Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

Facile Synthesis of Spherical Nanoparticles with a Silica Shell and Multiple Au Nanodots as the Core

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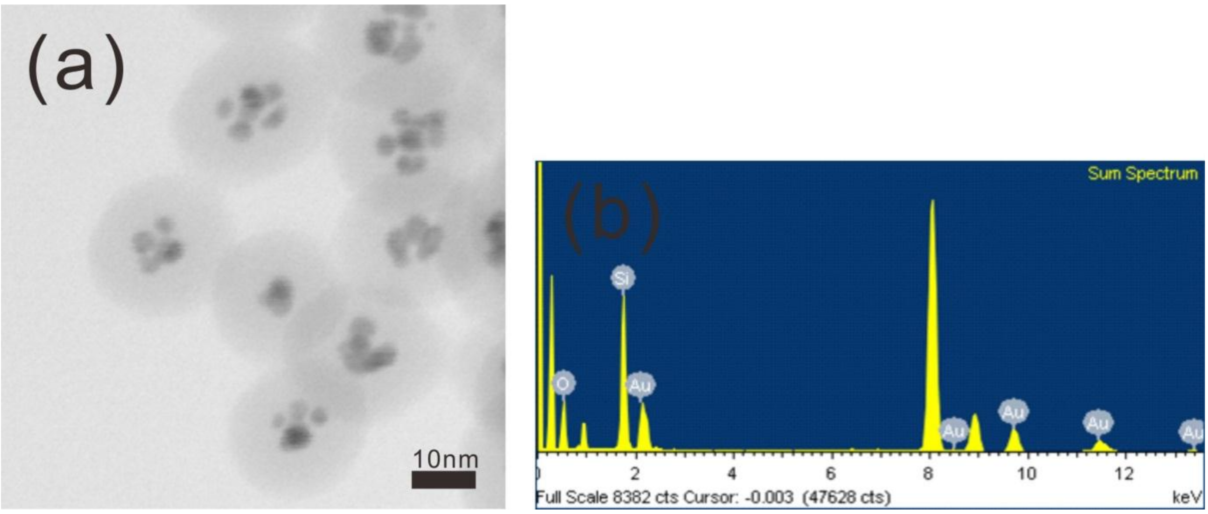

Figure S1. (a) Transmission electron microscopy (TEM) image of Multi-Au@SiO_2 NPs; (b) Elemental analysis by energy dispersive X-ray spectroscopy (EDX) analysis.

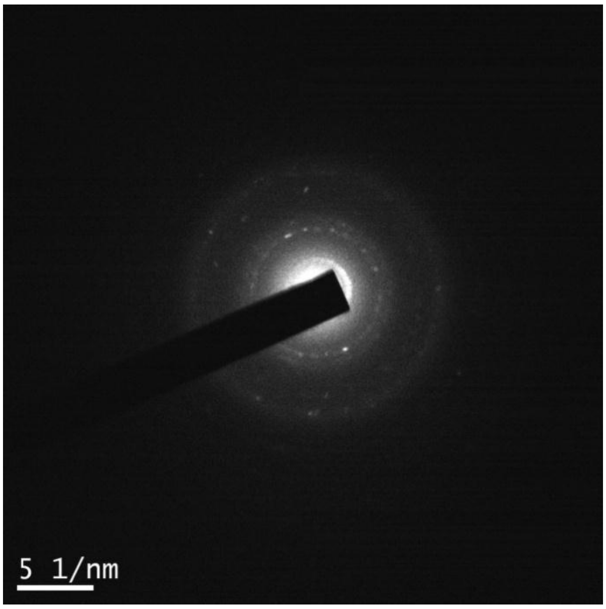

Figure S2. Electron diffraction pattern of Multi-Au@SiO_2 NPs. Because of the presence of multi Au nanodots, band-like diffraction spots were detected.

