Supporting Information

Asymmetric Silica Encapsulation toward Colloidal Janus Nanoparticles: Concave Nanoreactor for Template-synthesis of Electocatalytic Hollow Pt Nanodendrite

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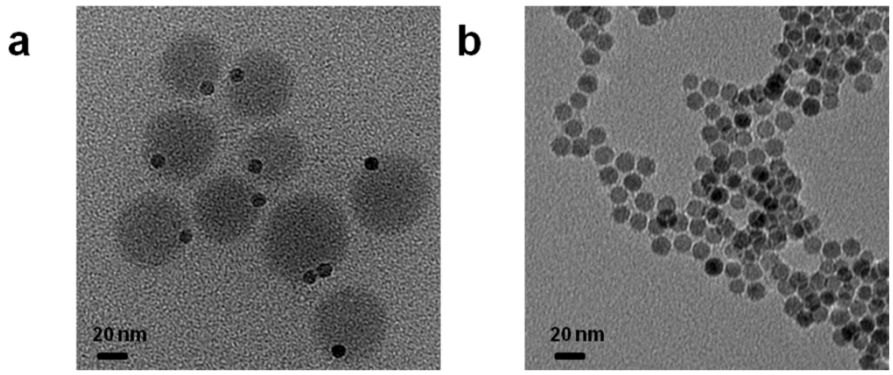

Figure S1. TEM images of the product from the silica encapulation reaction of the Fe_3O_4 nanocrystal with pure TSD as a sole silica precursor (a) before and (b) after the washing procedure

