Supplementary Information

Improved Hydrogen Evolution Performance by Engineering Bimetallic AuPd Loaded on Amino and Nitrogen Functionalized Mesoporous Hollow Carbon Spheres

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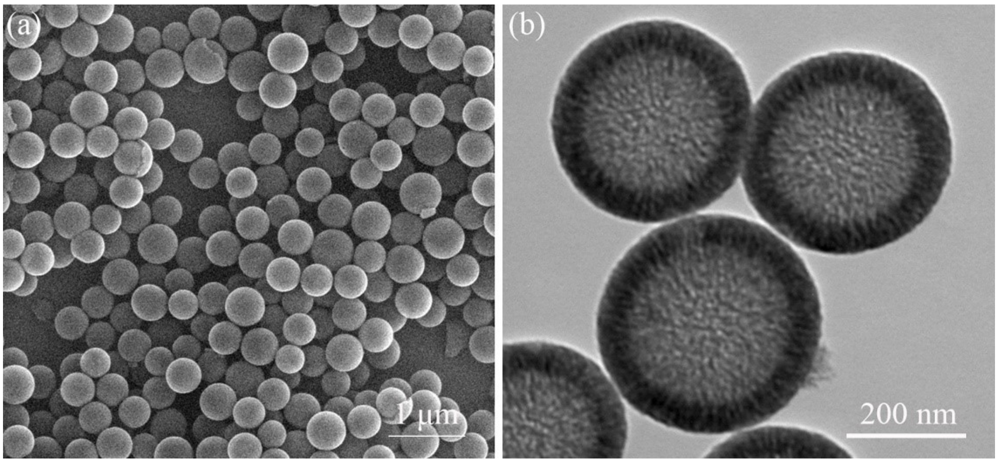

Fig. S1. SEM image (a) and TEM image of HMCS (b).

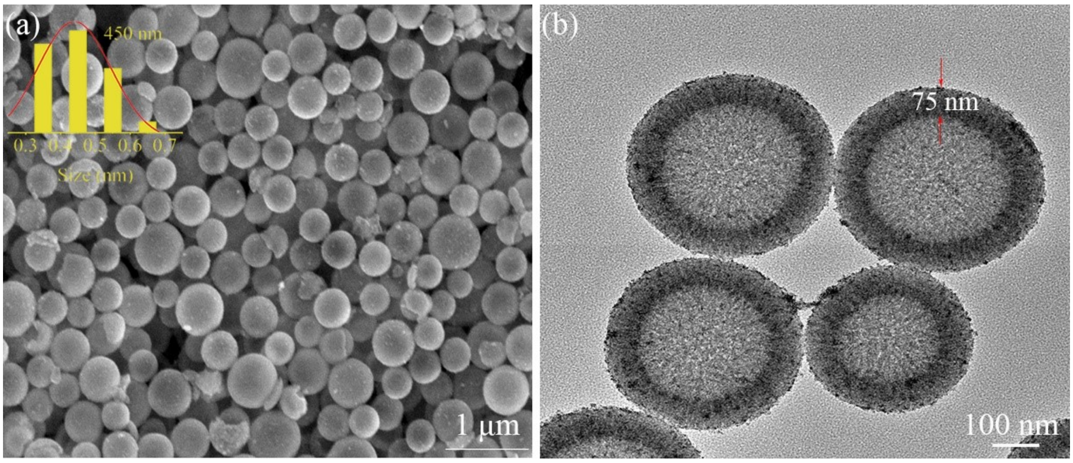

Fig. S2. SEM image(a) and TEM image(b) of $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS.

