SUPPLEMENTARY INFORMATION

Variant shape growth of nanoparticles of metallic Fe-Pt, Fe-Pd and Fe-Pt-Pd alloys

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1. TEM images

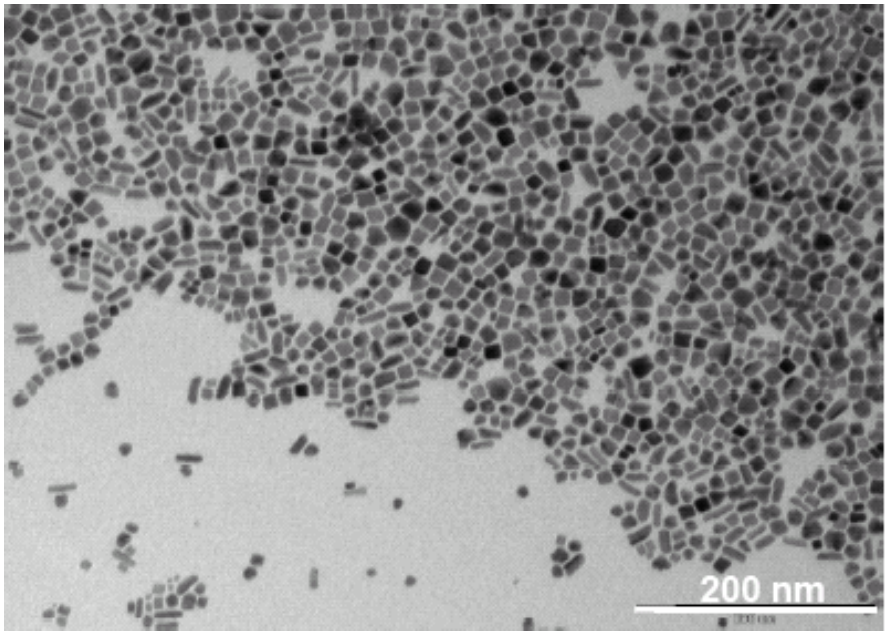

Figure S1. TEM image of Fe-Pt NPs prepared by decomposition of $Fe(CO)_5$ (8.3 mM) and reduction of $Pt(acac)_2$ (8.3 mM) in the presence of OA (466 mM) showing a mixture of nanocubes, rods, and spheres with sizes in the range of 5-50 nm.

