Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary information

PdPt bimetallic nanoparticles enabled by shape control with halide ions and their enhanced catalytic activities

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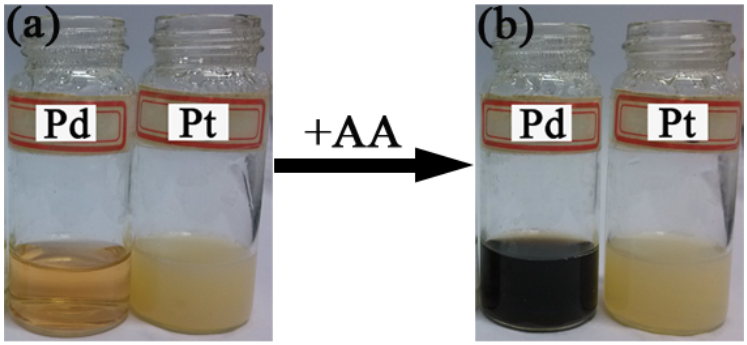

Figure S1. Photograghs of CPC aqueous solutions containing Pd and Pt precursors respectively before (a), and after (b) the addition of reducing agent AA at 90 ℃.

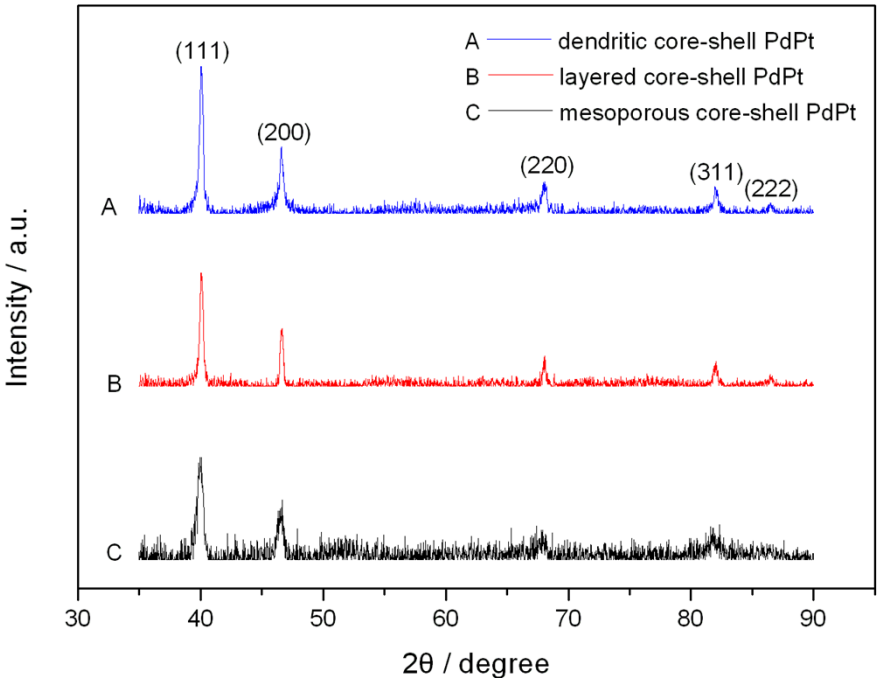

Figure S2. Powder XRD pattern of dendritic core-shell (A), layered core-shell (B) and mesoporous core-shell (C) PdPt bimetallic nanoparticles.

