Supporting Information

Strain-induced Stranski-Krastanov growth of Pd@Pt core-shell hexapods and octapods as electrocatalysts for methanol oxidation

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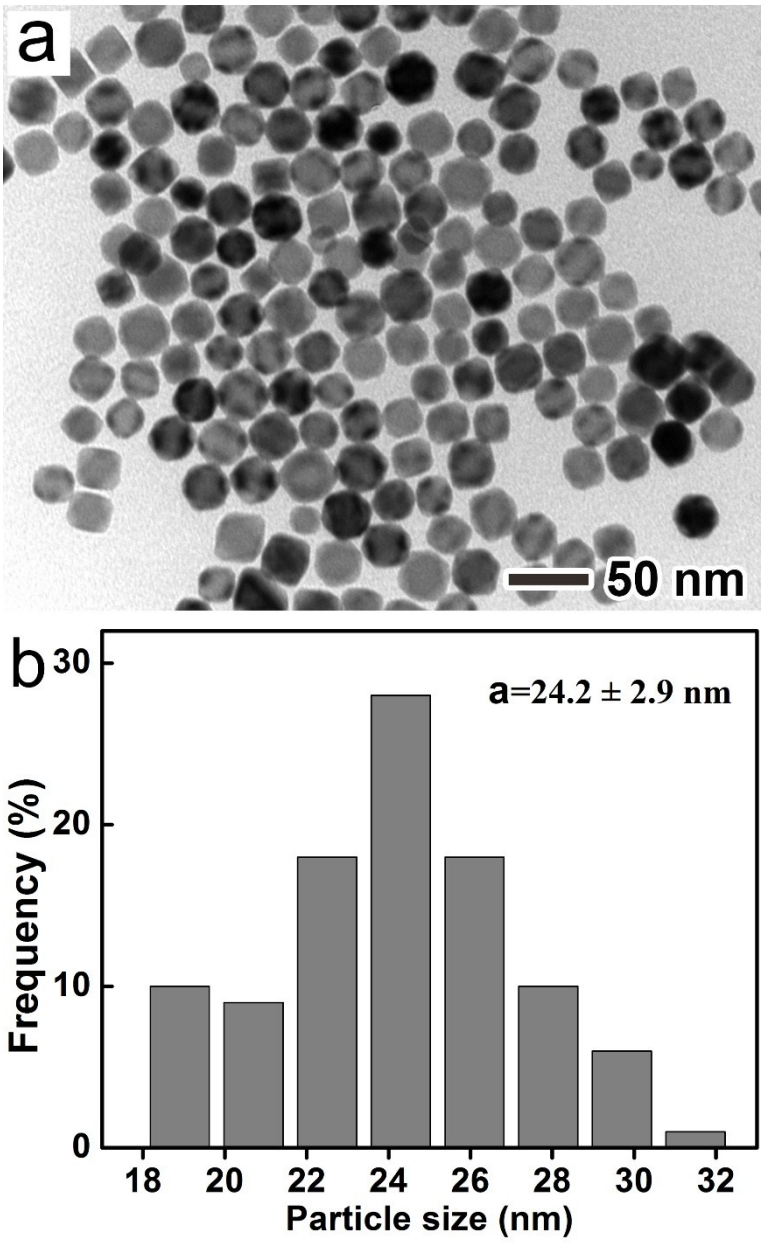

Figure S1. (a) TEM image and (b) size distribution of the Pd octahedra serving as the seeds for the synthesis of Pd@Pt hexapods.

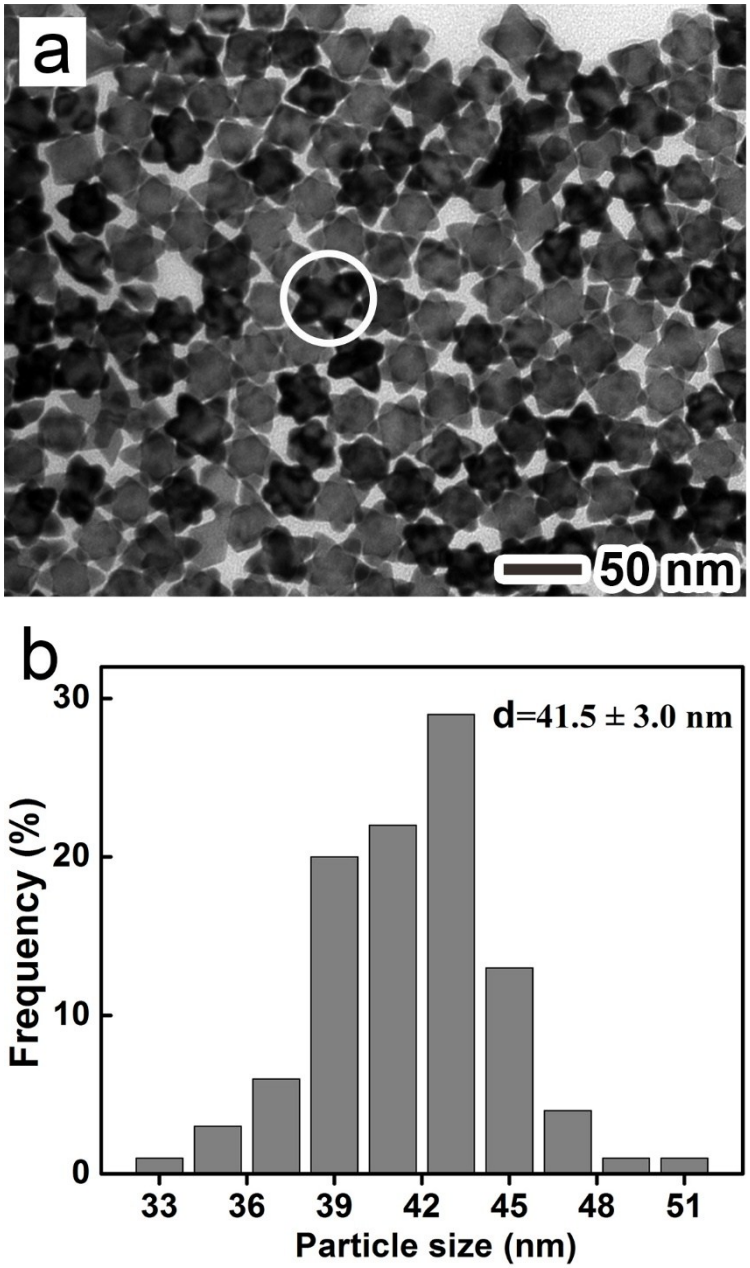

Figure S2. (a) TEM image of the Pd@Pt hexapods at lower magnification and (b) the corresponding size distrubution.