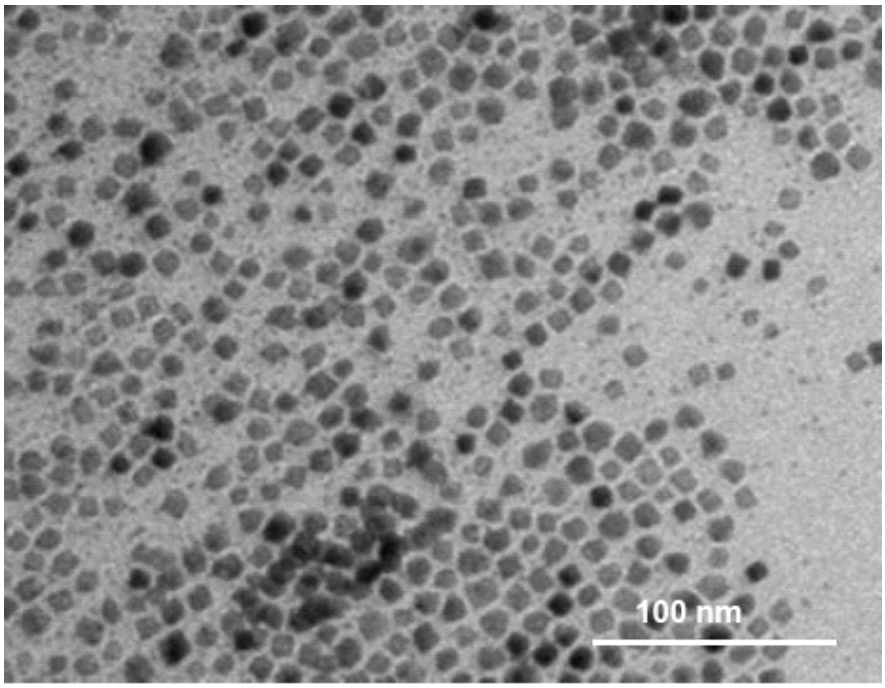

Figure S2. TEM image of Fe-Pt NPs prepared by decomposition of $Fe(CO)_5$ (8.3 mM) and reduction of $Pt(acac)_2$ (8.3 mM) in the presence of equimolar mixture of OA and OLA (16.6 mM). The sample is heterogeneous containing nanocubes and others with ill- defined shapes.

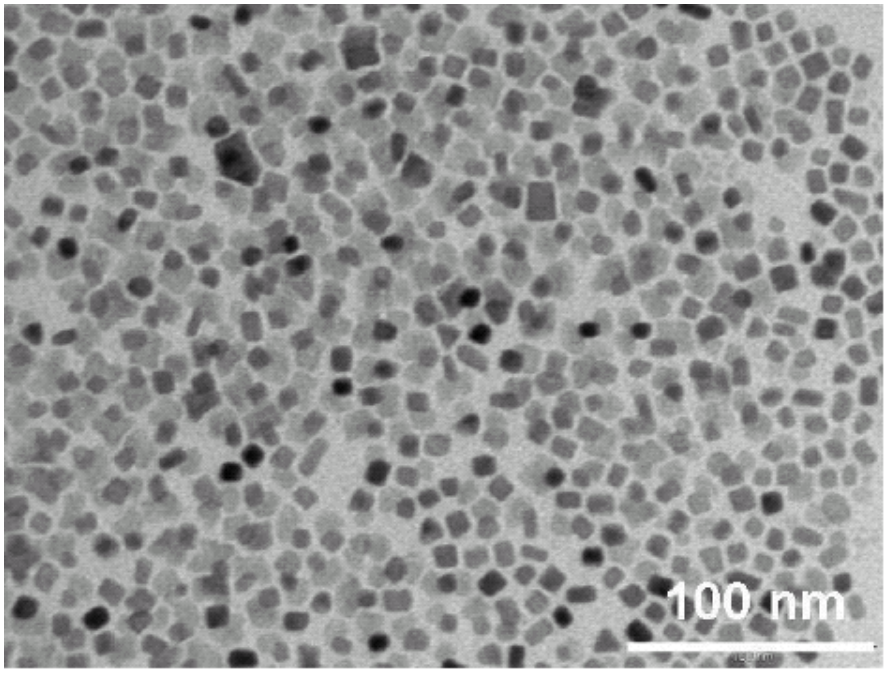

Figure S3. TEM image of Fe-Pt NPs prepared by decomposition of $Fe(CO)_5$ (8.3 mM) and reduction of $Pt(acac)_2$ (8.3 mM) in the presence of equimolar mixture of OA and OLA (533 mM). The sample is heterogeneous containing nanocubes, bilobars and others with ill-defined shapes.