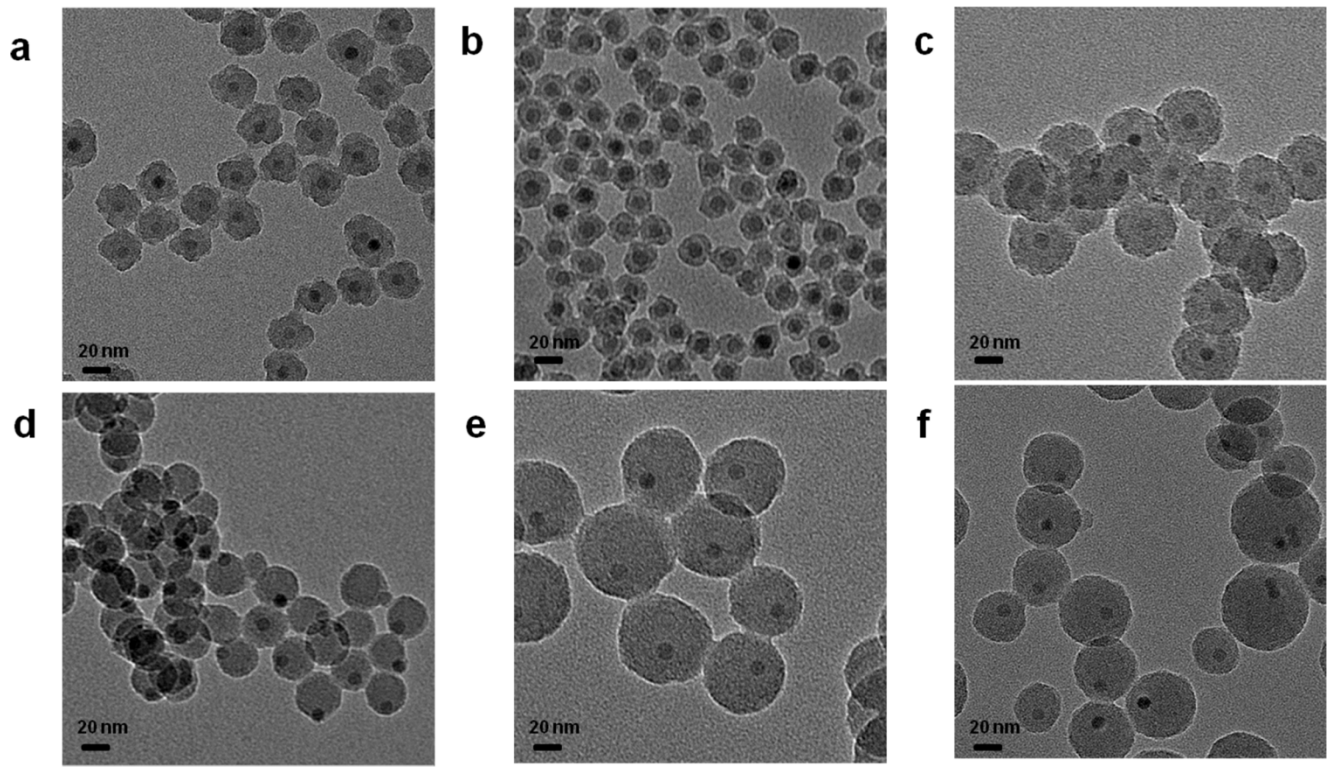

Figure S2. TEM images of the silica encapulation reaction of the Fe_3O_4 nanocrystal with mixtures of the TEOS with (a) C18TMS, (b) 3-mercaptopropyltriethoxysilane, (c) *N*-propylethylenediamine, (d) APTMS, (e) TESD, and (f) APTES.

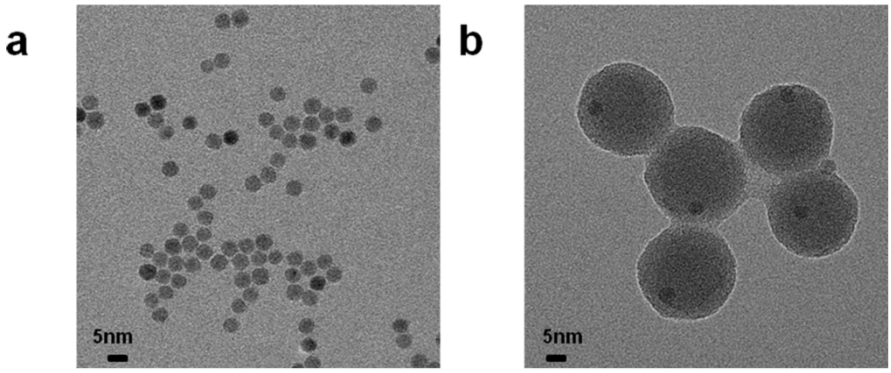

Figure S3. TEM images of (a) the water-dispersible citrate-coated Fe_3O_4 nanocrystals and (b) the Janus-type products from their silica encapsulation reaction with a mixture of TEOS and TSD.