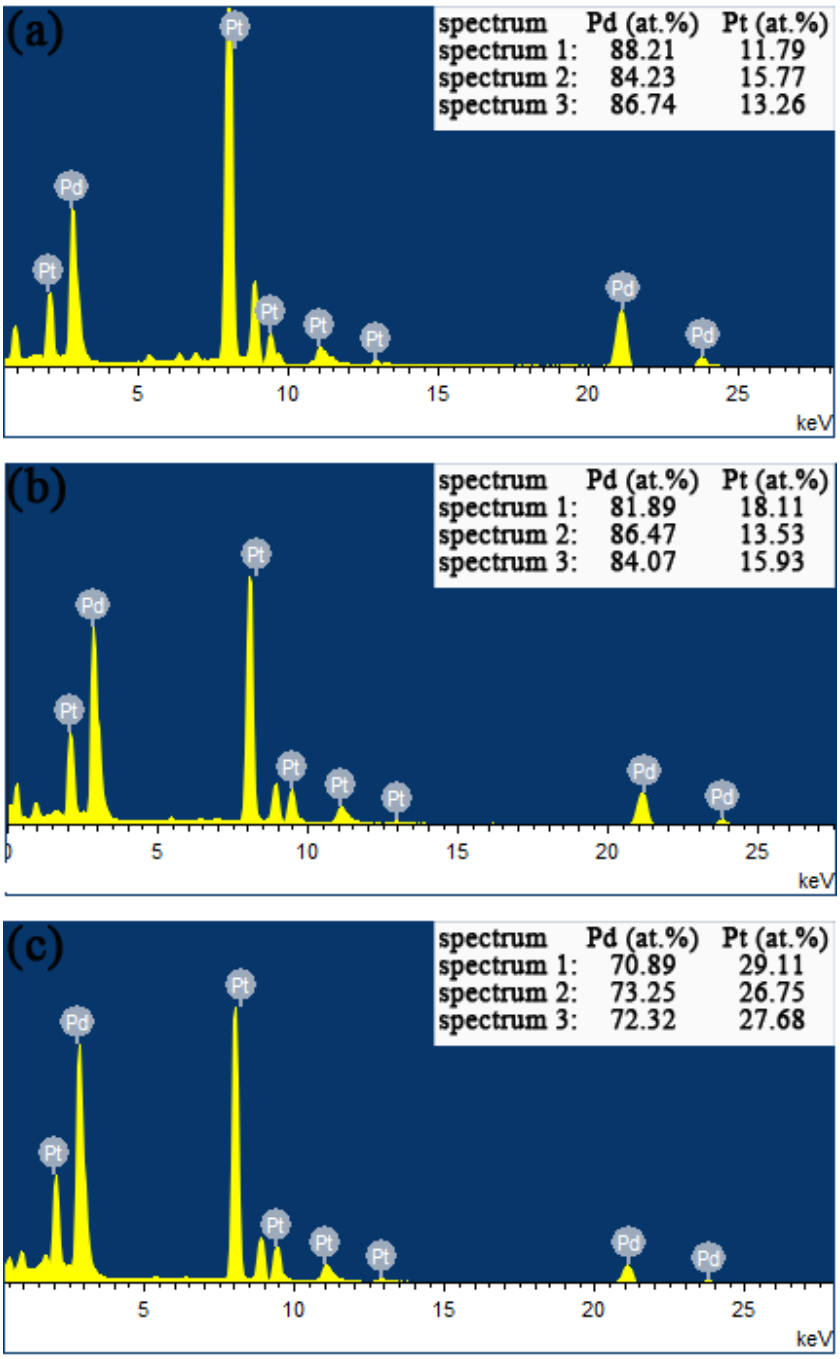

Figure S3. EDS results of dendritic core-shell (a), layered core-shell (b) and mesoporous core-shell (c) PdPt bimetallic nanoparticles.

Table S1. The percentages of Pd and Pt for different PdPt bimetallic nanoparticles determined by inductively coupled plasma-mass spectroscopy (ICP-MS).

PdPt shape	Pd (wt.%)	Pt (wt.%)	Pd (at.%)	Pt (at.%)
dendritic core-shell (NaCl)	77.55	22.45	86.36	13.64
dendritic core-shell (HCl)	71.20	28.80	81.93	18.07
layered core-shell (NaBr)	74.55	25.45	84.30	15.70
mesoporous core-shell (NaI)	52.67	47.33	67.11	32.89

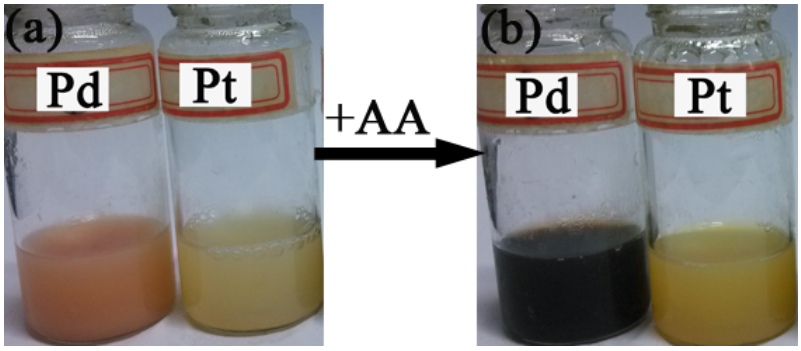

Figure S4. Photograghs of CPC aqueous solutions containing Pd and Pt precursors respectively followed by the introduction of 80 mM NaBr before (a), after (b) the addition of reducing agent AA for 5 min at 90 ℃.

