Electronic Supplementary Information

Effective Adsorption of Phenolic Pollutants from Water using β-cyclodextrin Polymer Assembled Fe_3O_4 magnetic Nanocomposites

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Text S1. Determination of CD content of the polymer

According to the Prior to calculate the CD content, a calibration curve was prepared. The solution containing various concentrations of anhydrous glucose was mixed with 1 ml 4% phenol standard solution and 7 ml concentrated sulphuric acid. After shaken well, the mixing aqueous was thermostatically incubated in 50 ^{o}C water bath for 30min and then measured the absorbance of the mixing aqueous at room temperature by Perkin Elmer Lambda 365 spectrophotometer. The absorbance signals at 490 nm were plotted versus the concentration of anhydrous glucose to obtain the calibration curve.

CDP (10 mg) was mixed with 10ml 5mol/L H_2SO_4 in test tubes, and the sample was kept for 4 h in 80 ^{o}C water bath to ensure complete acidolysis. After the determination of glucose level, the corresponding CD content was calculated as follows:

$$\text{CD content} = \frac{C \times V \times M}{180 \times n \times 0.01} \times 100\%$$

where C is the glucose concentration (g/L); V is the volume of mixed solution (L); M is the molar mass of CD (g/mol); and n is the number of glucose in CD unit.

Text S2. Determination of binding constant by fluorescence titration measurements

The binding constants of phenolic pollutants with carboxymethyl-β-cyclodextrin(CM-CD) have been determined by Bensei-Hildebrand method. The fluorescence signal changes of resorcin and bisphenol A solutions have been observed by adding small amount of CM-CD gradually. Following the Bensei-Hildebrand method, the $1/\Delta I$ were plotted versus the 1/[CM-CD] to obtain the straight line which indicated the 1:1 host-guest complex formed. The binding constant (K_c) was obtained by calculation the ratio between intercept and slope of the line.

Table S1 Concentration of Iron ions release from CDP-MNPs under different pH at 25 °C .

Time/h	C_i at pH 5 (μg/L)[a]	C_i at pH 7 (μg/L)
6	30.42	26.65
12	25.44	21.32
24	26.83	17.93
48	24.32	18.56
Control [b]	0.00	0.00

[a] the water solution is adjusted to pH 5 with HNO_3. [b] the water solution without CDP-MNPs.

Table S2 Values of pH effects on the adsorption of bisphenol A or resorcin onto CDP-MNPs.

pH	Bisphenol A					Resorcin				
	Q_{e1} (mg/g)	Q_{e2} (mg/g)	Q_{e3} (mg/g)	Mean (mg/g)	SD/%	Q_{e1} (mg/g)	Q_{e2} (mg/g)	Q_{e3} (mg/g)	Mean (mg/g)	SD/%
3	48.77	48.79	48.79	48.78	1.41	66.45	66.49	66.50	66.48	2.76
4	58.55	58.51	58.46	58.51	3.04	75.68	75.64	75.68	75.67	2.68
5	62.23	62.25	62.23	62.24	1.97	81.15	81.18	81.19	81.17	2.61
6	59.17	59.18	59.16	59.17	1.34	72.04	72.09	72.06	72.06	3.25
7	51.70	51.76	51.76	51.74	3.95	67.85	67.89	67.86	67.87	2.68
8	37.30	37.35	37.51	37.39	3.39	59.63	59.67	59.69	59.67	2.96
9	27.74	27.71	27.71	27.72	1.97	48.89	48.93	48.94	48.92	3.04

Table S3 Adsorption kinetic values of CDP-MNPs towards bisphenol A and resorcin under pH 5.0 at 25 °C

Bisphenol A					Resorcin				
Q_{e1} (mg/g)	Q_{e2} (mg/g)	Q_{e3} (mg/g)	Mean (mg/g)	SD/%	Q_{e1} (mg/g)	Q_{e2} (mg/g)	Q_{e3} (mg/g)	Mean (mg/g)	SD/%
6.38	6.43	6.38	6.40	3.25	9.52	9.56	9.55	9.54	2.54
17.67	17.64	17.69	17.67	2.33	26.10	26.12	26.118	26.11	1.62
29.55	29.58	29.82	29.65	1.69	43.35	43.31	43.25	43.31	2.60
41.34	41.32	41.32	41.32	1.48	61.81	61.78	61.803	61.80	2.47
49.39	49.42	49.42	49.41	2.19	73.22	73.20	73.182	73.20	1.97
53.54	53.50	53.57	53.54	3.04	78.72	78.68	78.693	78.70	3.35
56.92	56.98	56.96	56.95	4.13	79.10	79.13	79.102	79.11	1.97
58.03	57.98	58.05	58.02	3.46	79.31	79.35	79.316	79.37	2.68
58.66	58.69	58.72	58.69	2.19	79.29	79.26	79.323	79.29	1.97

