Supporting Information

Enhanced oxygen reduction activity of Pt shells on PdCu truncated octahedra with different compositions

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Table S1 ICP-AES data of the Pd_xCu@Pt core-shell nanocrystals

Samples	Pd/Cu/Pt atomic ratio	wt% of Pt
Pd_2Cu@Pt	6.1:3:1	18.8
PdCu@Pt	4.5:4.3:1	20.6
$PdCu_2$@Pt	4.2:7.4:1	17.4

Table S2 Average number (n) of Pt atomic layers and the weight percentage of Pt derived from the geometry analysis and ICP-AES data.

Samples	n of Pt atomic layers	weight percentage of Pt calculated from the value of n	weight percentage of Pt calculated from the ICP data
Pd_2Cu@Pt	2	14.36 (n=1)	18.8
		25.45 (n=2)	
PdCu@Pt	2	13.62 (n=1)	20.6
		23.39 (n=2)	
$PdCu_2$@Pt	1	17.9 (n=1)	17.4
		30.9 (n=2)	

Table S3 Electrochemical performances of the Pd_xCu@Pt and Pt/C catalysts

Samples	ECSA (m^2/g_{Pt})	i_s (mA/cm^2)	i_m ($mA/\mu g_{Pt}$)	i_m/ADT* ($mA/\mu g_{Pt}$)	durability**
Pd_2Cu@Pt	129.0	0.46	0.59	0.42	71.2%
PdCu@Pt	106.2	0.37	0.39	0.24	61.5%
$PdCu_2$@Pt	70.3	0.31	0.22	0.15	68.2%
Pt/C	78.2	0.17	0.13	0.096	73.8%

*The results of ADTs with 10,000 cycles are listed here.
**The durability is obtained by using the ratio of current densities after and before the ADTs.

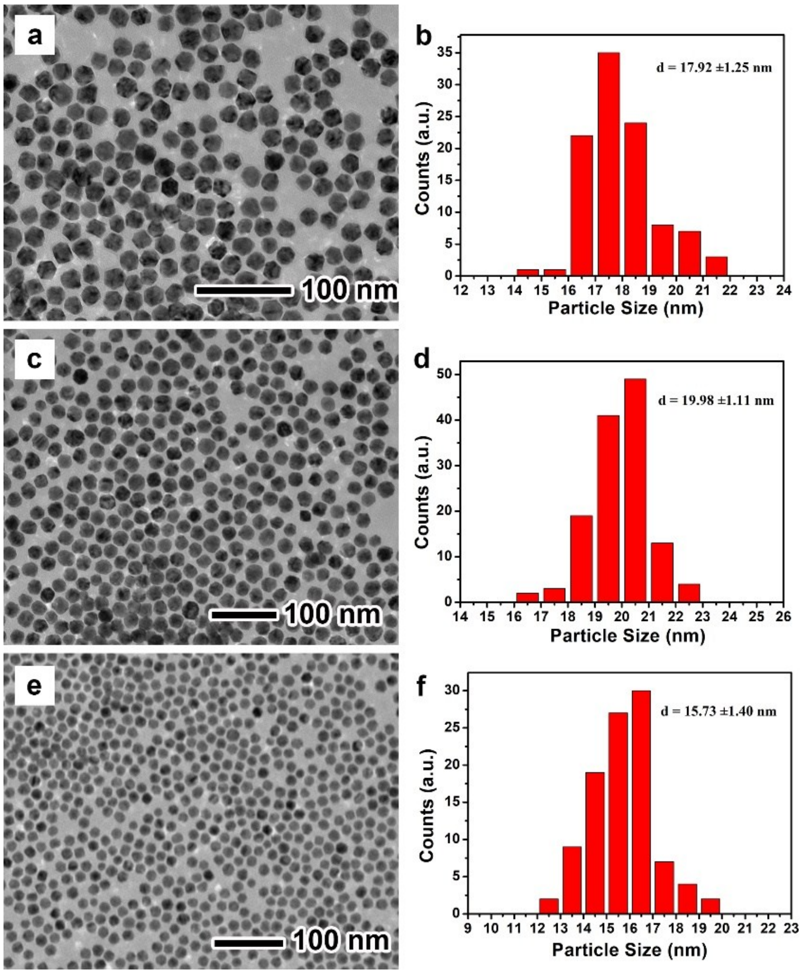

Fig. S1 (a, c, e) TEM images and (b, d, f) corresponding size distributions of Pd_2Cu, PdCu and $PdCu_2$ truncated octahedra.

