Supporting Information

Pt/Fe_3O_4 Core/Shell Triangular Nanoprisms by Heteroepitaxy: Facet Selectivity at the Pt-Fe_3O_4 Interface and the Fe_3O_4 Outer Surface

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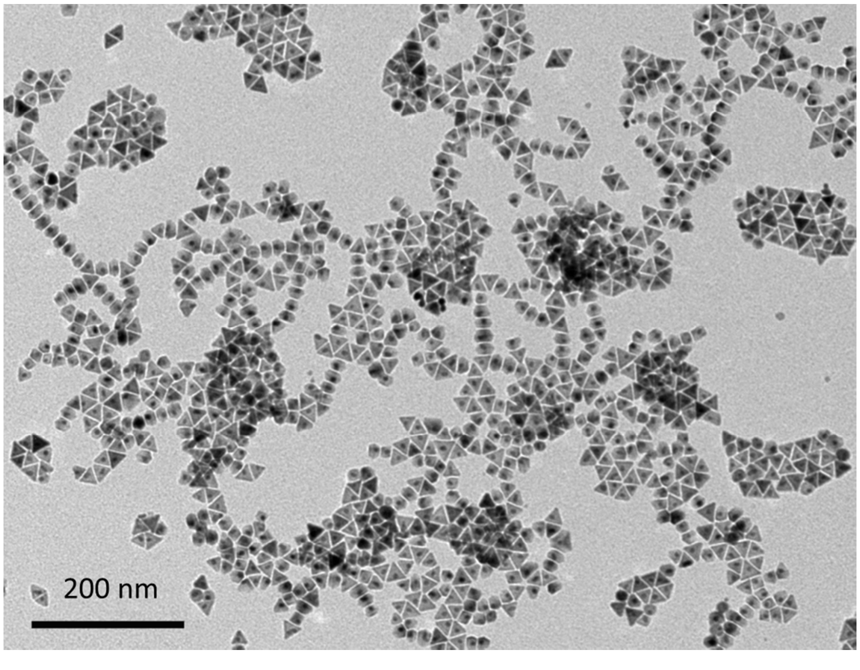

Figure S1: Figure 1a with high magnification.

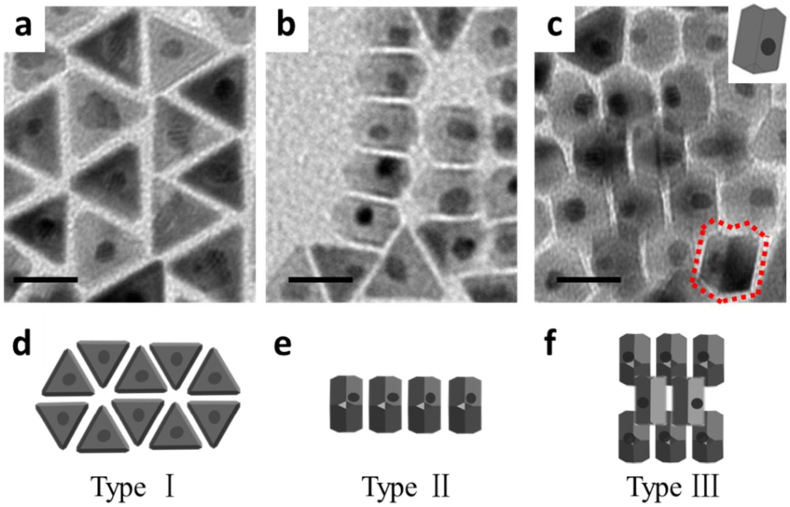

Figure S2. Three assembly patterns identified in TEM measurements (a, b, c). Insert in c gives the model for nanocrystal outlined within the dash lines. Scale bar: 20nm. Models d, e, and f are the corresponding illustration of the assemblies in a, b, and c, respectively. Evidently, Type III (c and f) pattern is a hybridization of Type I and Type II.