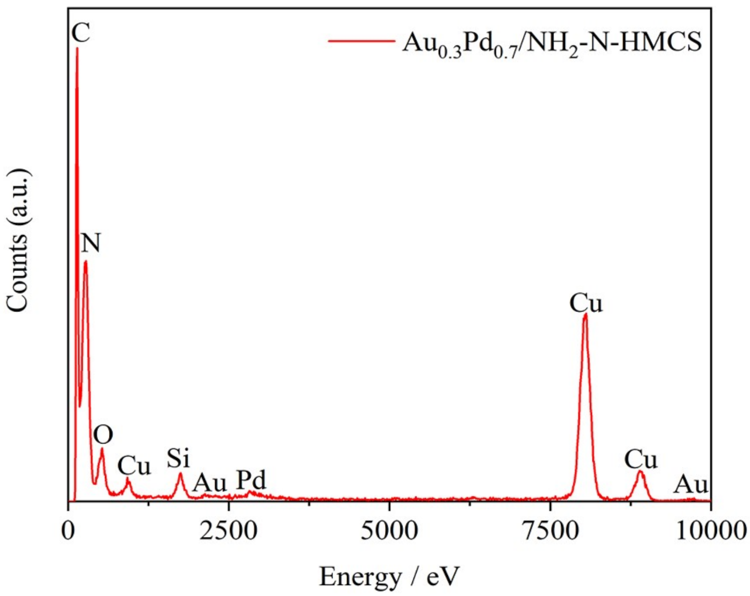

Fig. S3. EDX spectrum of $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS

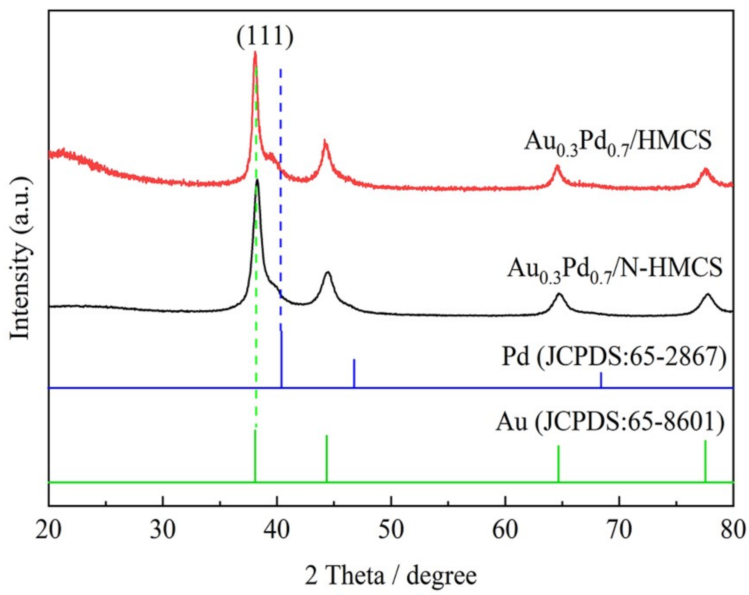

Fig. S4. The XRD patterns of $Au_{0.3}Pd_{0.7}$/HMCS and $Au_{0.3}Pd_{0.7}$/N-HMCS.

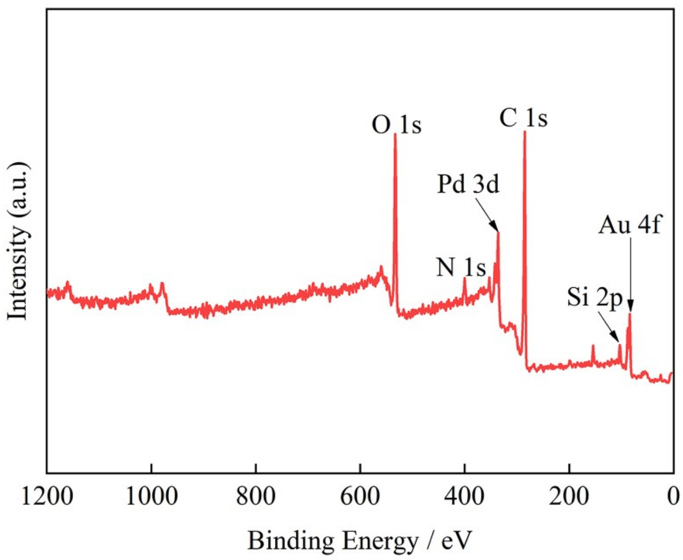

Fig. S5. The XPS spectrum of $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS.

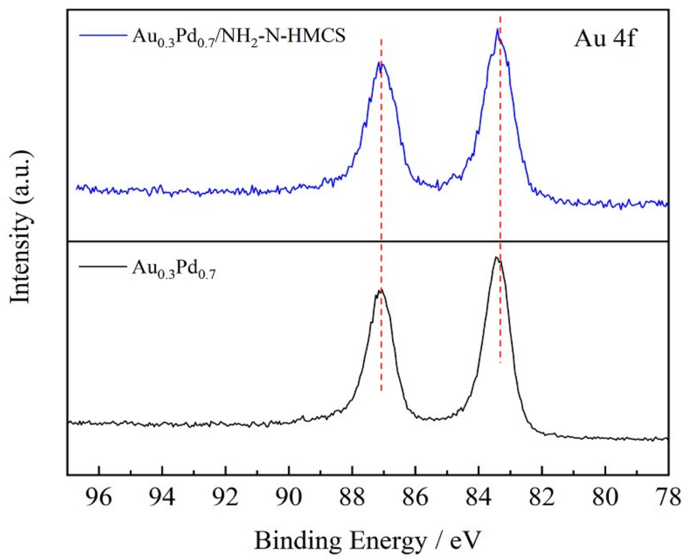

Fig. S6. The high-resolution XPS spectra of Au 4f for $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS.

