Supporting Information

Composition-controllable synthesis of defect-rich PtPdCu nanoalloy with hollow cavity as superior electrocatalyst for alcohol oxidation

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Sample	Element	Atom% feeding radio	Atom% (result from ICP-OES)
$Pt_{41}Pd_{22}Cu_{37}$	Pt	33	41
	Pd	22	22
	Cu	45	37
$Pt_{30}Pd_{41}Cu_{29}$	Pt	22	30
	Pd	45	41
	Cu	33	29
$Pt_{34}Pd_{33}Cu_{33}$	Pt	33.3	34
	Pd	33.3	33
	Cu	33.3	33

Table S1 The composition of the as-synthesized PtPdCu nanocrystals calculated from ICP-OES.

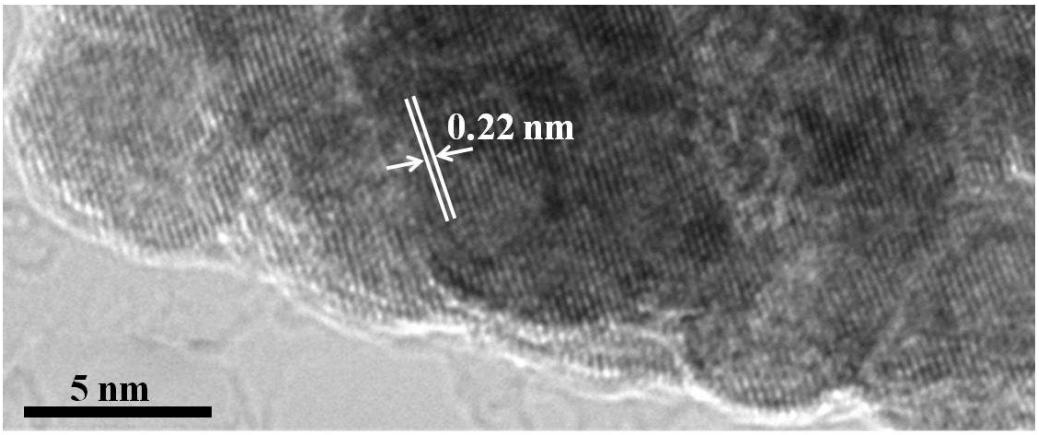

Fig. S1 HRTEM image of as-synthesized $Pt_{34}Pd33Cu_{33}$ nanoalloys.

