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Effect of water on size-controllable synthesis of mesoporous Fe_3O_4 microspheres and their applications in waste water treatment

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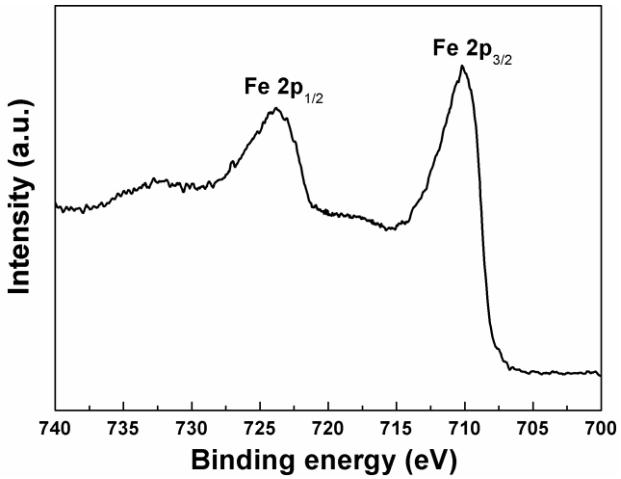

Fig. S1 XPS spectra of the typical Fe_3O_4 with E/W=50

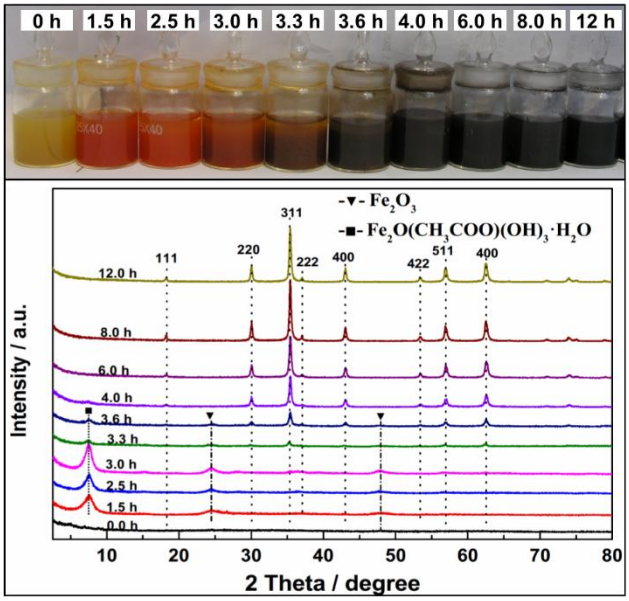

Fig. S2 XRD patterns and photography of precursors prepared with different treatment time.

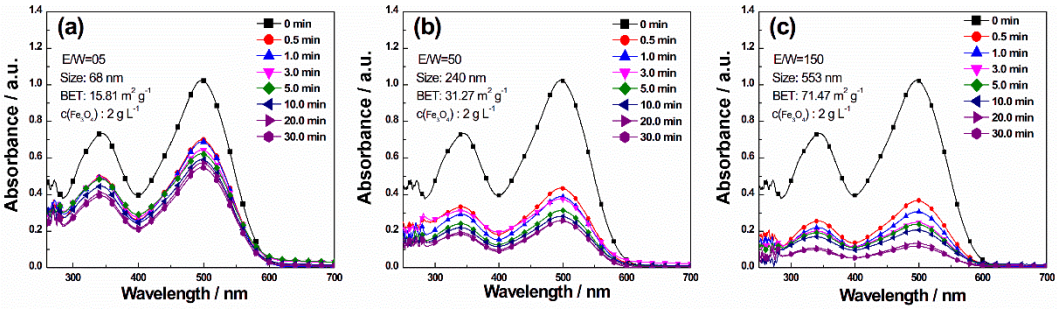

Fig. S3 UV-vis absorption spectra at different time for Fe_3O_4 microspheres with particle size of: (a) 68 nm, (b) 240 nm, (c) 553 nm.

