

## Supporting Information Available

### Single-Phase Aqueous Approach toward Pd Sub-10nm Nanocubes and Pd-Pt Heterostructured Ultrathin Nanowires

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### Experimental section.

Chemicals: PVP (CP, MW= 30000), NaBr and SLS were purchased from Beijing Chemical Reagent Company. PdCl<sub>2</sub>, H<sub>2</sub>PtCl<sub>6</sub>.6H<sub>2</sub>O and RhCl<sub>3</sub> were purchased from Beijing research institute for nonferrous metals. Chemicals except PVP were of analytical grade and were used as received without further purification. Deionized water was used throughout.

#### Synthesis of Pd nanocubes.

PdCl<sub>2</sub> (20.0 mg), NaBr (103 mg), PVP (MW=30000, 300 mg) and SLS ( 289 mg) were added into 8.0 mL water with stirred for 5 minutes. The resulting homogeneous orange red solution was transferred to a 12 mL Teflon-lined stainless-steel autoclave. The sealed vessel was then heated at 210°C for 6 h before it was cooled to room temperature. The products were separated via centrifugation at 10000 rpm for 30 minutes and further purified twice by deionized water. Then the products were dispersed with ethanol or deionized water for further use.

#### Synthesis of Rh nanocubes.

RhCl<sub>3</sub> (21.0 mg), NaBr (103 mg), PVP (MW=30000, 300 mg) and SLS ( 289 mg) were added into 8.0 mL water with stirred for 5 minutes. The resulting homogeneous brown solution was transferred to a 12 mL Teflon-lined stainless-steel autoclave. The

sealed vessel was then heated at 220°C for 6 h before it was cooled to room temperature. The products were separated via centrifugation at 10000 rpm for 30 minutes and further purified twice by deionized water. Then the products were dispersed with ethanol.

#### **Synthesis of Pd-Pt heterostructured ultrathin nanowires.**

0.1 ml (approximate 2.30 mg/ml Pd) above-synthesized Pd nanocubes aqueous solution, PVP (MW=30000, 100 mg) and 0.4 ml H<sub>2</sub>PtCl<sub>6</sub> solution (0.1 M) were added into 7.5 ml water with stirred for 5 minutes. The resulting homogeneous yellow solution was transferred to a 12 mL Teflon-lined stainless-steel autoclave. The sealed vessel was then heated at 180°C for a desired time (i.e., 6 h and 12 h) before it was cooled to room temperature. The products were separated via centrifugation at 10000 rpm for 30 minutes and further purified twice by deionized water. Then the products were dispersed with ethanol.

#### **Characterizations.**

Transmission electron microscopy (TEM): The size and morphology of the Nanocrystals were determined by a JEOL JEM-1200EX transmission electron microscope (TEM) at 120 kV, and a Tecnai G2 F20 S-Twin high-resolution transmission electron microscope (HRTEM). The STEM, element analysis mapping and EDS line scanning were determined by a Titan 80-300 Cs-corrected TEM at 300 kV.

X-ray diffraction (XRD): The XRD patterns of samples were recorded on a Rigaku D/max-2400 diffractometer operated at 40 kV voltage and a 200 mA current with Cu K $\alpha$  radiation ( $\lambda= 1.5418\text{\AA}$ ).

