Supporting Information

Aggregation-free Gold Nanoparticles in Ordered Mesoporous Carbons: Towards Highly Active and Stable Heterogeneous Catalysts

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Preparation of low-polymerized phenolic resins.

8.0 g of phenol was melted at 42 - 45 °C in a flask and mixed with 1.7 g of 20 *wt*% NaOH aqueous solution under stirring. After 10 min, 14.16 g of formalin (37 *wt*% formaldehyde) was added. Then the mixture was heated to 70 °C. Upon further stirring for 1 h at this temperature, the mixture was cooled to room temperature. The PH value was adjusted with 2 M HCl solution until it reached a value of ~ 7.0. Subsequently, water was removed by vacuum evaporation below 50 °C.

SI Table S1. Oxidation of benzyl alcohol in water using Au based or bimetallic Au-Pd based supported catalysts.

Catalyst	Au:substrate /mol: mol	Solvent	T / °C	P /atm	t / h	Conv. %	Sel. % (acid)	TON/h^{-1} (*initial rate/total Au concentration*)	Ref.
Au/SBA-15	1:400	water	80 (MW)	---	1	100	91	not provided	1
Au-Pd/SBA-15	1:120[a]	decane/ water	80	1	8	40	97 (aldehyde)	12[a]	2
Au60-Pd40/C	1:20000	cyclo-hexane /water	60	1.5	4	90	98 (aldehyde)	7600[b]	3
Au/PVP	1:50	water	RT	1	6	95	91	not provided	4
Au/P*o*PD	1:33.3	water	RT	1	24	99	99	not provided	5
Au/C	1:1600	water	90	10	1	> 99	> 99	4512[c]	this work
Au/C	1:1600	water	60	1	12	> 99	> 99	384[d]	this work

a: Not provided. Calculated on the basis of the experimental data, and assumed that gold species were completely loaded on the support. Measured after 2 h of reaction.

b: Not provided. Calculated on the basis of the experimental data. Measured after 30 min of reaction.

c: Measured after 10 min of reaction.

d: Measured after 30 min of reaction.

Reference:

(1) Liu, Y.; Tsunoyama, H.; Akita, T.; Tsukuda, T. *J. Phys. Chem. C* **2009**, *113*, 13457.

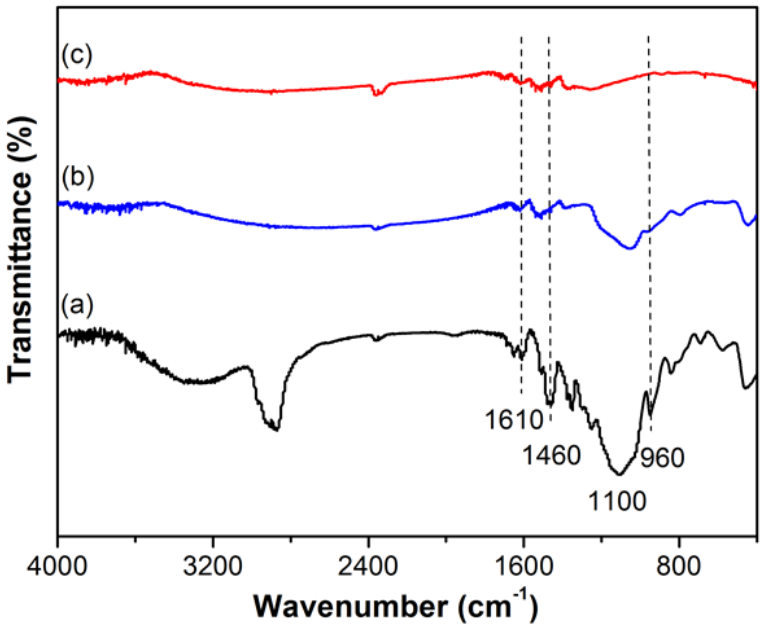
(2) Ma, C. Y.; Dou, B. J.; Li, J. J.; Cheng, J.; Hu, Q.; Hao, Z. P.; Qiao, S. Z. *Appl. Catal., B* **2009**, *92*, 202.

(3) Villa, A.; Janjic, N.; Spontoni, P.; Wang, D.; Su, D. S.; Prati, L. *Appl. Catal., A* **2009**, *364*, 221.

