

Supplementary Materials

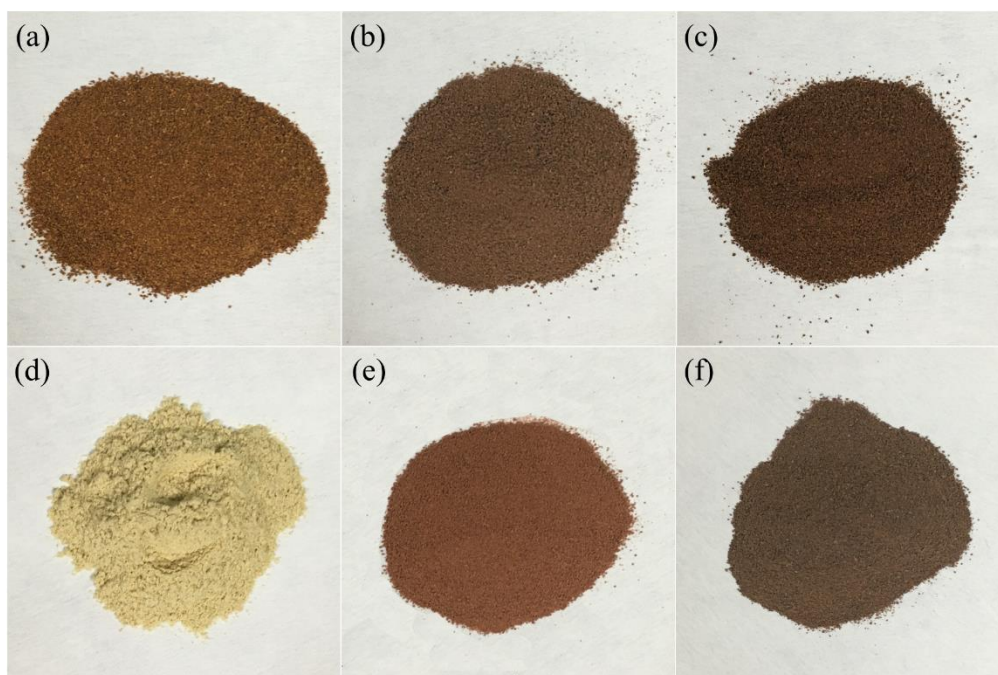


Fig. S1. The appearance of NLC (a), LC@PEI-30 (b), LC@PEI-65 (c), NLG (d), LG@PEI-30 (e), LG@PEI-65 (c).

Table S1. EDS Analysis of Adsorbent Surface

Element	wt%		
	NLP	LP@PEI-65	LP@PEI-65-MO
C	56.94	68.95	67.64
N	1.61	6.10	10.66
O	41.46	24.95	21.69

Table S2. Kinetic Parameters of MO Adsorption by Pericarps

Kinetic model	Parameter	NLC	LC@PEI-30	LC@PEI-65	NLG	LG@PEI-30	LG@PEI-65
	$q_{e,exp}$	2.50	91.31	96.74	1.43	89.18	94.72
Pseudo-first order	$q_{e,cal}$	2.51	88.30	93.36	1.45	87.46	91.90
	k_1	0.092	0.015	0.038	0.056	0.049	0.061

Pseudo-second order	R^2	0.995	0.993	0.979	0.951	0.986	0.974
	$q_{e,cal}$	2.57	96.59	98.40	1.51	91.38	95.70
	k_2	7.06×10^{-2}	2.24×10^{-4}	6.18×10^{-4}	5.94×10^{-2}	9.18×10^{-4}	1.1×10^{-3}
	R^2	0.970	0.998	0.999	0.898	0.998	0.999
Elovich	α	4.52×10^4	7.01	1.17×10^2	15.59	4.99×10^2	1.69×10^3
	β	7.494	0.063	0.091	7.502	0.116	0.123
	R^2	0.904	0.944	0.947	0.773	0.937	0.957
Intra-particle diffusion	K_1	0.341	7.102	9.966	0.209	10.105	10.587
	C_1	0.209	-2.839	3.378	-0.046	4.271	7.303
	R_1^2	0.913	0.978	0.982	0.882	0.973	0.941
	K_2	-9.64×10^{-17}	1.885	0.828	-4.82×10^{-17}	0.457	0.532
	C_2	2.502	52.104	79.316	1.436	80.466	84.071
	R_2^2	0.999	0.939	0.883	0.999	0.890	0.921
	K_3	-4.83×10^{-17}	0.156	0.084	-2.41×10^{-17}	0.022	0.045
	C_3	2.502	83.639	93.505	1.436	88.400	92.975
	R_3^2	0.999	0.873	0.994	0.999	0.911	0.985

unit: $q_{e,exp} = \text{mg/g}$, $q_{e,cal} = \text{mg/g}$, $k_1 = \text{min}^{-1}$, $k_2 = \text{g} \cdot \text{mg}^{-1} \cdot \text{min}^{-1}$, $\alpha = \text{mg} \cdot \text{g}^{-1} \cdot \text{min}^{-1}$, $\beta = \text{g} \cdot \text{mg}^{-1}$, $K_i = \text{mg g mi}^{-1}$, $C_i = \text{mg/g}$