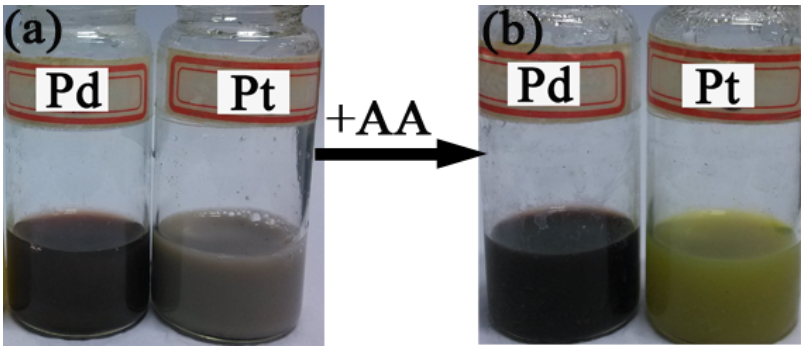

Figure S5. Photograghs of CPC aqueous solutions containing Pd and Pt precursors respectively in the presence of 80 mM NaI before (a), and after (b) the addition of reducing agent AA for 10 min at 90 ℃.

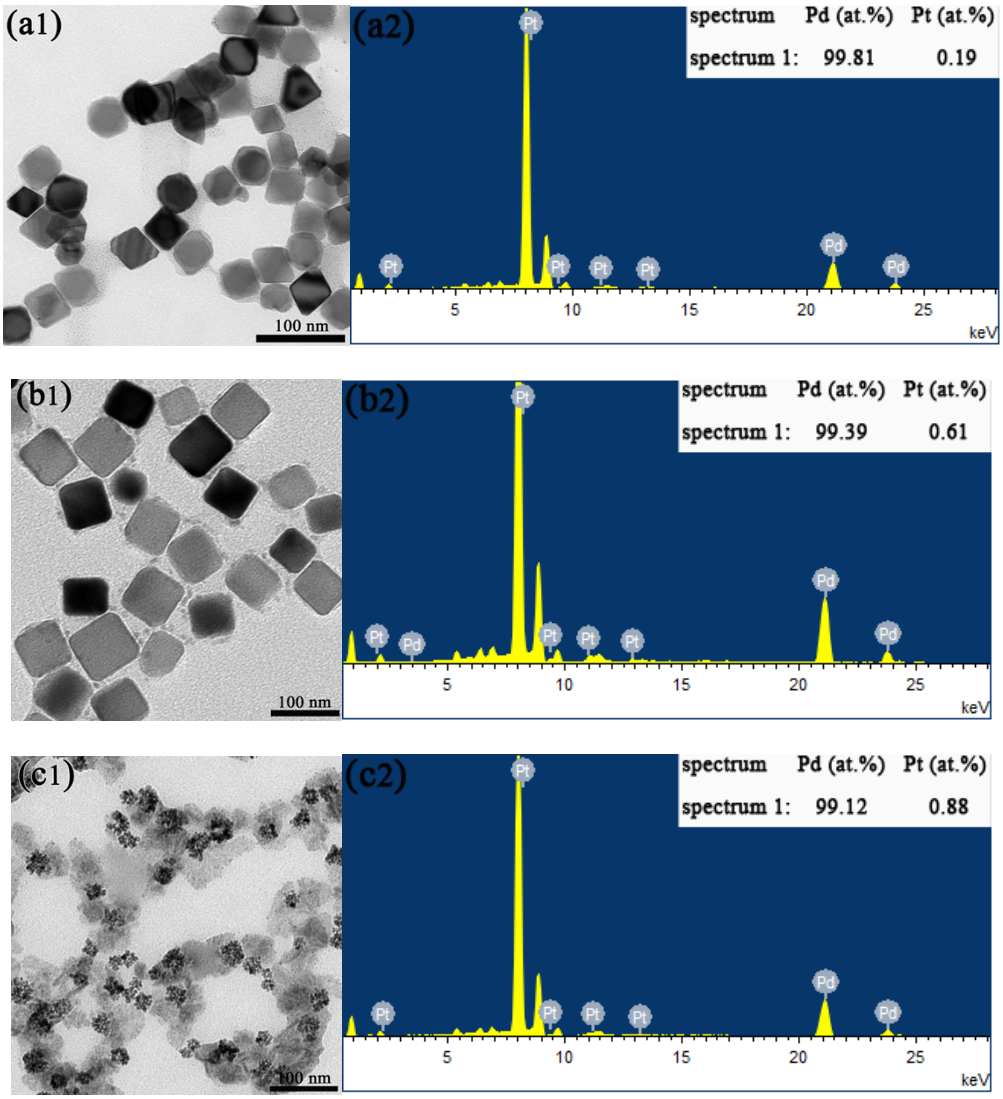

Figure S6. TEM image and the corresponding EDS results of dendritic core-shell (a1, a2), layered core-shell (b1, b2) and mesoporous core-shell (c1,c2) PdPt bimetallic nanoparticles for 1 min reaction time (All the strong peak located at 8 keV is actually the position of Cu element from copper grid with carbon support film loading the samples for TEM test, and the peak is too strong to weaken the signal of Pd around 3 keV.).