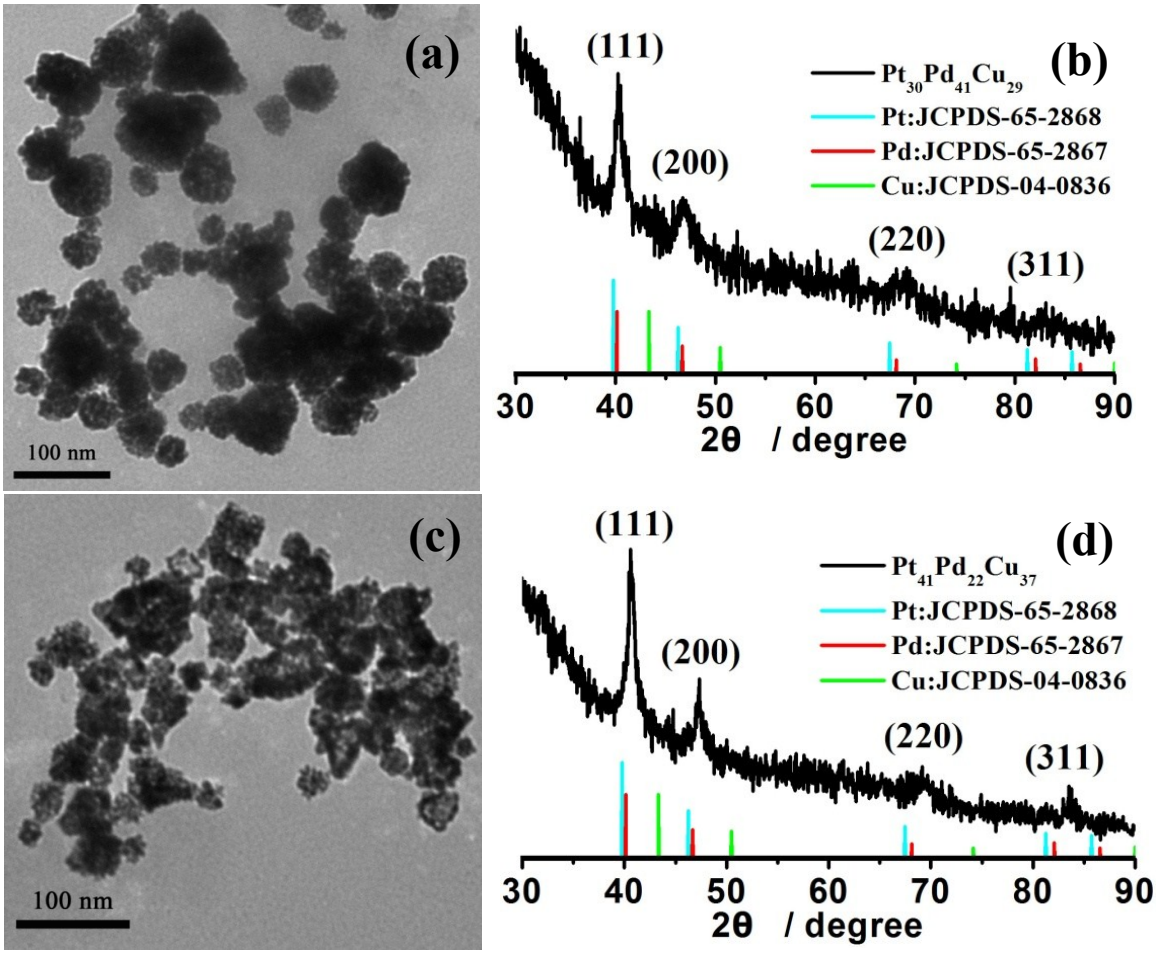

Fig. S2 TEM images and XRD patterns of the as-synthesized PtPdCu nanocrystals. (a, b) $Pt_{30}Pd_{41}Cu_{29}$; (c, d) $Pt_{41}Pd_{22}Cu_{37}$.