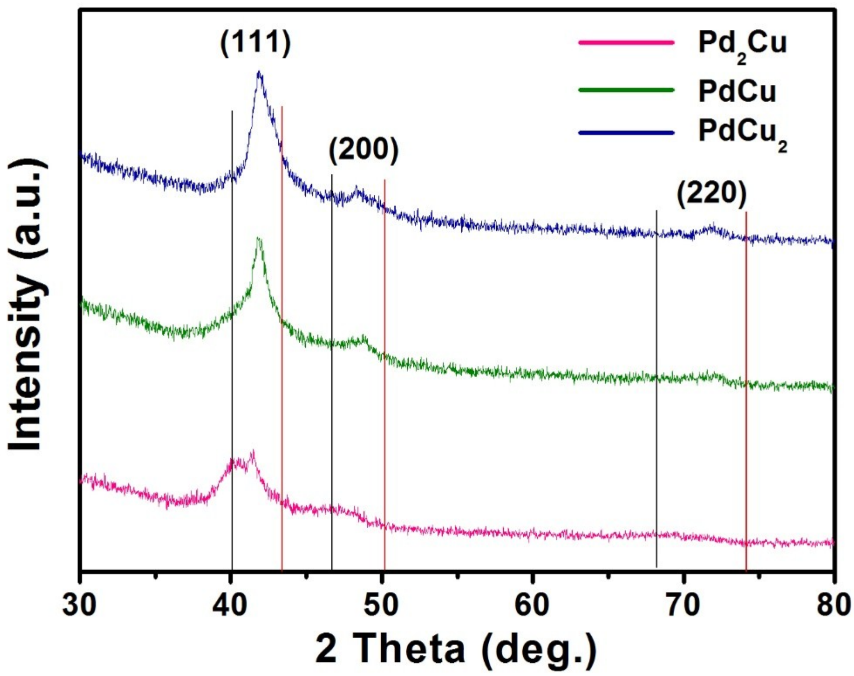

Fig. S2 XRD patterns of Pd_2Cu, PdCu and $PdCu_2$ truncated octahedra. The black and red vertical lines represent the positions of standard diffraction peaks for Pd and Cu, respectively.

