Electronic Supplementary Material (ESI) for Green Chemistry.

A type of raspberry-like silica composite with tunable nickel nanoparticles coverage towards nanocatalysis and protein adsorption

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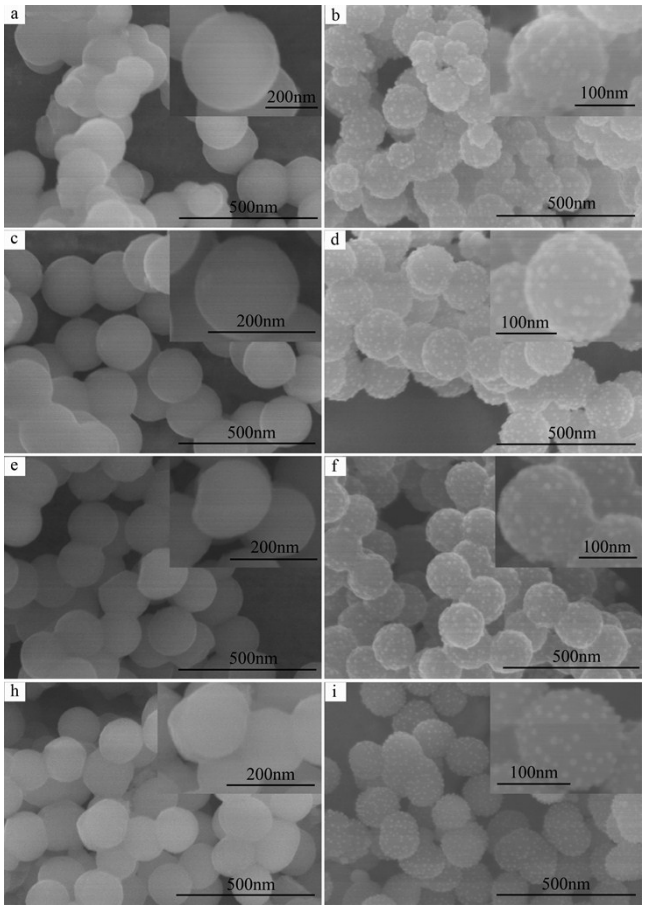

Figure S1. SEM images of core-shell structured SiO_2@PDA-Ni^{2+} and SiO_2@C-Ni composite (different volume ratios of ethanol to water) (a,b) E/W=2:1; (c,d) E/W=6:1; (e,f) E/W=10:1; (g,h) E/W=15:1. Note: the molar ratio of dopamine/nickel salt was fixed at 2:4.

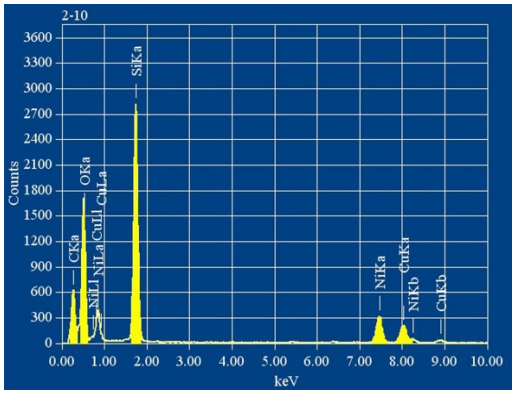

Figure S2. Energy-disperse X-ray spectrum (EDS) of SiO_2@C-Ni composites (E/W=6:1, molar ratio of dopamine to nickel salt 2:4).