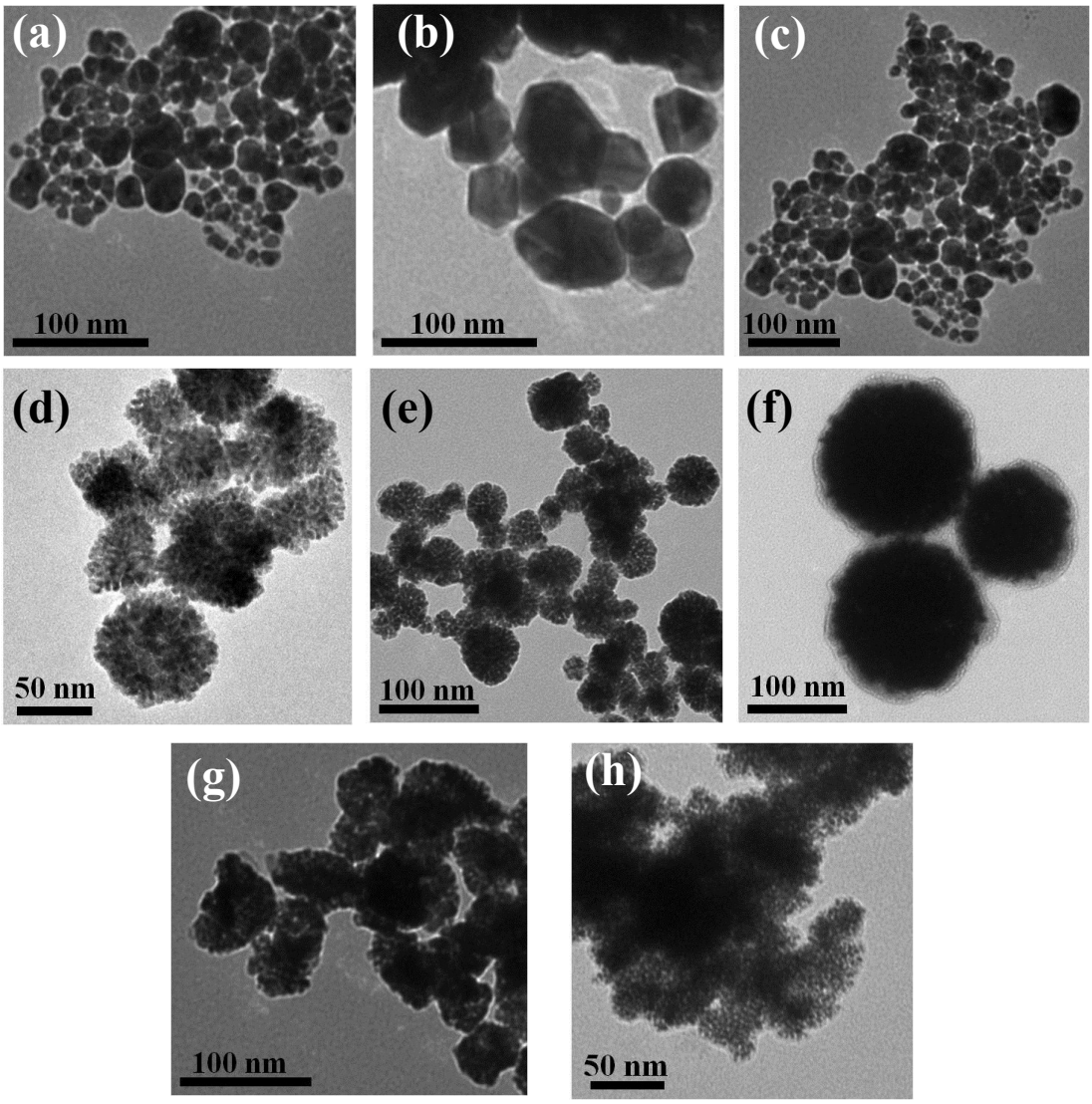

Fig. S3 TEM images of product obtained in current synthesis system. (a) Pure Pt, (b) Pure Pd, (c) In the presence of Pd and Cu precursors, (d) In the presence of Pt and Pd precursors, (e) In the presence of Pt and Cu precursors, (f) In the absence of CTAC, (g) In the absence of citric acid and (h) In the absence of ascorbic acid.