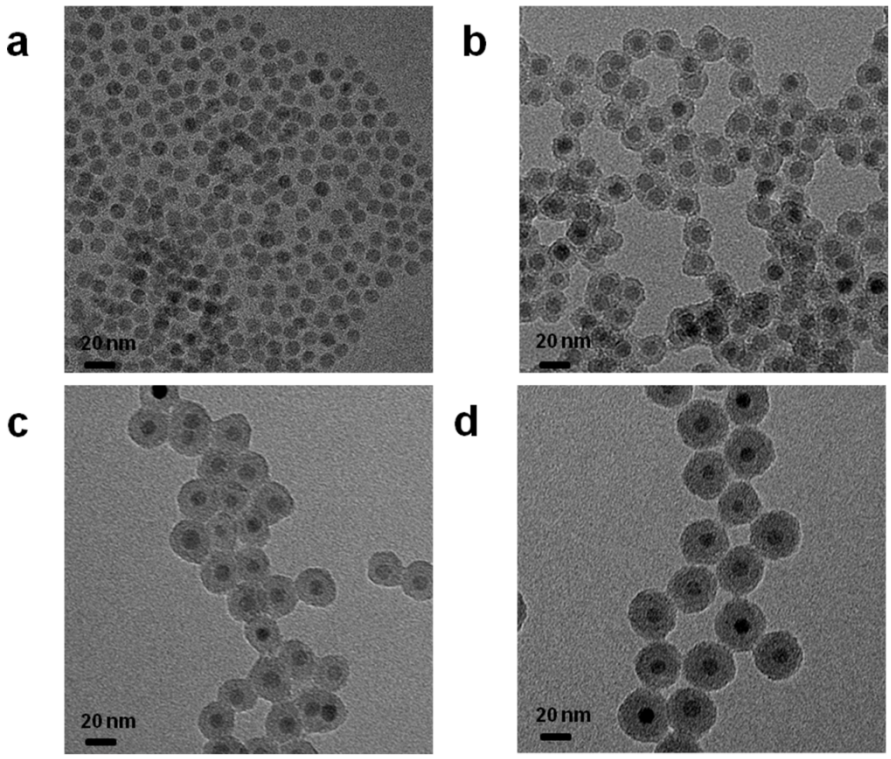

Figure S4. TEM images of nanoparticles which were sampled during the formation of the concentric **Fe_3O_4@SiO_2** in the suspension containing TEOS as a sole silica precursor at (a) 30 min, (b) 2 hr, (c) 4 hr, and (d) 9 hr of reaction time periods.

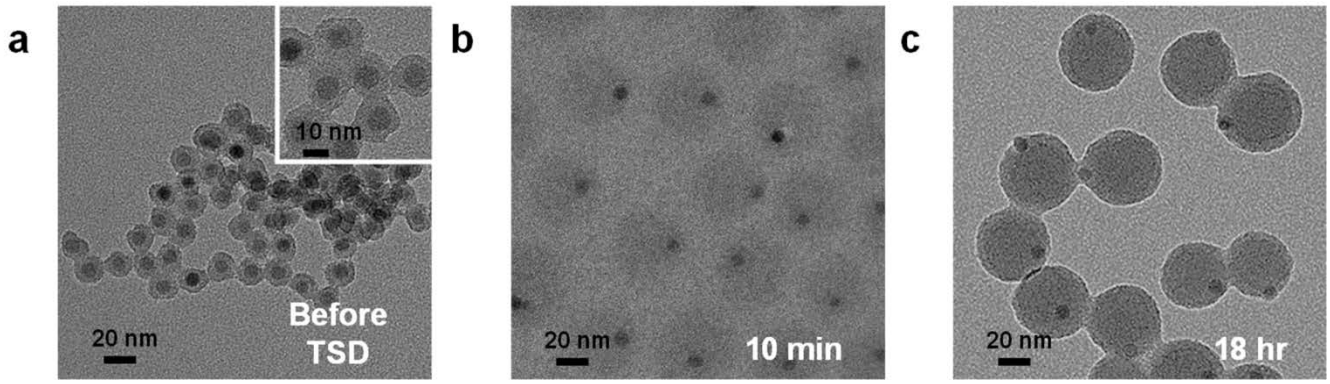

Figure S5. TEM images of the nanoparticles sampled, during the silica encapsulation reaction of the Fe_3O_4 nanocrystal through the subsequent addition of the TEOS and TSD at the interval of 2 hr, (a) just before the addition of the TSD and at (b) 10 min and (c) 18 hr after the addition of the TSD

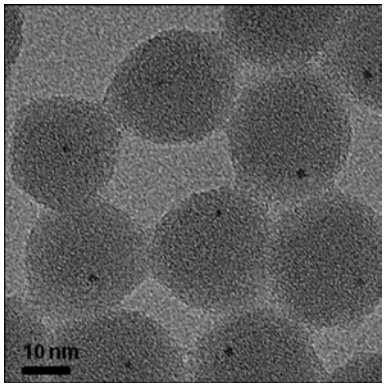

Figure S6. TEM image of **Au@*ece*-SiO_2** nanospheres.

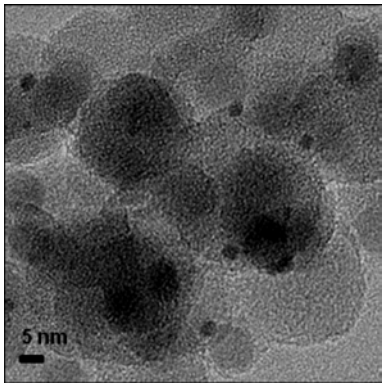

Figure S7. TEM images of the products obtained after treating the (**Fe_3O_4/Au)@*asy*-SiO_2** in a 1.9 mM $NaBH_4$ solution.