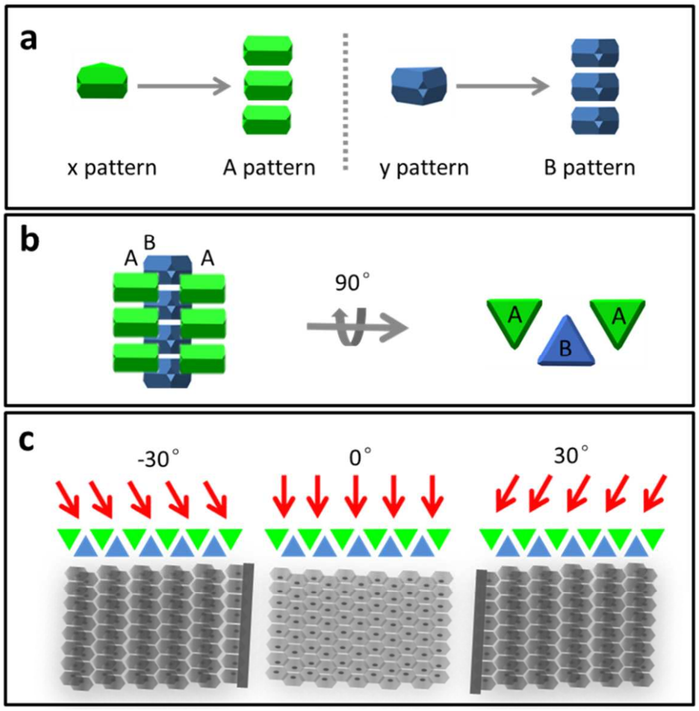

Figure S3. a) Illustration of relationship between single nanocrystal orientation and assembly patterns. b) Top view (left) and side view (right) of a small area of assembly. c) Large area views from different view angles.

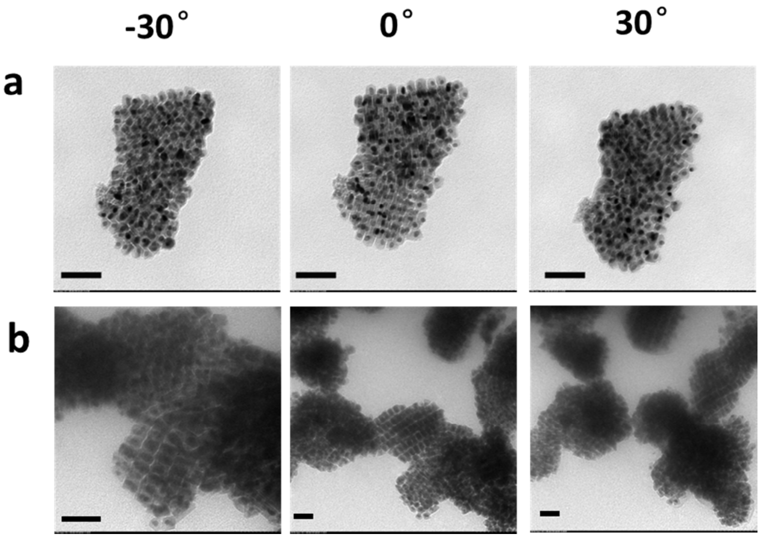

Figure S4: Rotated TEM images of the assemblies in multi-layers corresponding to the models in Figure S3. Scale bar: 50 nm.