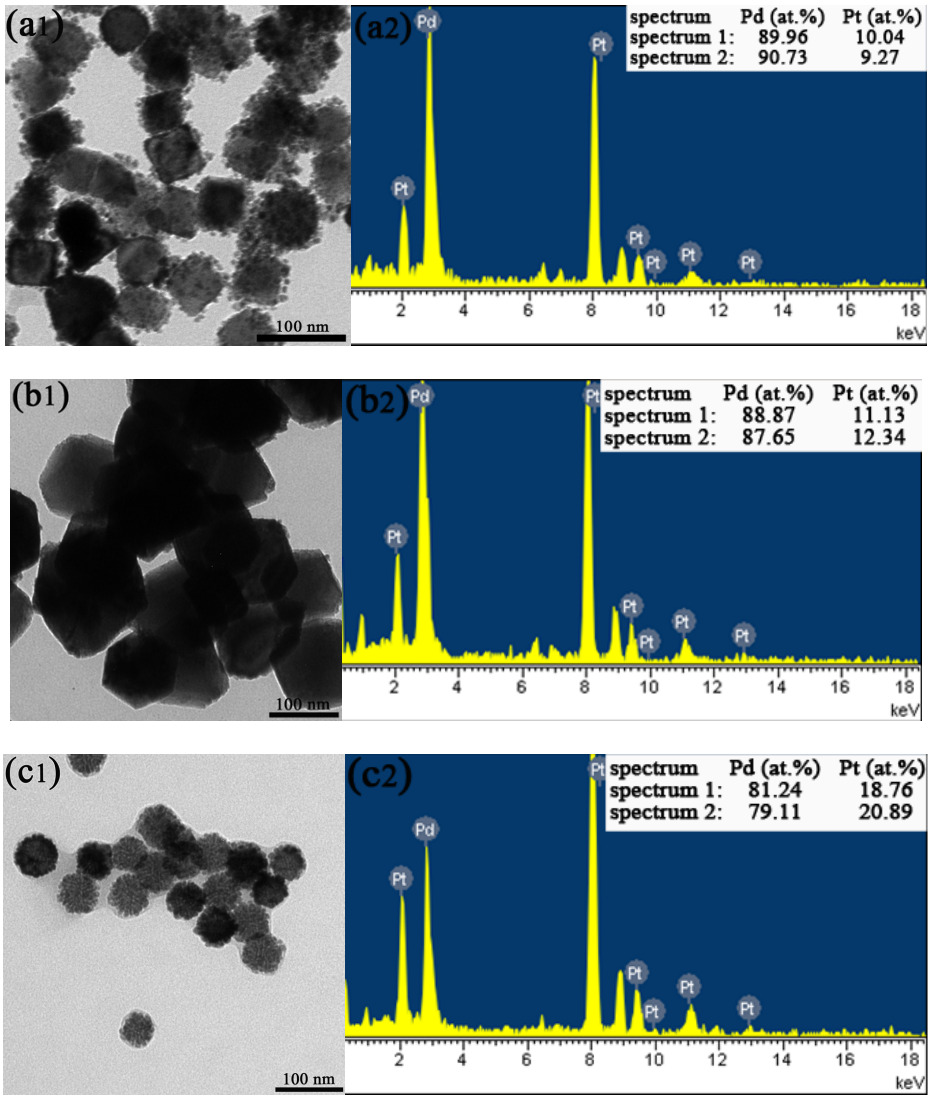

Figure S7. TEM image and the corresponding EDS results of dendritic core-shell (a1, a2), layered core-shell (b1, b2) and mesoporous core-shell (c1,c2) PdPt bimetallic nanoparticles for 40 min reaction time.