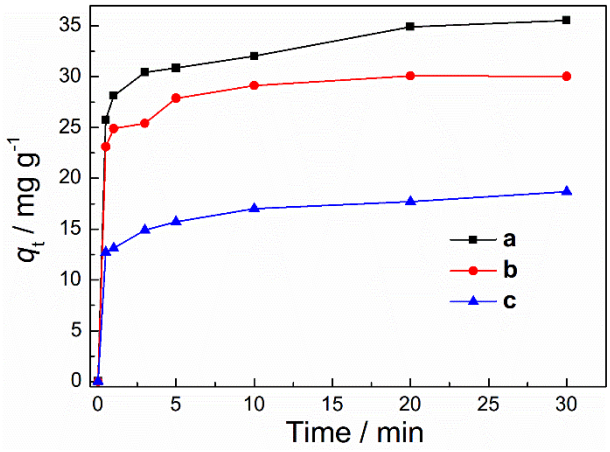

Fig. S4 Calculated adsorption capacities for Fe_3O_4 microspheres with different size: (a) 553 nm; (b) 240 nm; (c) 68 nm.

Table S1 Equilibrium adsorption capacity for 553 nm Fe_3O_4 microspheres under different concentration of Congo red (CR)

Dosage of Fe_3O_4 / g L^{-1}	**Concentration of CR solvent / mg L^{-1}**	**Adsorption capacity / mg g^{-1}**
2	120	41.83
2	100	42.18
2	90	40.51
2	80	35.54
2	70	32.94
2	60	29.48

Freundlich model:

Freundlich equation can be expressed as follow:

$$\log q_e = \log K_F + \frac{1}{\mathrm{n}} \log c_e \quad (1)$$

Where c_e is equilibrium concentration of CR in solution (mg L^{-1}), q_e is the adsorption capacity of CR adsorbed at equilibrium (mg g^{-1}), K_F is the Freundlich constant ($mg^{1-(1/n)}\ L^{1/n}\ g^{-1}$) and n is the heterogeneous factor. The K_F and n can be obtained from intercept and slope of the linear plot between logc_e and logq_e.

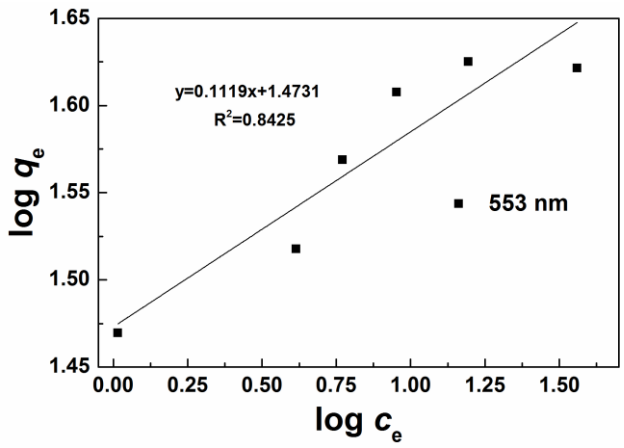

Fig. S5 Freundlich isotherm for CR adsorption onto 553 nm Fe_3O_4 microspheres.

Table S2 Adsorption isotherm constants calculated from Freundlich model

Sample	Freundlich isotherm constants		
	K_F /$mg^{1-(1/n)}L^{1/n}g^{-1}$	n	R^2
553 nm	29.72	8.9	0.8425

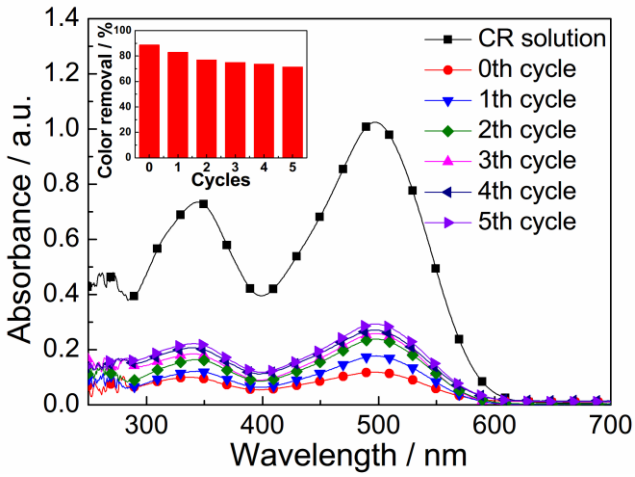

Fig. S6 The UV-vis absorption spectras and color removal efficiencies of the regenerated Fe_3O_4 microspheres after different cycles.

The Fe_3O_4 microspheres with CR are regenerated by combustion at 400 °C for 1 h under protection of N_2 flow.