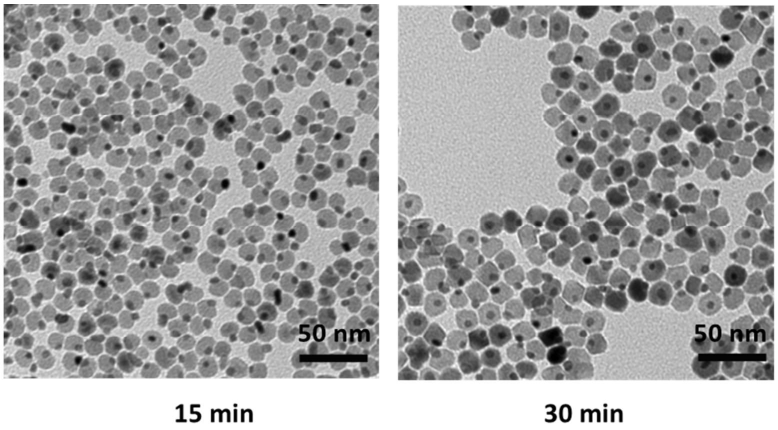

Figure S5: TEM images of dumbbell-like heterostructures at different reaction times. **Synthetic Method:** 4.5 mg platinum acetylacetonate, 1.5 mg iron stearate, 0.325 g n-octadecylamine, 0.11g myristic acid and 2 ml octodecane were mixed together and heated up to 120 °C for 10 minutes with Ar. Increased the temperature to 310 °C for 20 minutes. Cooled the reaction mixture to below 150 °C, then, added 0.12 g iron myristate and 0.4 ml octodecane. Increased the reaction temperature to 310 °C for 15 min and obtained heterogeneous nanostructure as shown to the left. If we prolongated the reaction time to 30 min, the iron oxide domain grew large and appeared faceted. However, irregular morphology of the iron oxide portion was still apparent for these large particles with the Pt seeds partially connected to the large iron oxide domains. The replacement of myristic acid and iron myristate by palmitic acid and iron palmitate would lead to similar result.

Table S1. EXAFS fitting parameters at Fe K-edge.

Sample	Path	p	N	R (Å)	σ^2 (10^{-3}Å^2)	ΔE_0 (eV)
Fe foil	Fe-Fe$_1$		8.0	2.47	5.0	4.0
	Fe-Fe$_2$		6.0	2.84	5.8	4.0
FeO	Fe-O		6	2.12	4.4	2.2
	Fe-Fe		12	3.07	6.4	4.0
Fe_3O_4	Fe-O$_1$		1.3	1.88	4.0	1.8
	Fe-O$_2$		4	2.06	4.8	1.8
	Fe-Fe$_1$		4	2.97	7.6	3.3
	Fe-Fe$_2$		8	3.48	8.3	3.3
Pt seed	Fe-O	0.3	1.7	2.03	5.0	2.6
	Fe-Pt		6.0	2.70	8.5	-3.9
Pt@Fe_3O_4	Fe-O$_1$		1.3	1.87	4.1	1.7
	Fe-O$_2$		3.8	2.04	5.5	1.7
	Fe-Pt		0.8	2.70	8.4	-3.3
	Fe-Fe$_1$		3.8	2.98	7.7	3.0
	Fe-Fe$_2$		7.8	3.47	8.5	3.0

*p: Fe atoms are in the mixture of FeO and FePt alloy in the Pt seed. “p” is denoted as the proportion of Fe existed in the form of FeO.