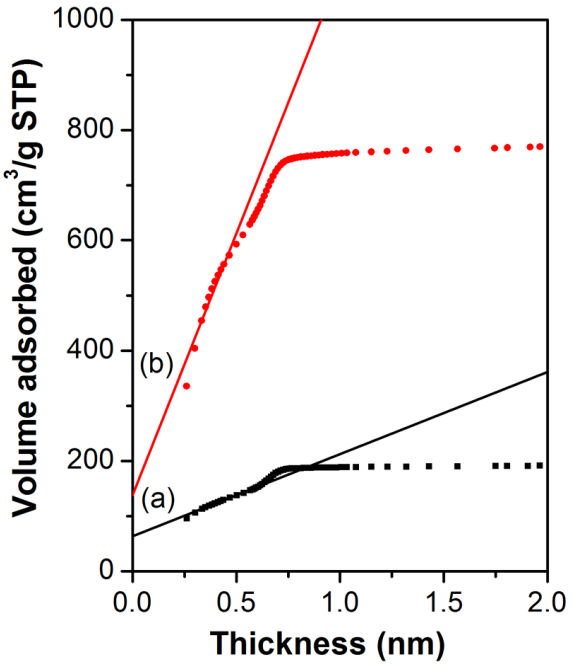
(4) Tsunoyama, H.; Sakurai, H.; Negishi, Y.; Tsukuda, T. *J. Am. Chem. Soc.* **2005**, *127*, 9374.

(5) Han, J.; Liu, Y.; Guo, R. *Adv. Funct. Mater.* **2009**, *19*, 1112.

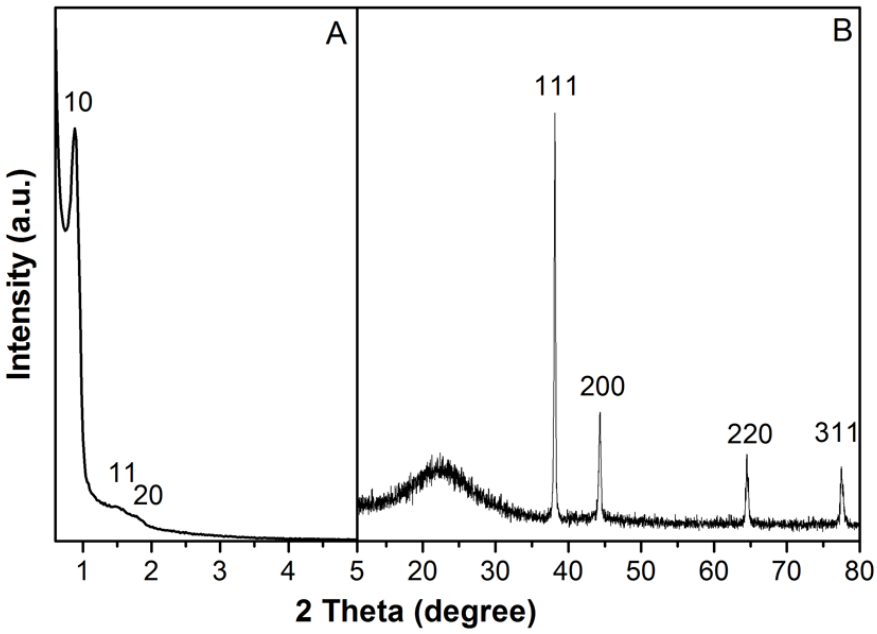
SI Figure S1. FT-IR spectra for (a) as-made gold-containing mesoporous catalysts synthesized by solvent evaporation induced self-assembly (as-made Au(SH)-SC); (b) the catalyst calcined at 600 °C (Au(SH)-SC); and (c) the Au(SH)-SC catalyst after dissolution of silica (Au(SH)-C).



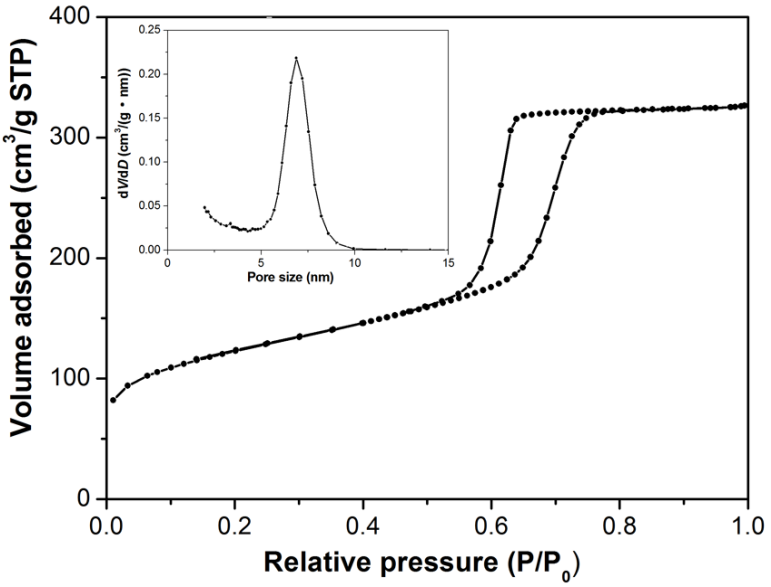
SI Figure S2. *t*-plots for (a) Au(SH)-CS and (b) Au(SH)-C.