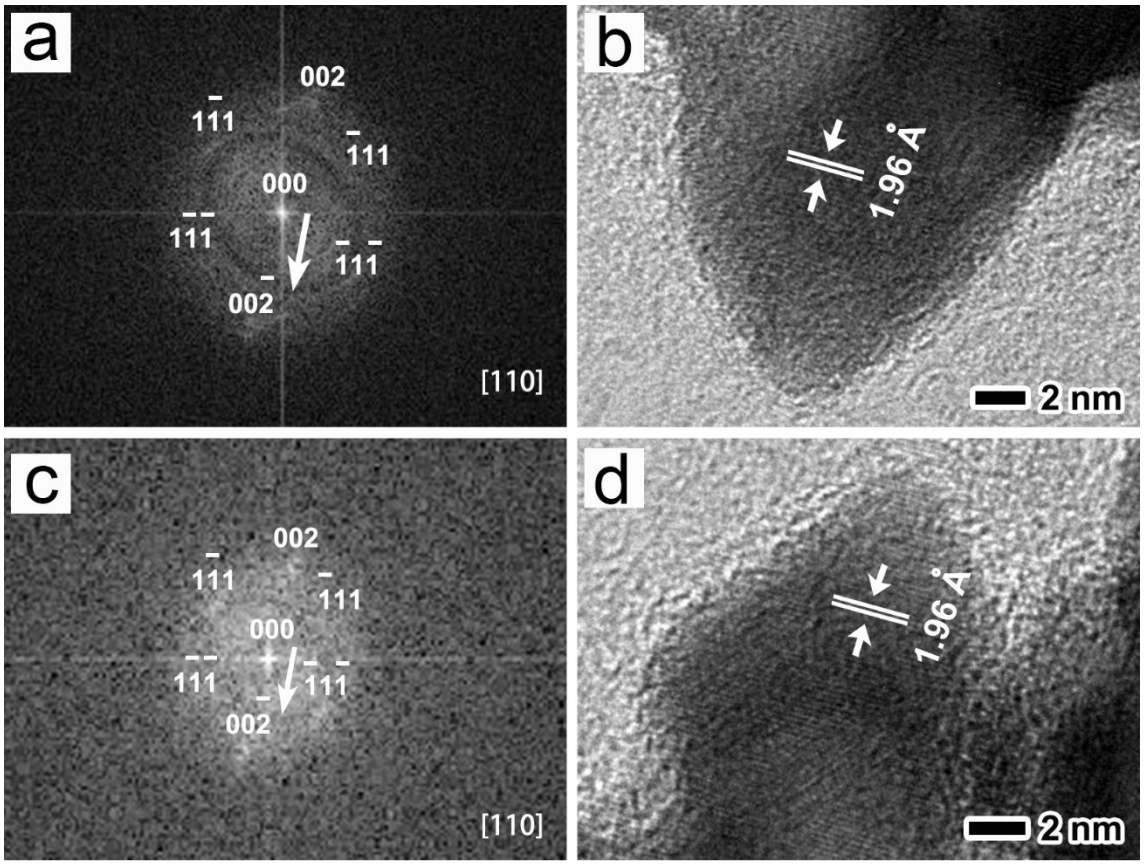

Figure S3. (a, c) Fast Fourier transform (FFT) patterns of the Pd@Pt hexapods and (b, d) their corresponding HRTEM images.

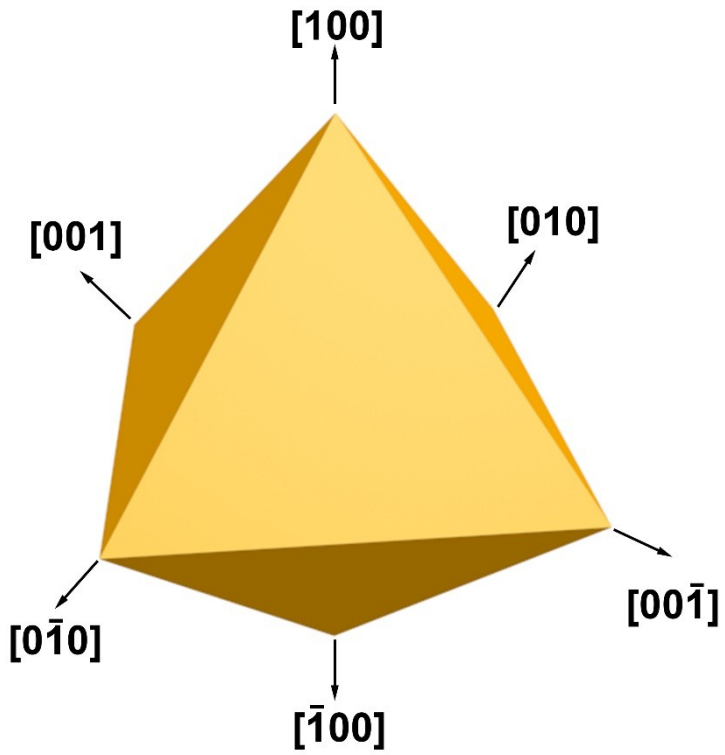

Figure S4. Schematic illustration showing six equivalent <100> directions from six corners for an octahedral seed.