Table S4. Binding constants (K_c) of phenolic pollutants with carboxymethyl-β-cyclodextrin

Phenolic pollutants	K_c (10^4 L/mol)
Resorcin	0.6
Bisphenol A	0.7

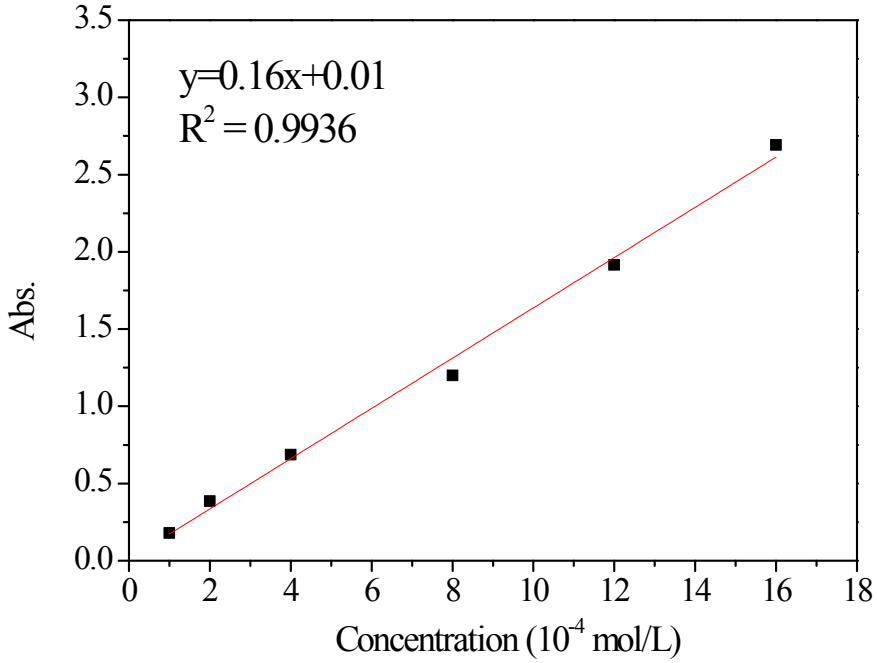


Figure S1. Plot of calibration curves for glucose solution with different concentration.

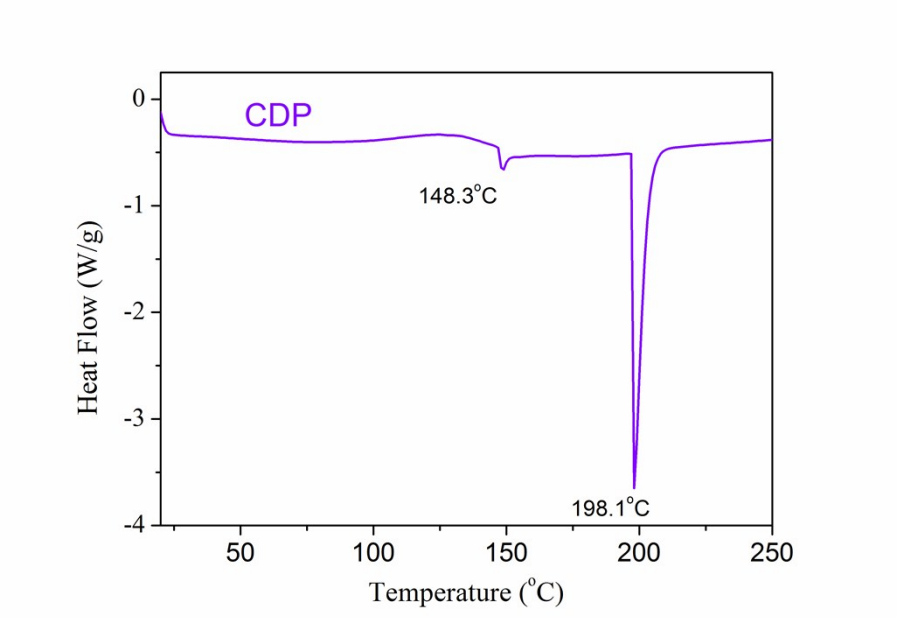


Figure S2. Differential scanning calorimetry of cyclodextrin polymers.