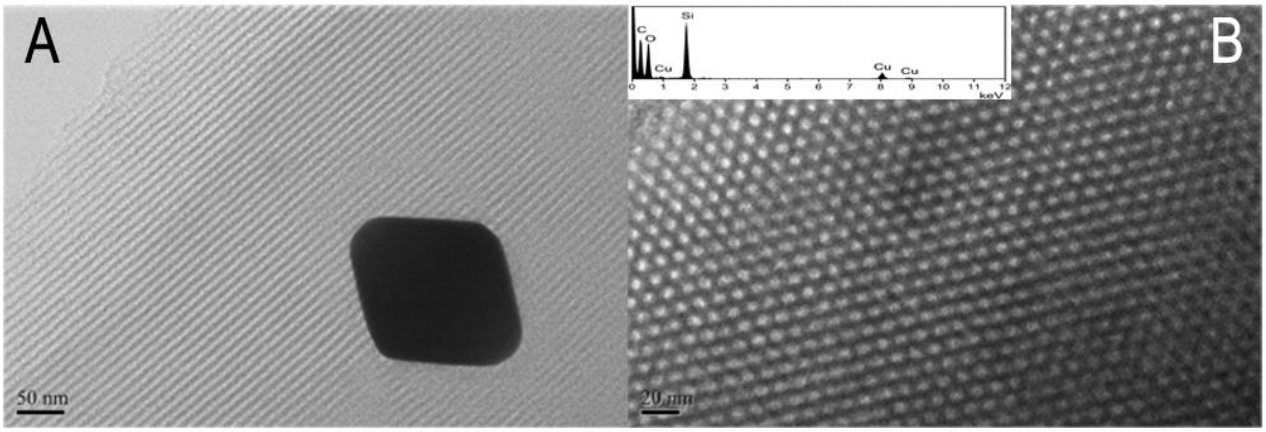
SI Figure S3. SAXRD (A) and WAXRD (B) patterns for the thiol-free sample Au(0)-SC.



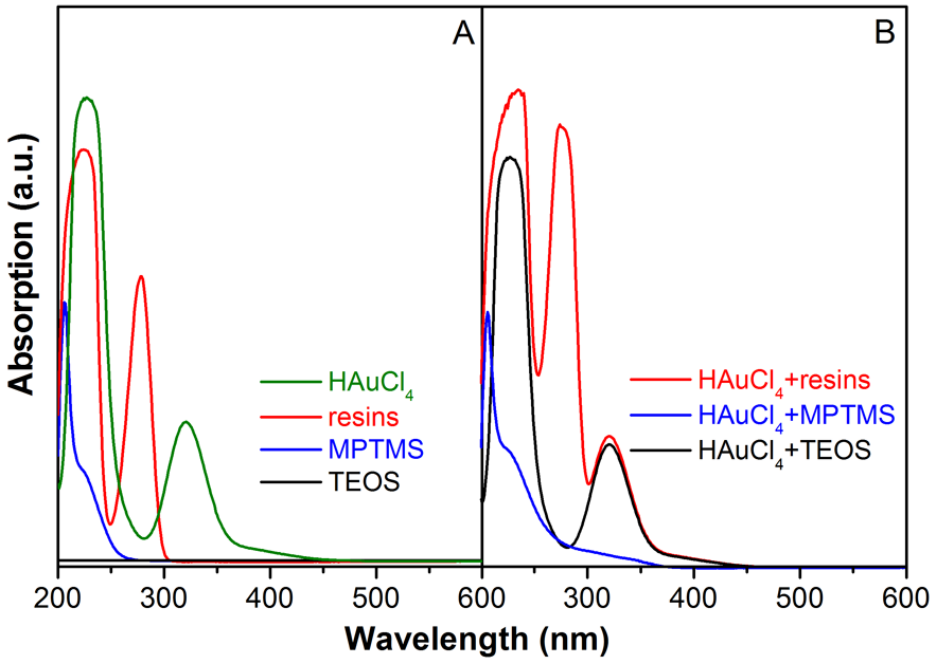
SI Figure S4. N_2 sorption isotherms and pore-size distribution curve (inset) for the thiol-free sample Au(0)-SC.



