Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Hierarchical core–shell structured Fe_3O_4@$NiSiO_3$ magnetic microspheres: preparation, characterization, and adsorption of methylene blue from aqueous solution

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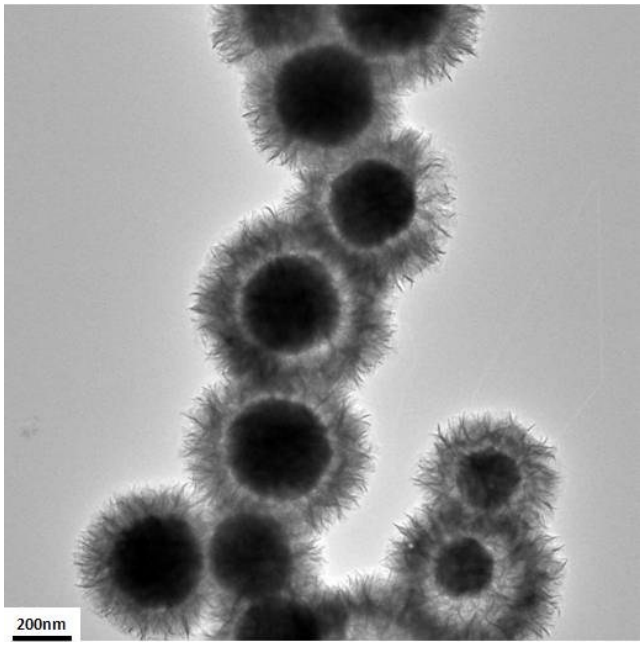