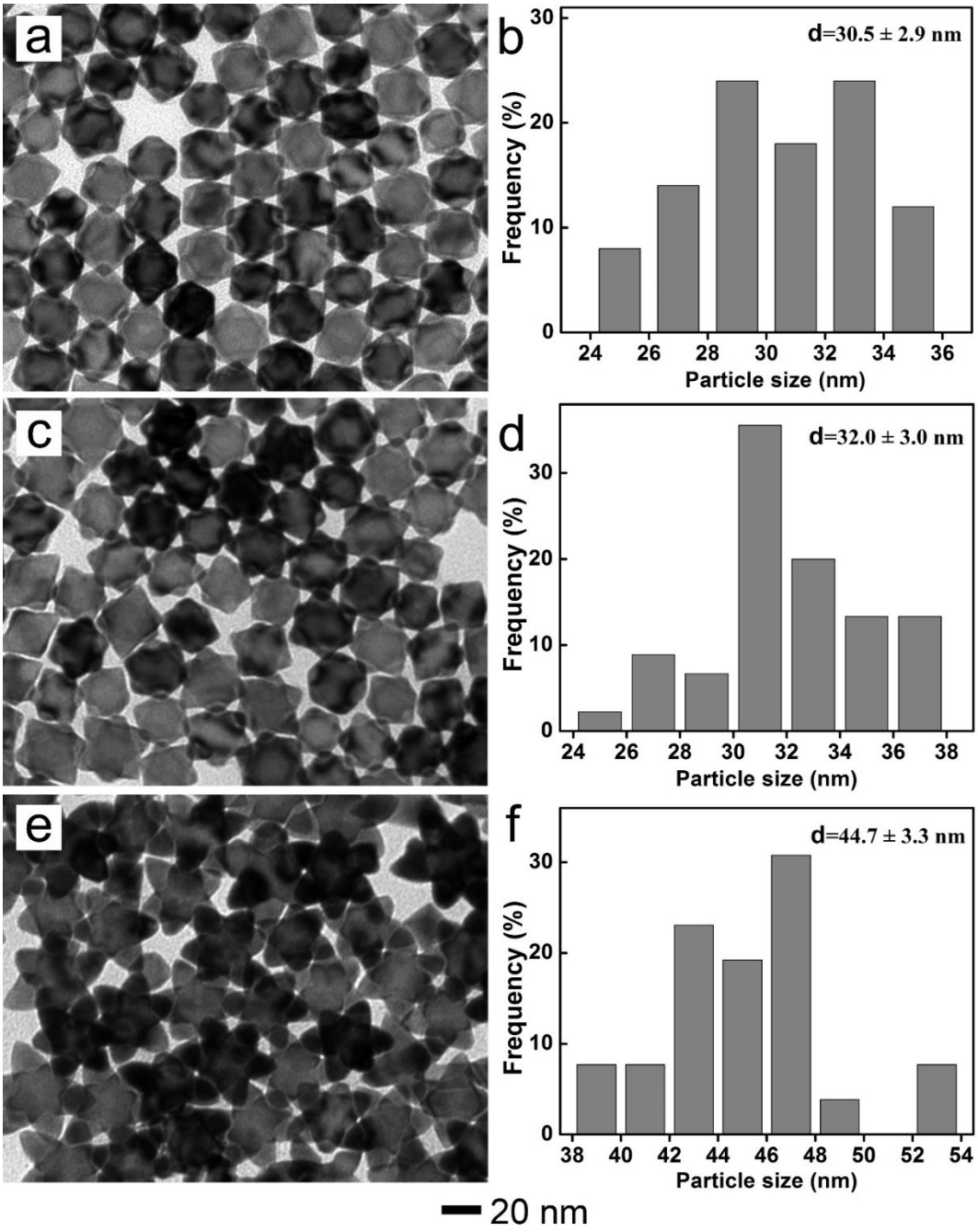

Figure S5. TEM images and the corresponding size distributions of the Pd@Pt hexapods obtained by varying the amount of H_2PtCl_6 with Pd octahedra of 24.2 nm in size as the seeds: (a, b) 1.8, (c, d) 3.6, and (e, f) 9 mg.