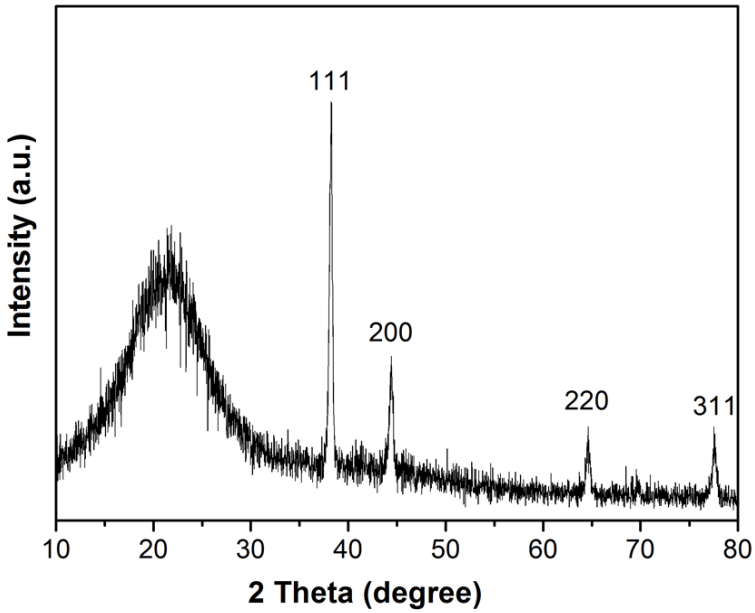
SI Figure S5. TEM images for Au(0)-SC heated at 600 ºC with low (A) and high (B) magnifications . Inset (B) is EDX pattern.



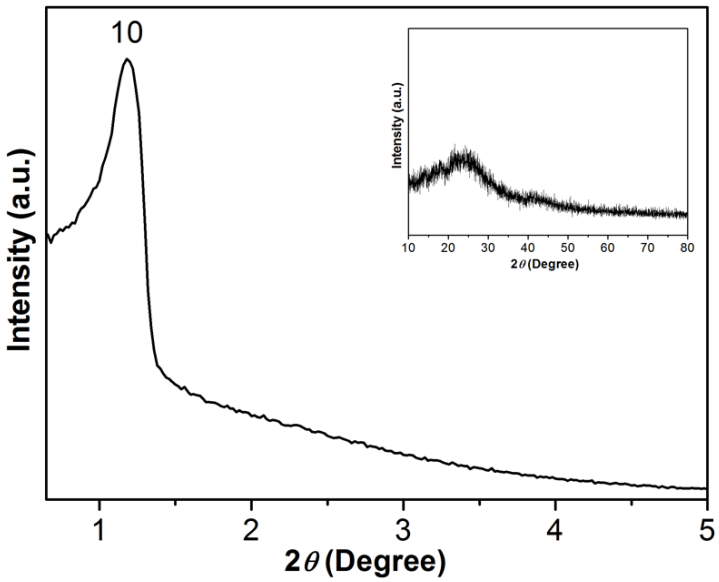
SI Figure S6. UV-vis spectra for mono-constituent (A) and bi-constituent (B) synthesis solutions in ethanol.



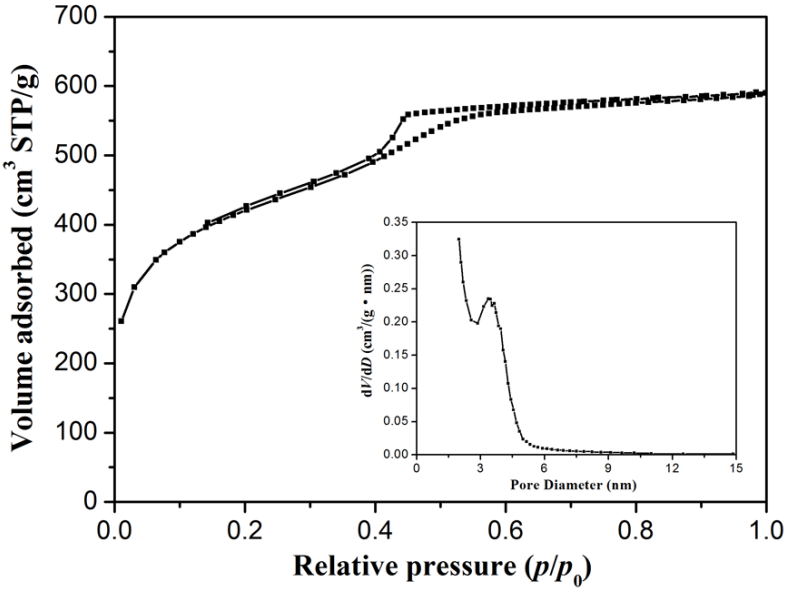
SI Figure S7. WAXRD pattern for as-made Au(0)-SC.



