

Supporting information

AuPd bimetallic nanoparticles decorated on graphene nanosheets: their green synthesis, growth mechanism and high catalytic ability in 4-nitrophenol reduction

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Supplementary Results

1. The preparation of AuPdNPs/GNs

(1) Size distribution histogram

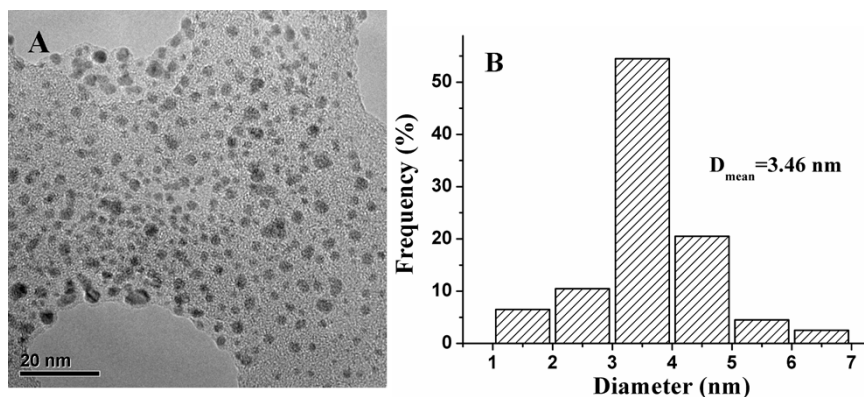


Fig. S1 (A) TEM image and (B) particle size distribution histogram of AuPdNPs/GNs.

(2) GNs effect

In the synthesis of GNs, 10 mL as-prepared GO solution was mixed with 10 mL water, 5 μL hydrazine solution (35 wt% in water) and 35 μL ammonia solution (25 wt% in water) in a 50 mL glass vial. Other synthesis procedures were the same with those of AuNPs/GNs.

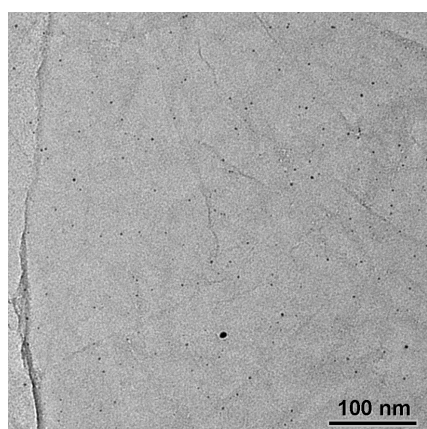


Fig. S2 TEM image of AuPdNPs/GNs synthesized by GNs with low reducing capability.

(3) XPS of C 1S

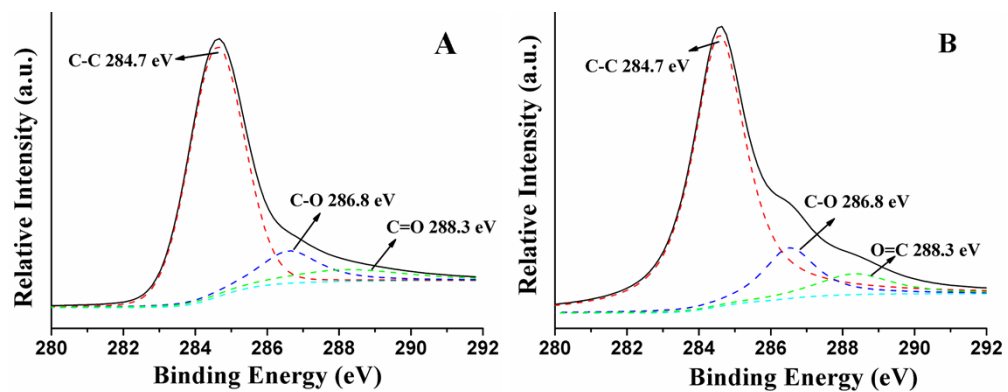


Fig. S3 The deconvoluted XPS spectra of C 1s (A) before and (B) after deposition of AuPdNPs

