.8, 1.5, and 3.0 mM, respectively. (b) Extinction spectra of aqueous solutions containing approximately equal concentrations of Au bipyr amids and nanospheres after the addition of glycine at the concentrations of 0, 0.3, 0.8, 1.5, and 3.0 mM, respectively. The stock glycine solution was prepared at the concentrations of 0.01 and 0.1 M so that the concentrations of the Au nanorod and bipyr amid solutions after the addition of glycine stayed approximately constant. The concentration of Au nanorods is estimated to be 0.6 nM. The concentrations of Au bipyr amids and nanospheres are estimated to be 0.7 and 0.5 nM, respectively.

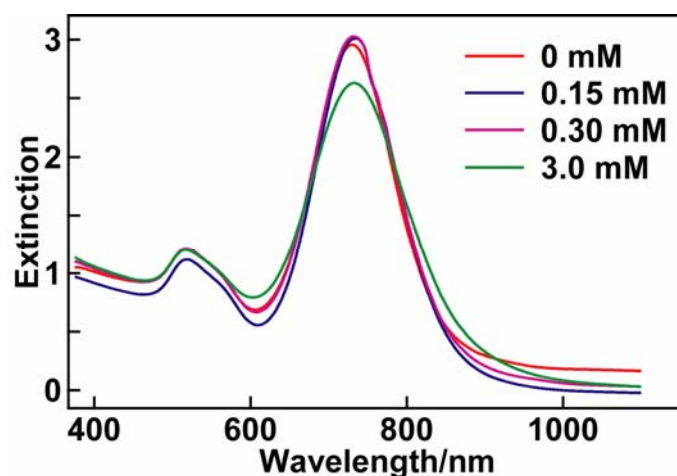


Fig. S9 (a) Extinction spectra of Au nanorod solutions after the addition of 3-mercaptopropionic acid at the concentrations of 0, 0.15, 0.30, and 3.0 mM, respectively. The stock solution of 3-mercaptopropionic acid was prepared at the concentrations of 0.01 and 0.1 M so that the concentrations of the Au nanorod solutions after the addition of 3-mercaptopropionic acid stayed approximately constant. The concentration of Au nanorods is estimated to be 0.6 nM.

Table S1 Statistical results of glutathione-induced end-to-end assembly

Description	Number	Percentage
Nanorods		
Nanorods linked to nanorods	1369	98%
Non-assembled nanorods	29	2%
Total number of nanorods	1398	
Nanorods and nanospheres		
Nanorods linked to nanospheres	340	75%
Nanorods linked to nanorods	96	21%
Non-assembled nanorods	16	4%
Total number of nanorods	452	
Nanospheres linked to nanorods	361	73%
Nanospheres linked to nanospheres	111	22%
Non-assembled nanospheres	22	5%
Total number of nanospheres	494	
Bipyramids and nanospheres		
Bipyramids linked to nanospheres	253	95%
Bipyramids linked to bipyramids	8	3%
Non-assembled bipyramids	6	2%
Total number of bipyramids	267	
Nanospheres linked to bipyramids	154	90%
Nanospheres linked to nanospheres	9	5%
Non-assembled nanospheres	8	5%
Total number of nanospheres	171	