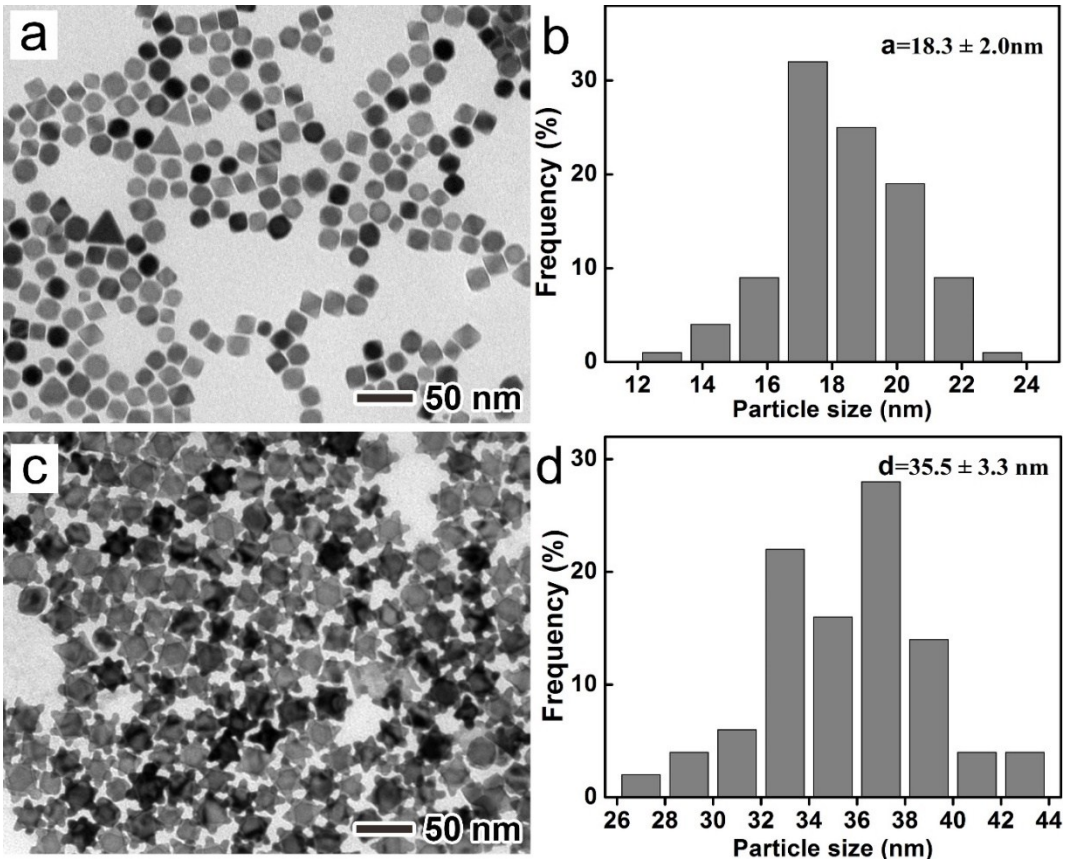

Figure S6. (a) TEM image and (b) size distribution of the Pd octahedral seeds with average size of 18.3 nm. (c) TEM image and (d) size distribution of the Pd@Pt hexapods prepared using above-mentioned Pd octahedra as the seeds in the presence of 14 mg H_2PtCl_6.

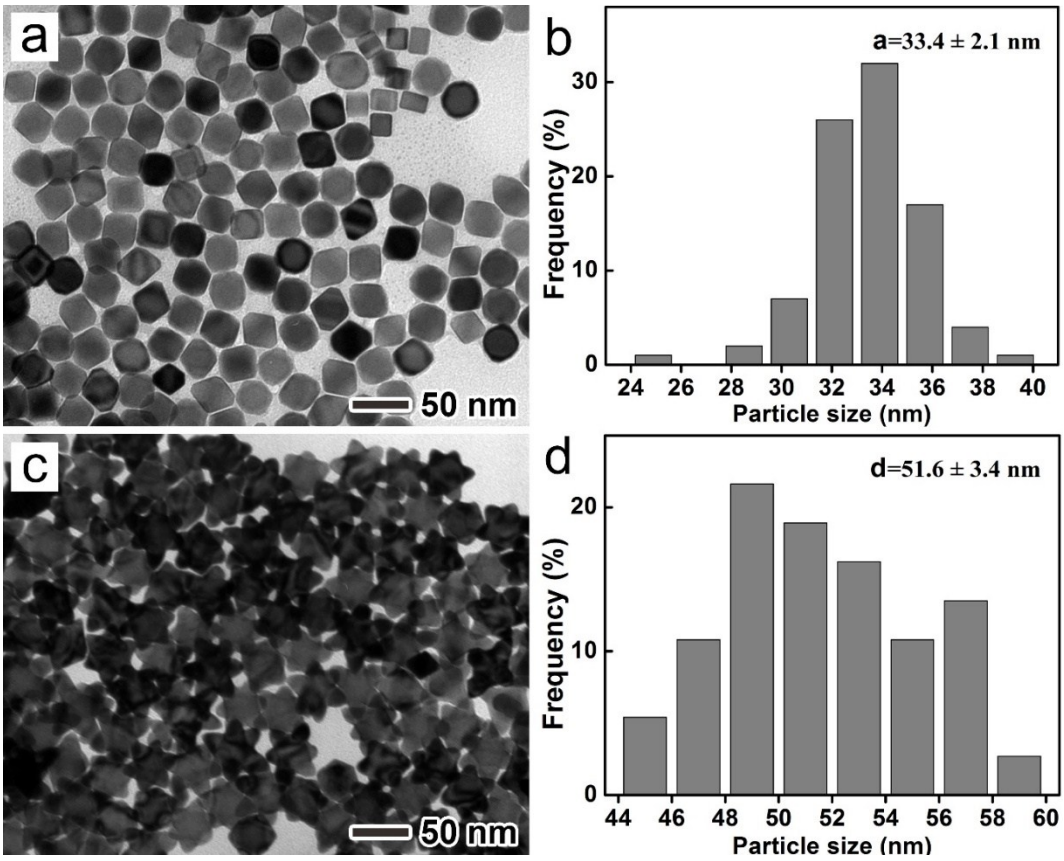

Figure S7. (a) TEM image and (b) size distribution of the Pd octahedral seeds with average size of 33.4 nm. (c) TEM image and (d) size distribution of the Pd@Pt hexapods prepared using the above-mentioned Pd octahedra as the seeds in the presence of 14 mg H_2PtCl_6.