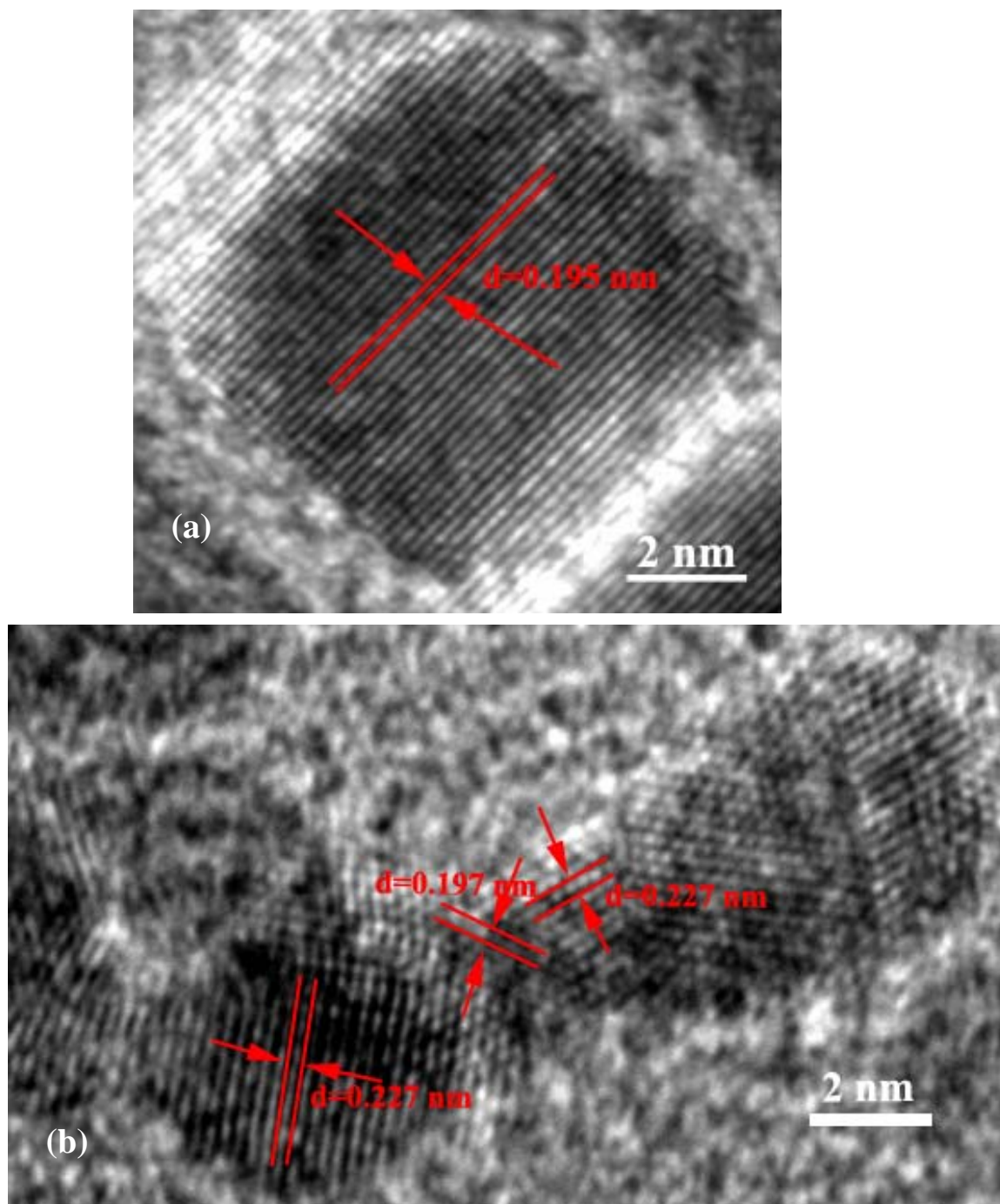


Fig. S1. HRTEM images of Pd nanocube (a) and Pd-Pt heterostructured nanowire (b).

As shown in Fig. S1, the corners of core-shell Pd@Pt structured nodes is rounder than that of Pd nanocubes, and the size of core-shell Pd@Pt structured nodes is much smaller than that of Pd nanocubes. The exposure facets of Pd nanocubes are (200), however, the exposure facets of Pd-Pt heterostructured nanowires mainly are (111) of fcc Pt. From Fig. S1 (b), we can see the Pt stem mainly grew from the corners of

core-shell Pd@Pt structured nodes. The effect of Pd nanocubes is like the bridge pier in the formation of Pd-Pt heterostructured nanowires.

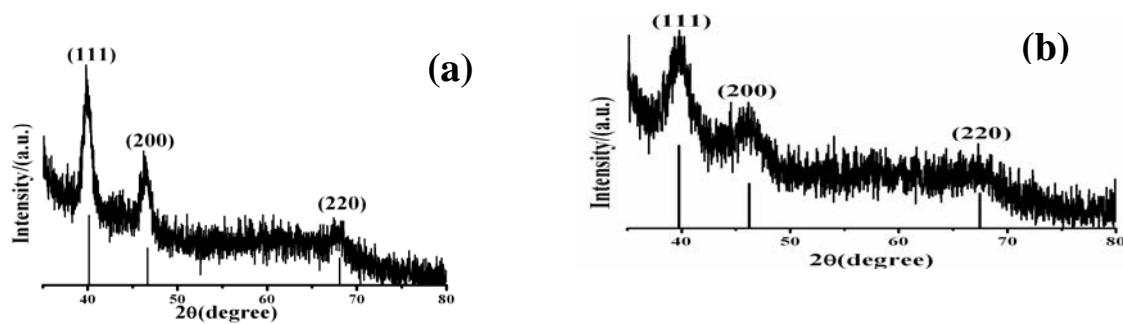


Fig. S2. XRD spectra of Pd nanocubes and heterostructured ultrathin nanowires synthesized at 180 °C for 12 h (b).

