

Electronic Supplementary Information

**Dendritic Gold Nanowires Supported on SiO₂ Nanoparticles
Fabricated by Seed Growth Method**

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Experimental

Preparation of SiO₂@Au NPs (Figures 4 and S2-4)

(1) Effect of amount of HAuCl₄

SiO₂@Au NPs (0.05 mL) and 24 mM HAuCl₄ aqueous solution (0.1, 0.2, and 0.4 mL) were added to 2.0 wt% C18AA aqueous solution (1.0 mL). The mixture was left for 3 days at room temperature without stirring (Figure 4).

(2) Effect of C18AA concentration

SiO₂@Au NPs (0.05 mL) and 24 mM HAuCl₄ aqueous solution (0.2 mL) were added to 0.5 and 4.0 wt% C18AA aqueous solution (1.0 mL). The mixture was left for 3 days at room temperature without stirring (Figure S2).

(3) Effect of preparation time

SiO₂@Au NPs (0.05 mL) and 24 mM HAuCl₄ aqueous solution (0.2 mL) were added to 2.0 wt% C18AA aqueous solution (1.0 mL). The mixture was left for 4, 24, and 72 hours at room temperature without stirring (Figures 4b, 4c, and S3).

(4) Effect of reduction rate by adding NaBH₄

SiO₂@Au NPs (0.05 mL) and 24 mM HAuCl₄ aqueous solution (0.2 mL) were added to 2.0 wt% C18AA aqueous solution (1.0 mL). NaBH₄ (4.8 μmol) aqueous solution was added to the mixture, and left for 1 and 3 days at room temperature without stirring (Figure S4).

Effect of seed Au NPs on SiO₂ NPs (Figure 5)

SiO₂ NPs without Au NPs (0.05 mL, Figure 3a and Figure S1a) and 24 mM HAuCl₄ aqueous solution (0.2 mL) were added to 2.0 wt% C18AA aqueous solution (1.0 mL). The mixture was left for 3 days at room temperature without stirring.

Morphological and dispersion stability (Figure 9)

SiO₂@Au DNWs were prepared by adding SiO₂@Au NPs (0.05 mL) and 24 mM HAuCl₄ aqueous solution (0.2 mL) to 2 wt% C18AA aqueous solution (1.0 mL), and quickly adding 10 mM ascorbic acid aqueous solution (0.48 mL; 4.8 μmol) to the mixture. The pH value of SiO₂@Au DNWs was 7.0 (Figure 7e). 1M NaOH aqueous solution was added to the SiO₂@Au DNWs (1.0 mL), and the pH value was changed from 7.0 to 10.0 (Figure 9d). 1M HCl aqueous solution was added to the SiO₂@AuDNWs (1.0 mL), and the pH value was changed from 7.0 to 5.0 and 3.0 (Figures 9e and f). Unsupported Au DNWs (Figure 5) were prepared by adding 24 mM HAuCl₄ aqueous solution (0.2 mL) and SiO₂ aqueous solution (0.05 mL) in 2 wt% C18AA aqueous solution (1.0 mL), left for 3

days at room temperature (Figure 5). 1M HCl aqueous solution and 1M NaOH aqueous solution were added to 1.0 mL of the unsupported Au DNWs dispersion solution (Figure 9a-c).

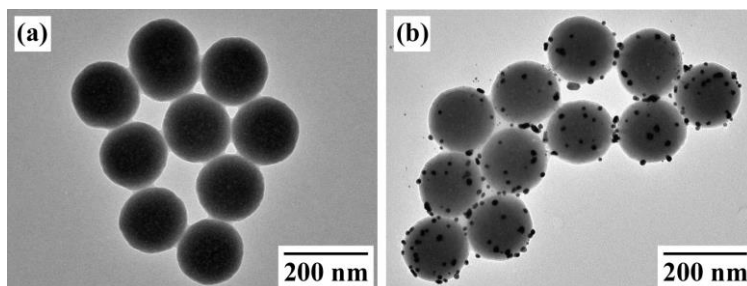


Figure S1. Low-magnification TEM images of (a) as-prepared SiO₂ NPs and (b) SiO₂@Au NPs.