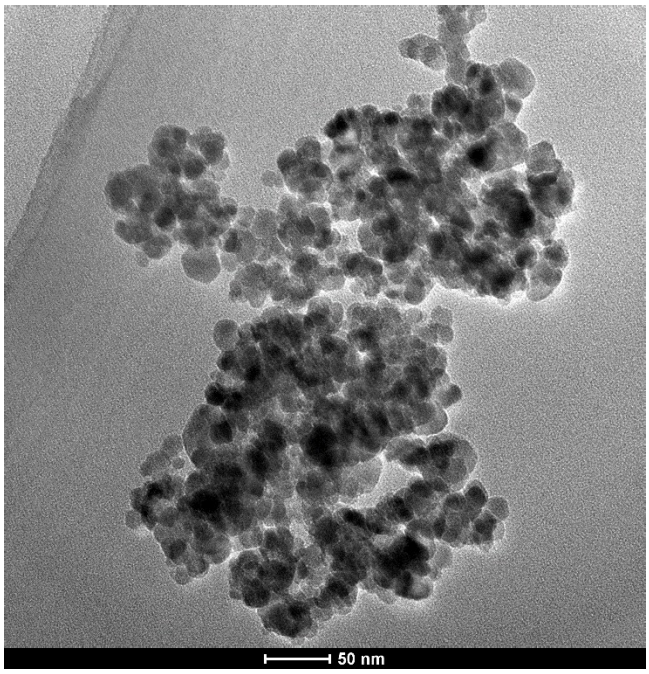


Figure S3. TEM images for naked MNPs.

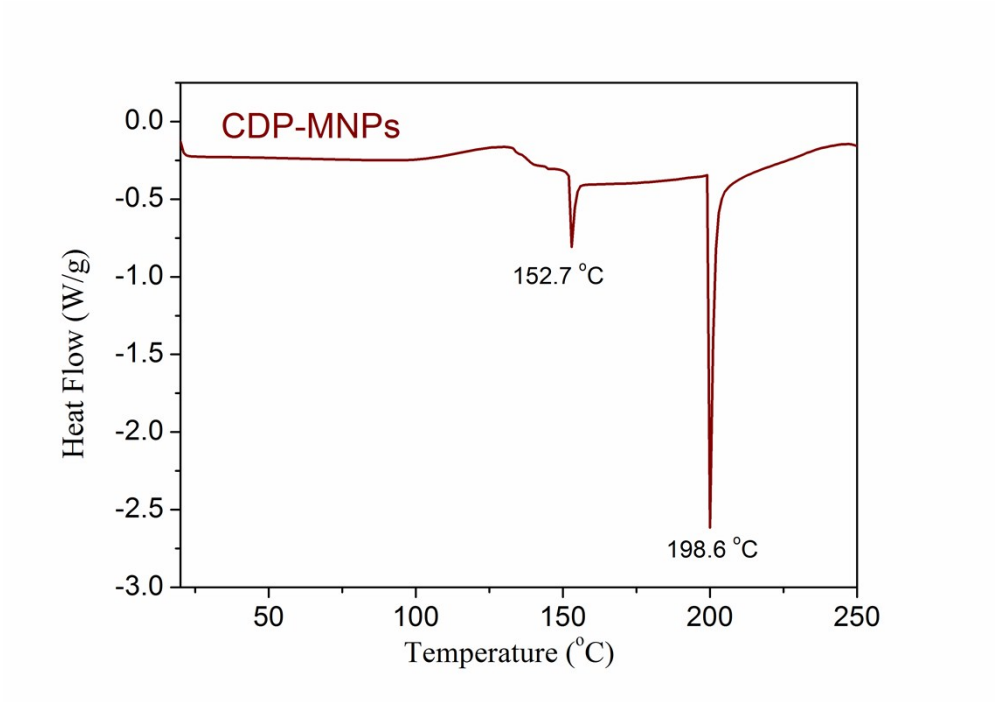
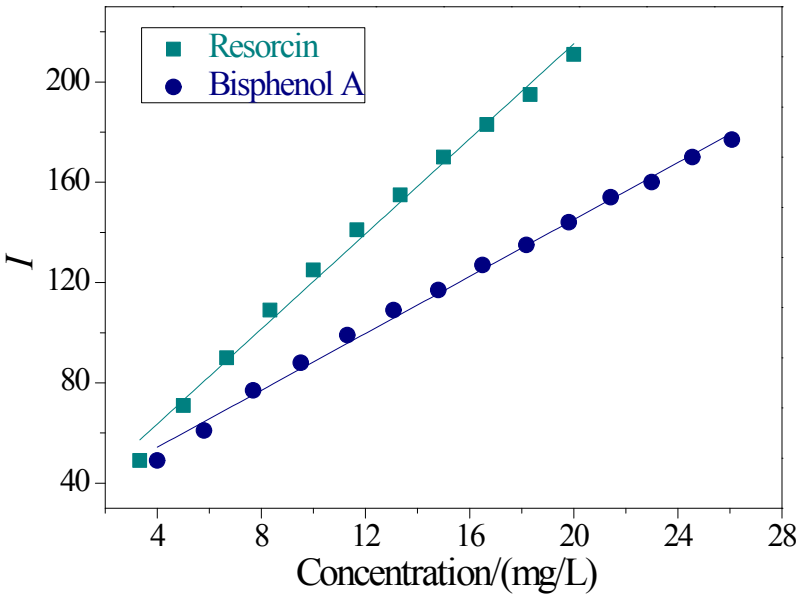


