

Supporting information

The High Yield Synthesis and Characterization of Gold Nanoparticles with Superior Stability and Their Catalytic Activity

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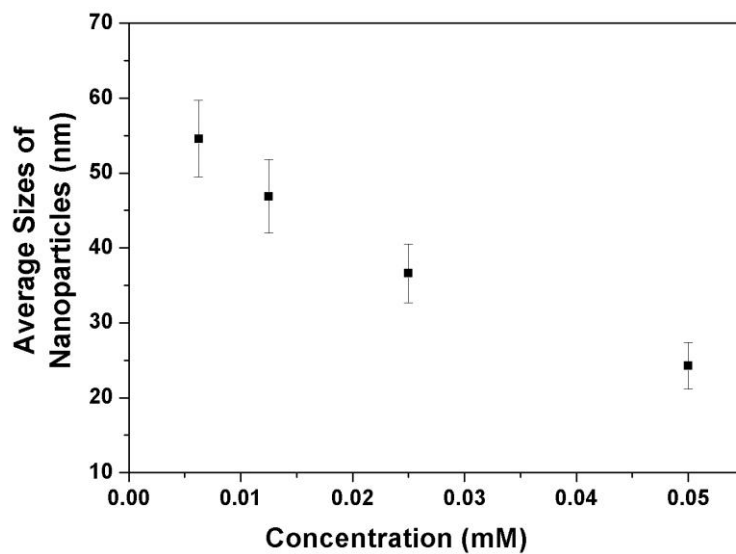


Figure S1. The average sizes of gold nanoparticles synthesized at various initial concentration of BPS-30 after incubation of 4 hours. The concentration of HAuCl_4 is set as 0.5 mM.

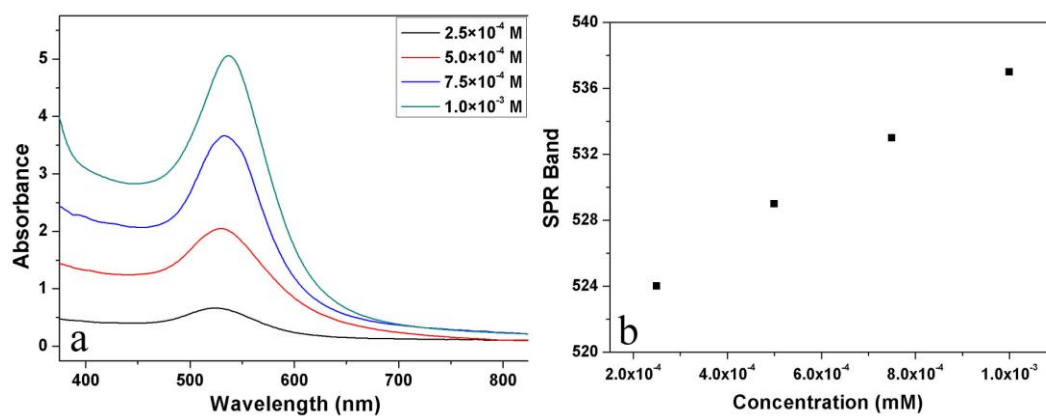


Figure S2. (a) UV-vis absorption spectra of gold nanoparticles synthesized at various initial concentration of HAuCl₄ after incubation of 4 hours. The concentration of BPS-30 is set as 50 mM. (b) The corresponding plot of λ_{\max} values against the concentrations of HAuCl₄.

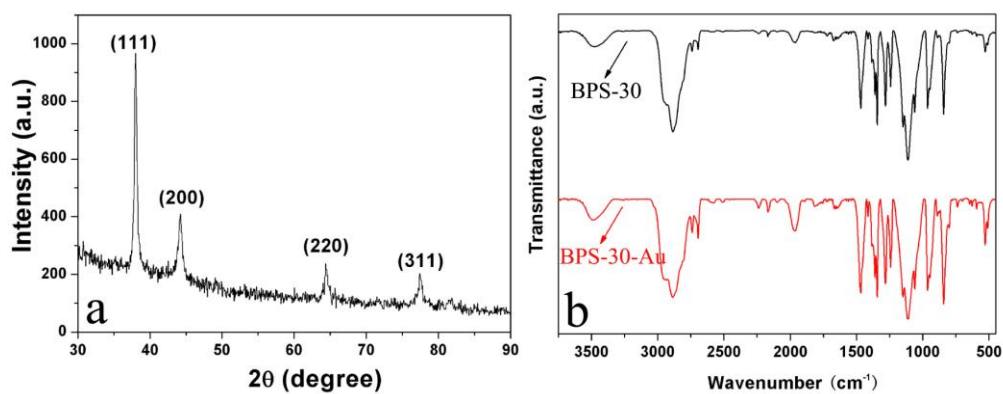


Figure S3 (a) XRD patterns characteristics of the gold nanoparticles. (b) FTIR spectra of BPS-30 and BPS-30 capped gold nanoparticles. The concentrations of BPS-30 and HAuCl_4 are 50 and 0.5 mM, respectively. And the incubation time is 4 h.

