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Supporting Information

Two-dimensional Structure Au Nanosheets Are Super Active for the Catalytic Reduction of 4-Nitrophenol

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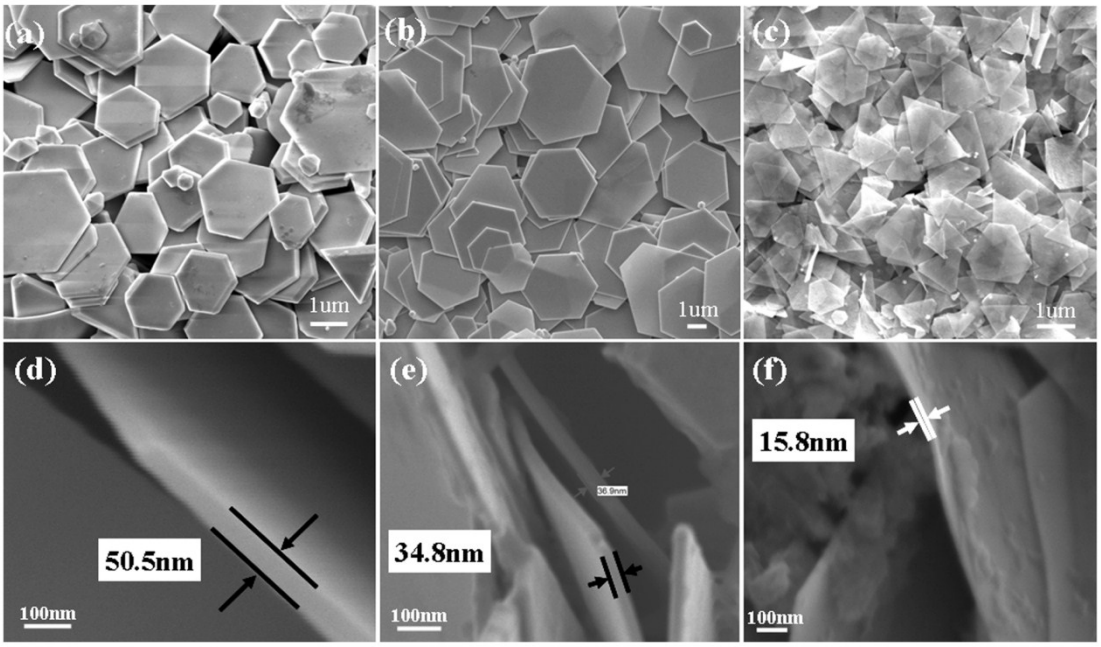

Figure S1. The SEM of Au nanosheets with different thicknesses: (a) ~ 50 nm; (b) ~ 35 nm; (c) ~ 15 nm; Amplifying SEM of the Au with different thicknesses: (d) ~ 50 nm; (e) ~ 35 nm; (f) ~ 15 nm.