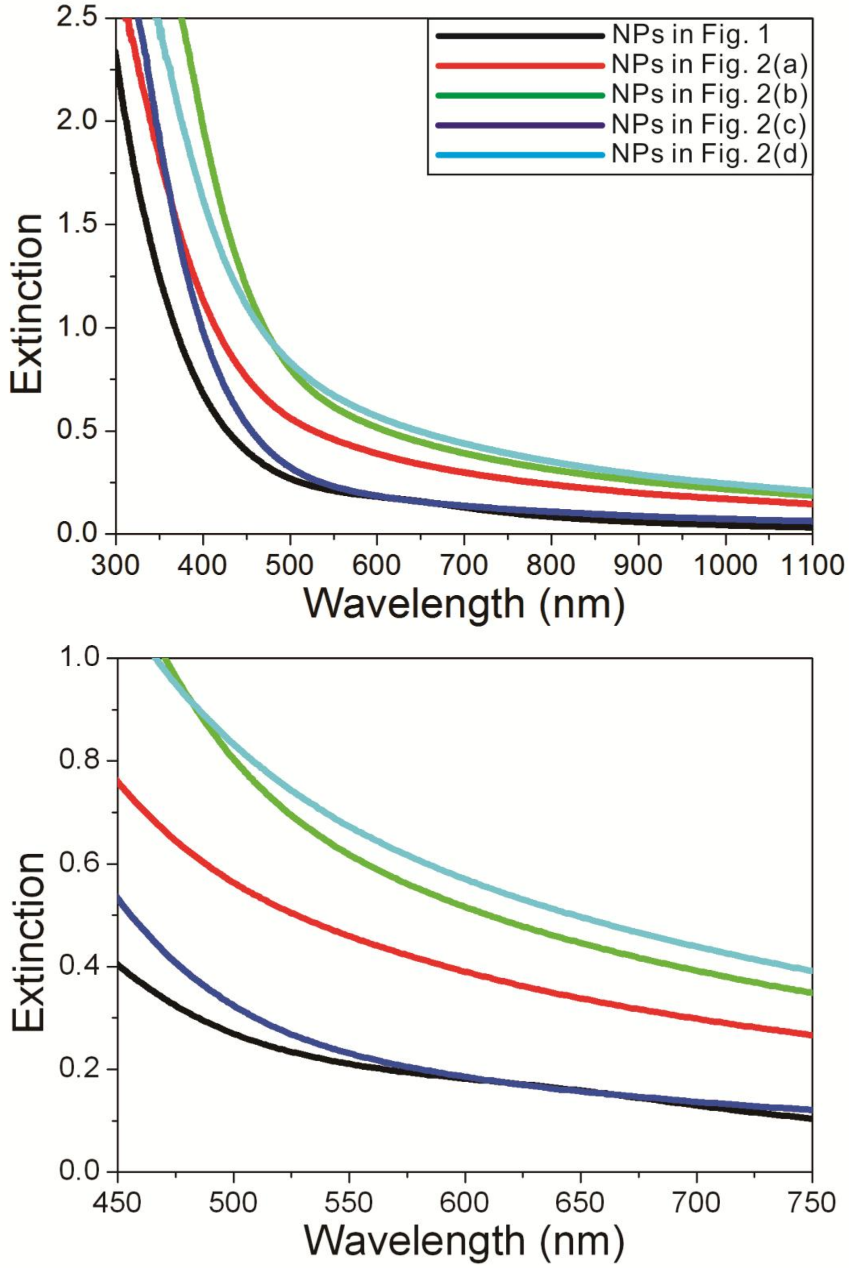

Figure S3. UV-vis spectra of Multi-Au@SiO_2 NPs which were synthesized using 0.03 mL of 1 M $HAuCl_4$ (aq) (0.03 mmol, solid) and 0.3 mL of 0.1 M (0.03 mmol, dotted). (Below) Enlarged UV-vis spectra of Multi-Au@SiO_2 NPs in the range between 450 and 750 nm.