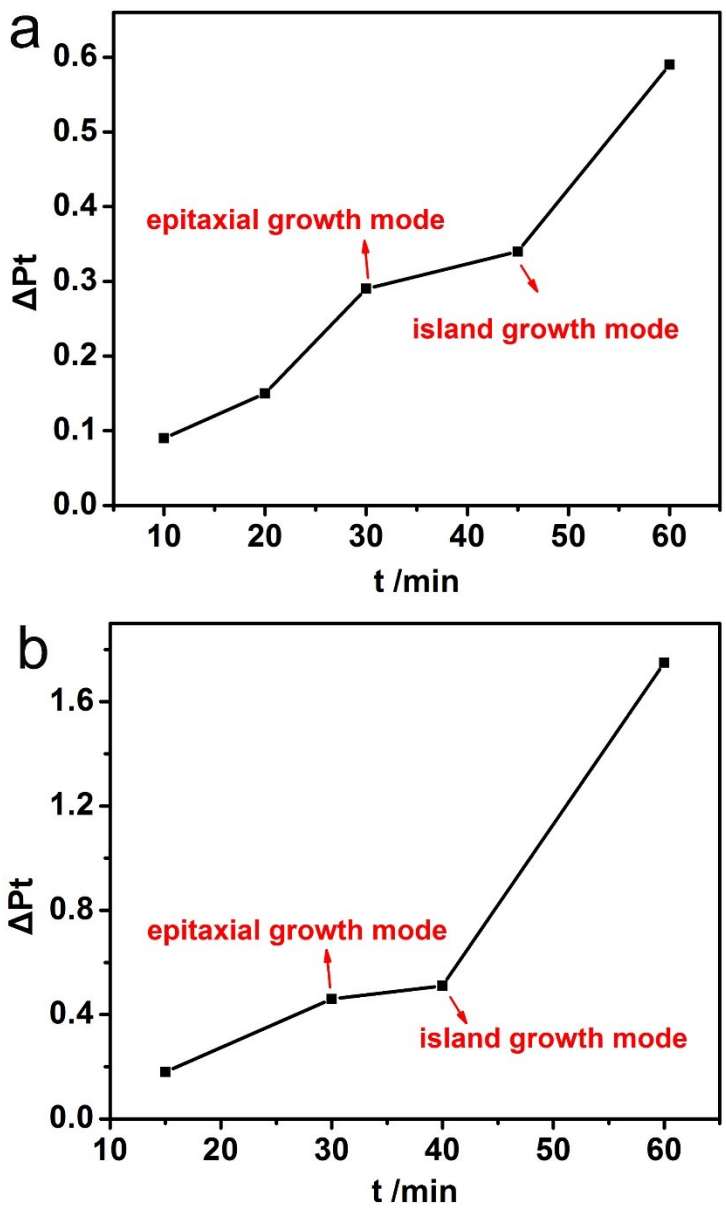

Figure S8. Change in mol % of Pt (ΔPt) during the reaction for the synthesis of (a) Pd@Pt hexapods and (b) Pd@Pt octapods.

Table S1. Average number (n) of Pt atomic layers and weight percentage (wt%) of Pt derived from the geometry analysis and ICP-AES data, and the atomic ratio of Pd/Pt determined from ICP-AES data for the samples including Pd@Pt hexapods and octapods.

samples	Reaction time (min)	atomic ratio of Pd:Pt calculated from ICP data	wt% of Pt calculated from ICP data	wt% of Pt calculated from the value of n	n of Pt atomic layers before it switches to island growth
Pd@Pt hexapods	10	1:0.09	14.2	11.4 (n=1)	4
	20	1:0.15	21.6	20.8 (n=2)	
	30	1:0.29	34.7	28.7 (n=3)	
	45	1:0.34	38.4	35.4 (n=4)	
	60	1:0.59	51.2	41.2 (n=5)	
Pd@Pt octapods	/	/	/	13.1 (n=1)	5
	/	/	/	23.6 (n=2)	
	15	1:0.18	24.8	32.3 (n=3)	
	30	1:0.46	45.7	39.5 (n=4)	
	40	1:0.51	48.3	45.6 (n=5)	
	60	1:1.75	76.2	50.7 (n=6)	

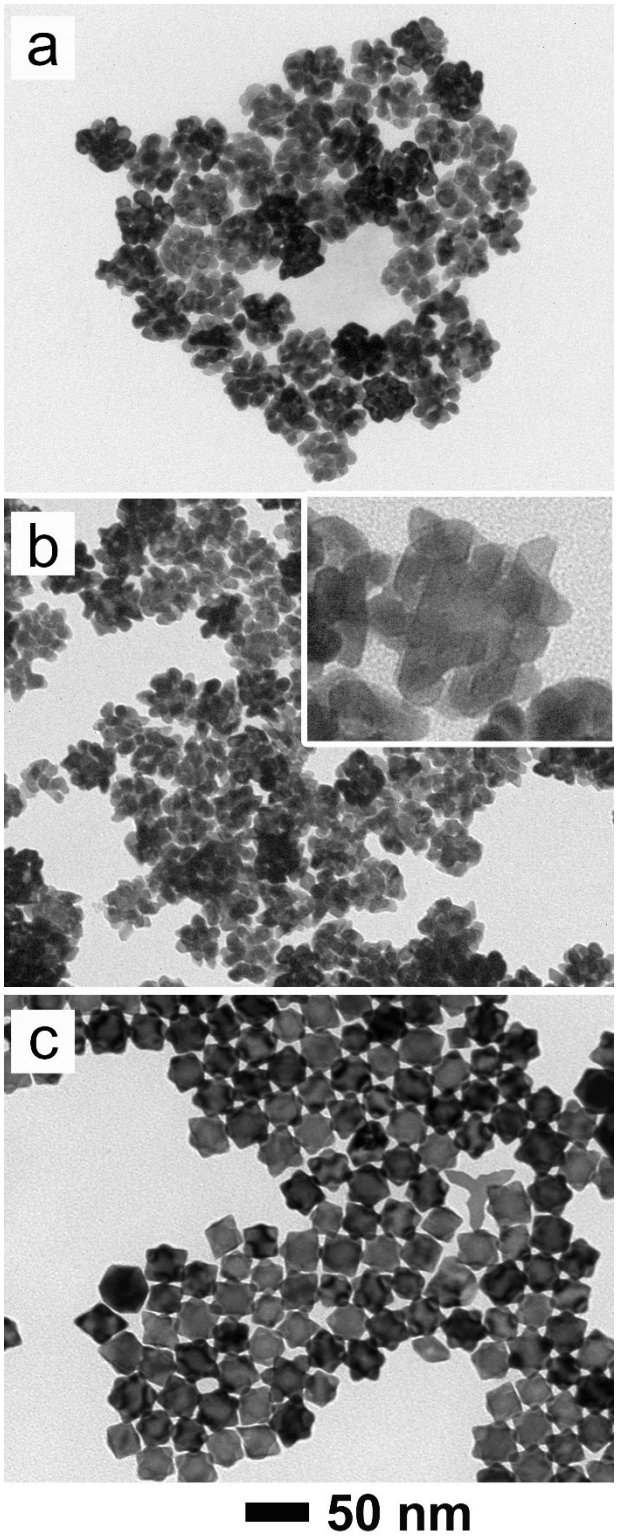

Figure S9. TEM images of the Pd-Pt nanocrystals that prepared using the standard producure with Pd octadra as the seeds, expect for the difference in the amount of solvent. (a) 8 mL of tetrahydronaphthalene and 2 mL of OAm, (b) 5 mL of tetrahydronaphthalene and 5 mL of OAm, (c) 2 mL of tetrahydronaphthalene and 8 mL of OAm.