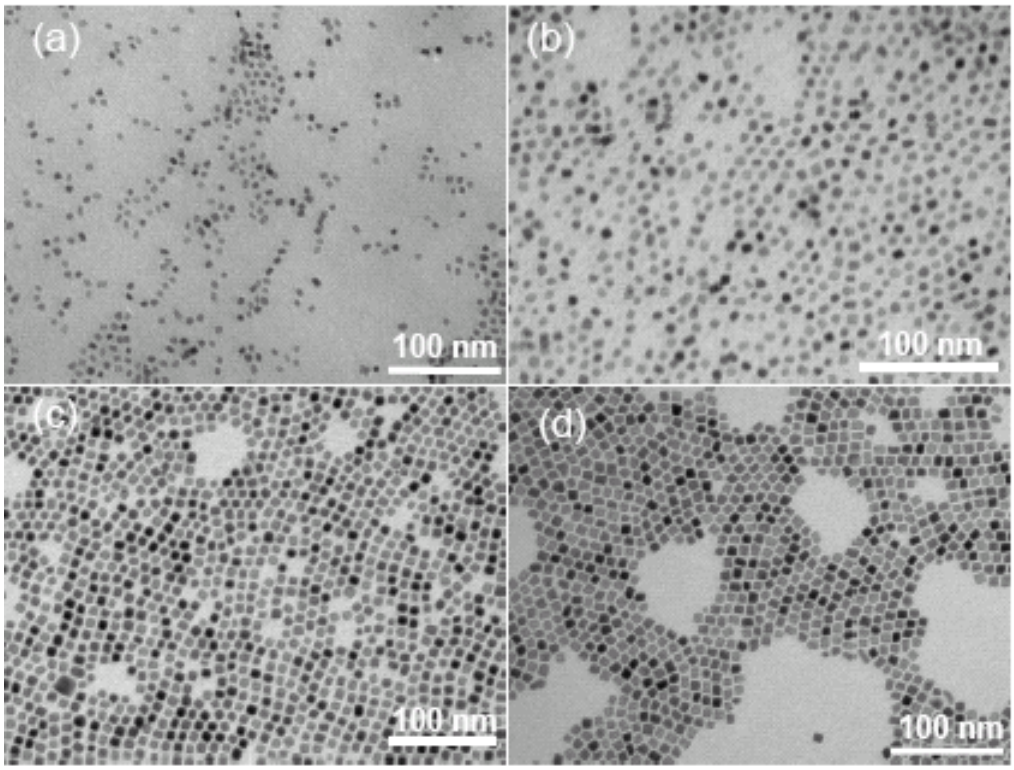

Figure S4. TEM images of Fe-Pt nanocubes prepared by decomposition of $Fe(CO)_5$ (8.3 mM) and reduction of $Pt(acac)_2$ (8.3 mM) with an equimolar mixture of surfactants at total concentration of 266 mM; (a) MA and HDA; (b) OA and OLA; (c) ACA and HDA; (d) ACA and OLA. The corresponding average size of the nanocubes is 6.7 ± 1.1, 7.5 ± 1, 8.9 ± 1 and 9.2 ± 1.3 nm.