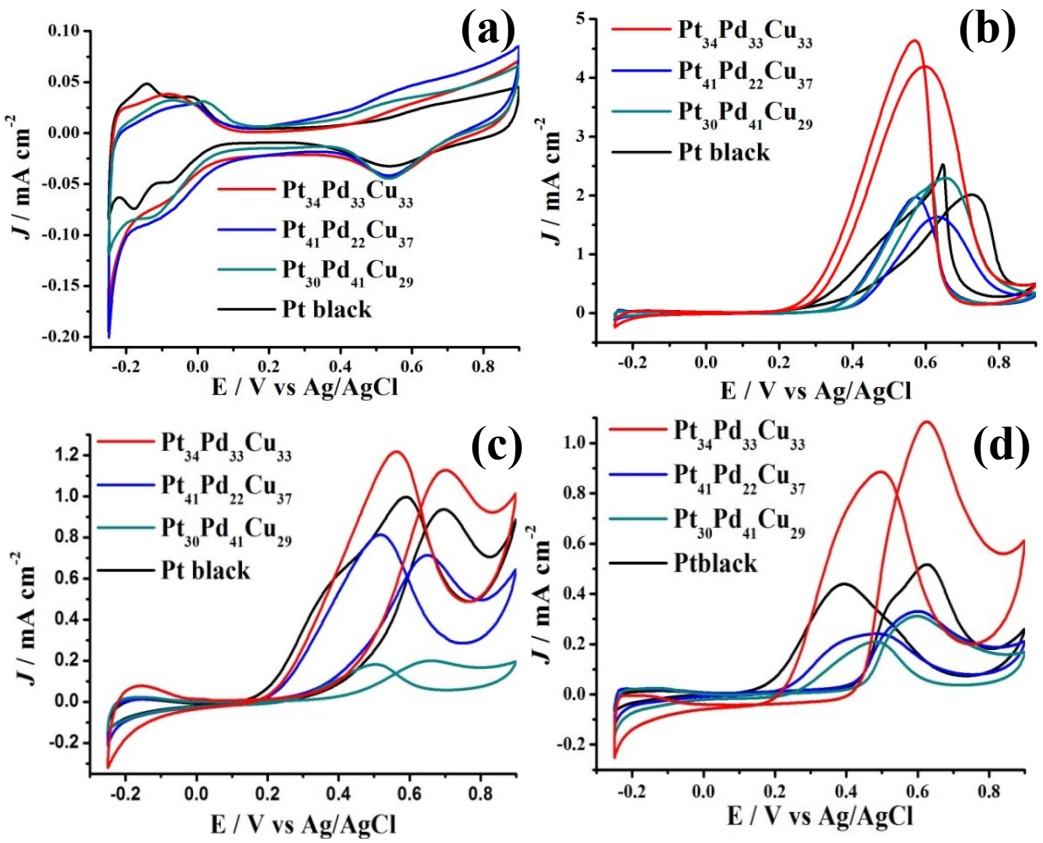

Fig. S4 CVs of the PtPdCu nanoalloys and the commercial Pt black with a scan rate of 50 mV/s at room temperature. The hydrogen adsorption/desorption method was used to measure the ECSA (m^2g^{-1}) of these catalysts. (a) in a 0.1 M $HClO_4$ solution (b) in 0.1 M HClO4 + 0.5 M methanol solution, (c) in 0.1 M HClO4 + 0.5 M ethanol solution and (d) in 0.1 M HClO4 + 0.5 M glycol solution.