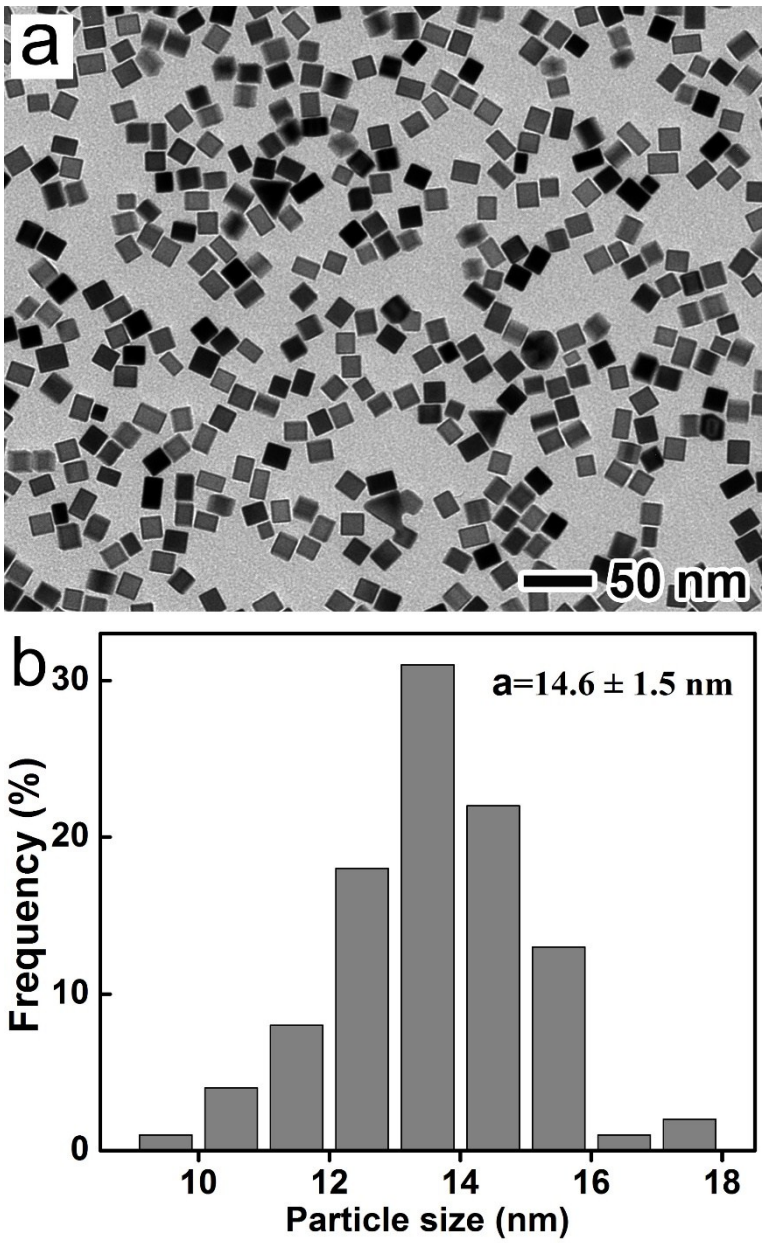

Figure S10. (a) TEM image and (b) size distribution of the Pd cubes serving as the seeds for the synthesis of Pd@Pt octapods.

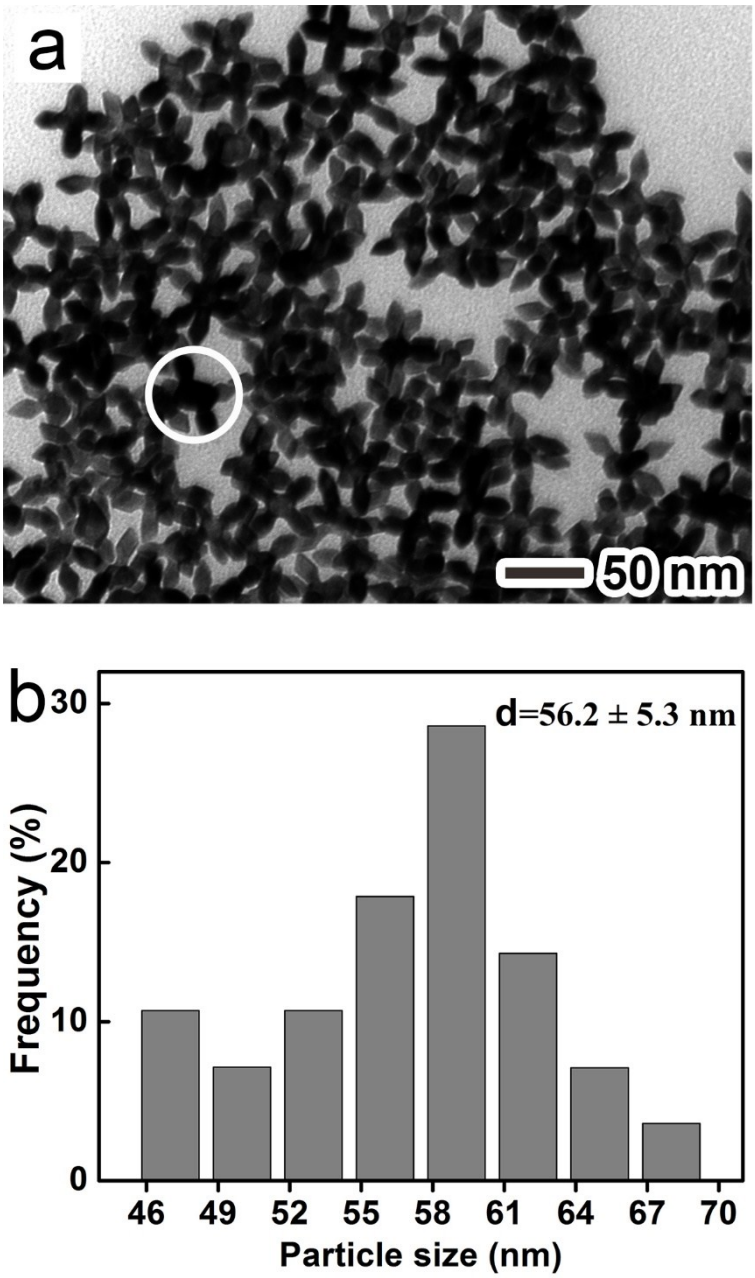

Figure S11. (a) TEM image at low magnification and (b) size distribution of the Pd@Pt octapods prepared by using Pd cubes of 14.6 nm in size as the seeds.