Figure S4. Differential scanning calorimetry of CDP-MNPs.



Figuer S5. Plot of calibration curves for resorcin and bisphenol A solution with different concentration.

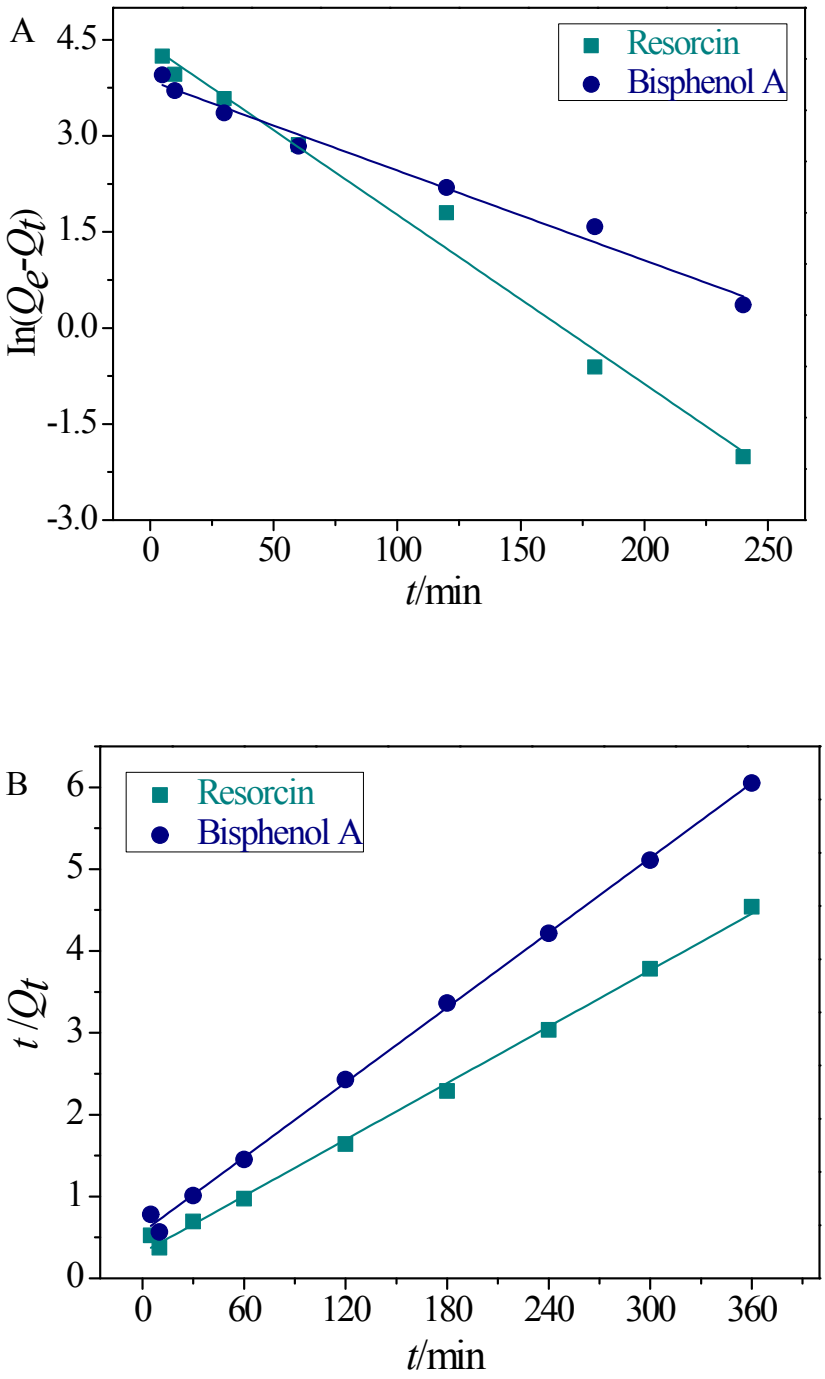


