Supplementary materials for:

Melamine-derived mesoporous carbon for efficient and selective removal of trace Hg(II) from honeysuckle decoction

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1. Schematic diagram

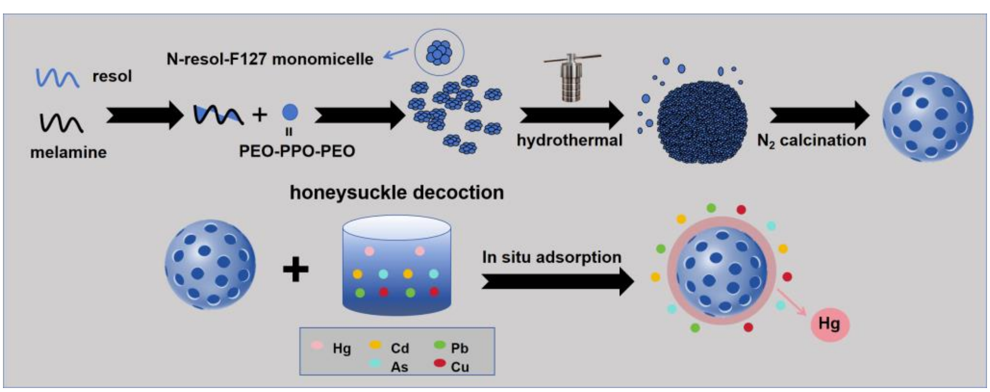

Fig.S1 Schematic diagram of synthesis and adsorption

2. Selective adsorption study

The results of MCN_1, MCN_2, MCN_3, and MCN_4 on the removal of Pb(II), As(II), Cd(II), Hg(II), and Cu (II) in Table S1. The best adsorption effect of MCNs is at 20 mg·L^{-1} Hg (II) concentrations (pH = 6.0). As can be seen from the Table S1, among Pb(II), As(II), Cd(II), Hg(II), and Cu(II), MCNs show certain selective removal performance of Hg(II), and the selectivity rate for Hg(II) by MCN_1 is 92.18%.

Table S1 Selective removal rate of five heavy metals by mesoporous carbon materials

Removal (%)	Pb	Hg	As	Cd	Cu
MCN_1	0%	92.18%	0%	0%	0%
MCN_2	2.63%	62.08%	2.77%	1.05%	1.96%
MCN_3	0%	30.97%	0.85%	0%	0.16%
MCN_4	3.06%	68.61%	0%	0%	3.72%

3. Dosage effects on adsorption

Fig. S1 shows the adsorbent dose influence on Hg(II) removal rate. The removal efficiencies of the MCN_1, MCN_2, MCN_3, and MCN_4 increased from the initial dose of 5 mg/20 mL to 20 mg/20 mL (10 $mg\cdot L^{-1}$ Hg(II)), 24 h of the adsorption time, and 30 ℃ of the temperature).

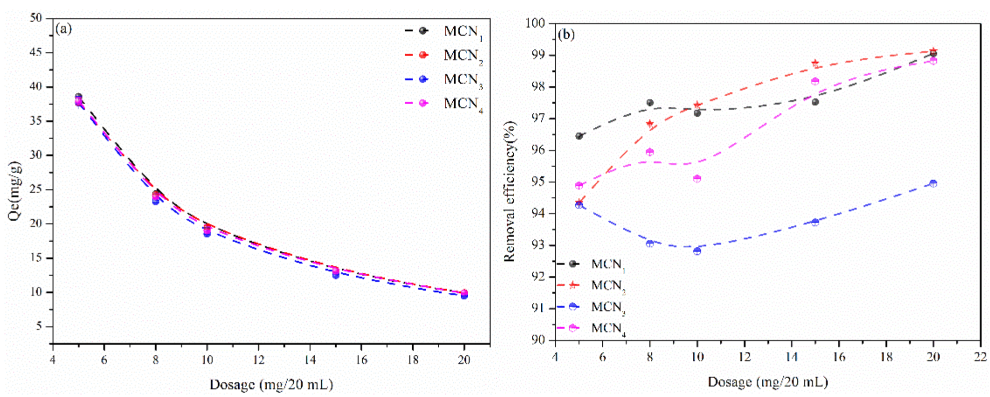

Fig.S2 Removal efficiency and adsorption of Hg(II) by the dosing amount of MCNs (a) and (b)

