Electronic Supplementary Material (ESI) for Nanoscale Advances.

Supporting Information

Ultrafine PdAu Nanoparticles Immobilized on Amine Functionalized Carbon Black toward Fast Dehydrogenation of Formic Acid at Room Temperature

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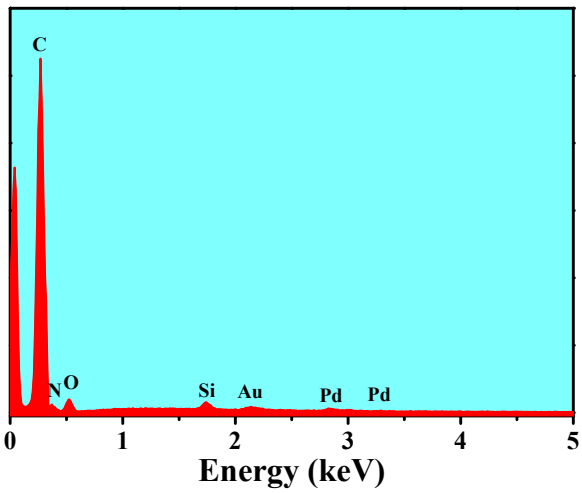

Figure S1. EDX pattern of the $Pd_{0.6}$ $Au_{0.4}$/VXC-72-NH_2.

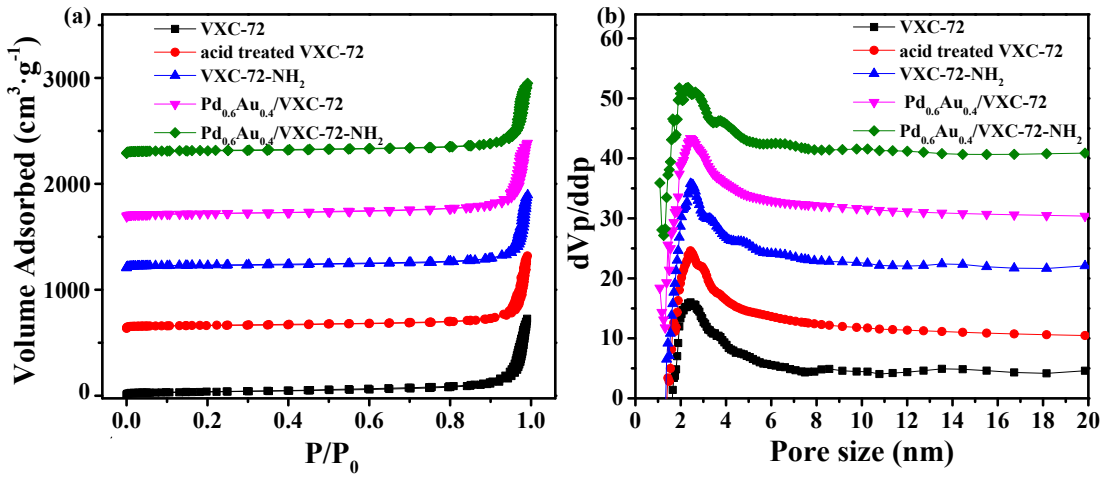

Figure S2. (a) N_2 adsorption-desorption isotherms and (b) the corresponding PSD curves.

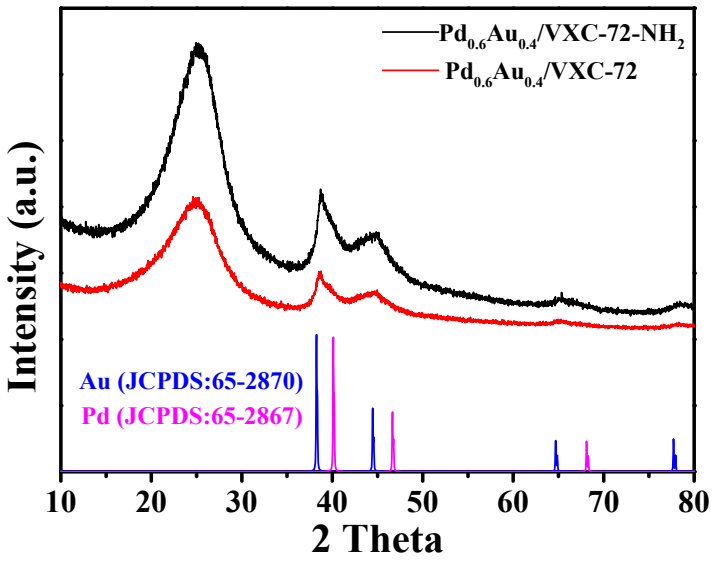

Figure S3. XRD patterns of $Pd_{0.6}Au_{0.4}$/VXC-72-NH_2 and $Pd_{0.6}Au_{0.4}$/VXC-72 after heat treatment at 773 K for 3 h in Ar atmosphere.

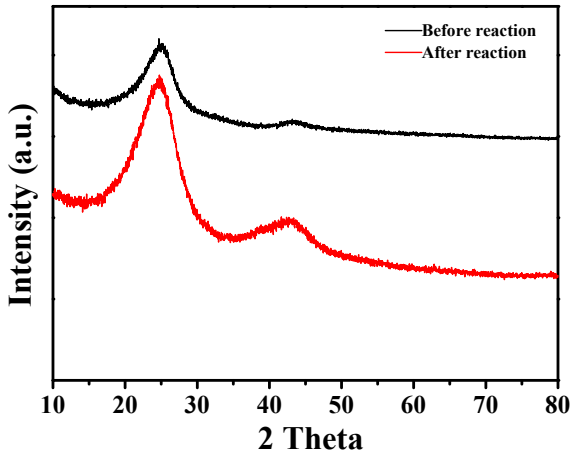

Figure S4. XRD patterns of the $Pd_{0.6}Au_{0.4}$/VXC-72-NH_2 (a) before and (b) after catalysis.