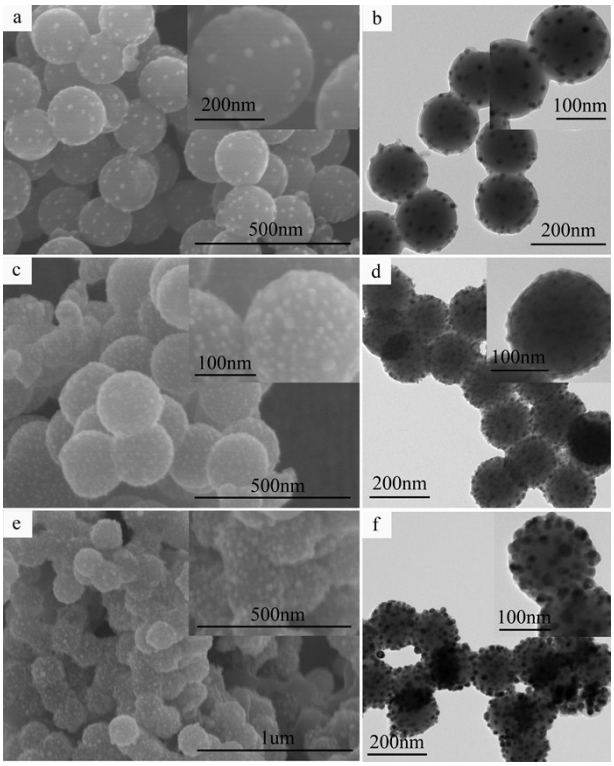

Figure S3. SEM and TEM images of core-shell structured SiO_2@C-Ni (E/W=6:1, different molar ratios of dopamine to nickel salt:(a,b)2:1; (c,d) 2:6; (e,f) 2:8.

Table S1. Properties of SiO_2@C-Ni/350, SiO_2@C-Ni/500, and SiO_2@C-Ni/800

Samples	Average nickel size(nm) observed from the TEM images	Average nickel size calculated by the scherrer's equation (nm)	Hc (Oe)	Mr (emu g^{-1})	Ms (emu g^{-1})
SiO_2@C-Ni/350	6	3.27	0	0	1
SiO_2@C-Ni/500	10	16.74	86.4	1.89	4
SiO_2@C-Ni/800	30	25.72	50	1.9	6.5

Table S2 the synthesis parameter of SiO_2@PDA-Ni^{2+} with larger diameter

The size of SiO_2@PDA-Ni^{2+}	E/W ratio	TEOS (mL)	$NH_3 \cdot H_2O$ (mL)
~350 nm	25/15	3.14	3.7

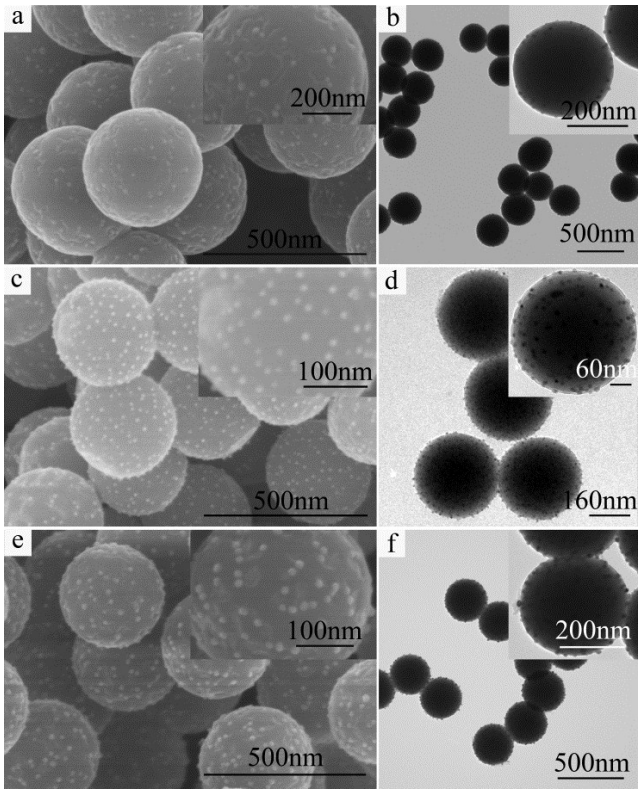

Figure S4. SEM and TEM images of core-shell structured SiO_2@C-Ni (dopamine/nickel salt 2:1) (a,b), (dopamine/nickel salt 2:6) (c,d) and (dopamine/nickel salt 2:8) (e,f)