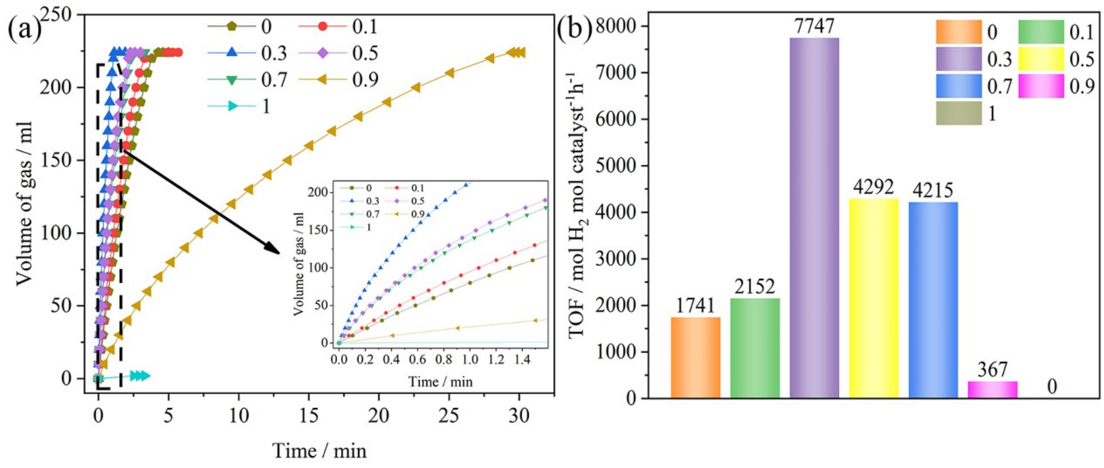

Fig. S7. Time-course plots for the dehydrogenation of FA (1.0 M, 5.0 mL) catalyze by Au_xPd_{1-x}/NH_2-N-HMCS (x= 0, 0.1, 0.3, 0.5, 0.7, 0.9 and 1) at 298 K (a) and the related initial TOF values (b).

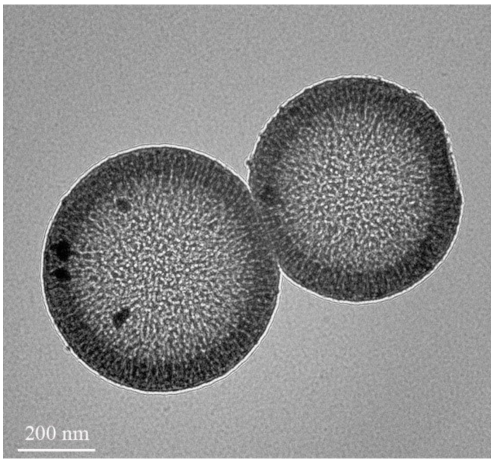

Fig. S8. TEM image of $Au_{0.3}Pd_{0.7}$/HMCS.

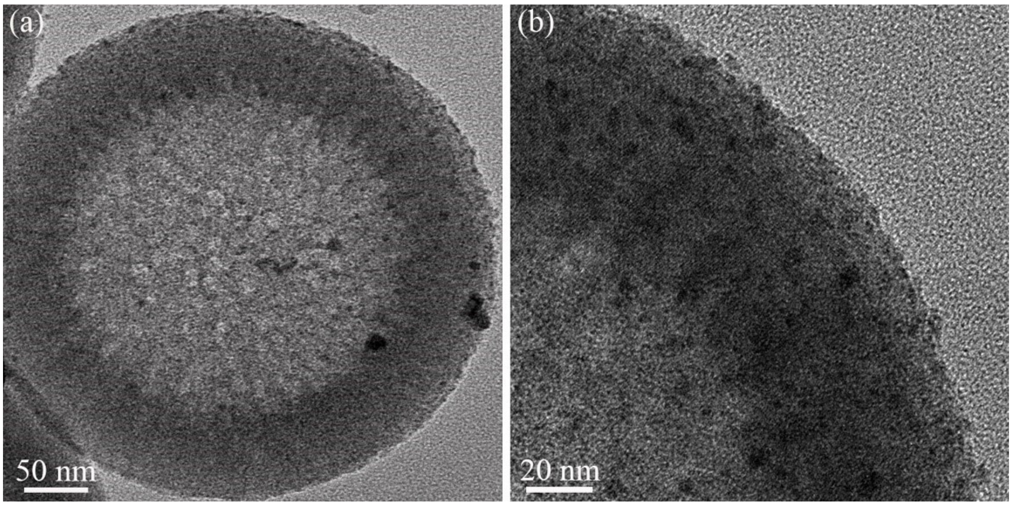

Fig. S9. TEM images of $Au_{0.3}Pd_{0.7}$/N-HMCS.