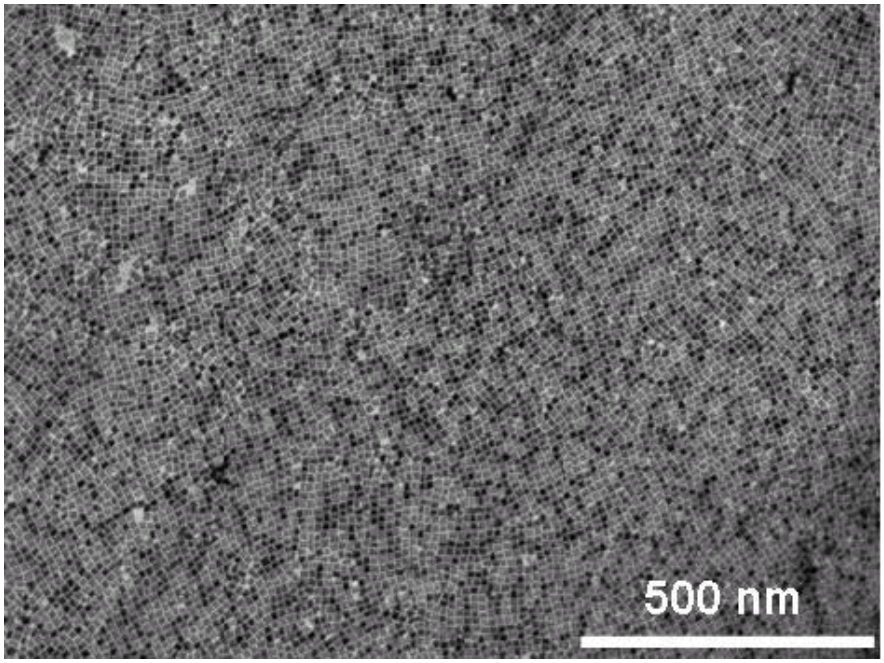

Figure S5. TEM image of self-assembly of the Fe-Pt octopod-cubes into a large micron sized area indicating the high monodispersity in size and homogeneity in shape of the NPs.

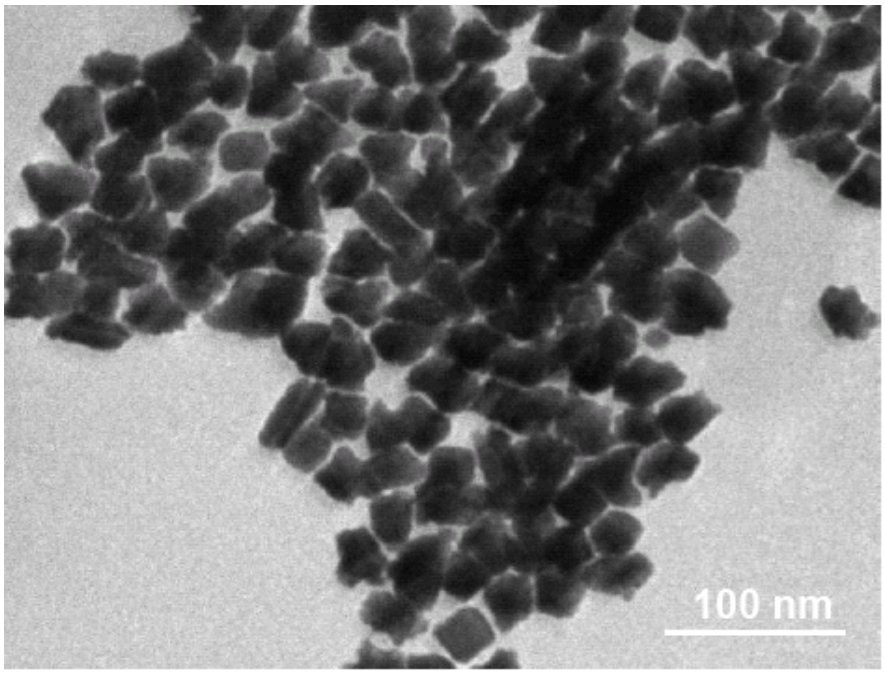

Figure S6. TEM image of Fe-Pt NPs prepared by decomposition of $Fe(CO)_5$ (4.15 mM) and reduction of $Pt(acac)_2$ (4.15 mM) with equimolar mixture of OA and OLA (266 mM). The NPs are ill-defined in shape with size larger than 30 nm.