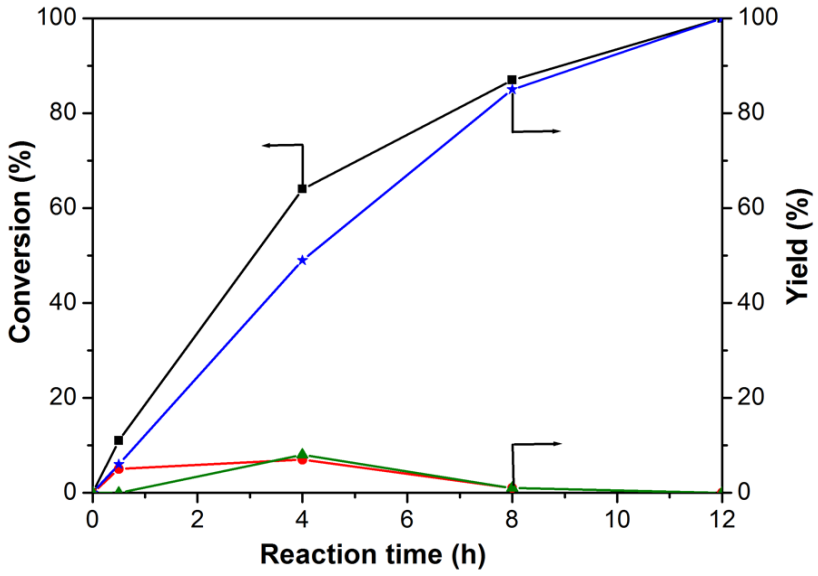
SI Figure S8. SAXRD and WAXRD (inset) patterns for the gold-free sample (SH)-C.



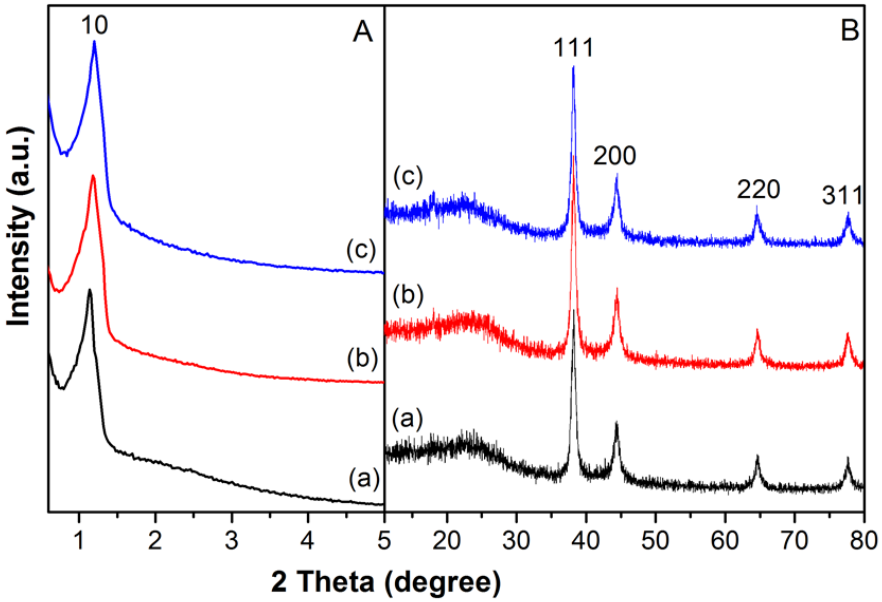
SI Figure S9. N_2 sorption isotherms and pore-size distribution curve (inset) for the gold-free sample (SH)-C.