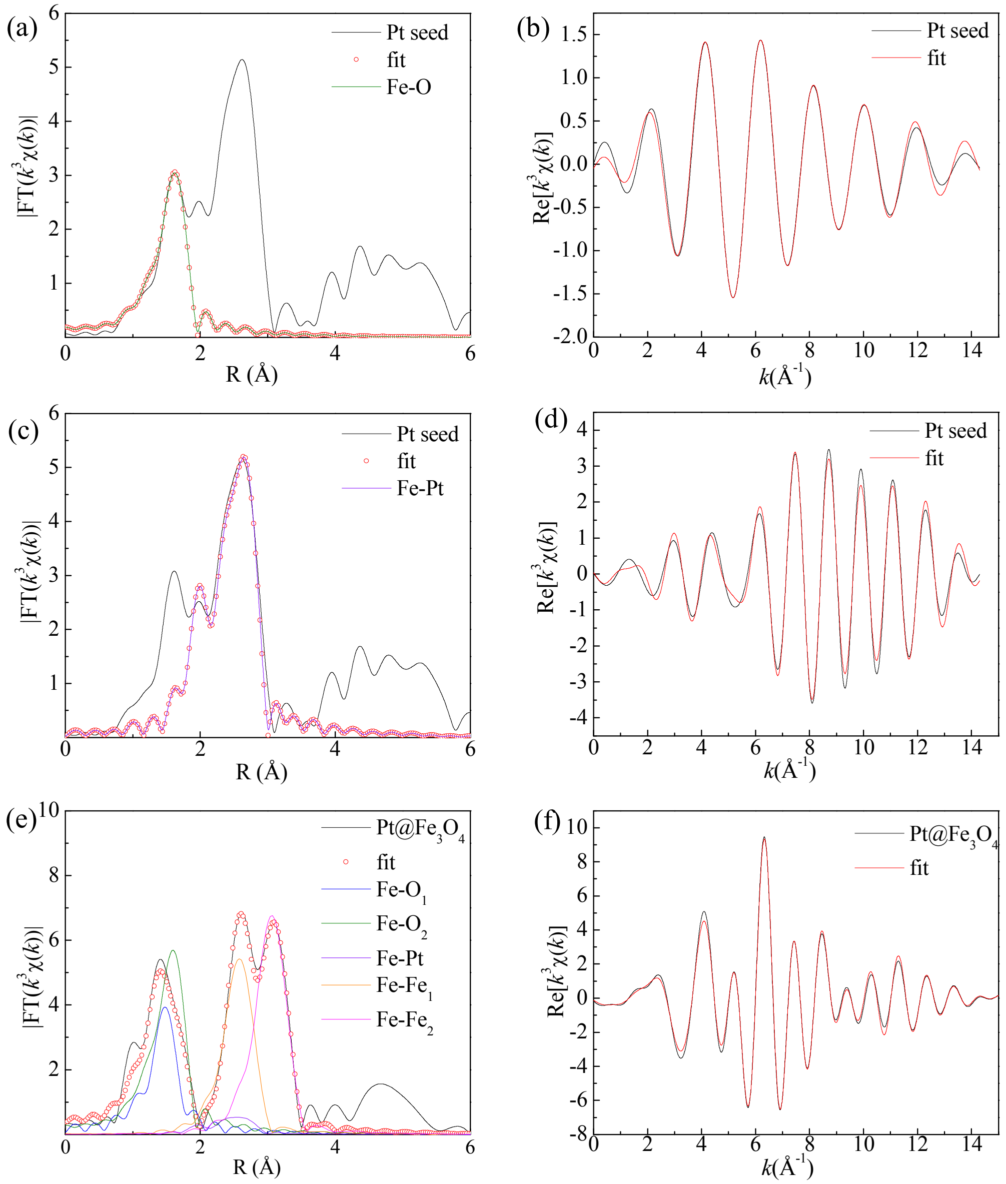

Figure S6. The fitting curves of Fe K-edge k^3-weighted Fourier transforms EXAFS spectrum (a) and the corresponding inverse Fourier transform $k^3\chi(k)$ oscillation (b) of Fe-O coordination in the Pt seed. The fitting curves of Fe K-edge k^3-weighted Fourier transforms EXAFS spectrum (c) and the corresponding inverse Fourier transform $k^3\chi(k)$ oscillation (d) of Fe-Pt coordination in the Pt seed. We can find from Fig. S6d that the curve displays quite slow oscillation decay with the maximum peak at k=9 Å^{-1}, and remains strong oscillation up to 12 Å^{-1}. This provides solid evidence that the FT peak at 1.62 Å in the FT curve is attributed to Fe-Pt rather than Fe-Fe coordination. (e)The fitting curves of Pt L_3-edge k^3-weighted Fourier transforms EXAFS spectrum of Pt@Fe_3O_4. The contributions of all the fitted shells are displayed in (e). (f) The corresponding inverse Fourier transform $k^3\chi(k)$ oscillation of Pt@Fe_3O_4.