(4) XPS of Pd 3d

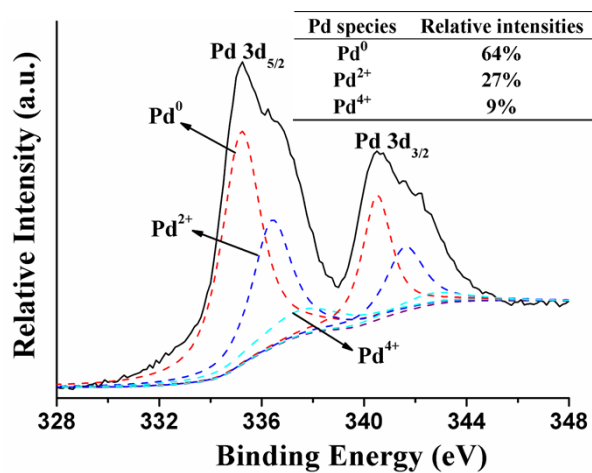


Fig. S4 The deconvoluted XPS spectra of Pd 3d.

(5) Time effect

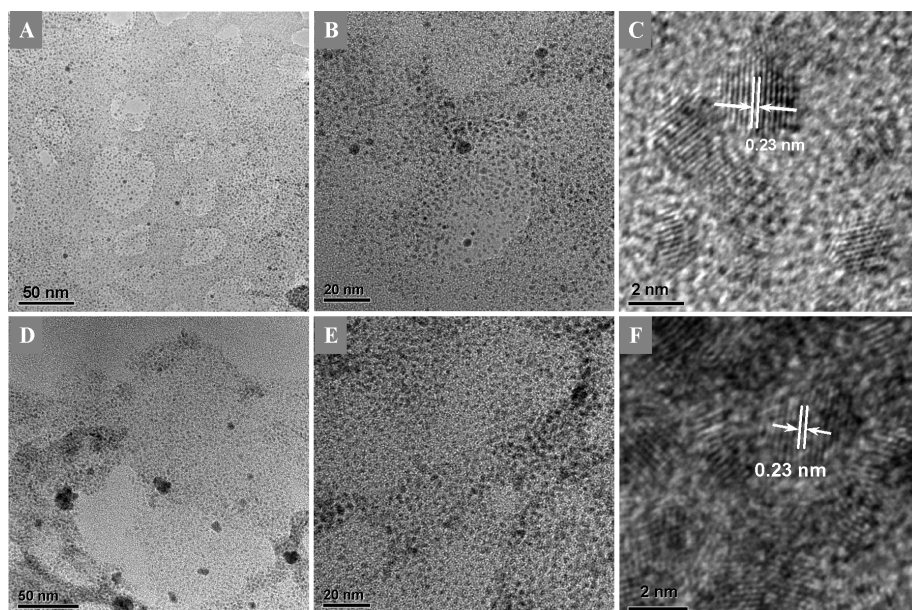


Fig. S5 TEM images of AuPdNPs/GNs stirring (A-C) for 5 min and (D-F) for 30 min.

(6) Size of NPs based on XRD results

Table S1 Summary of the calculation parameters based on XRD result.

Samples	b	θ	D^*_{XRD} (nm)	D_{TEM} (nm)
AuPdNPs/GNs	1.2°	19.7°	6.94	3.46
AuNPs/GNs	2.3°	19°	3.61	3.15
PdNPs/GNs	1.4°	20.1°	5.96	2.67

* D_{XRD} is calculated according to Scherrer formula: $D=0.89\lambda/(B\cos\theta)$, where λ is equal to 0.154056 nm, and B is equal to $\pi b/180^\circ$.