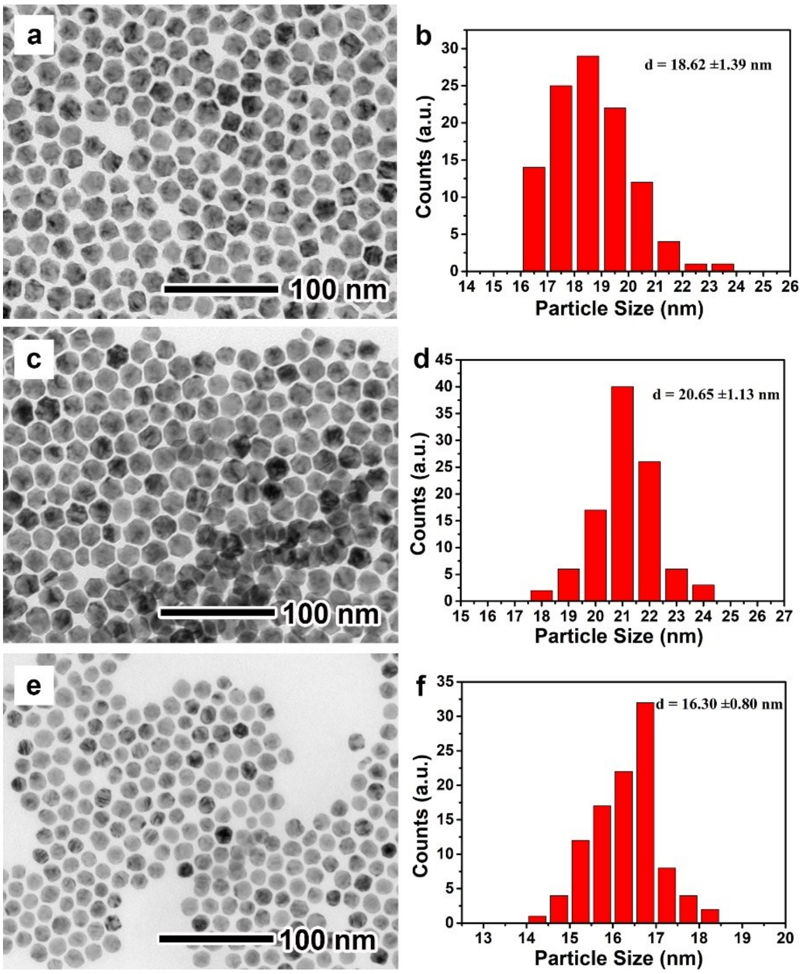

Fig. S3 (a, c, e) TEM images and (b, d, f) corresponding size distributions of $Pd_2Cu@Pt$, PdCu@Pt and $PdCu_2@Pt$ truncated octahedra.

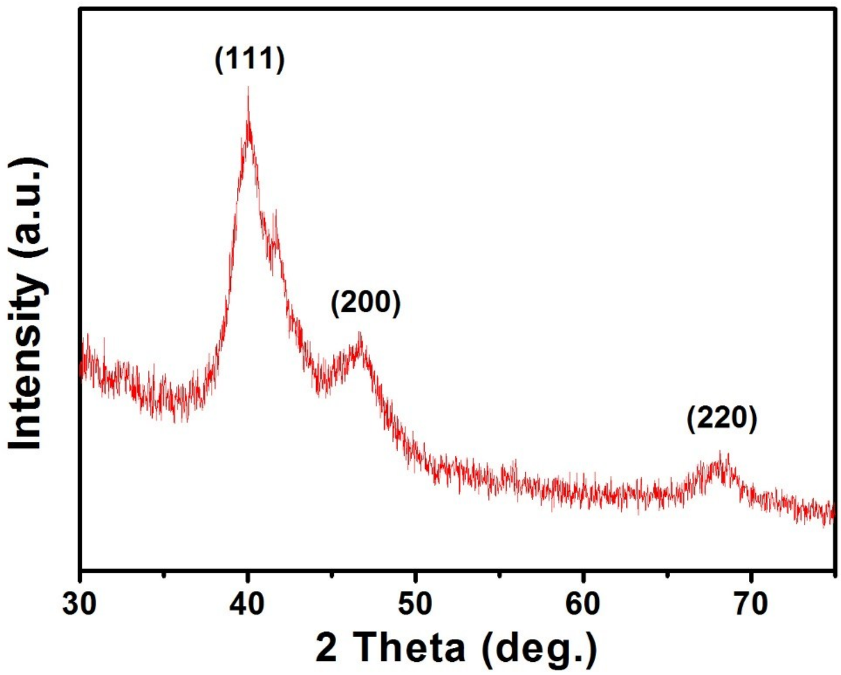

Fig. S4 XRD patterns of Pd_2Cu@Pt truncated octahedra.