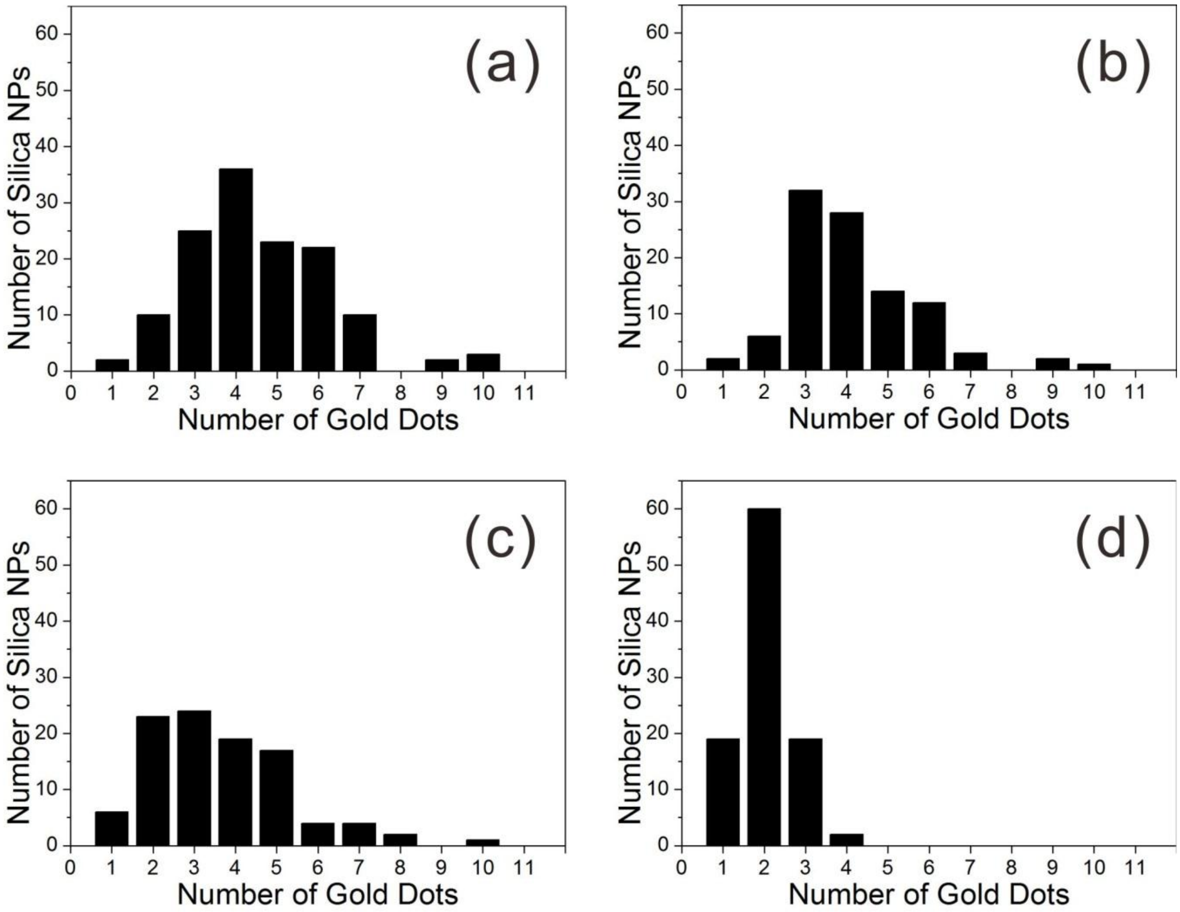

Figure S4. Number distributions of the Au nanodots within the silica nanoparticles by varying water-to-surfactant ratio: the same moles of Au^{3+} precursor were used for each trial (0.03 mmol): (a) 0.03 mL of a 1 M, (b) 0.06 mL of a 0.5 M, (c) 0.12 mL of a 0.25 M, and (d) 0.3 mL of a 0.1 M of $HAuCl_4$ (aq) with no change in the other reaction conditions (from Figure 1 and 2). The average numbers were (a) 4.60 ± 1.82, (b) 4.13 ± 1.58, (c) 3.63 ± 1.72, and (d) 2.04 ± 0.68, respectively.