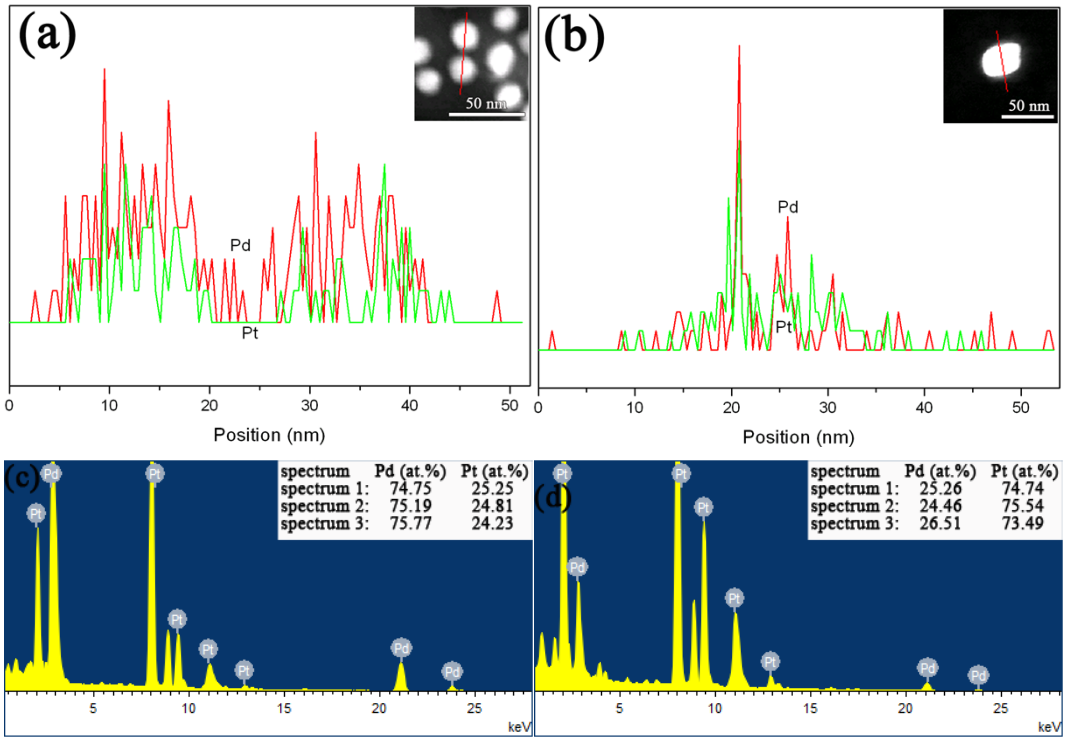

Figure S8. EDX line scan (a, b), EDS (c, d) results of layered (a, c) and mesoporous (b, d) PdPt bimetallic nanoparticles corresponding to Figure 5b3 and Figure 5c3, respectively.