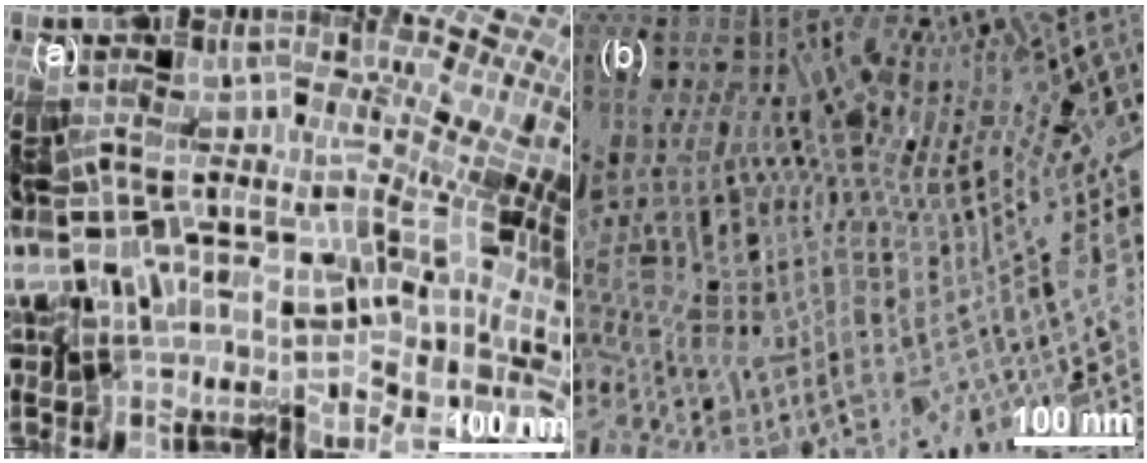

Figure S7. TEM images of Fe-Pt nanocubes prepared by decomposition of $Fe(CO)_5$ and reduction of $Pt(acac)_2$ (8.3 mM) using equimolar mixture of OA and OLA (266 mM) and a ratio of $Pt(acac)_2$:$Fe(CO)_5$ = 1:2 (a) or = 1:3 (b). The corresponding average particle size is 8.7 ± 1.5, 7.6 ± 1.2 nm.

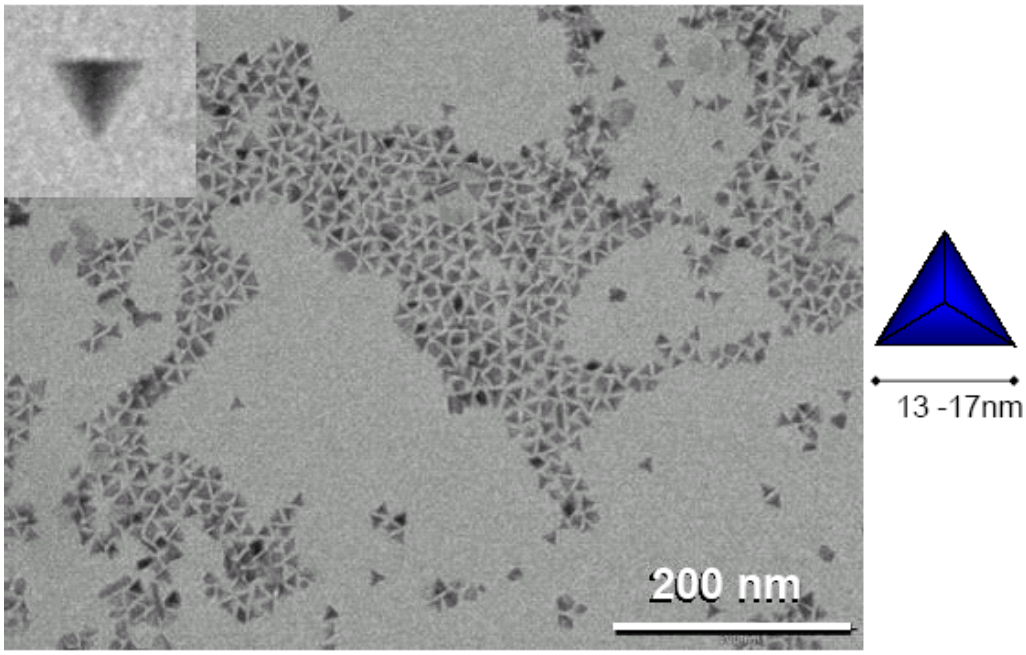

Figure S8. TEM images of Fe-Pd triangular-like NPs prepared by decomposition of $Fe(CO)_5$ (8.3 mM) and reduction of $Pd(OAc)_2$ (8.3 mM) using equimolar mixture of MA and HAD (266 mM). The inset shows zoom-in view on a selected particle from which the contrast suggests the real shape is tetrahedral. The particle size is in between 13-17 nm.