Table S1. Comparisons of catalytic activities for the dehydrogenation of FA catalyzed by previously reported heterogeneous catalysts with the as-synthesized $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS in this work.

Catalyst	Temp. (K)	Additive	TOF (h^{-1})	Ref
Au@Pd/UiO-66($Zr_{85}Ti_{15}$)	303	None	200	3
$Pd/CN_{0.25}$	298	None	752	17
Au1Pd1.5/MIL-101-NH2	298	None	526	40
NiPd/NH_2-N-rGO	298	None	954.3	33
$Au_{0.75}Pd_{0.25}$/C-L-7.5	298	HCOONa	718	11
Pd/S-1-in-K	298	HCOONa	856	9
$(Co_6)Ag_{0.1}Pd_{0.9}$/RGO	323	HCOONa	2739	41
Au_2Pd_3@(P)N-C	303	HCOONa	5400	6
$Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS	298	None	7747	This work

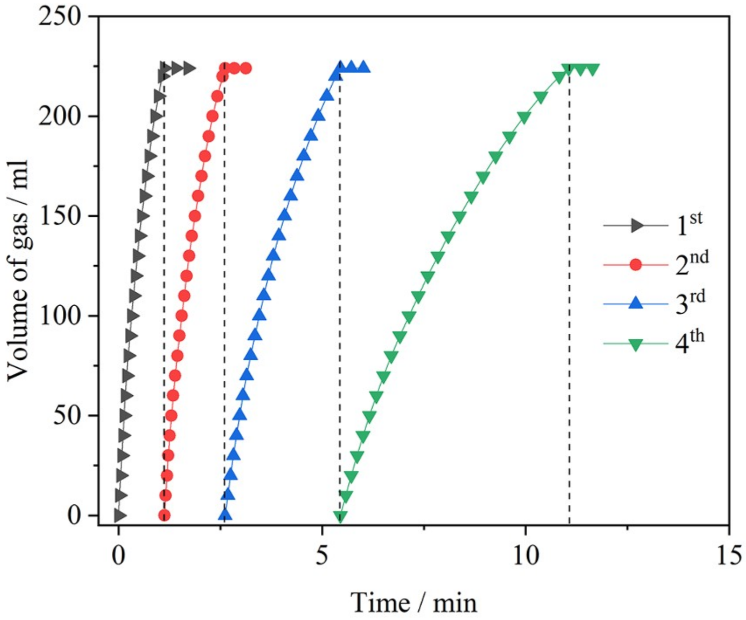

Fig. S10. Durability test of $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS towards the dehydrogenation of FA.

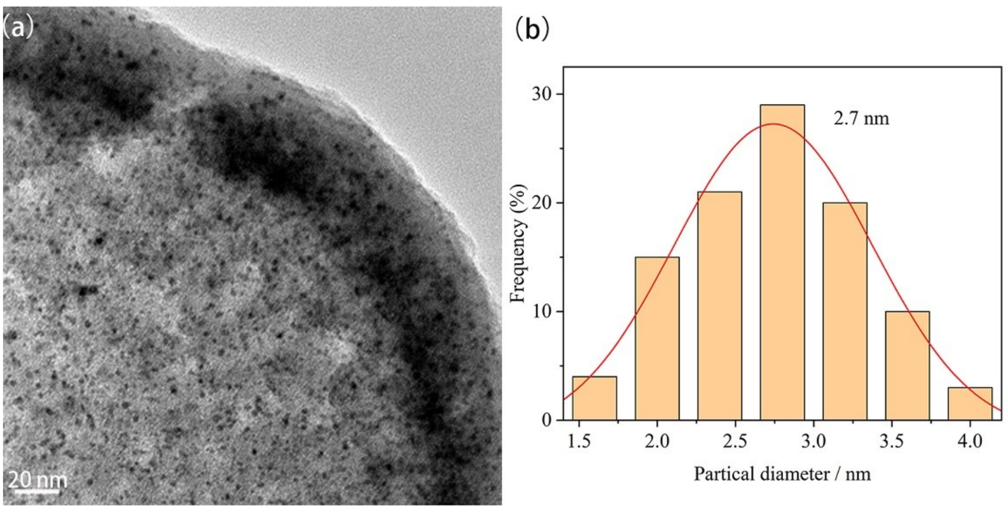

Fig. S11. (a) TEM image and (b) the corresponding particle size distribution of $Au_{0.3}Pd_{0.7}/NH_2$-N-HMCS after the 4^{th} run.