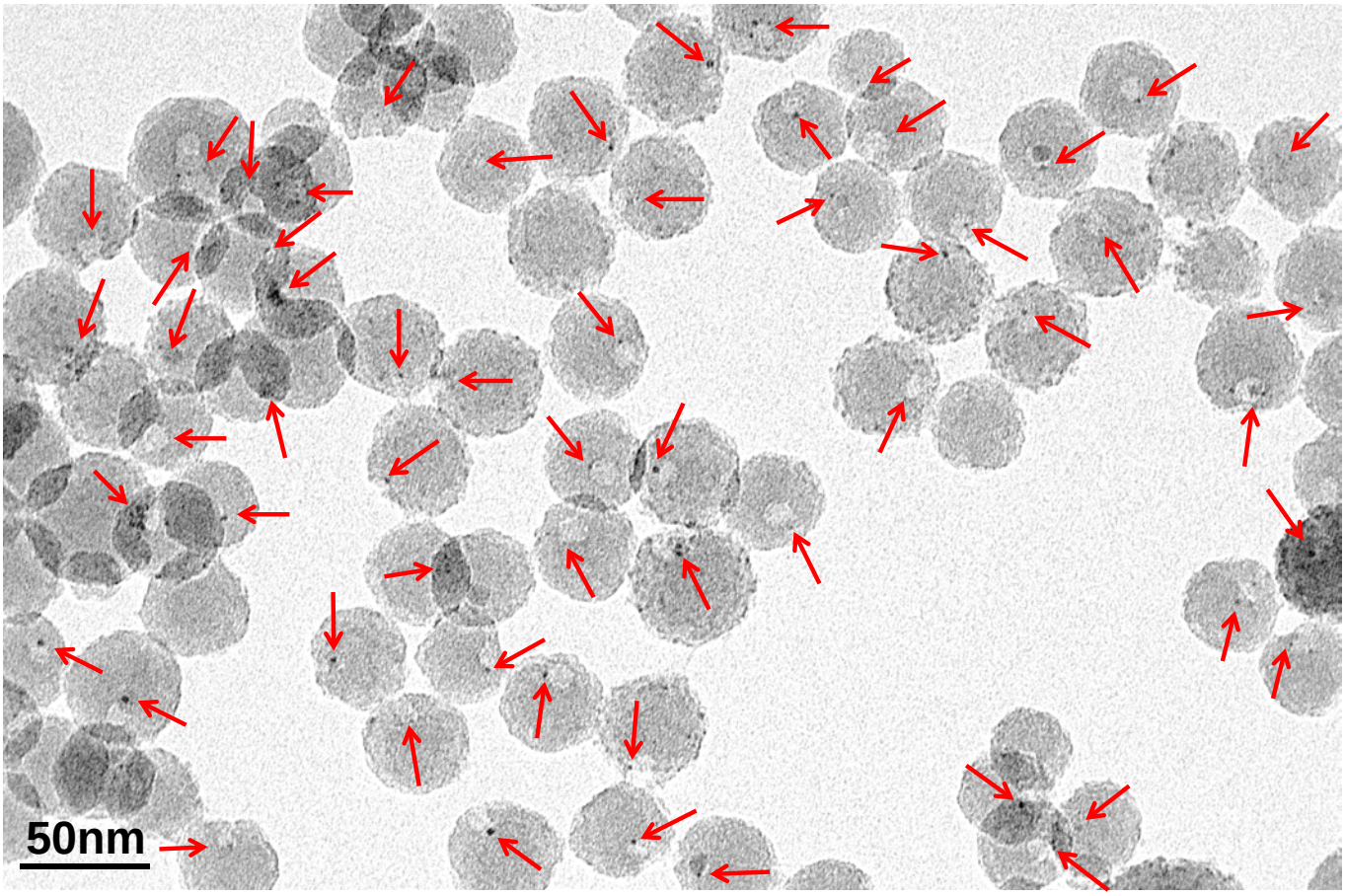

Figure S8. TEM images of the **Au@*con*-SiO_2** nanoreactors. Red-arrows indicate Au nanocrystals settled on the concave surface.