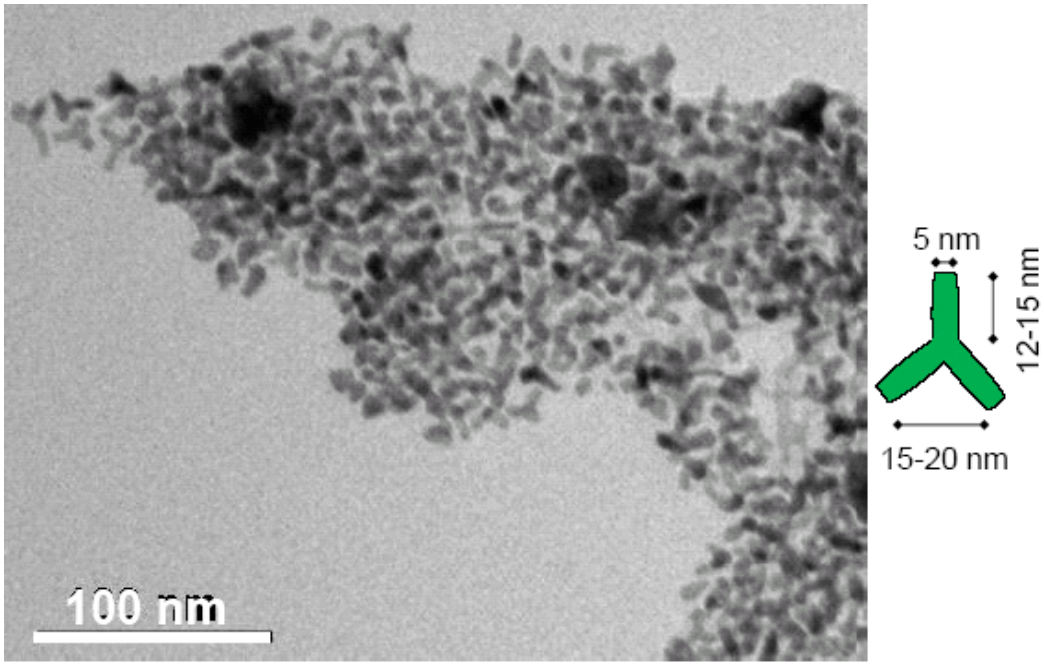

Figure S9. TEM images of Fe-Pd multipod-like NPs prepared by decomposition of $Fe(CO)_5$ (8.3 mM) and reduction of $Pd(acac)_2$ (8.3 mM) using equimolar mixture of OA and OLA (266 mM). The pods have maximum of 4 pods with an average pod width of 5 nm, pod length in the range of 12-15 nm and 'pod-pod' distance of 15-20 nm.