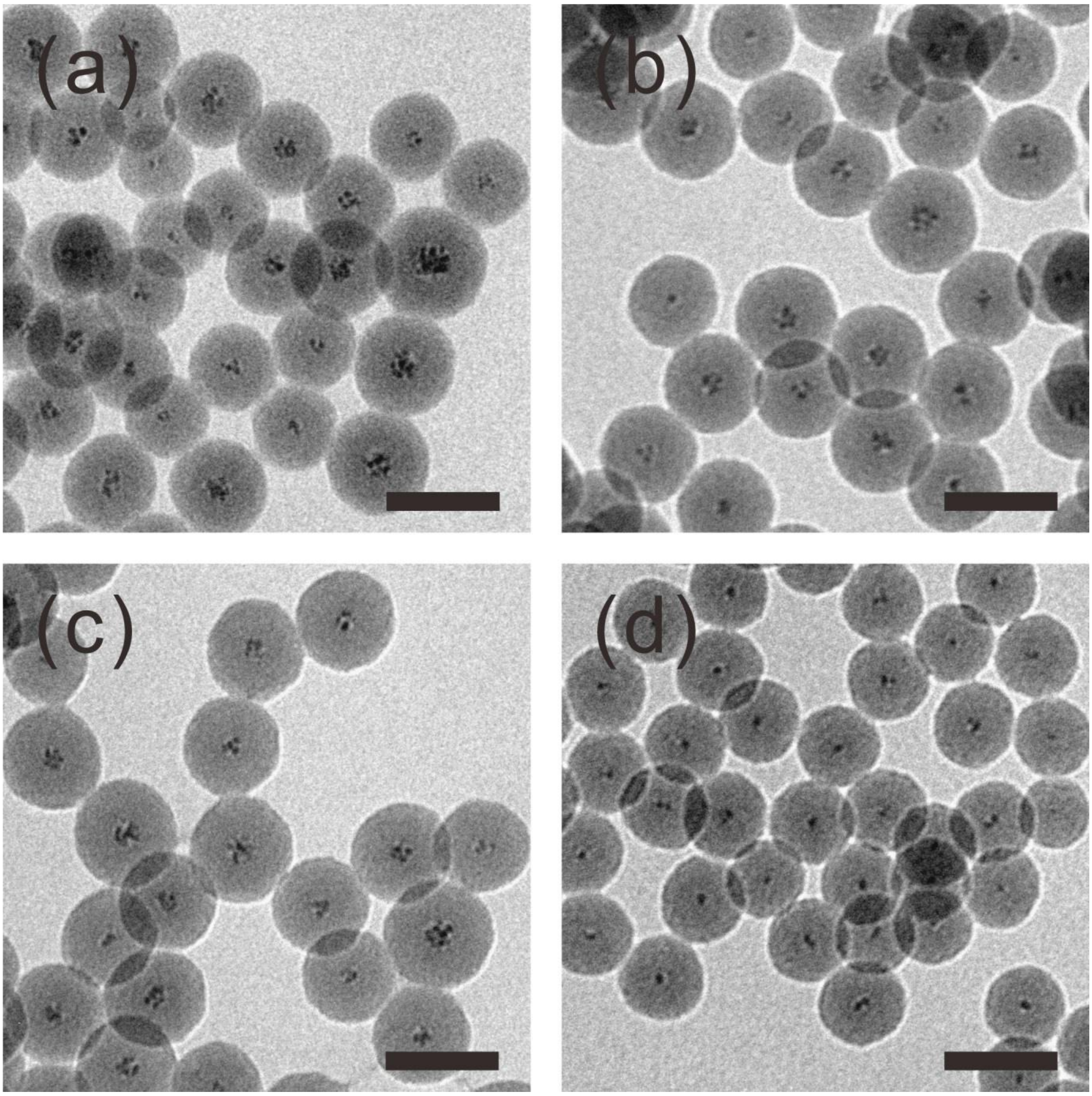

Figure S5. TEM images of the silica nanoparticles synthesized using 0.003 mmol of Au^{3+} precursor by varying the water-to-surfactant ratio: (a) 0.03 mL of a 0.1 M (0.003 mmol), (b) 0.06 mL of a 0.05 M, (c) 0.12 mL of a 0.025 M, and (d) 0.3 mL of a 0.01 M of $HAuCl_4$ (aq), without any change in the other reaction conditions (Scale bars: 50 nm).