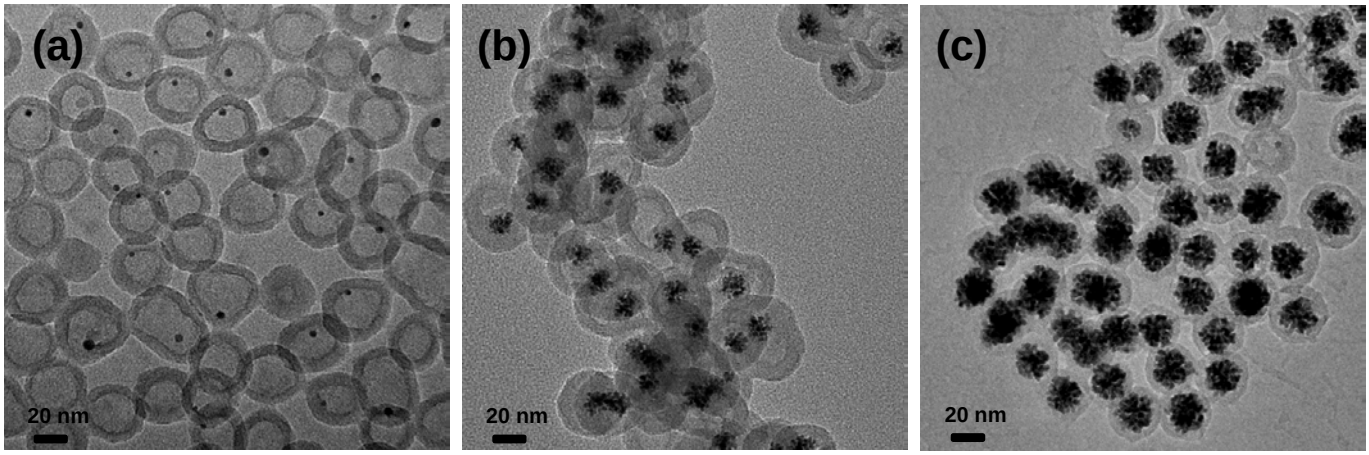

Figure S9. TEM images of (a) the **Au@*h*-SiO$_2$** nanoreactors and products of their Pt growth reaction at (b) 10 mM and (c) 50 mM of Na_2PtCl_4 concentration.

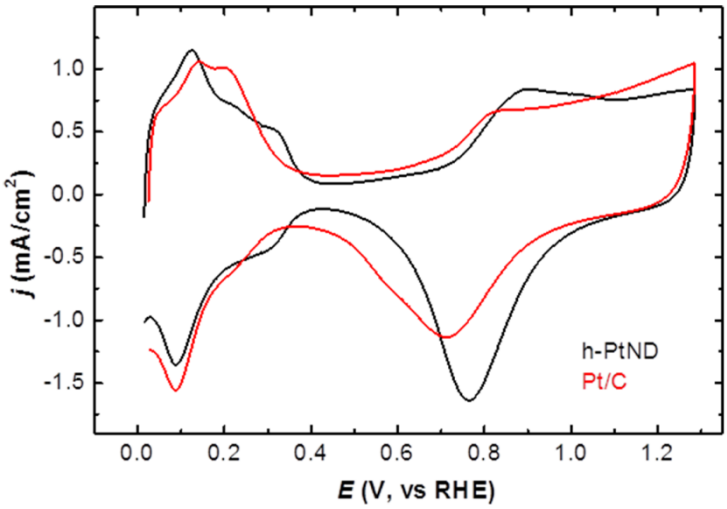

Figure S10. Cyclic voltammograms of Pt/C (red line) and h-PtND (black line) obtained in a 0.1 M $HClO_4$ solution saturated with N_2. Scan rate: 50 mV/s.

Table S1. Evaluation of mass and specific activity

Catalyst	Catalyst loading ($\mu g_{Pt}/cm^2_{disk}$)	ECSA (cm^2_{Pt}/cm^2_{disk})	j (mA/cm^2_{disk})			Mass activity ($mA/\mu g_{Pt}$)	Specific Activity (mA/cm^2_{Pt})
			j (0.9 V)	j_d	j_k		
h-PtND	15.3	19.9	2.53	5.26	4.86	0.318	0.24
Pt/C		17.5	1.53	5.87	2.08	0.136	0.12