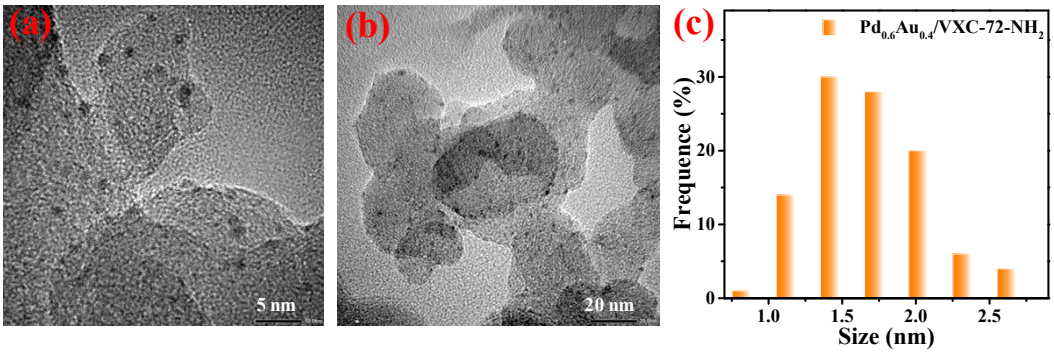

Figure S5. TEM images and size distribution of $Pd_{0.6}Au_{0.4}$/VXC-72-NH_2 after the 5th run.

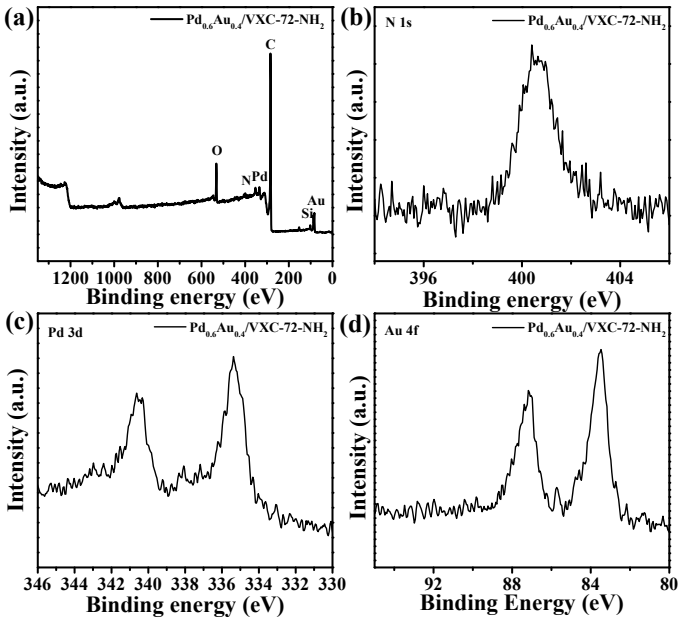

Figure S6. XPS spectra of $Pd_{0.6}Au_{0.4}$/VXC-72-NH_2 after after the 5th run.

Table S1. The BET surface area and pore volume of various samples measured from N_2 adsorption desorption isotherms.

Sample	S_{BET} ($m^2 \cdot g^{-1}$)	Pore volume ($cm^3 \cdot g^{-1}$)	Average pore size (nm)[a]
VXC-72	120	0.68	2.43
Acid treated VXC-72	119	0.65	2.43
VXC-72-NH_2	103	0.57	2.33
$Pd_{0.6}Au_{0.4}$/VXC-72	105	0.42	2.43
$Pd_{0.6}Au_{0.4}$/VXC-72-NH_2	108	0.35	2.33

Table S2. The C, O, N and Si atomic percentage in the samples as determined by XPS

Catalyst	C (at%)	O (at%)	N (at%)	Si (at%)	Au (at%)	Pd (at%)
VXC-72	99.08	0.92	--	--	--	--
Acid treated VXC-72	93.37	6.63	--	--	--	--
VXC-72-NH_2	85.32	10.70	1.98	2.00	--	--
$Pd_{0.6}Au_{0.4}$/VXC-72-NH_2	87.30	7.46	2.18	2.21	0.28	0.57
$Pd_{0.6}Au_{0.4}$/VXC-72-NH_2 (recycled)	90.01	7.31	1.83	1.86	0.26	0.54

Table S3. The contents of Au and Pd in the samples determined by inductively coupled plasma-atomic emission spectrometry (ICP-AES).

Catalyst	Pd (wt%)	Au (wt%)
Pd/VXC-72-NH_2	1.75	--
$Pd_{0.8}Au_{0.2}$/VXC-72-NH_2	1.41	0.62
$Pd_{0.6}Au_{0.4}$/VXC-72-NH_2	1.06	1.31
$Pd_{0.4}Au_{0.6}$/VXC-72-NH_2	0.71	1.92
$Pd_{0.2}Au_{0.8}$/VXC-72-NH_2	0.36	2.62
Au/VXC-72-NH_2	--	3.26
$Pd_{0.6}Au_{0.4}$/VXC-72	1.04	1.31
$Pd_{0.6}Au_{0.4}$/VXC-72-NH_2 (recycled)	1.03	1.29