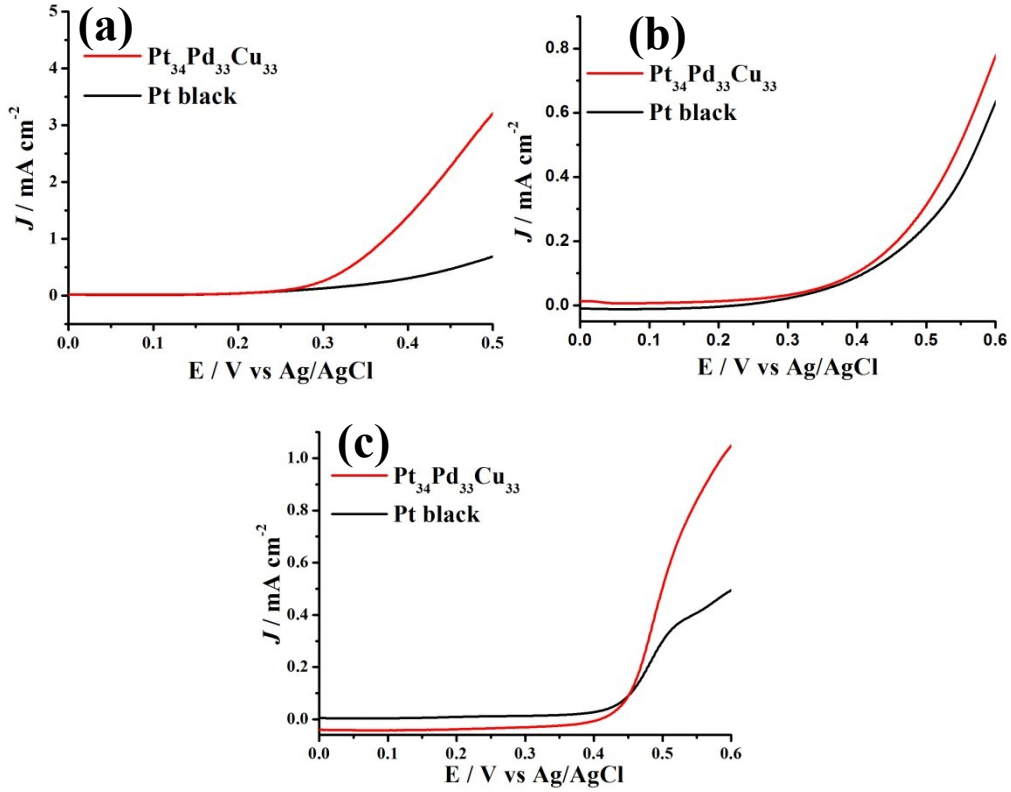

Fig. S5 Linear-sweep voltammetry curves measured at scan rate of 50 mV s^{-1}. (a) in 0.1 M $HClO_4$ + 0.5 M methanol solution, (b) in 0.1 M $HClO_4$ + 0.5 M ethanol solution and (c) in 0.1 M $HClO_4$ + 0.5 M glycol solution.

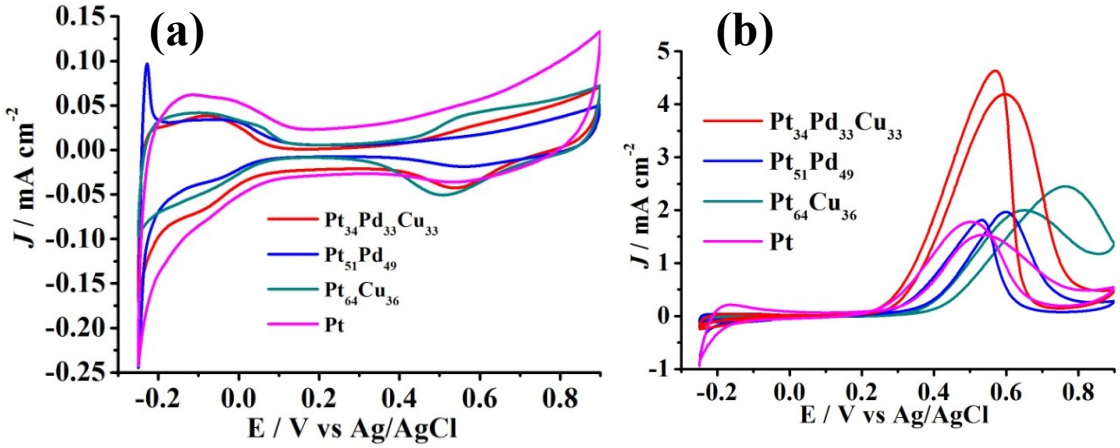

Fig. S6 CVs of the as-synthesized $Pt_{34}Pd_{33}Cu_{33}$, $Pt_{51}Pd_{49}$, $Pt_{64}Cu_{36}$ and Pt with a scan rate of 50 mV/s at room temperature. The hydrogen adsorption/desorption method was used to measure the ECSA (m^2g^{-1}) of these catalysts. (a) in a 0.1 M $HClO_4$ solution (b) in 0.1 M HClO4 + 0.5 M methanol solution. (The as-synthesized Pt, $Pt_{51}Pd_{49}$ and $Pt_{64}Cu_{36}$ nanocrystals come from Fig. S3a, d and e.)