2. Details for catalytic reaction of reduction of 4-NP.

(1) Photo image

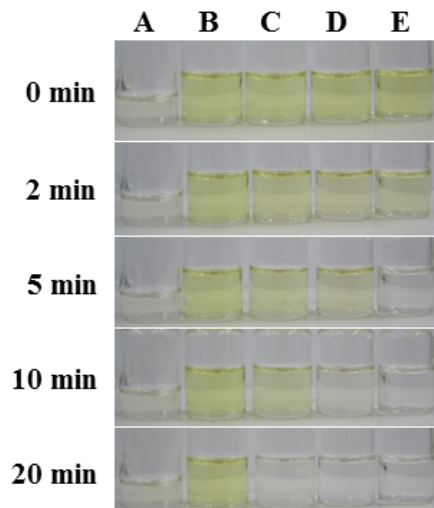


Fig. S6 Photo images of the color changed during the reaction. A: 4-NP; B: 4-NP+ NaBH₄; C: 4-NP+ NaBH₄+AuNPs/GNs; D: 4-NP+ NaBH₄+PdNPs/GNs; E: 4-NP+NaBH₄+AuPdNPs/GNs.

(2) UV-vis spectra

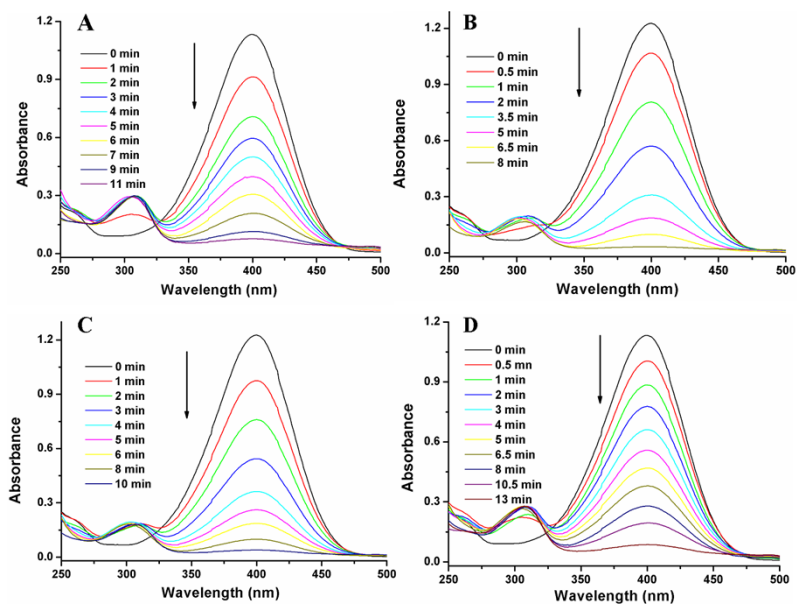


Fig. S7 The time-dependent UV-vis absorption spectra of reduction 4-NP by NaBH₄ in the presence of (A) Au₃₅Pd₆₅NPs/GNs, (B) Au₄₂Pd₅₈NPs/GNs (C) Au₇₁Pd₂₉NPs/GNs and (D) Au₈₂Pd₁₈NPs/GNs.

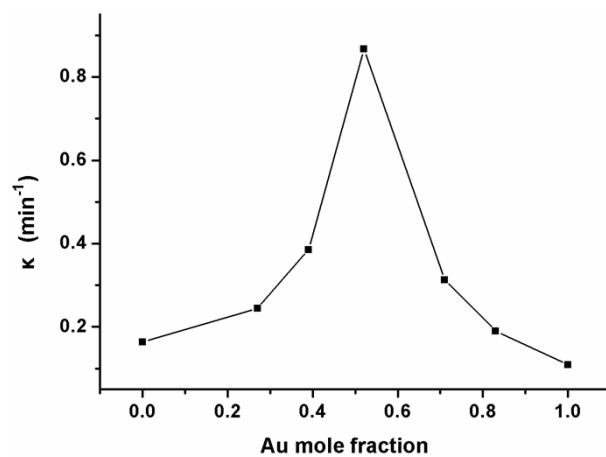


Fig. S8 The rate constants of the reaction (κ) versus mole fraction of Au for the AuPdNPs/GNs catalysts at different Au and Pd compositions.