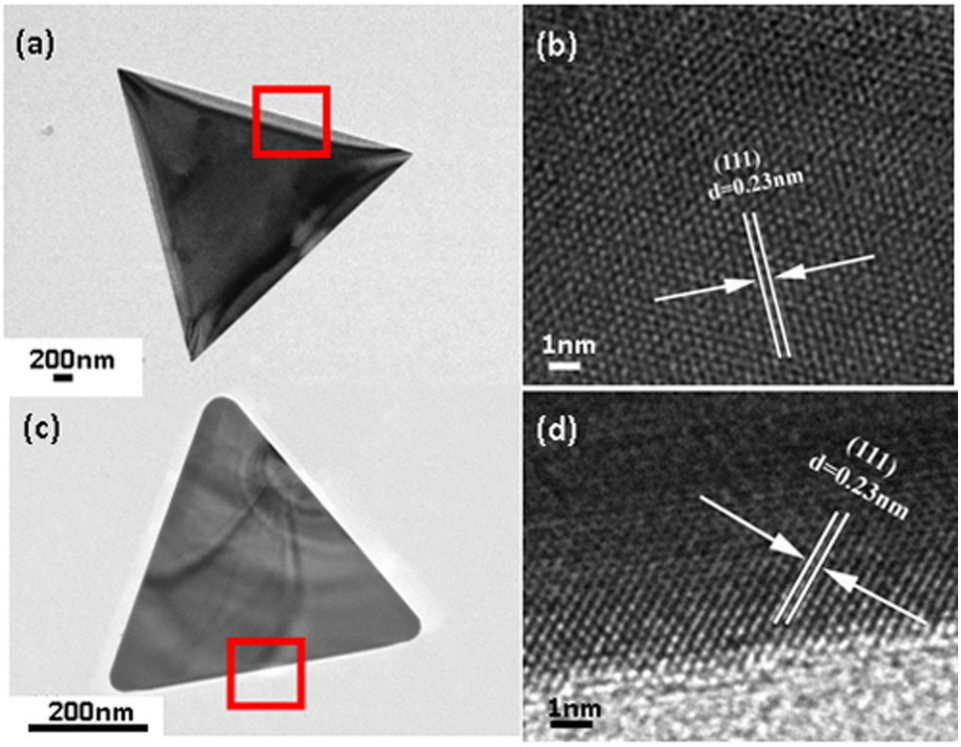

Figure S2. (a,b) TEM image of a typical crystal particle: (a) 35 nm Au nanosheet, (b) 15 nm

Au nanosheet; (b,d) HRTEM of the slected area: (b) 35 nm Au nanosheet, (d) 15 nm Au nanosheet.

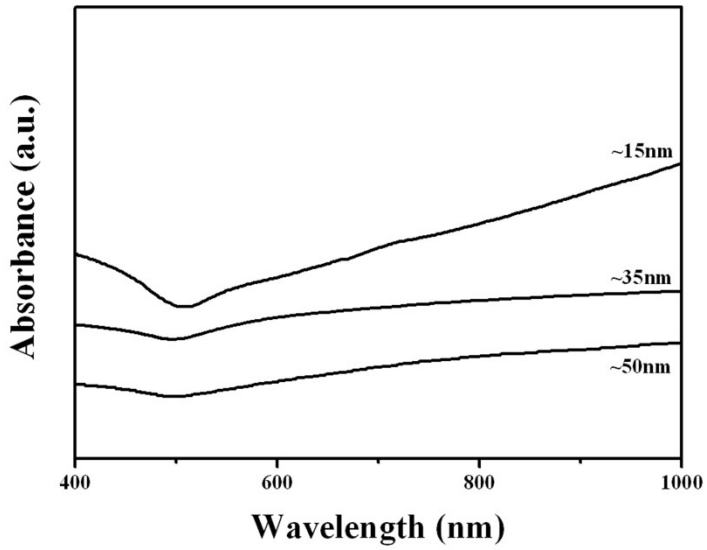

Figure S3. The ultraviolet spectrum of the three different thicknesses Au nanosheets.