4. Effects of initial concentration on adsorption

The effect of different initial concentration on the Hg(II) adsorption is presented in Fig. S2 (5 mg of adsorbent amount, Hg(II) initial concentration of two gradients. Gradients 1 is 0.0005 mg/L, 0.001 mg/L, 0.002mg/L, 0.004 mg/L, 0.006 mg/L, 0.008 mg/L, and 0.01mg/L. Gradients 2 is 0.01 mg/L, 0.13 mg/L, 0.16mg/L, 0.19 mg/L, 0.22 mg/L, 0.3 mg/L, 0.4mg/L.

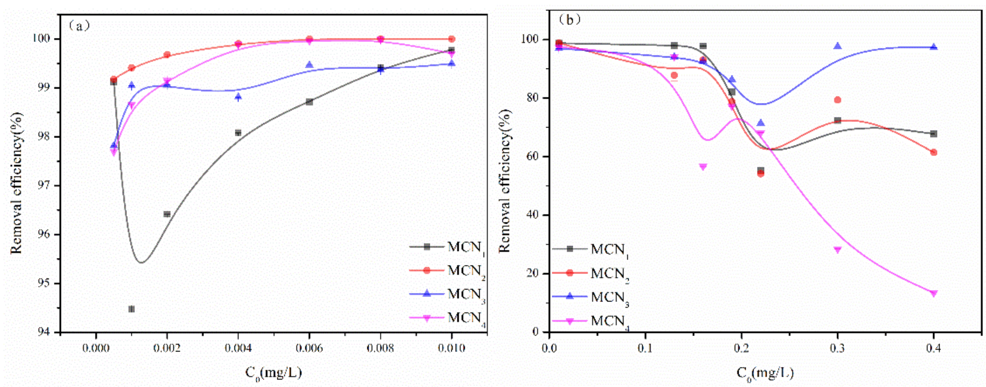

Fig.S3 Plots of the removal rate (%) of mesoporous carbon for different concentrations of Hg(II), (a)Gradient 1, (b)Gradient 2

5. Effects of adsorption time on on adsorption

The adsorption time is one of the main factors to measure the adsorption efficiency. The experimental conditions are as follows: 0.13 mg·L^{-1} of Mercury ion concentration, 30 min, 60 min, 90 min, 120 min, 180 min, 240 min, 420 min, 600 min and 960 min of adsorption times.

Table S2 Kinetic parameters of the pseudo-second-order and the pseudo-first-order models of MCNs for Hg(II)

Kinetic models	$q_{e,exp}$ (mg/g)	Pseudo-first-order			Pseudo-second-order		
		q_e (mg/g)	K_1 (1/min)	R^2	q_e (mg/g)	K_2 (g/(mg·min))	R^2
MCN_1	0.5094	0.0023	6.058	0.1599	0.5088	0.3034	0.99999
MCN_2	0.5169	0.0163	4.1168	0.0672	0.5052	0.3499	0.99999
MCN_3	0.4730	0.0363	3.3159	0.7493	0.4749	9.0147	0.99996
MCN_4	0.5002	0.0046	5.37612	0.1473	0.4907	-2.3255	0.99976

6. Effects of adsorption temperature on adsorption

This work is designed to 5 mg of MCN_X to 20 mL of different concentrations (0.01 mg·L^{-1}, 0.13 mg·L^{-1}, 0.16 mg·L^{-1}, 0.19 mg·L^{-1}, 0.22 mg·L^{-1}, 0.30 mg·L^{-1}, and 0.40 mg·L^{-1}) in Hg(II) for adsorption experiments. The results are shown in Fig.S3.