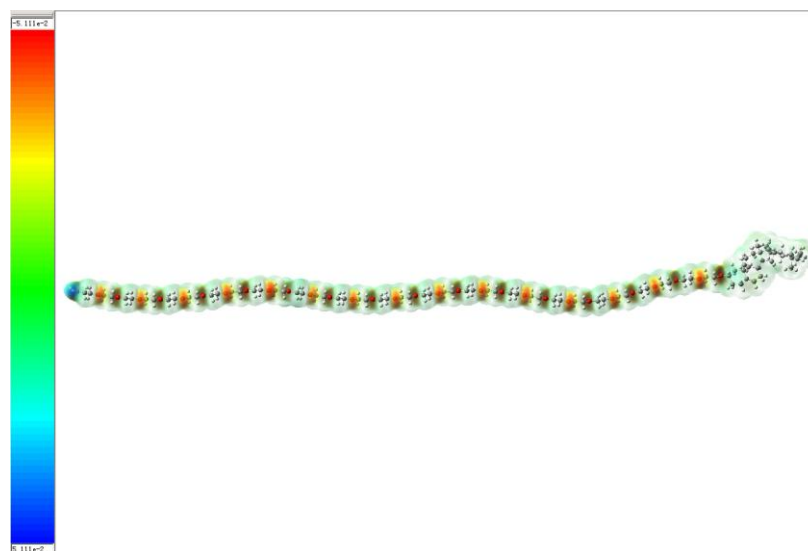


Figure S4. The configuration and electron density of BPS-30.

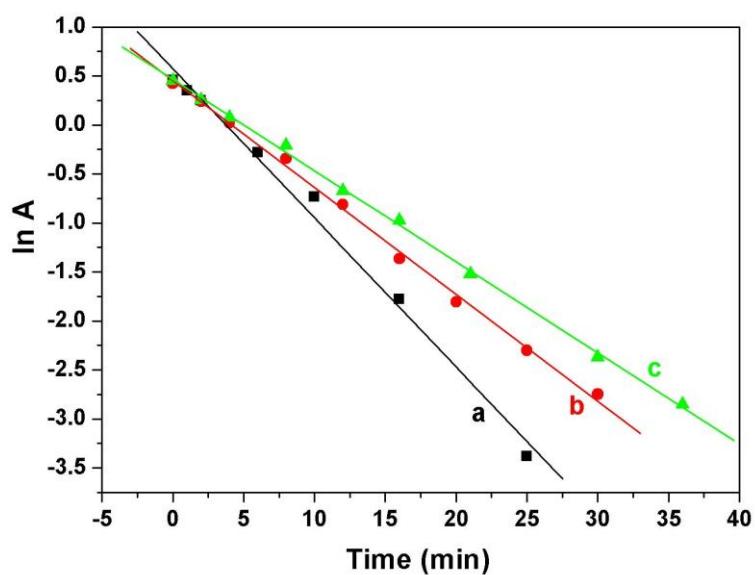


Figure S5. The corresponding linear relationship between $\ln(A_t/A_0)$ and reduction time for the catalytic reduction of 4-nitroaniline by KBH_4 in aqueous solution when the different sizes of the gold nanoparticles were used: 24.3 ± 3.1 nm (line a), 36.6 ± 3.9 nm (line b), and 46.9 ± 4.5 nm (line c). And the first-order rate constants, k_a , were calculated to be 0.152 min^{-1} , 0.109 min^{-1} and 0.093 min^{-1} for the line a, line b and line c, respectively.

The calculation of Turnover Number (TON) and Turnover Frequency (TOF) are followed:

The approximate number of the nanoparticles in our system is about 4.0×10^8 , that is 6.65×10^{-16} mol. And the approximate numbers of 4-nitroaniline are 3.0×10^{-6} mol, 3.3×10^{-6} mol, and 3.7×10^{-6} mol for the first, second, and third cycle, respectively.

According to the equations:

$$\text{TON} = \text{mol (substrat)} / \text{mol (catalyst)}$$

$$\text{TOF} = \text{TON} / \text{time}$$

The TON are 4.5×10^9 mol/mol, 5.0×10^9 mol/mol, and 5.6×10^9 mol/mol for the first, second, and third cycle, respectively.

The TOF are 1.8×10^8 mol/(mol·min), 1.1×10^8 mol/(mol·min), and 1.0×10^8 mol/(mol·min) for the first, second, and third cycle, respectively.