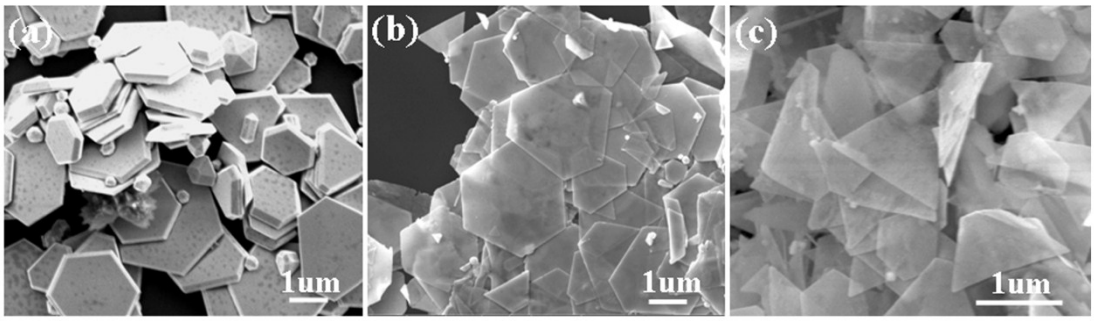

Figure S4. The SEM of Au nanosheets with three different thicknesses after two catalytic cycles: (a) ~ 50 nm; (b) ~ 35 nm; (c) ~ 15 nm.

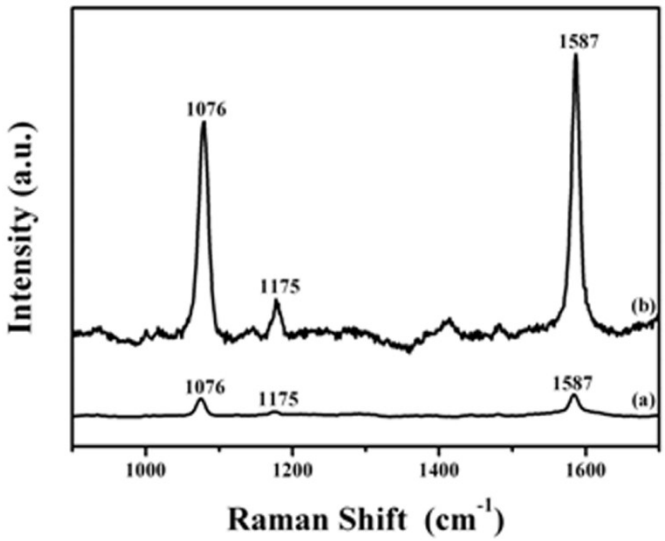

Figure S5. (a) SERS spectra of PMBA absorbed on the Au nanoparticles of around 125 nm; (b) SERS spectra of PMBA absorbed on thinnest ~15 nm Au nanosheets. All of the spectra reported were the result of 100 s accumulation.

The thinnest thickness of ~15 nm Au nanosheets and ordinary Au nanoparticles were investigated the SERS behaviors. PMBA was selected as the probe molecule because it is a most-used molecule in SERS studies.[1] The SERS spectra of PMBA adsorbed on the ~15 nm Au nanosheets and prdinary Au nanoparticles excited with the 633 nm laser line are presented in figure S5. Compared with the normal Raman spectrum of solid PMBA previously reported,[1] we find that the Raman shift changed and the Raman intensity was enhanced in the SERS spectra on the two Au substrates. As shown in figure S5, the predominant bands in the spectrum of solid PMBA are located at 1099, 1183 and 1594 cm^{-1}, which can be assigned to a1 modes of ν CS, δ CH, and ν CC, respectively.[1] In SERS spectrum, the band ν CS shifted from 1099 cm^{-1} to 1076 because of the formation of Au-S bonding.[1] The ν CC band at 1594 cm^{-1} shifted to 1587 and the δ CH band shifted from 1183 cm^{-1} to 1175 as a result of bonding and electronic structure changes. Obviously, the SERS intensity on the ~15 nm Au

nanosheet substrate gains larger enhancement than that of on an ordinary Au nanoparticles substrate.