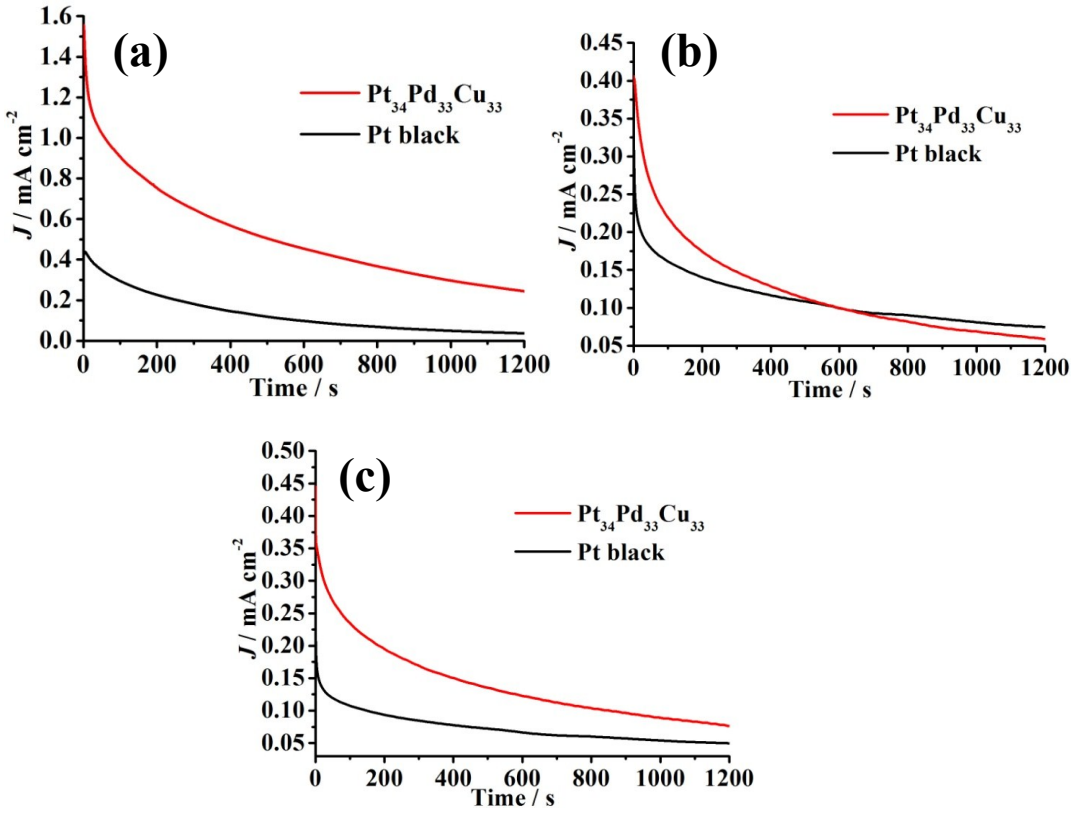

Fig. S7 Current-time curves of the as-synthesized $Pt_{34}Pd_{33}Cu_{33}$ nanoalloys and the commercial Pt black recorded for 1200 s. (a) in 0.1 M $HClO_4$ + 0.5 M methanol solution at 0.4 V; (b) in 0.1 M $HClO_4$ + 0.5 M ethanol solution at 0.5 V and (c) in 0.1 M $HClO_4$ + 0.5 M glycol solution at 0.5 V.

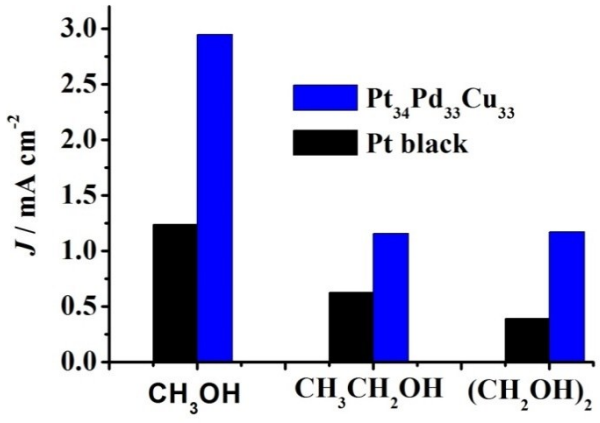

Fig. S8 Histogram of the peak current density on $Pt_{34}Pd_{33}Cu_{33}$ nanoalloy and commercial Pt black after 1000 cycles.

