

## Electronic Supplementary Information

# One step synthesis of a hierarchical dendritic Pt nanostructure with the building unit of Pt concave octahedron via simultaneous vertex growth and facet etching

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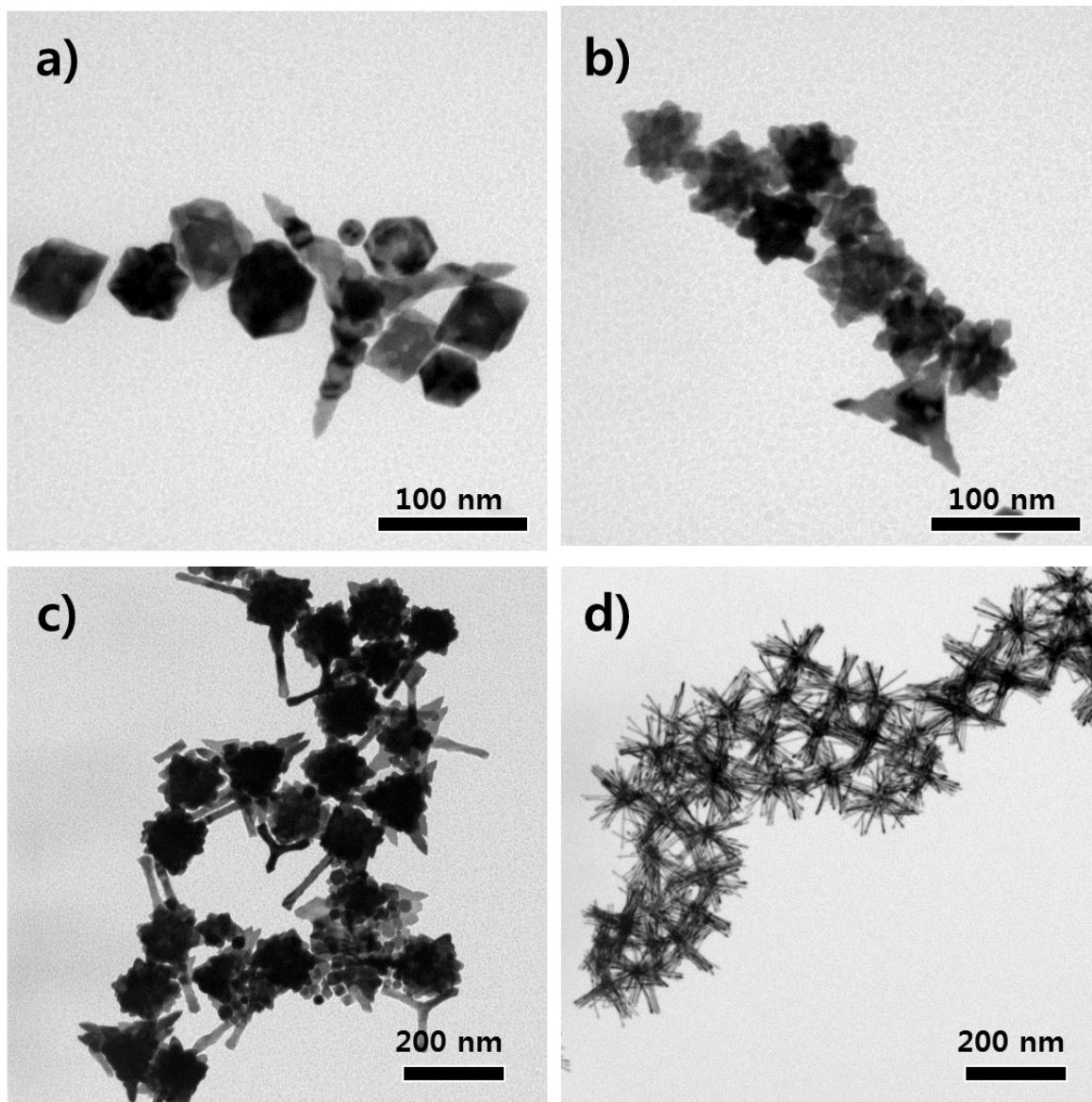
### Material Characterizations

Transmission electron microscopy (TEM) and high-resolution TEM (HRTEM) were performed on a TECNAI G2 20 S-Twin operated at 200 kV and TECNAI G2 F30 operated at 300 kV. Elemental mapping and energy dispersive X-ray spectra (EDX) were obtained with a FEI Titan Cubed 60-300 with Chemi-STEM technology and a JEOL ARM200F Cs STEM. X-ray diffraction (XRD) patterns were collected with a Rigaku Ultima III diffractometer system using a graphite-monochromatized Cu-K $\alpha$  radiation at 40 kV and 40 mA.