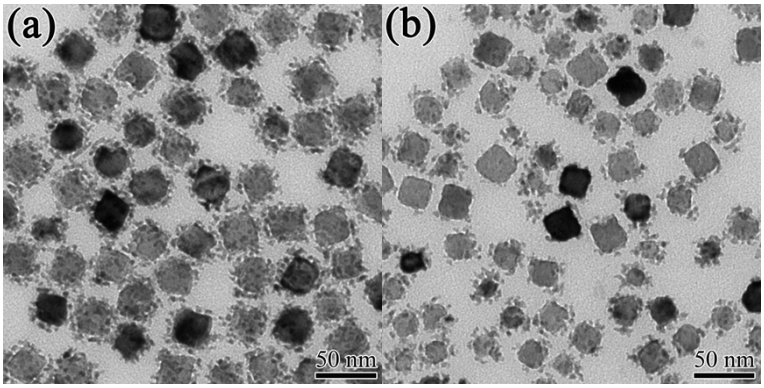

Figure S9. TEM images (a−b) of dendritic core-shell PdPt bimetallic nanoparticles without the involvement of any additional halide ions in the case of (a) the precursors of Pd and Pt simultaneously present in the mixture solution for one-step method, (b) Pd nanocubes premade as seeds followed by the addition of Pt precursors for two-step method.

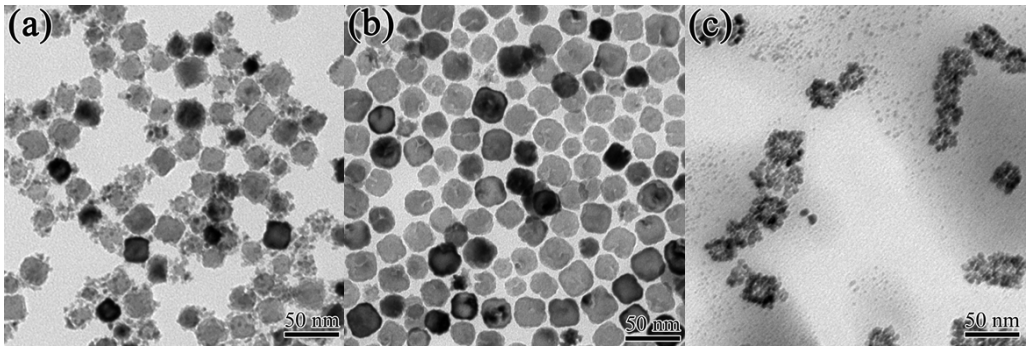

Figure S10. TEM images (a−c) of PdPt bimetallic nanoparticles synthesized with premade Pd nanocubes as seeds, followed by the addition of Pt precursors and the introduction of various halides: (a) 80 mM NaCl; (b) 80 mM NaBr; (c) 80 mM NaI.