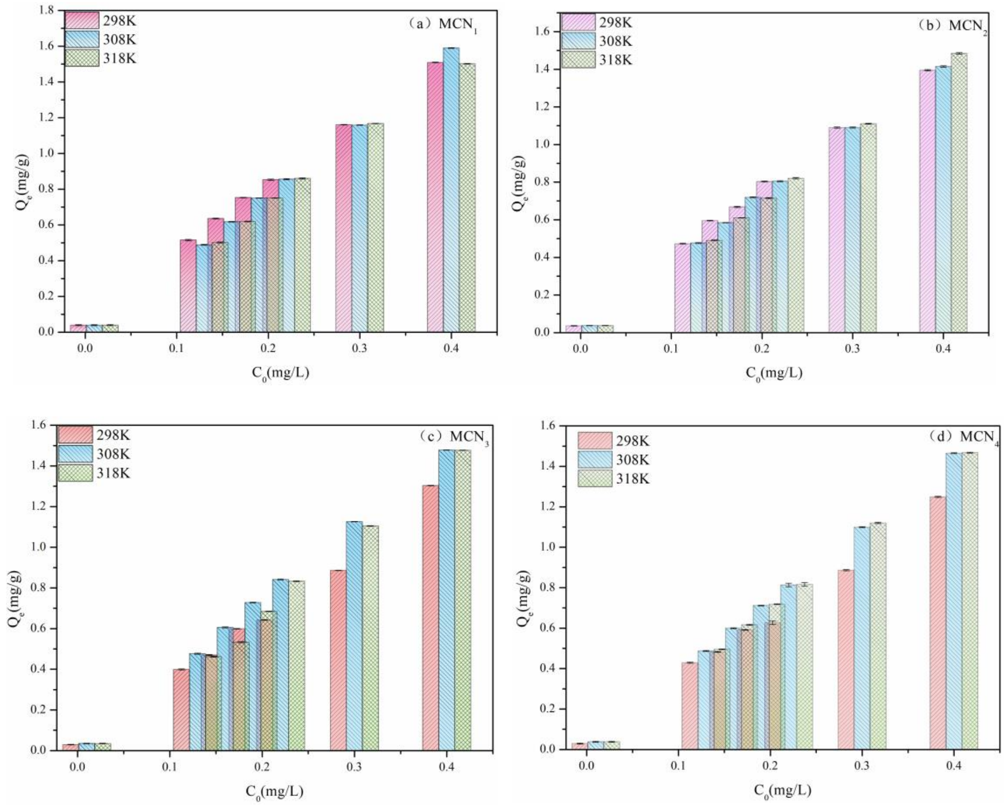

Fig.S4 The removal rate of Hg(II) at different temperatures: (a)MCN_1, (b) MCN_2, (c) MCN_3, (d) MCN_4

7. The effect of pH on the stability of the solution

This work designed Hg(II) adsorption experiments using 5 mg of MCN_1 in 20 mL of honeysuckle extract at different pH levels (2, 4, 5, 6, 7, 8, 9). The results are shown in Figure S4.

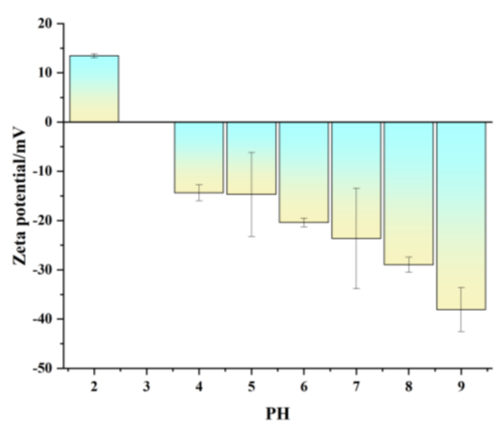

Fig.S5 PH influence on zeta potential: MCN_1