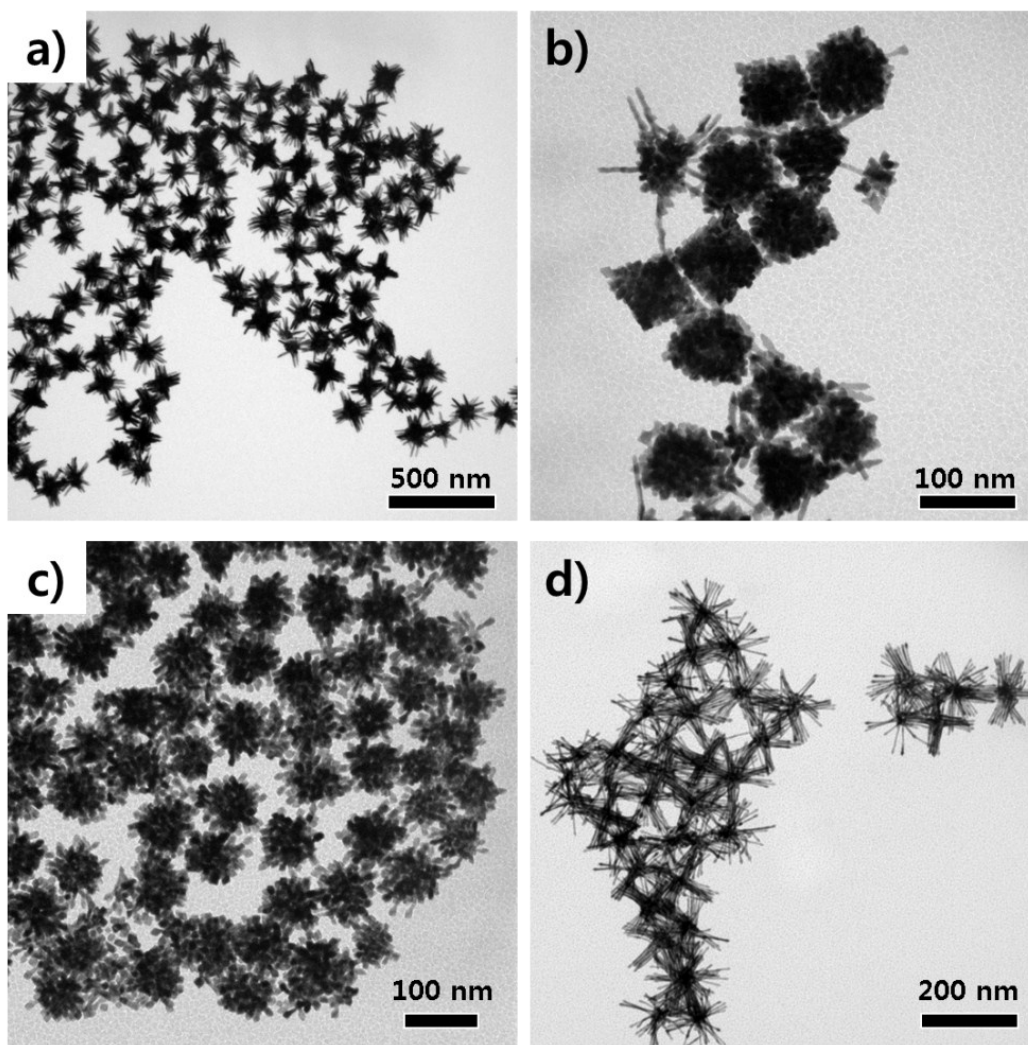
### Experimental Section

#### *Preparation of hierarchical dendritic Pt nanostructure with the building unit of Pt concave octahedron*

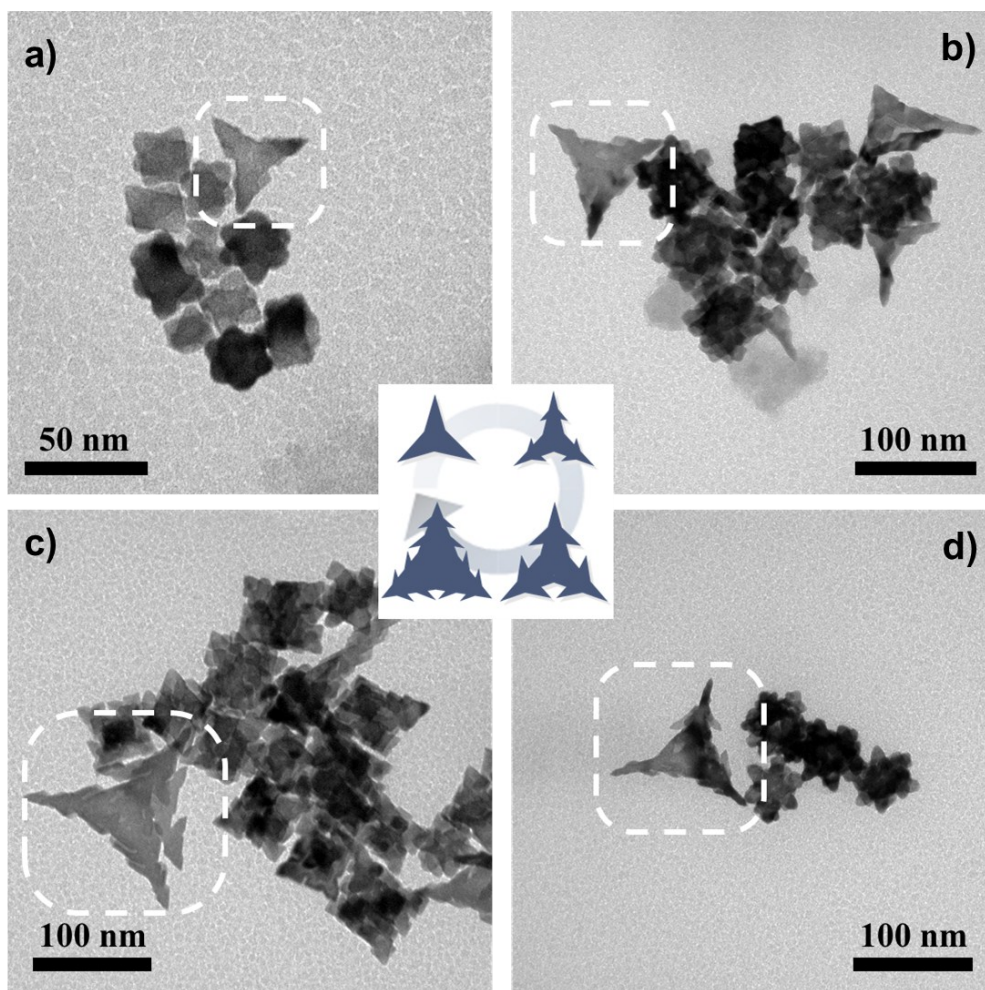
In a typical synthesis of Pt nanocrystals, a solution of Pt(acac)<sub>2</sub> (0.02 mmol, Aldrich, 97%), CTAB (Cetyltrimethyl ammonium bromide) (0.10 mmol, Aldrich, 99%) in octadecylamine (15 mmol, Aldrich, 90%) was prepared in 100 mL Schlenk tube. After removing gas in the solution under vacuum 10 minutes at 100°C, mixed gas (O<sub>2</sub> 20%, N<sub>2</sub> 80%) was charged into the tube. Then the tube was directly injected to hot oil bath at 165°C. After 11 hours, the reaction mixture was cooled down to room temperature. The product was purified by multiple centrifugal separation with added toluene and methanol.



**Fig. S1** TEM images of Pt nanocrystals at different reaction temperature. a) 145°C, b) 165°C, c) 185°C, d) 210°C



**Fig. S2** Low resolution TEM images of synthesized Pt nanocrystals at various condition in Fig. 3.



**Fig. S3** TEM temporal images of side product hierarchical nanocrystals with different structural features. a) 3 h, b) 4 h, c) 10 h, d) 5 h.