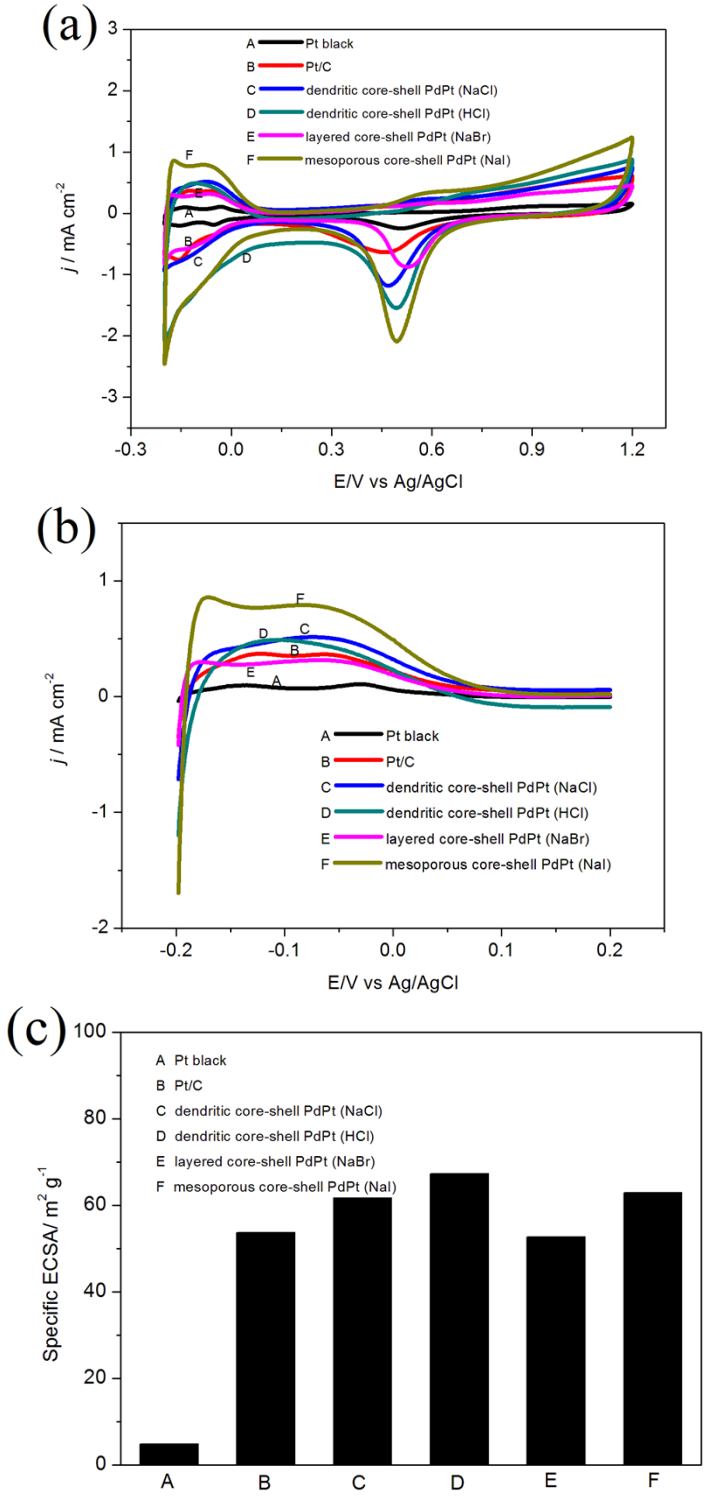

Figure S11. CV curves (a), Blow-ups of the H_{upd} desorption peaks in the potential region from −0.198 to 0.2 V (b), and the specific ECSA (c) of commercial Pt black (A), commercial Pt/C (B), the obtained dendritic core-shell (C, D), layered core-shell (E) and mesoporous core-shell (F) PdPt bimetallic nanoparticles synthesized by involving 80 mM NaCl, HCl, NaBr and NaI, respectively measured in the solution of N_2-purged 0.1 M $HClO_4$ at a scan rate of 50 $mV.s^{-1}$.The loading for all the catalysts was 50 µg/cm^2, the current densities are normalized relative to the area of GCE (0.196 cm^2).

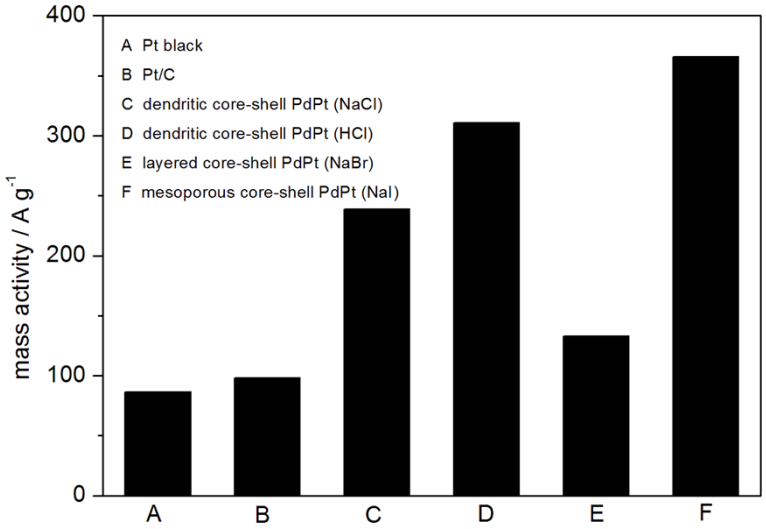

Figure S12. Bar graph in unit mass activity of commercial Pt black (A), commercial Pt/C (B), the obtained dendritic core-shell (C, D), layered core-shell (E) and mesoporous core-shell (F) PdPt bimetallic synthesized by involving 80 mM NaCl, HCl, NaBr and NaI, respectively.