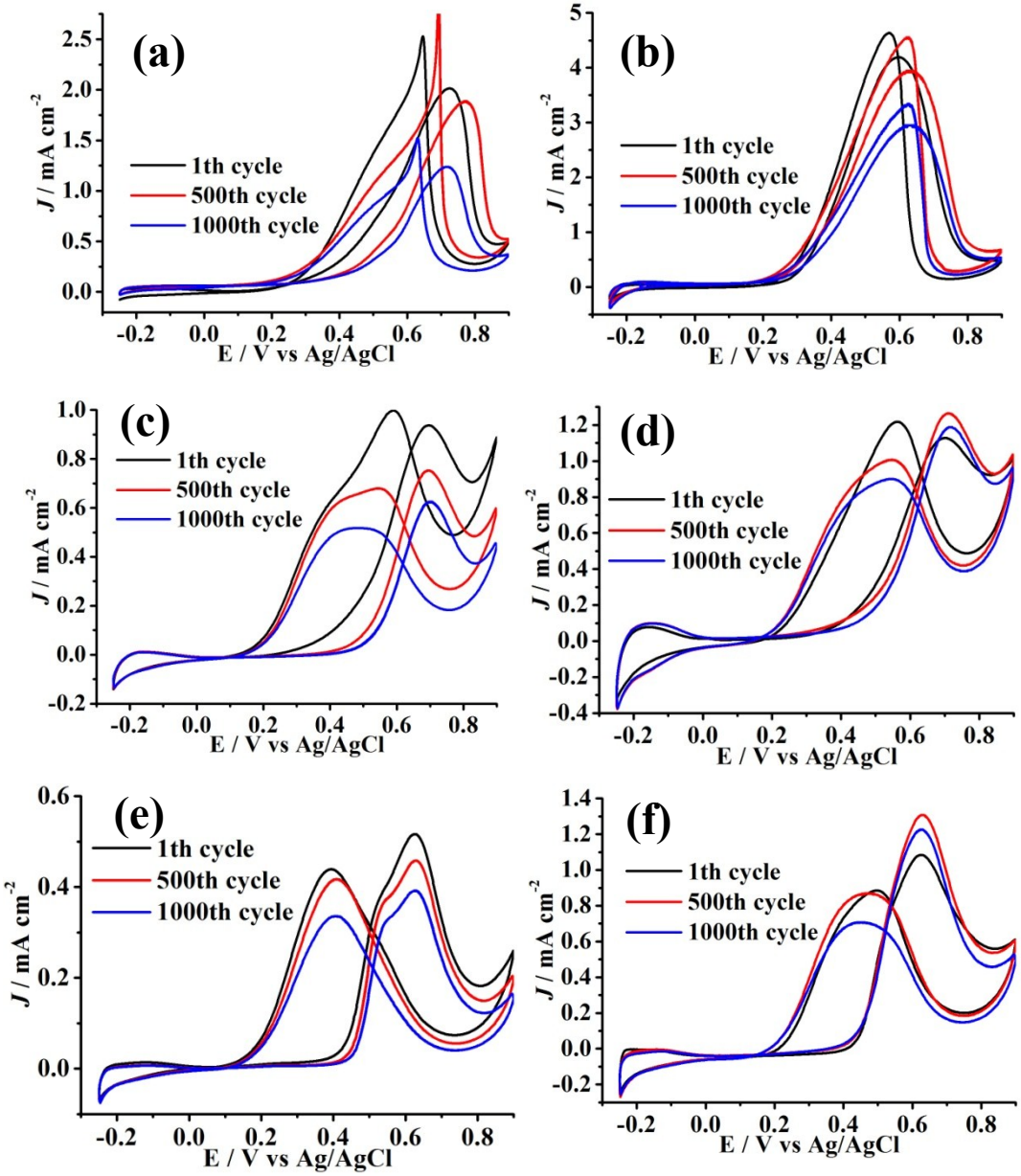

Fig. S9 CVs of the commercial Pt black (a: in 0.1 M HClO4 + 0.5 M methanol solution, c: in 0.1 M HClO4 + 0.5 M ethanol solution and e: in 0.1 M HClO4 + 0.5 M glycol solution.) and the $Pt_{34}Pd_{33}Cu_{33}$ nanoalloys (b: in 0.1 M HClO4 + 0.5 M methanol