Figure S6. The linear fitting plots of Lagergren's pseudo-first-order (A) and Ho's pseudo-second-order (B) equations.

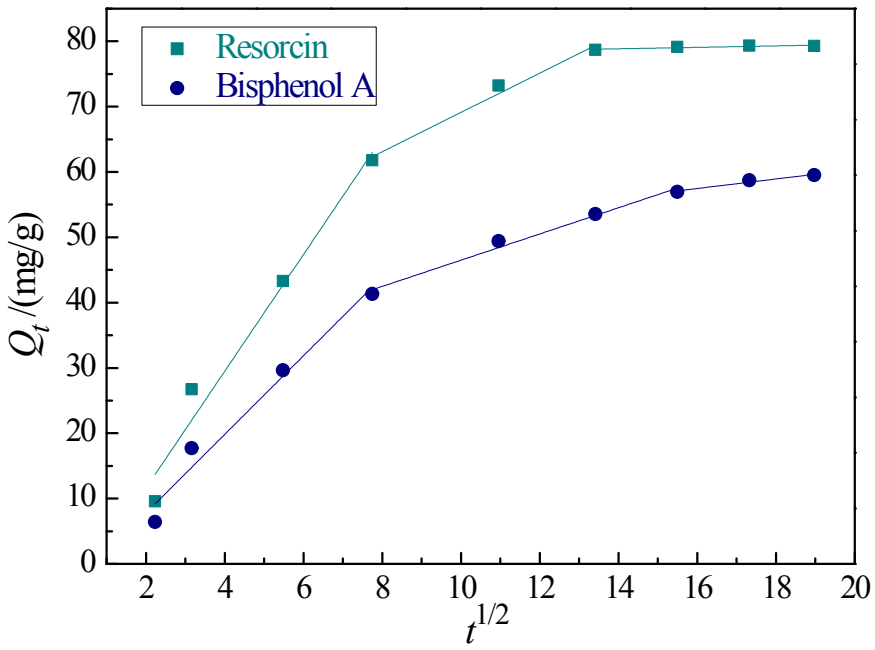


Figure S7. The plot of Weber's intraparticle diffusion model.