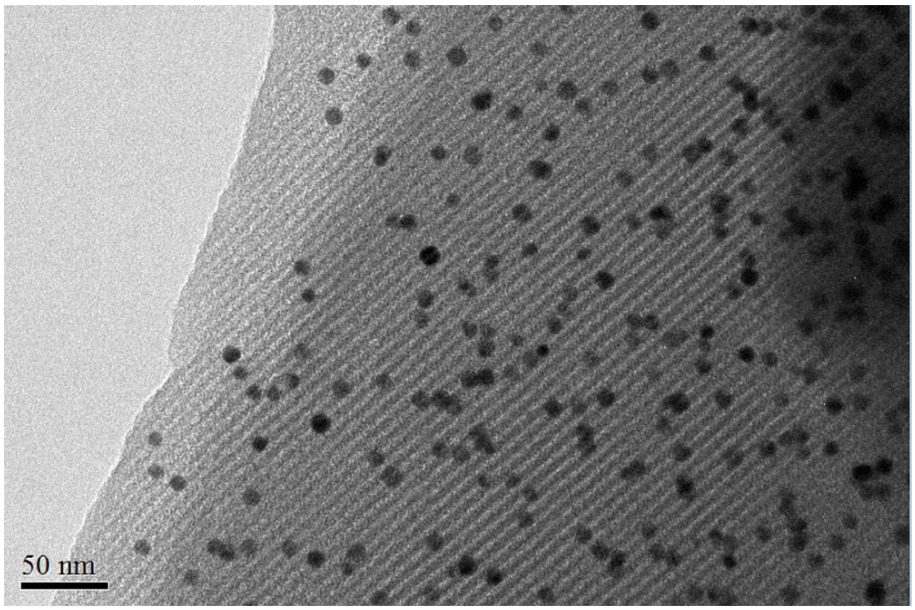
SI Figure S10. Time course plots for the conversion of benzyl alcohol (-■-) and yields of benzoic acid (-★-), benzaldehyde (-●-), and benzyl benzoate (-▲-) over the reused catalyst Au(SH)-C-R2.



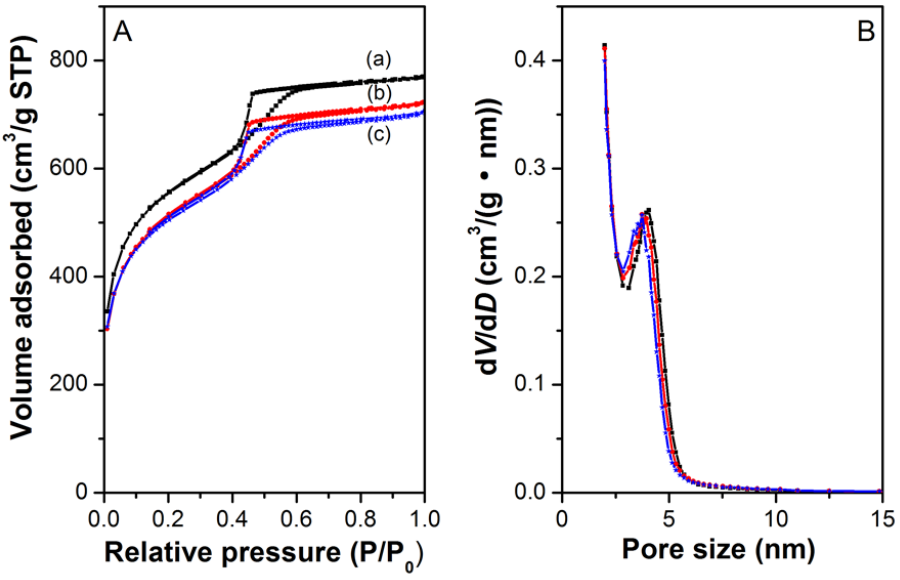
SI Figure S11. SAXRD (A) and WAXRD (B) patterns for the (a) fresh Au(SH)-C catalyst, and the catalysts after (b) the first run (Au(SH)-C-R2) and (c) third run (Au(SH)-C-R4).



SI Figure S12. TEM image for the reused catalyst Au(SH)-C-R2.



SI Figure S13. N_2 sorption isotherms (A) and pore-size distribution curves (B) for the (a) fresh Au(SH)-C-600 catalyst, and the catalysts after (b) the first run (Au(SH)-C-600-R2) and (c) third run (Au(SH)-C-R4).



SI Figure S14. TEM image (A), and WAXRD pattern (B) for the supported 5.0 nm-gold catalyst.