Table S2. EXAFS fitting parameters at Pt L_3-edge.

Sample	Path	N	R (Å)	σ^2 (10^{-3} Å^2)	ΔE_0 (eV)
Pt foil	Pt-Pt	12	2.77	5.2	6.6
PtO_2	Pt-O	6	2.07	3.1	4.5
	Pt-Pt_1	6	3.10	5.8	6.5
	Pt-Pt_2	12	3.44	6.6	6.5
Pt seed	Pt-Fe	1.2	2.72	6.0	-2.6
	Pt-Pt	10.8	2.75	6.6	6.6
Pt@Fe_3O_4	Pt-Fe	1.2	2.71	6.2	-2.6
	Pt-Pt	10.7	2.75	6.6	6.5

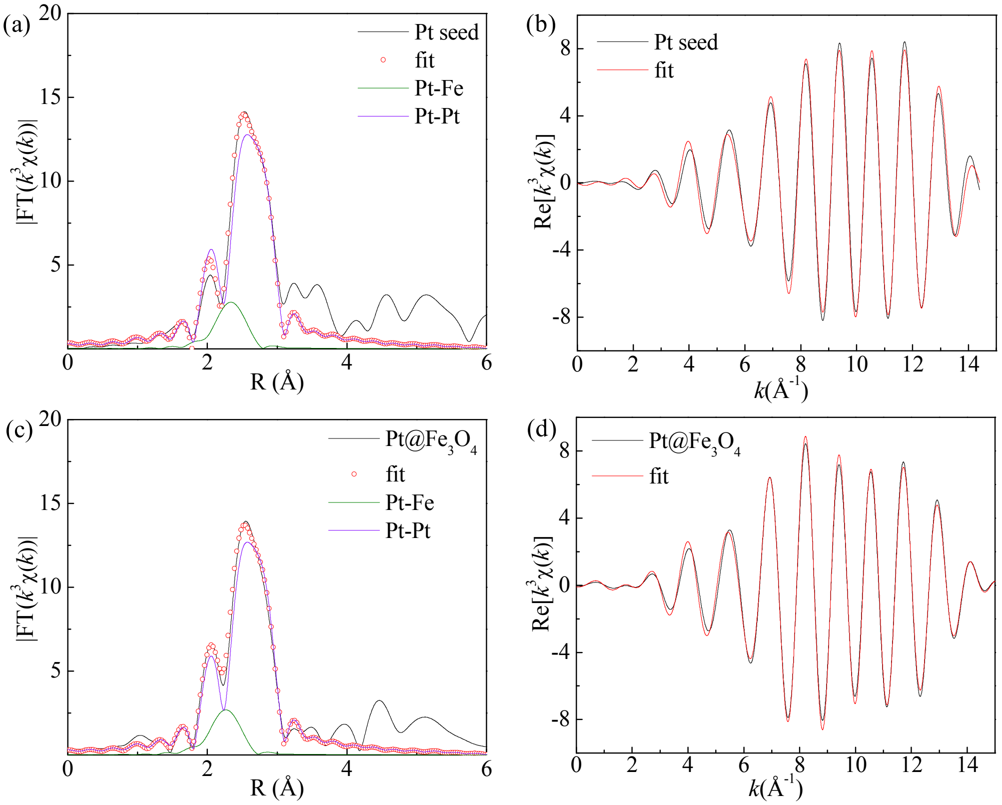

Figure S7. The fitting curves of Pt L_3-edge k^3-weighted Fourier transforms EXAFS spectrum (a) and the corresponding inverse Fourier transform $k^3\chi(k)$ oscillation (b) of the Pt seed. The fitting curves of Pt L_3-edge k^3-weighted Fourier transforms EXAFS spectrum (c) and the corresponding inverse Fourier transform $k^3\chi(k)$ oscillation (d) of Pt@Fe_3O_4.