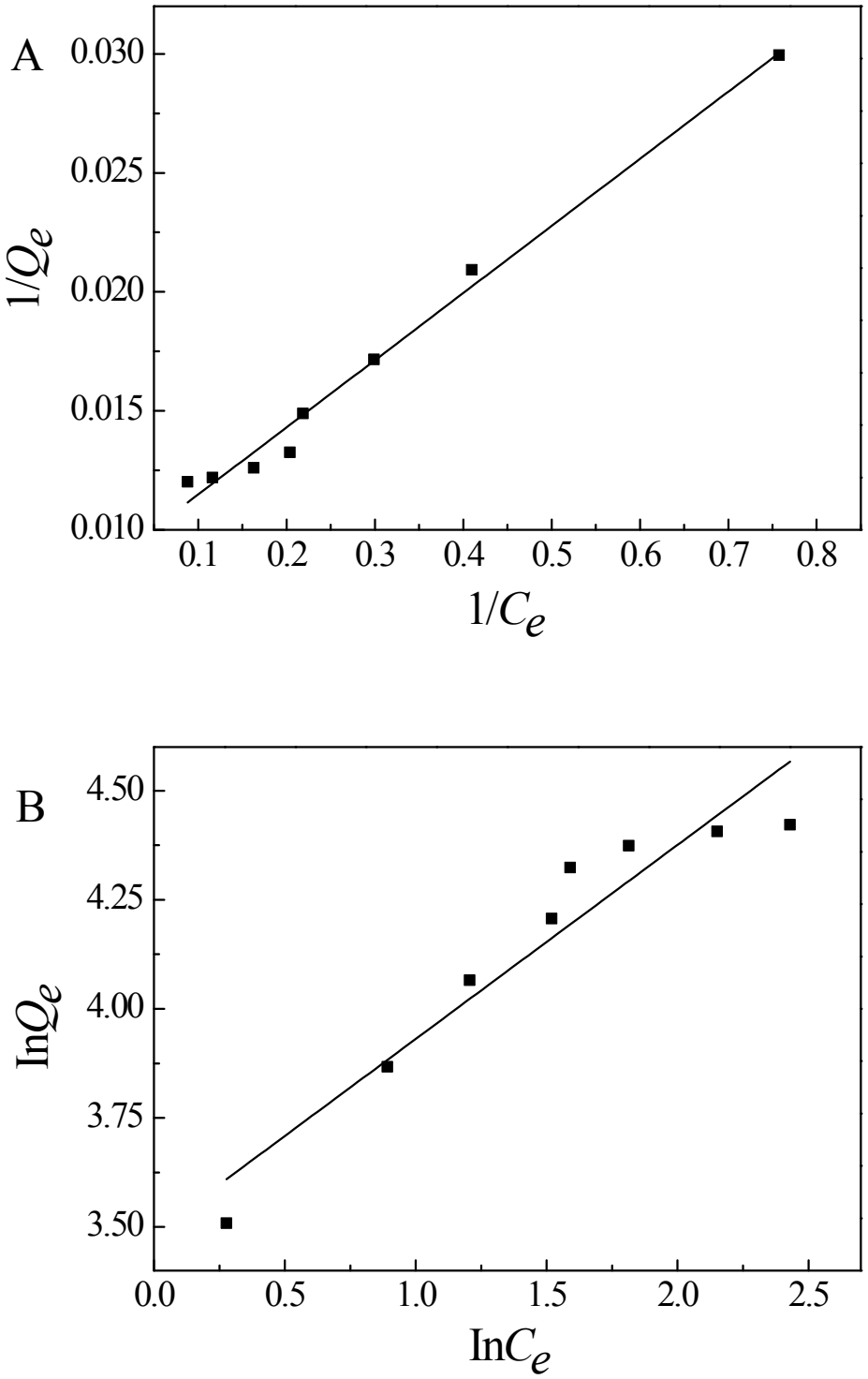


Figure S8. (A) Langmuir plot illustrating the linear dependences of $1/Q_e$ on $1/C_e$, and (B) Freundlich plot illustrating the linear dependences of $\ln Q_e$ on $\ln C_e$ for adsorption of resorcin.