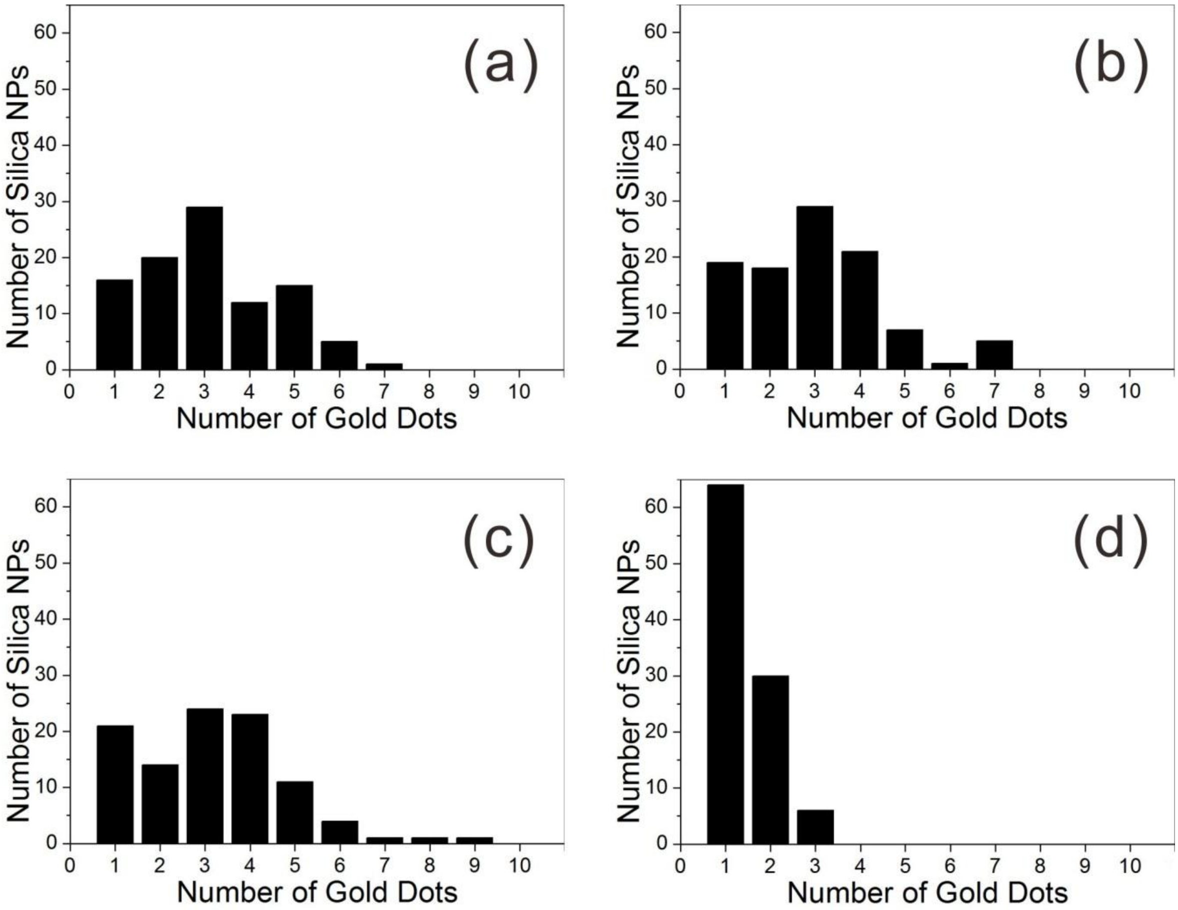

Figure S6. Number distributions of the Au nanodots within the silica nanoparticles by varying water-to-surfactant ratio: the same moles of Au^{3+} precursor were used for each trial (0.003 mmol): (a) 0.03 mL of a 0.1 M (0.003 mmol), (b) 0.06 mL of a 0.05 M, (c) 0.12 mL of a 0.025 M, and (d) 0.3 mL of a 0.01 M of $HAuCl_4$ (aq) with no change in the other reaction conditions (from Figure S5). The average numbers were (a) 3.08 ± 1.49, (b) 3.02 ± 1.53, (c) 3.16 ± 1.67, and (c) 1.42 ± 0.61, respectively.

