

Graphene oxide-based polymeric membranes for broad water pollutants removal

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Supplementary Material

Preparation of graphene oxide (GO)

GO was prepared by a modified Hummers method. Briefly, 5 g of graphite, 3.75 g of NaNO₃ and 150 mL of H₂SO₄ were placed in a flask. 20 g of KMnO₄ was slowly added to the flask with gentle stirring in an ice-water bath. Then the mixture was vigorously stirred at 40 °C in a water bath. The viscosity of the mixture will increase dramatically after certain reaction time (usually 12 hours), and then the stirring could be turned off. The reaction was kept for three days, the obtained brown mud was diluted with DI water (500 mL) slowly, and the insoluble precipitations were then removed by centrifugation. The resulted GO solution was dialyzed with DI water for one week, and concentrated by centrifugation.

The fitting results of pseudo-first-order model and pseudo-second-order model.

Table S1

The parameters of pseudo-first-order model and pseudo-second-order model.

	pseudo-first-order model			pseudo-second-order model		
	k_1 (1/min)	$q_{e(cal)}$ (mg/g)	r^2	k_2 (g/mg·min)	$q_{e(cal)}$ (mg/g)	r^2
M-GO3	8.9×10^{-3}	16.73	0.98	1.10×10^{-3}	29.41	0.99
M-GO6	9.9×10^{-3}	25.68	0.99	6.93×10^{-4}	37.74	0.99
M-RGO3	10.6×10^{-3}	10.29	0.94	1.07×10^{-3}	14.01	0.98
M-RGO6	9.4×10^{-3}	11.99	0.95	7.93×10^{-4}	18.98	0.98
M-PEI3	8.6×10^{-3}	29.76	0.99	3.61×10^{-4}	35.34	0.99
M-PEI6	8.6×10^{-3}	58.82	0.98	1.46×10^{-4}	60.97	0.99

The fitting results of intraparticle diffusion model.

Table S2

The parameter of intraparticle diffusion model.

	C (mg/g)	Step I		Step II	
		k_1 (mg/g·min ^{1/2})	r^2	k_2 (mg/g·min ^{1/2})	r^2
M-GO3	6.01	1.53	0.98	0.11	0.98
M-GO6	6.59	1.90	0.99	0.11	0.99
M-ROG3	-2.87	1.13	0.98	0.06	0.99
M-RGO6	-3.87	1.54	0.98	0.07	0.99
M-PEI3	1.02	1.75	0.99	0.27	0.98
M-PEI6	0.58	2.62	0.99	0.76	0.97

The fitting results of Langmuir adsorption isotherm.

Table S3

The parameters of Langmuir adsorption isotherm.

	q_{\max} (mg/g)	k_L (L/mg)	r_L^2
M-GO3	33.48	0.18	0.99
M-GO6	43.86	0.17	0.99
M-RGO3	16.14	0.04	0.99
M-RGO6	21.63	0.11	0.99
M-PEI3	36.94	0.14	0.99
M-PEI6	63.05	0.57	0.99

The analysis results of thermodynamics.

Table S4

The parameters of thermodynamics.

	ΔH^0 (kJ/mol)	ΔS^0 (J/mol·K)	ΔG^0 (kJ/mol)					r^2
			293.15k	303.15k	313.15k	323.15k	333.15k	
M-GO3	-22.59	-17.07	-17.59	-17.42	-17.24	-17.07	-16.90	0.99
M-GO6	-39.82	-59.53	-22.37	-21.77	-21.18	-20.58	-19.99	0.99
M-RGO3	-23.97	-33.03	-14.29	-13.96	-13.63	-13.30	-12.96	0.99
M-RGO6	-34.12	-59.66	-16.63	-16.03	-15.44	-14.84	-14.24	0.99
M-PEI3	-20.98	-14.85	-16.63	-16.48	-16.33	-16.18	-16.03	0.98
M-PEI6	-30.19	-32.69	-20.61	-20.28	-19.95	-19.62	-19.30	0.98