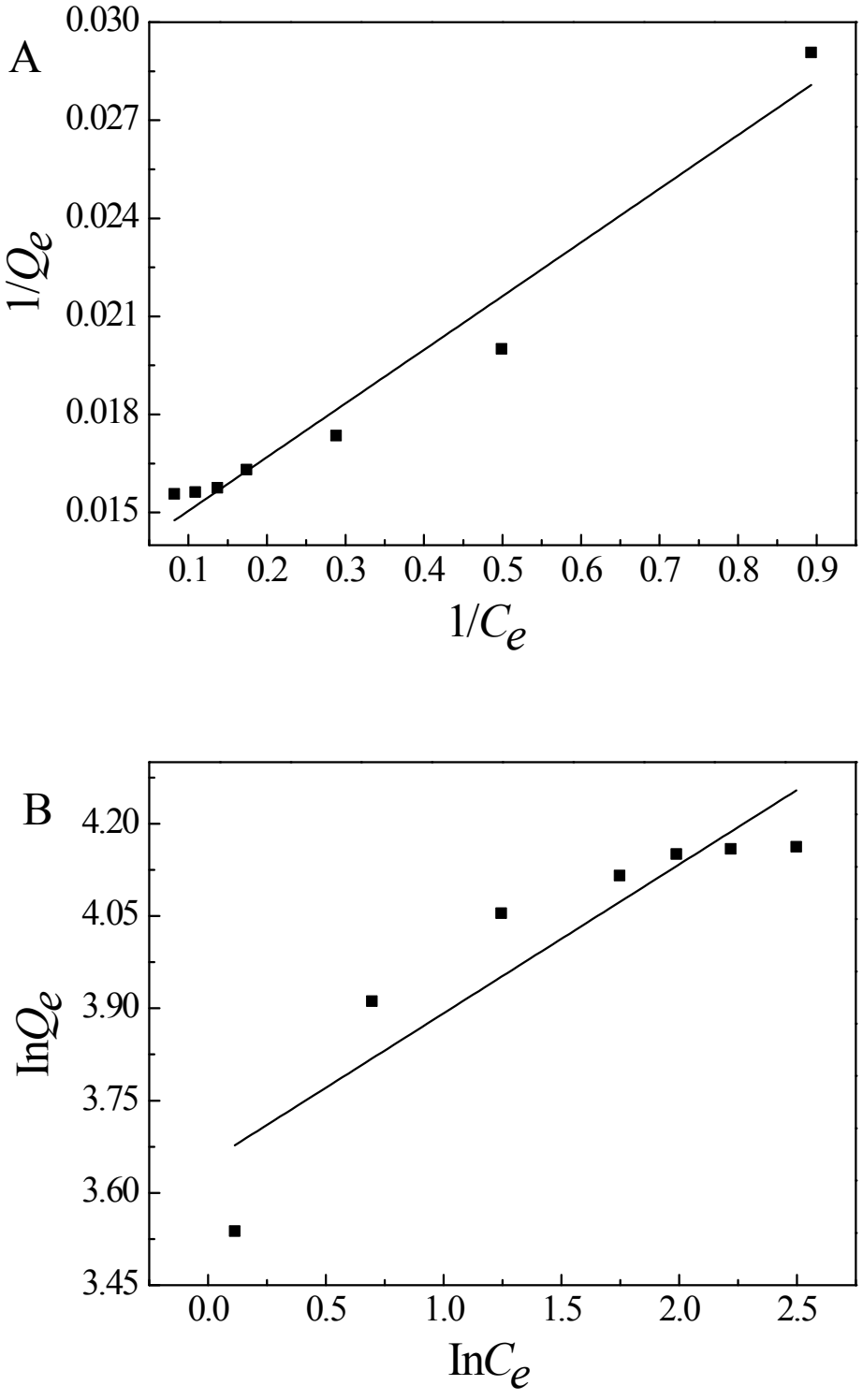


Figure S9. (A) Langmuir plot illustrating the linear dependences of $1/Q_e$ on $1/C_e$, and (B) Freundlich plot illustrating the linear dependences of $\ln Q_e$ on $\ln C_e$ for adsorption of bisphenol A.

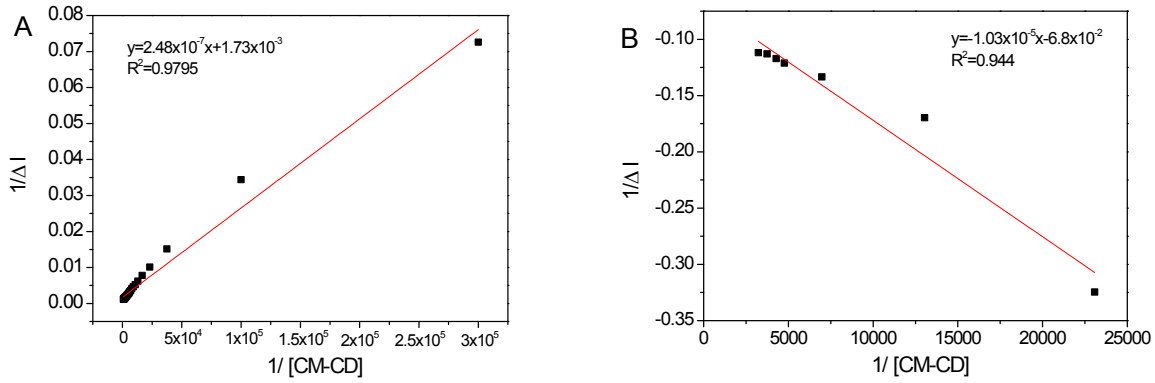


Figure S10. Plot of binding constant for bisphenol A (A) and resorcin (B) with carboxymethyl-β-cyclodextrin (CM-CD).