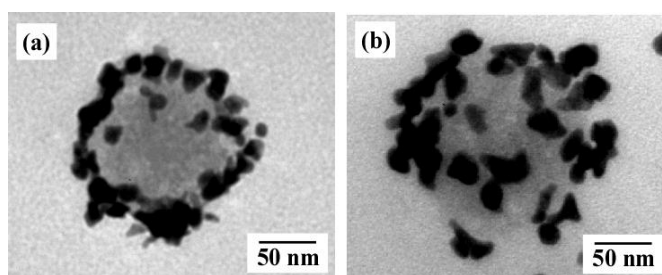


Figure S2. TEM images of SiO₂@Au NPs prepared using (a) 0.5 wt% and (b) 4.0 wt% C18AA aqueous solution.

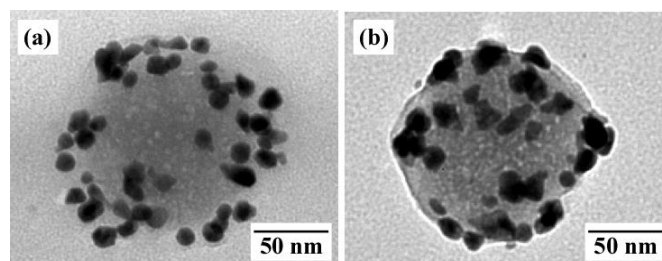


Figure S3. TEM images of SiO₂@Au NPs prepared using 2 wt% C18AA (1.0 mL) and 24 mM HAuCl₄ (0.2 mL) at (a) 4 and (b) 24 hours.

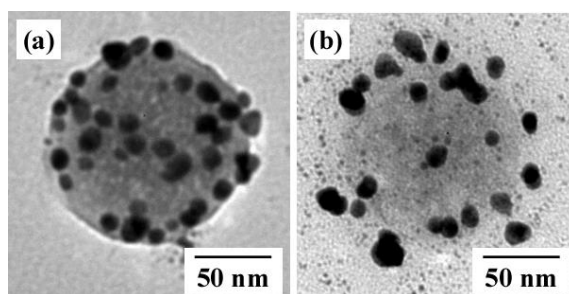


Figure S4. TEM images of SiO₂@Au NPs prepared using 2 wt% C18AA (1.0 mL), 24 mM HAuCl₄ (0.2 mL), NaBH₄ (4.8 μmol) at (a) 1 and (b) 3 days.

TEM-EDX measurement: TEM-EDX spectra of SiO₂@Au DNWs indicated that they were composed of Au and Si. The Cu and Fe peaks were from the TEM copper grid.^[1]

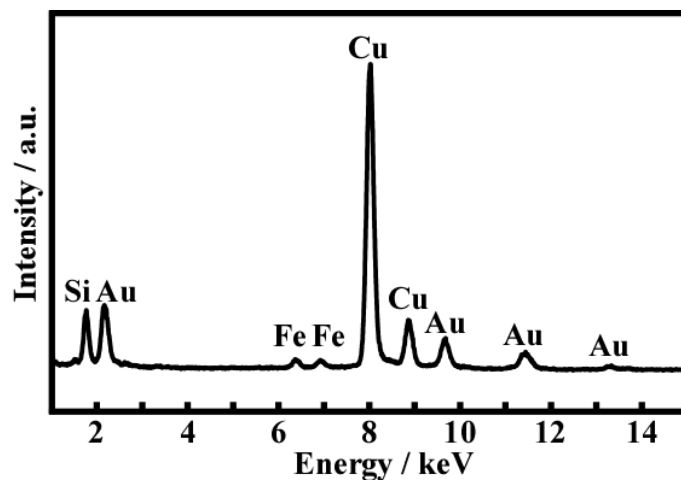


Figure S5. TEM-EDX spectra of SiO₂@AuDNWs.