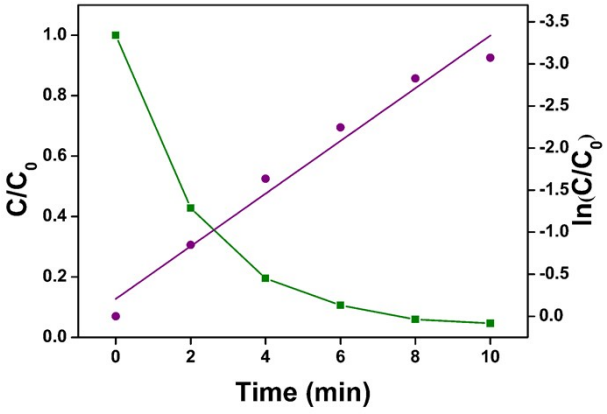

Figure S5 C/C_0 and $\ln(C/C_0)$ versus time for the reduction of 4-NP over 1 mg SiO_2@C-Ni catalysts, the ratio of 4-NP concentration (C at time t) to its initial value C_0 is directly represented by the relative

intensity of the respective absorption peak at 400 nm.

Table S3 Comparison of the activity parameter κ of composite Ni catalysts and noble catalysts for the reduction of 4-NP

Samples	Type	$K(\times 10^{-3}s^{-1})$	$k(\times 10^{-3}mg^{-1}s^{-1})$	References
SiO_2@C-Ni	Core–shell	5.2	37	This work
Ni/SNTs(23.0 wt%)	Nanotube	84	91	47
Ni/SNTs (15.2 wt%)	Nanotube	20	44	47
Ni/SNTs (8.1 wt%)	Nanotube	9.9	31	47
Ni/SNTs (5.6 wt%)	Nanotube	7.6	34	47
Ni (modified)	Nanoparticles	2.4	0.80	48
Ni/p (AMPS)	Hydrogel	0.9	0.15	49
Ni@SiO_2	Core–shell	2.8	0.94	50
RGO-Ni	Nanosheets	0.25	0.04	51
Fe_3O_4@SiO_2–Au@mSiO_2	Core–shell	7	105	52

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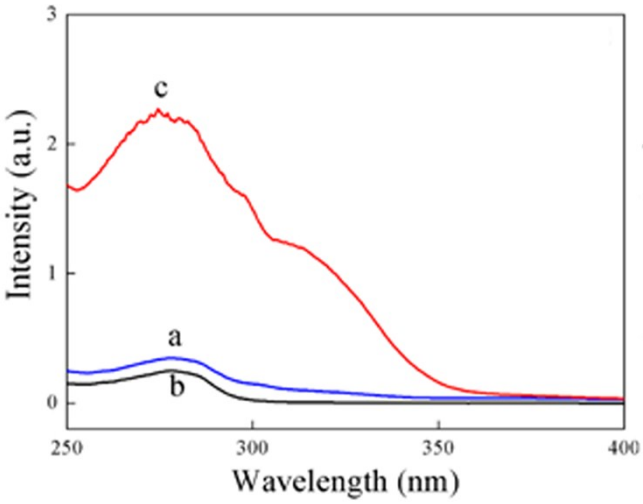

Figure S6. Curve a is the UV-vis spectrum of 0.4 mg mL^{-1} of the BSA solution before adsorption by SiO_2@C-Ni. Curve b is the UV-vis spectrum of supernatant of BSA after adsorbed by SiO_2@C-Ni. Curve c is the UV-vis spectrum of desorption solution of the adsorbed protein by SiO_2@C-Ni in BSA solution using concentration of 0.2 g mL^{-1} of imidazole solution as the eluent