Fig. S1 TEM image of Fe_3O_4@$NiSiO_3$ magnetic microspheres

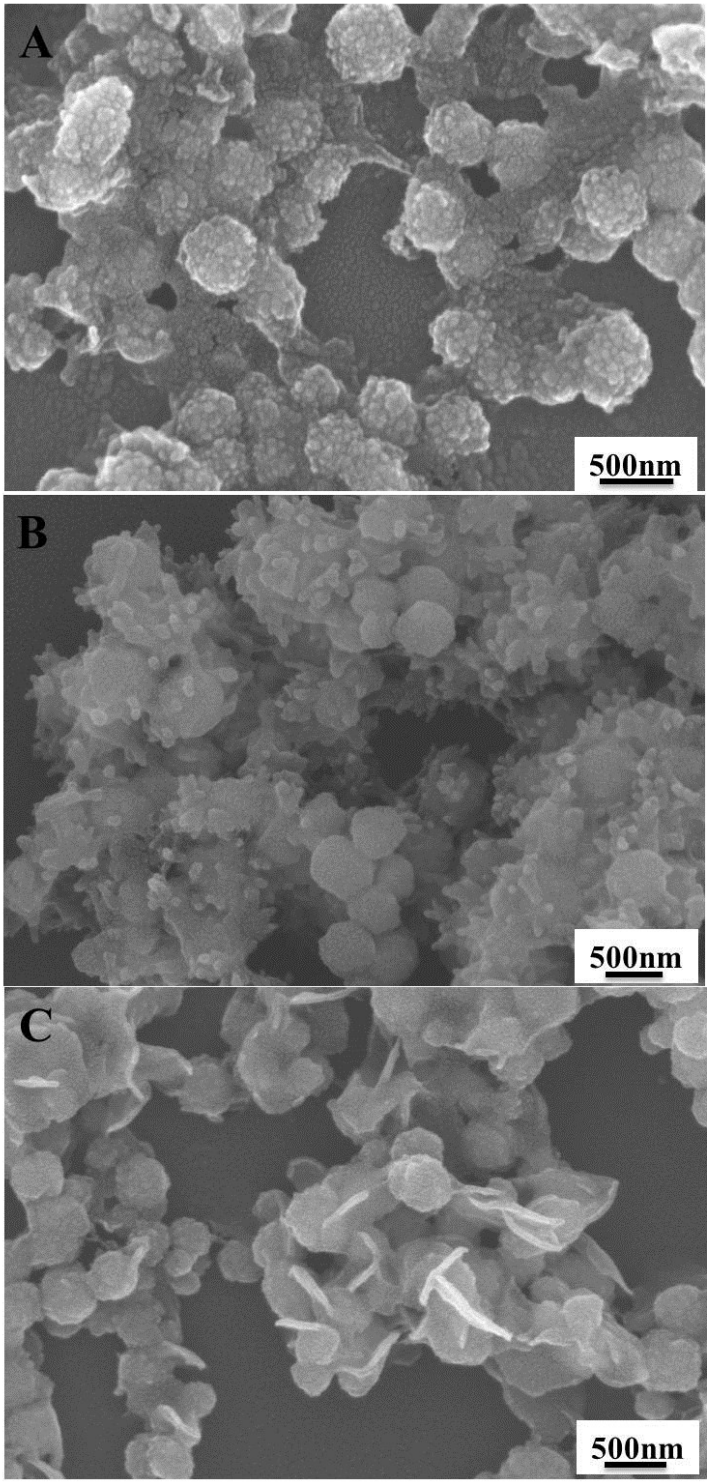

Fig. S2 SEM images after replaced Ni element by Co (A), Cu (B) and Zn (C) element

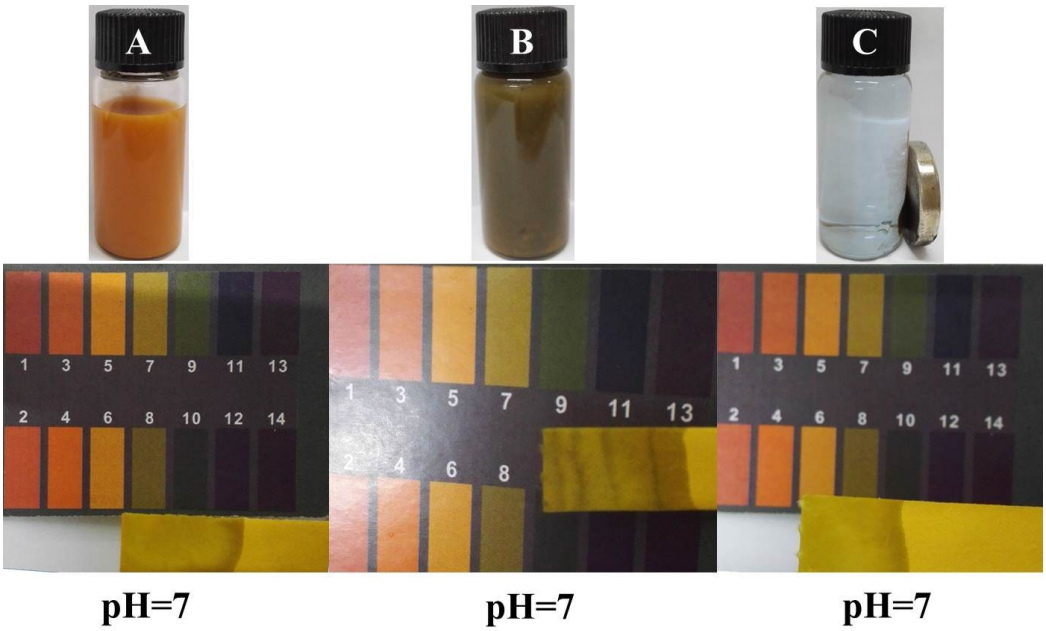

Fig. S3 The solution pH of the addition of the adsorbents (A), before (B) and after the adsorption of MB (C)

Table S1. Langmuir, Freundlich and Temkin model parameters for adsorption of MB onto the Fe_3O_4@$NiSiO_3$ microspheres

Isotherm of Fe_3O_4@$NiSiO_3$	Parameters and units		
Langmuir model $\frac{C_e}{q_e} = \frac{1}{q_m K_L} + \frac{C_e}{q_m}$	q_m (mg/g)	K_L	R_L^2
	19.14	0.12	0.9924
Freundlich model $\ln q_e = \ln K_F + \frac{1}{n} \ln C_e$	n	K_F	R_F^2
	2.06	2.37	0.6848
Temkin model $q_e = \frac{RT}{b} \ln K_T + \frac{RT}{b} \ln C_e$	b (J/mol)	K_T	R_T^2
	729.72	2.44	0.7628

Table S2. Kinetic adsorption parameters for MB adsorbed onto the Fe_3O_4@$NiSiO_3$ microspheres obtained by using pseudo-first-order and pseudo-second-order models

Adsorbent	Pseudo-first-order		
	q_{e1} (mg/g)	k_1 (min^{-1})	R_1^2
Fe_3O_4@$NiSiO_3$	7.5	0.023	0.9373
	Pseudo-second-order		
	q_{e2} (mg/g)	k_2 ($g \cdot mg^{-1} \cdot min^{-1}$)	R_2^2
	18.37	0.0093	0.9996