solution, d: in 0.1 M HClO4 + 0.5 M ethanol solution and f: in 0.1 M HClO4 + 0.5 M glycol solution.) with a scan rate of 50 mV/s at room temperature.

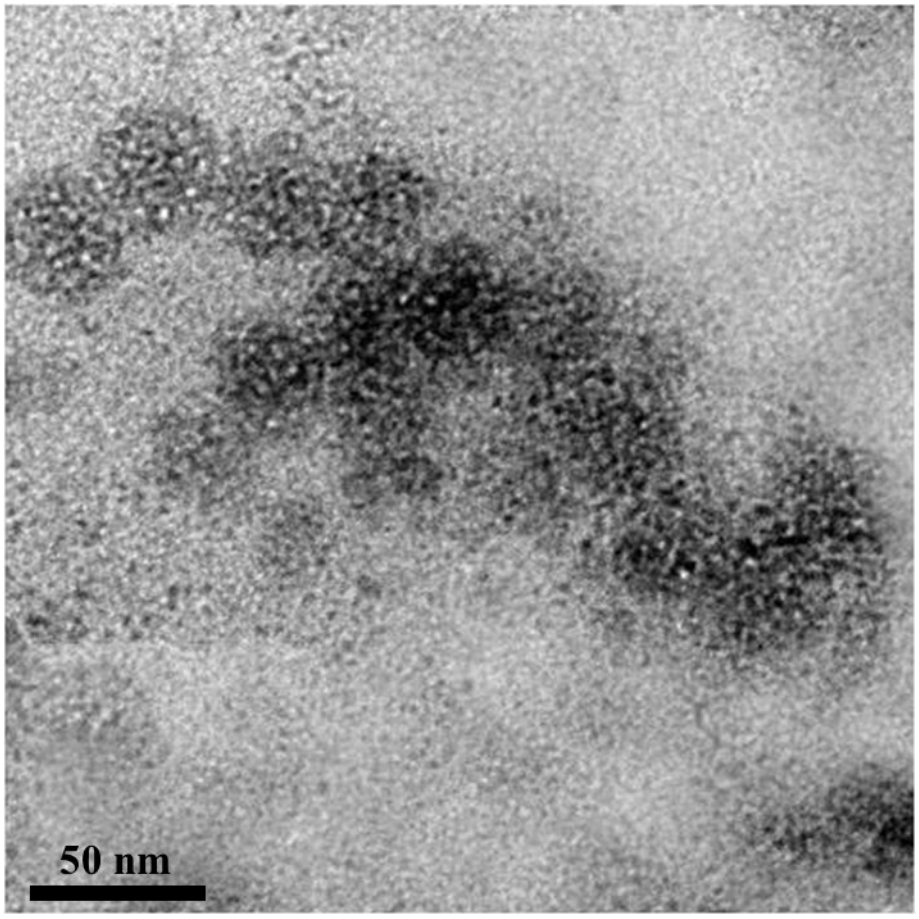

Fig. S10 TEM images of the as-synthesized $Pt_{34}Pd_{33}Cu_{33}$ nanoalloys after 1000 cycles test.