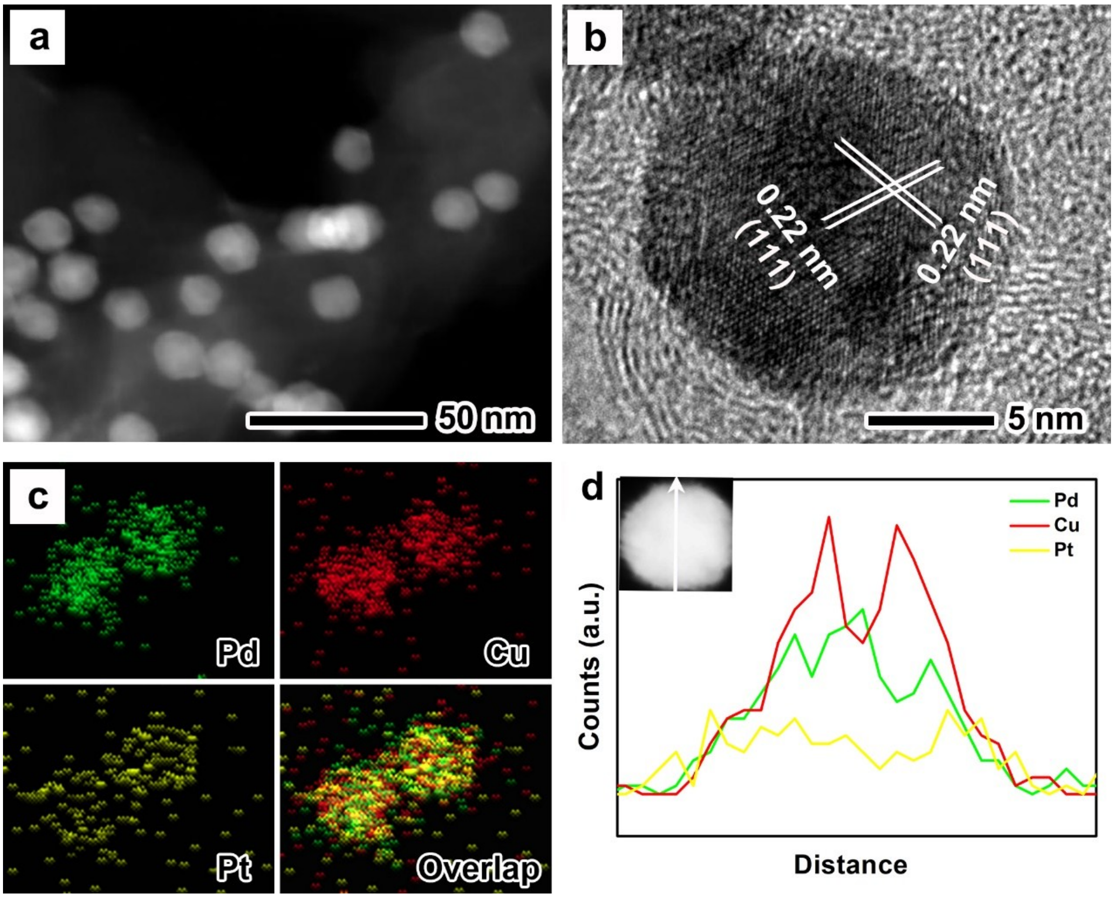

Fig. S5 Morphological, structural, and compositional characterizations of truncated octahedral $PdCu_2$@Pt nanocrystals (a) HAADF-STEM image, (b) HRTEM image, (c) EDX mapping image, and (d) line-scanning profiles.