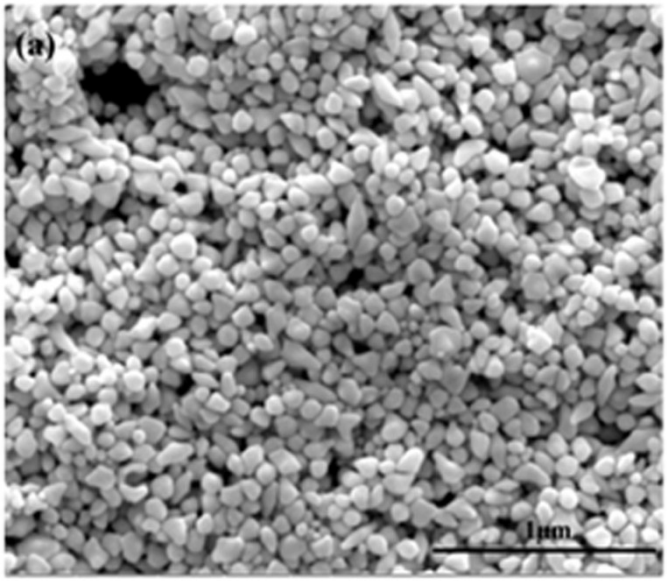

Figure S6. SEM of the compared Au nanoparticles

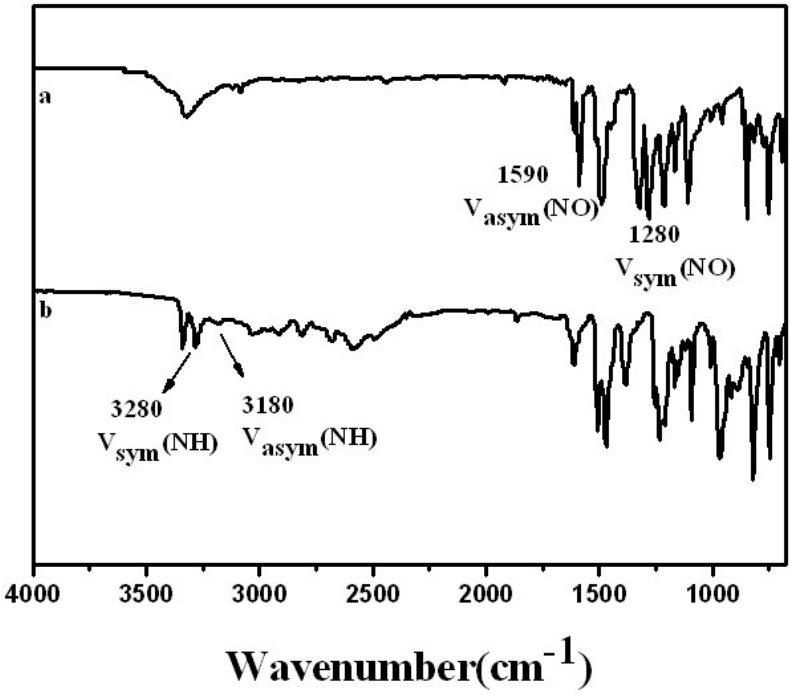

Figure S7. IR spectra of the 4-NP(a) and product 4-AP(b)

The rate constants for our nanosheet with thickness of ~ 15 nm, ~ 35 nm and ~ 50 nm were 0.48689 s^{-1}, 0.15036 s^{-1}, and 0.01789 s^{-1}, respectively. For the value of rate constant was often related with the amount of catalyst, more amounts of catalyst may lead to greater values of rate constant. Compared with the previously published papers, the results were shown in the Table 1.

Table 1

nanoparticles	Catalyst(mg)	K(s^{-1})	Ref.
TAC-Ag-1.0	4.0	5.19×10^{-3}	23
TAC-Ag-1.4	4.0	1.65×10^{-3}	23
TSC-Ag-1.4	4.0	3.64×10^{-4}	23
Ag-NP/C composite	1.0	1.69×10^{-3}	23
Fe3O4-@SiO2-Ag	1.0	7.67×10^{-3}	23
Au-15nm	0.67	4.87×10^{-1}	This work
Au-35nm	0.67	1.50×10^{-1}	This work
Au-50nm	0.67	1.79×10^{-2}	This work

References

[1] Yin P G, You T T, Tan E Z, Li J, Lang X F, Jiang L and Guo L 2011 *J. Phys. Chem. C* **115** 18061-9.