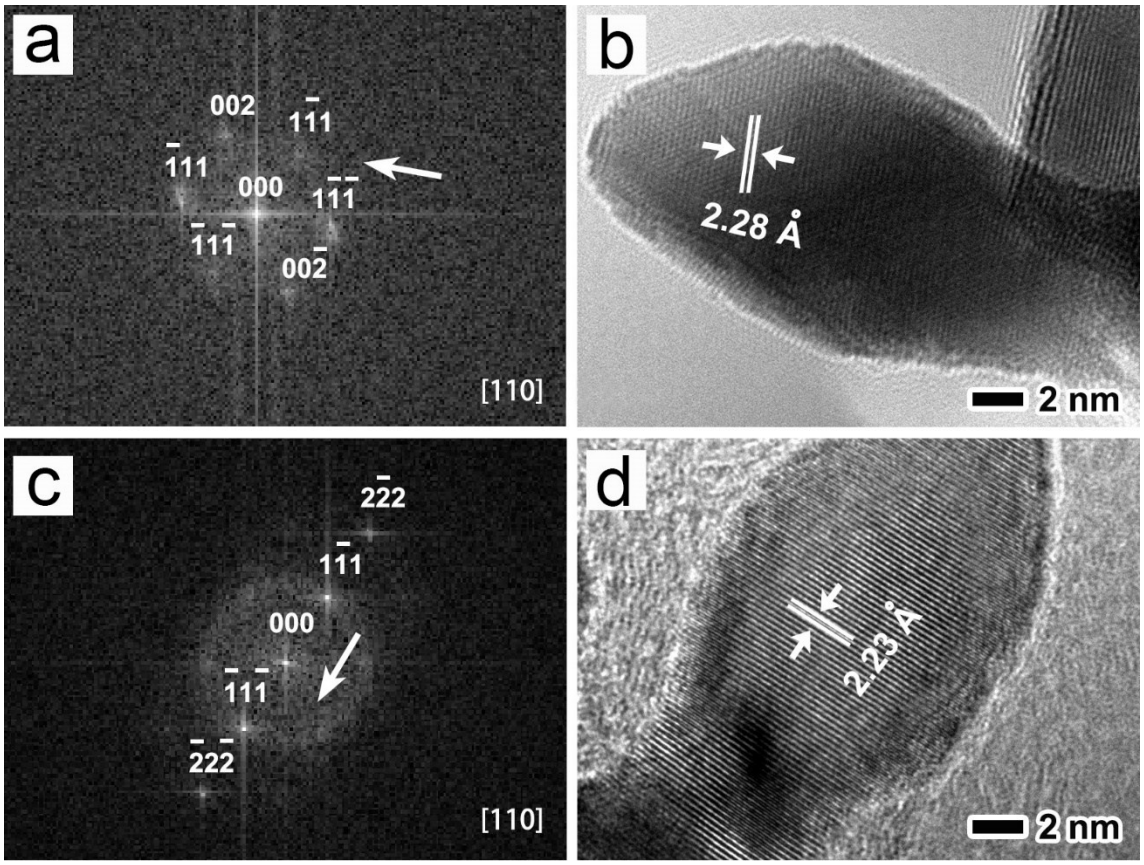

Figure S12. (a, c) Fast Fourier transform (FFT) patterns of the Pd@Pt octapods and (b, d) their corresponding HRTEM images.

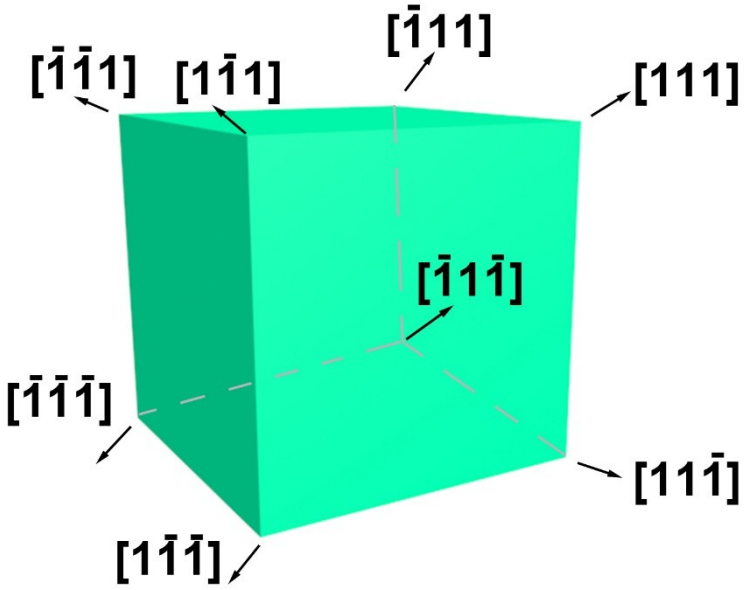

Figure S13. Schematic illustration showing eight equivalent <111> directions from eight corners for an cubic seed.