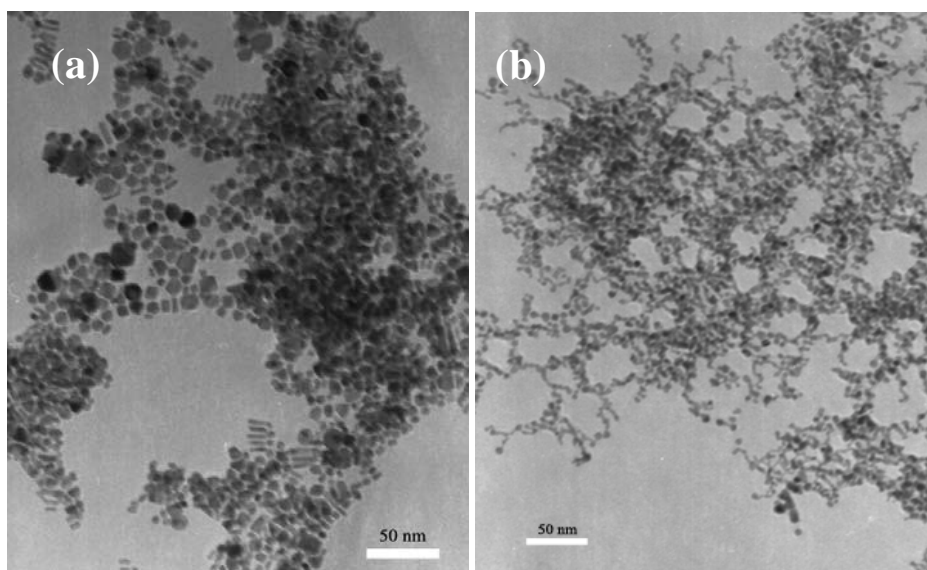


Fig. S3. The TEM pattern of Pd synthesized with the same conditions as Pd nanocubes except without SLS (a) and without NaBr (b).

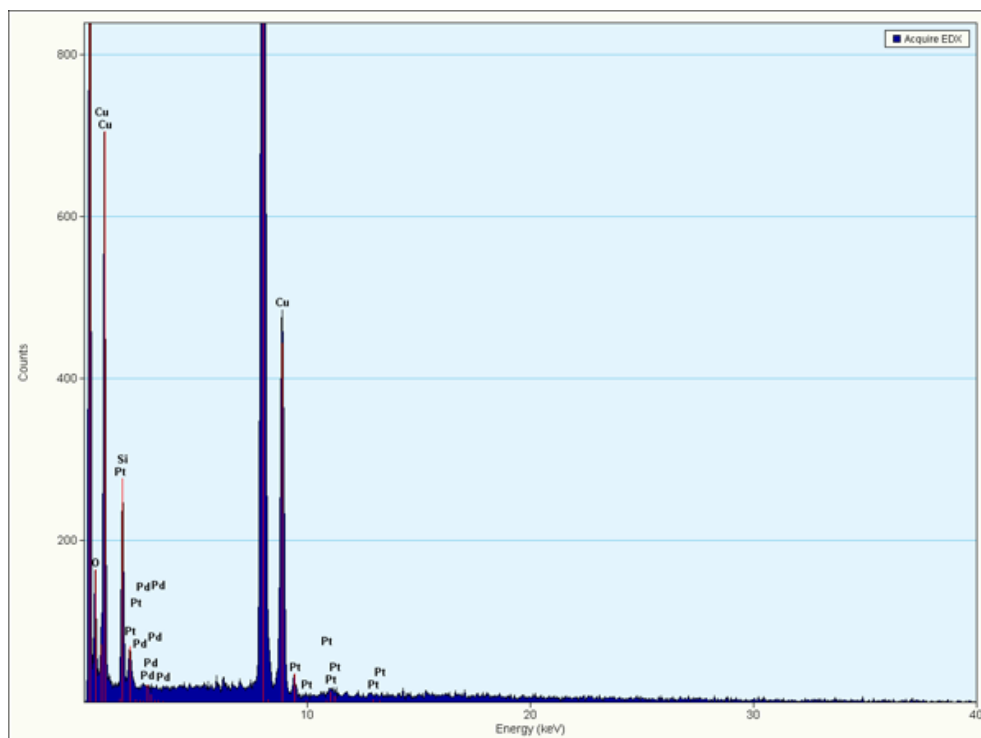


Fig. S4. The EDS spectra of Pd-Pt nanowires prepared for 12 h.