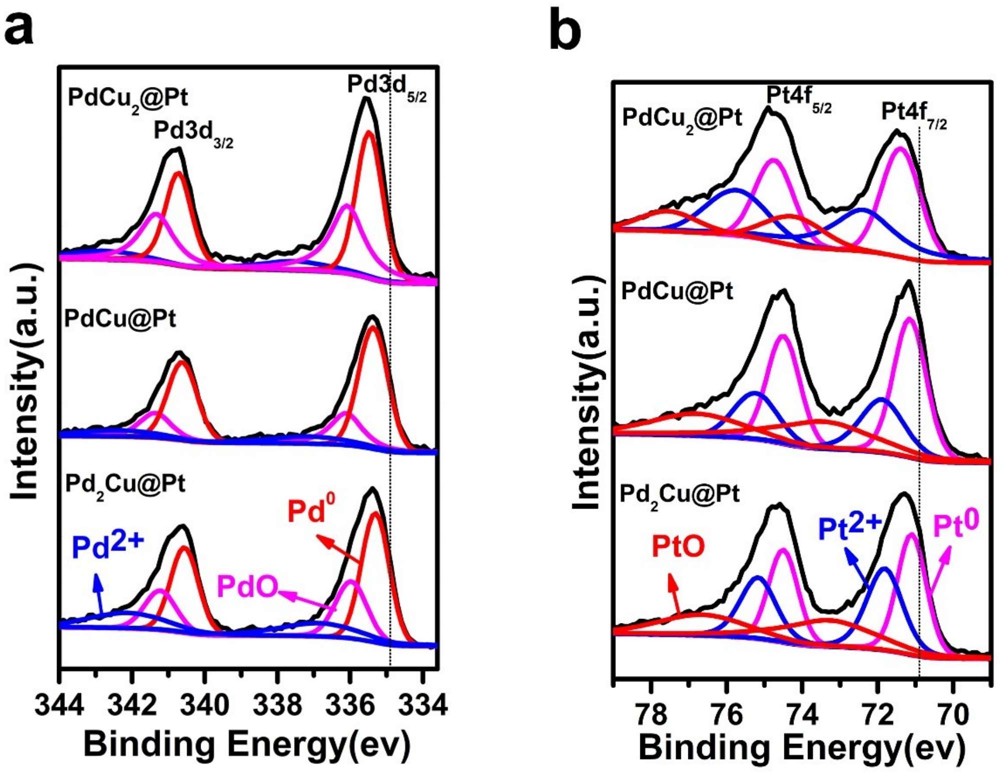

Fig. S6 (a) Pd 3d and (b) Pt 4f XPS spectra of Pd_2Cu@Pt, PdCu@Pt and $PdCu_2$@Pt truncated octahedra.

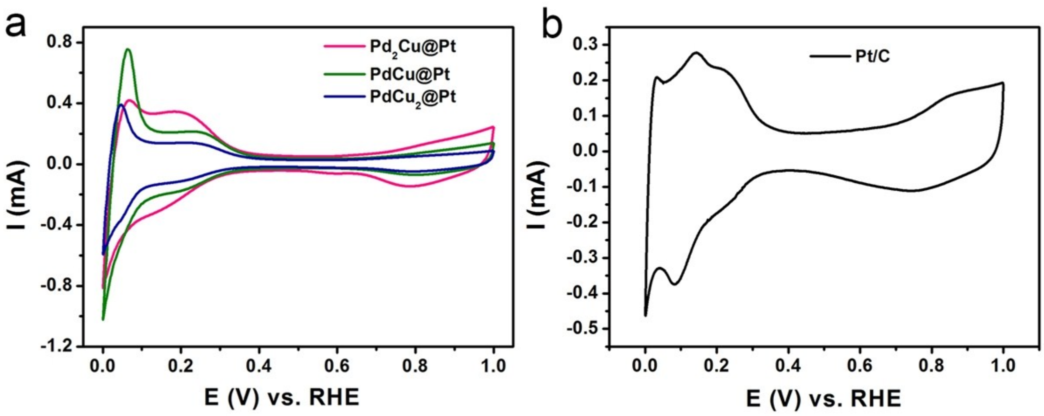

Fig. S7 Cyclic voltammetry (CV) curves of (a) Pd_2Cu@Pt, PdCu@Pt and $PdCu_2$@Pt catalysts, and (b) Pt/C catalysts in Ar-saturated 0.1 M $HClO_4$ solution with a scan rate of 50 mV/s.

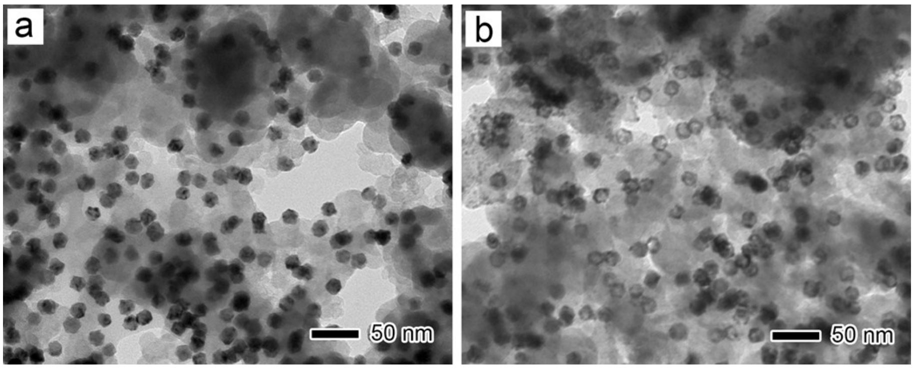

Fig. S8 TEM images of Pd_2Cu@Pt catalysts (a) before and (b) after ADTs for 10000 cycles in O_2 saturated 0.1 M $HClO_4$ solution.