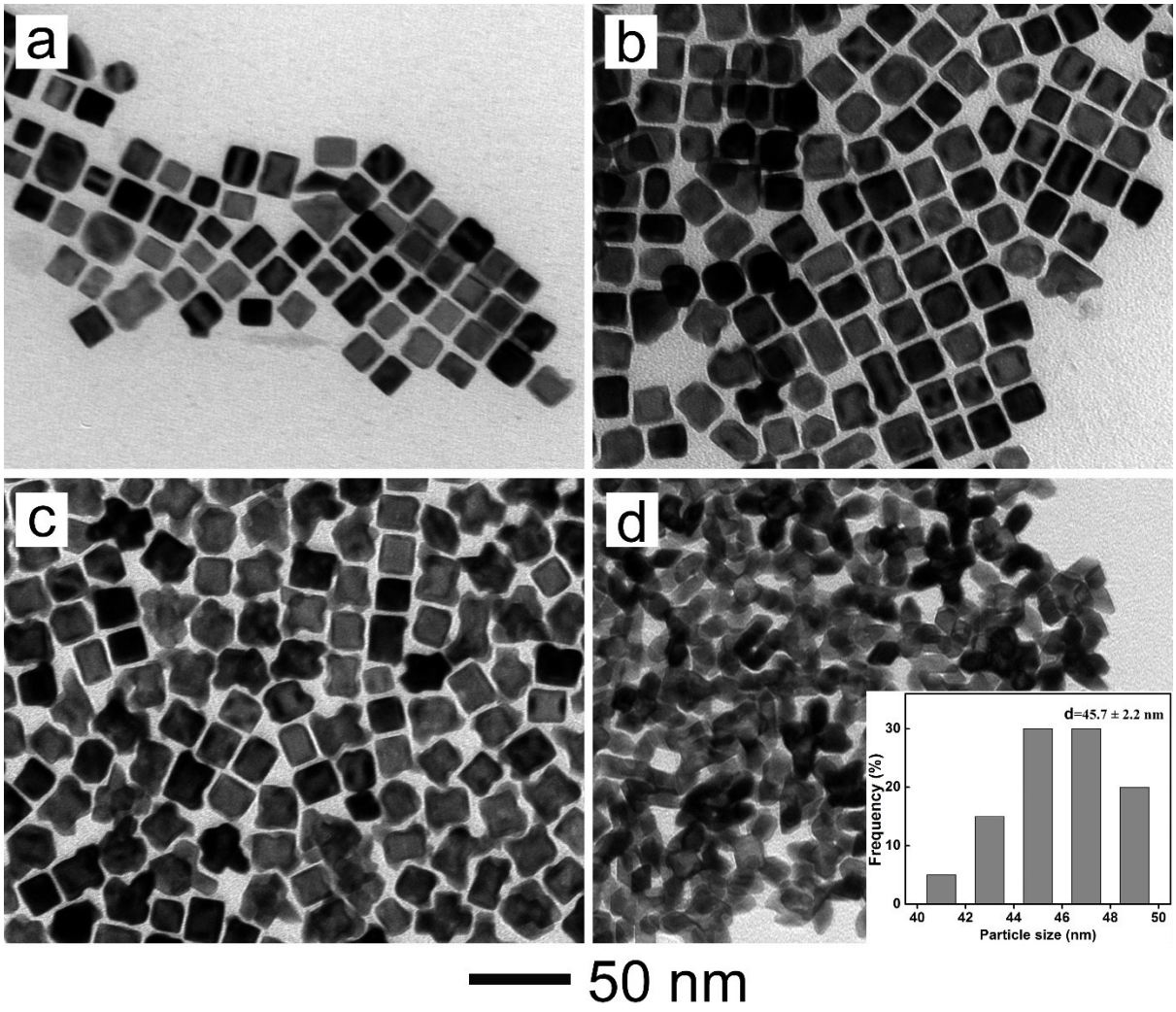

Figure S14. TEM images of the Pd@Pt octapods obtained by varying the amounts of H_2PtCl_6 with Pd cubes of 14.6 nm in szie as the seeds: (a) 4.8, (b) 7.3, (c) 9.7, and (d) 23.2 mg. The inset in (d) shows the size distribution of the Pd@Pt octapods obtained in the presence of 23.2 mg H_2PtCl_6.

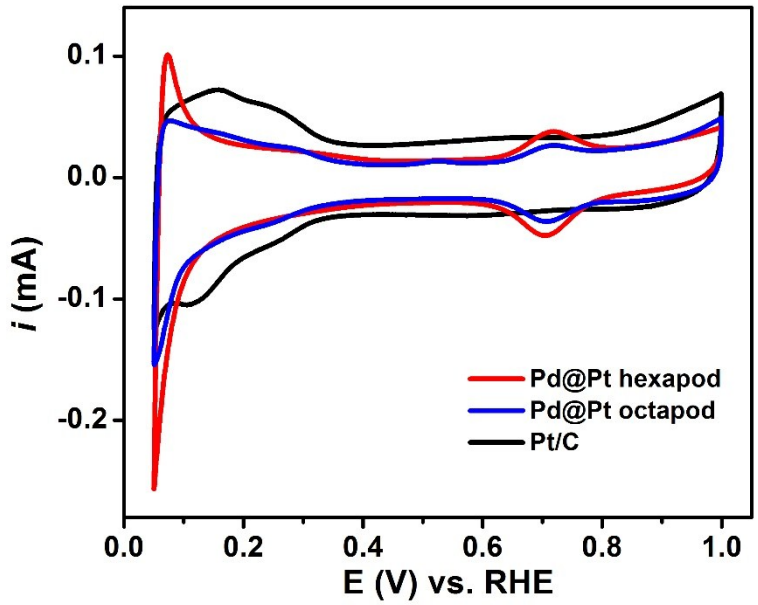

Figure S15. CV curves of the Pd@Pt hexapods (red), Pd@Pt octapods (blue), and Pt/C (black) in 0.1 M $HClO_4$ solution at a scan rate of 50 mV/s

Table S2. ICP-AES, ECSA, and I_f/I_b data of these three catalysts including the Pd@Pt hexapods, Pd@Pt octapods, and Pt/C.

Samples	Pd/Pt atomic ratio	ECSA (m^2/g_{Pt})	I_f/I_b
Pd@Pt hexapods	1:2.8	26.3	1.60
Pd@Pt octapods	1:4	25.8	1.28
Pt/C	/	57.8	1.26