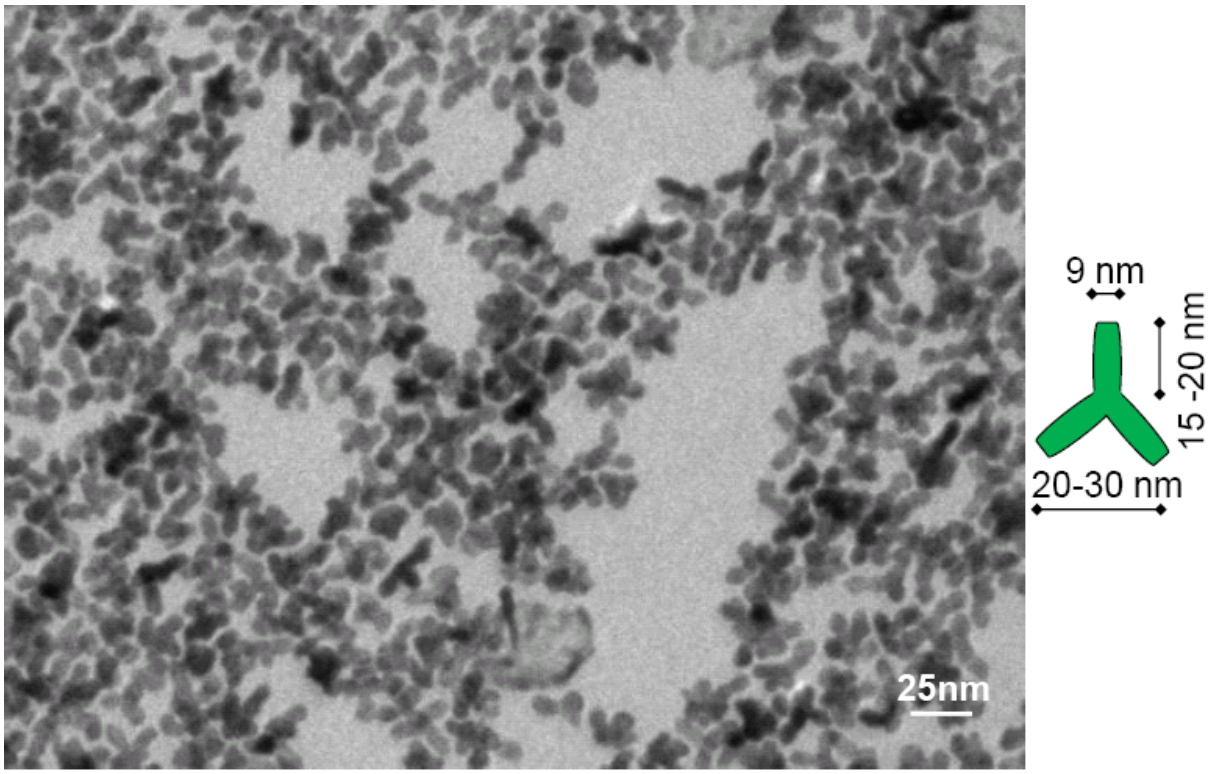

Figure S10. TEM images of Fe-Pt-Pd multipod-like NPs prepared by decomposition of $Fe(CO)_5$ (16.6 mM) and reduction of $Pt(acac)_2$ (8.3 mM) and $Pd(OAc)_2$ (8.3 mM) using equimolar mixture of OA and OLA (266 mM). The majority were in the form of tri-pods and tetrapods. The pods have an average width of 9 nm, length in the range of 15-20 nm and 'pod-pod' distance of 20-30 nm.

2. Composition analysis

Table S1. Size, shape and composition of selected Fe-Pt, Fe-Pd, Fe-Pt-Pd NPs.

Shape	Size (nm)	Compositions of as-synthesized NPs		
		Fe (% atoms)	Pt (% atoms)	Pd (% atoms)
cubes	6.7 ± 1.1	76	24	
cubes	7.6 ± 1.2	65	35	
cubes	7.8 ± 1.5	71	29	
cubes	8.7 ± 1.5	47	53	
cubes	9.2 ± 1.3	60	40	
cubes	9.8 ± 1.6	30	70	
cubes	12.2 ± 1.3	28	72	
octopod-cubes	13.2 ± 2	34	66	
stars	24.2 ± 6.1	13	87	
rods	average diameter of 5 ± 0.8 nm, length of 39.4 ± 8.6 nm (aspect ratio ~8)	75	25	
tetrahedrals	15	15		85
multipods	'pod-pod' distance 15-20 nm, pod length 12-15 nm and pod width 5 nm	30		70
multipods	'pod-pod' distance 20-30 nm, pod length 15-20 nm and pod width 9 nm	17	41	42
multipods	'pod-pod' distance 20-30 nm, pod length 15-20 nm and pod width 9 nm	16	34	50