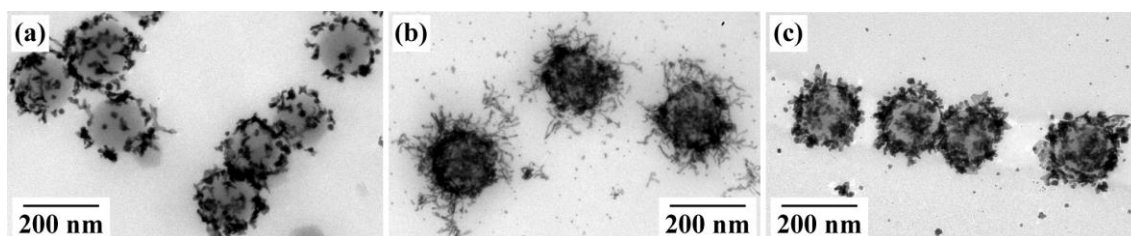


Figure S6. Low-magnification TEM images of SiO₂@Au NCs prepared using (a) 0.96, (b) 4.8, and (c) 48 μ mol ascorbic acid after 3day.

QCM measurement:

To determine the adsorbed amount of C18AA on Au, quartz crystal microbalance (QCM) was equipped using QCA 922 (SEIKO-EG&G). Au electrode was dipped in 30 mL of C18AA solution at pH 7 and 3, respectively. All measurements were equipped at 27°C. Here, the adsorbed mass of C18AA was estimated from frequency change (ΔF) for a QCM quartz resonator before and after adsorption using Sauerbrey equation, there is the linear dependence between the adsorbed mass Δm and ΔF .

$$\Delta f = -2f_0^2 \frac{\Delta m}{A\sqrt{\mu_q \rho_q}} \quad (1)$$

Where f_0 is the fundamental resonance frequency of crystal, μ_q is the shear modulus, ρ_q is the density of quartz and A is the area of Au electrode. The relation is valid when the adsorbed mass is distributed evenly over the crystal and Δm is much smaller (2%) of the crystal and the adsorbed material is rigidly and thin. For the experiments, Au coated AT-cut quartz crystals were used, with a resonant frequency of 9 MHz and an area of 0.196 cm². Sauebrey equation gives a mass sensitivity of 1.07 ng/Hz.

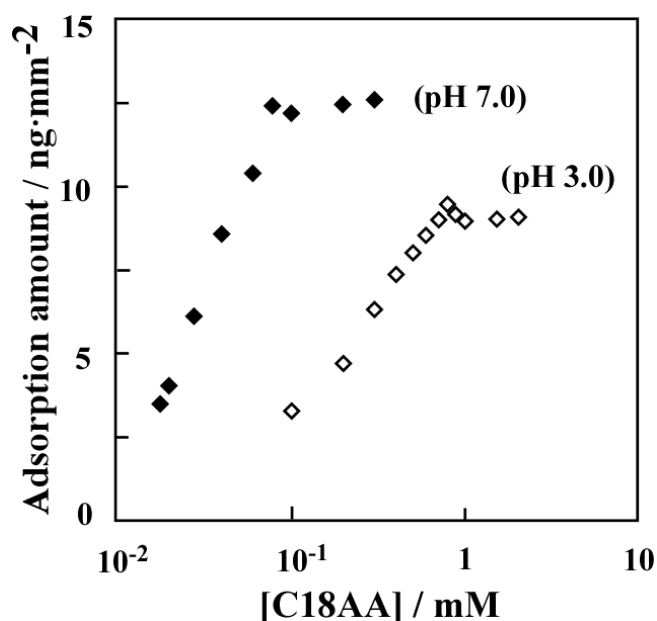


Figure S7. Adsorption amount of C18AA on Au surface, filled square: pH 7.0 and opened square: pH 3.0.

Reference

1. Feng, H.; Yang, Y.; You, Y.; Li, G.; Guo, J.; Yu, T.; Shen, Z.; Wu, T.; Xing, B. *Chem. Commun.* **2009**, 1984-1986.; Imura, Y.; Tanuma, H.; Sugimoto, H.; Ito, R.; Hojo, S.; Endo, H.; Morita, C.; Kawai, T. *Chem. Commun.* **2011**, 47, 6380-6382.