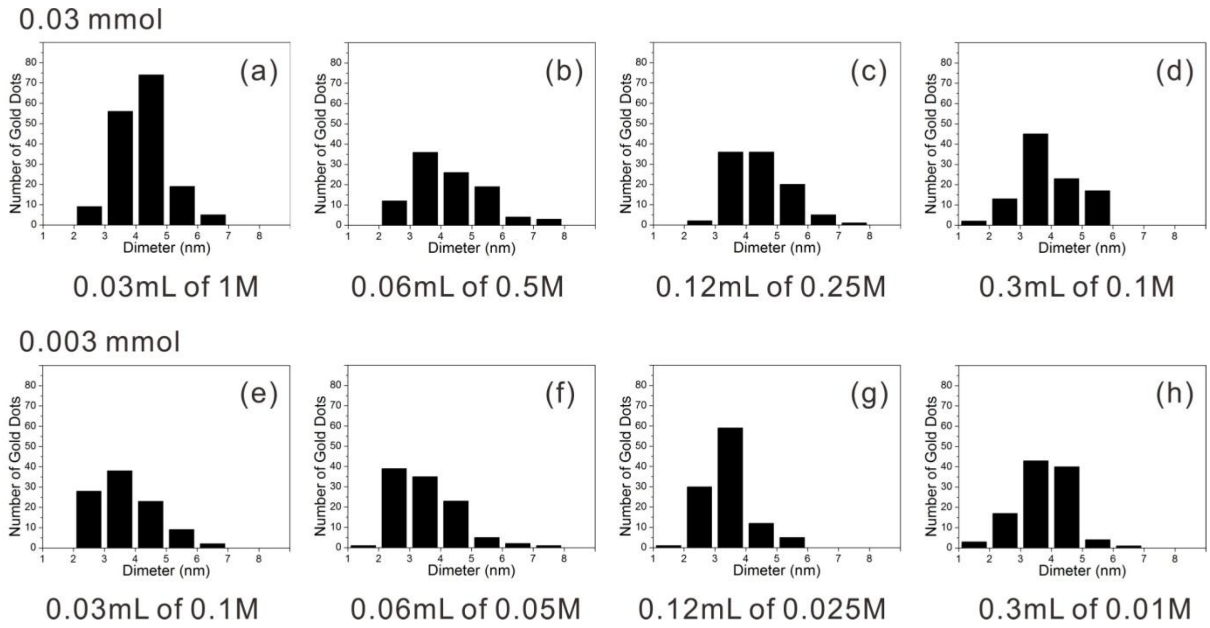

Figure S7. Size distributions of the Au nanodots within the silica nanoparticles by varying the amount of Au^{3+} precursors: the same moles of Au^{3+} precursor were used for each trial (a-d: 0.03 mmol; e-h: 0.003 mol): (a) 0.03 mL of a 1 M, (b) 0.06 mL of a 0.5 M, (c) 0.12 mL of a 0.25 M, and (d) 0.3 mL of a 0.1 M of $HAuCl_4$ (aq) (from Figure 2); (e) 0.03 mL of 0.1 M (0.003 mmol), (f) 0.06 mL of 0.05 M, (g) 0.12 mL of 0.025 M, and (h) 0.3 mL of 0.01 M of $HAuCl_4$ (aq) (from Figure S5). The average sizes of the Au nanodots were (a) 4.22 ± 0.88, (b) 4.21 ± 1.19, (c) 4.40 ± 0.94, (d) 3.92 ± 0.98, (e) 3.60 ± 0.91 , (f) 3.47 ± 0.97, (g) 3.29 ± 0.73, and (h) 3.72 ± 0.85, respectively.