Table S3. Diffusion Model Parameters of MO Adsorption by LC@PEI-65 at Different Initial Concentrations

Adsorption stage	Parameter	Initial MO concentration		
		10 mg/L	30 mg/L	50 mg/L
First step	K_1	2.650	6.434	9.238
	C_1	12.902	28.143	27.582
	R_1^2	0.955	0.992	0.983
Second step	K_2	0.058	1.163	1.905
	C_2	33.049	72.509	88.289
	R_2^2	0.987	0.989	0.999
Third step	K_3	0.008	0.192	0.434
	C_3	34.094	91.911	118.282
	R_3^2	0.941	0.936	0.874

unit: $K_i = (\text{mg} \cdot \text{g}^{-1} \cdot \text{min}^{-1})$, $C_i = (\text{mg/g})$

Table S4. The Adsorption Isotherm Parameters of MO Adsorption by Modified Pericarps

Isotherm model	Parameter	LC@PEI-30	LC@PEI-65	LG@PEI-30	LG@PEI-65
	$q_{e,exp}$	257.77	349.37	242.85	321.68
Langmuir	q_m	269.20	286.37	261.47	298.23
	K_L	0.443	0.207	0.038	0.075
	R^2	0.822	0.748	0.869	0.821
Freundlich	K_F	53.693	84.504	43.707	70.722
	n	3.352	3.847	3.044	3.549
	$1/n$	0.298	0.260	0.329	0.282
	R^2	0.970	0.958	0.978	0.977
Temkin	B	34.574	38.044	38.820	39.772
	K_T	4.518	13.741	1.733	6.251
	R^2	0.887	0.892	0.915	0.913
D-R	q_m	243.92	261.45	231.48	280.09
	β	1.21×10^{-4}	8.66×10^{-7}	1.32×10^{-4}	6.49×10^{-5}
	R^2	0.420	0.595	0.457	0.466

unit: $q_{e,exp} = \text{mg/g}$, $q_{e,cal} = \text{mg/g}$, $K_L = \text{L/mg}$, $K_F = \text{mg} \cdot \text{g}^{-1} \cdot \text{L}^{-1/n} \cdot \text{mg}^{-1/n}$, $B = \text{J/mol}$, $K_T = \text{L/mg}$, $\beta = \text{mol}^2/\text{kJ}^2$

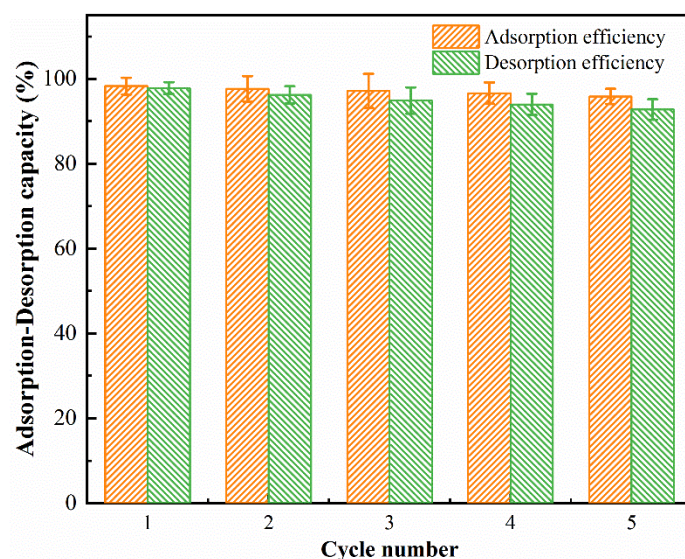


Fig. S2. Evaluation of desorption and reusability of LC@PEI-65.

Table S5. Cost Estimation Breakdown for the Production of MCPEI Adsorbent

Process	Cost breakdown	Measurement unit	Amount	Unit cost (CNY)	Power rating (kWh)	Price (CNY)
Preparation of LC@PEI-65	Lychee pericarp	kg	1	0	--	0
	Polyethyleneimine	kg	0.3	280	--	84
	50% glutaraldehyde	L	0.002	100	--	0.2
	Heating	65°C (power supply, 500 W), 6 h		39.45	0.04	1.58
Net amount of 1kg LC@PEI-65	--	--	--	--	--	85.78
Overhead cost (10 % of net cost)	--	--	--	--	--	8.578
Total cost	--	--	--	--	--	94.358

The economic indicators are converted from Chinese Yuan to Dollar at the exchange rate of 1 \$ = 6.5 CNY.