

Functions:

Removal efficiency and adsorption capacity:

$$R = (C_0 - C) / 100\% \quad (S1-1)$$

$$Q = V \times \frac{C_0 - C}{m} \quad (S1-2)$$

Where R is the removal efficiency; Q (mg/g) is the adsorption capacity; V (L) is the volume of solution; m (g) is the dosage of activated carbon; C₀ (mg/L) is the initial concentration of solution and C (mg/L) is the remaining concentration of solution after adsorption. Equilibrium adsorption capacity (Q_e, mg/g)

$$Q_e = \frac{(C_0 - C_e)V}{m} \quad (S2-1)$$

Where C₀ and C_e are the initial and equilibrium concentrations of the dye solution (mg/L), V is the volume of the dye solution (L), and m is the weight of the activated carbon (g).

Fitting equilibrium sorption data using Langmuir and Freundlich isotherm models

$$\frac{C_e}{Q_e} = \frac{1}{K_L Q_m} + \frac{C_e}{Q_m} \quad (S2-2)$$

$$\ln Q_e = \ln K_F + \frac{1}{n} \ln C_e \quad (S2-3)$$

Where, C_e (mg/L) is the equilibrium concentration during adsorption; Q_e and Q_m (mg/g) are the equilibrium adsorption capacity and Langmuir monolayer maximum adsorption capacity; K_L is the Langmuir constant; K_F is the Freundlich empirical constant; and n is the adsorption intensity. The proposed primary and secondary kinetic models were used to simulate the adsorption kinetics.

Pseudo-first-order model:

$$\ln(Q_e - Q_m) = \ln Q_e - K_1 t \quad (S3-1)$$

Pseudo-second-order model:

$$\frac{t}{Q_m} = \frac{1}{K_2 Q_e^2} + \frac{t}{Q_e} \quad (S3-2)$$

Where Q_e and Q_m (mg/g) are the equilibrium adsorption capacity and the maximum adsorption capacity of Langmuir monolayer, respectively; K₁ (/min) and K₂ (g/(mg min)) are the proposed primary and proposed secondary rate constants, respectively.

Thermodynamic parameters were calculated from thermodynamic equations using adsorption data of 200 mg- L-1 initial concentration at three temperatures (298, 308 and 313 K).

$$K_d = \frac{Q_e}{C_e} \quad (S4-1)$$

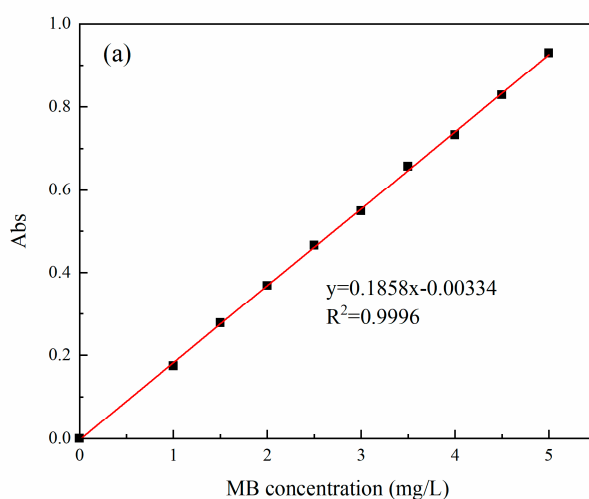
$$\Delta G = -RT \ln K_d \quad (S4-2)$$

$$\Delta G = \Delta H - \Delta S \quad (S4-3)$$

$$\ln K_d = \frac{\Delta S}{R} - \frac{\Delta H}{RT} \quad (S4-4)$$

Where K_d is the adsorption equilibrium constant; Q_e (mg/L) and C_e (mg/L) are the equilibrium adsorption capacity and concentration of the adsorbent, respectively; R (8.314, J-mol⁻¹K⁻¹) is the gas constant; T (K) is the adsorption temperature; ΔG (KJ/mol) is the Gibbs free energy change; ΔH (KJ/mol) and ΔS (J/mol·K) are obtained from the slope and intercept of the $\ln K_d$ and $1/T$ dotted line plots in figure.

Figure:



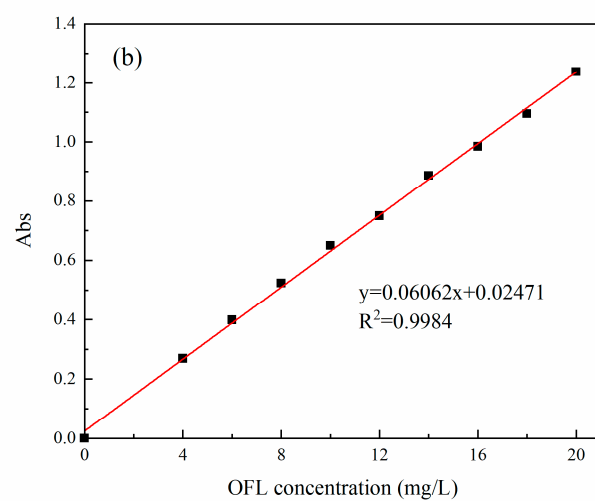


Figure S1. Standard curve plots of SAC adsorption of (a) MB and (b) OFL.

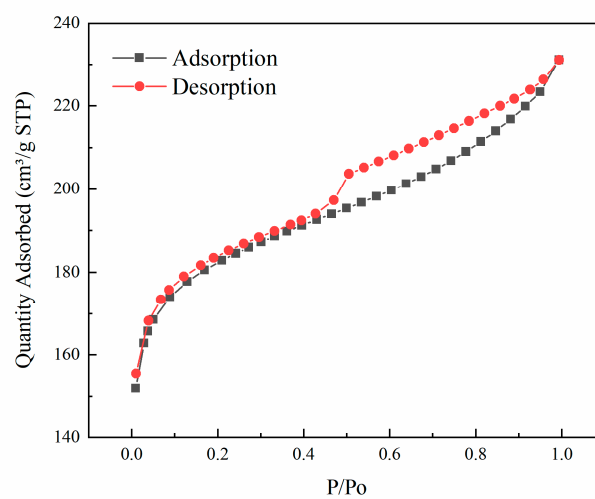


Figure S2 SAC adsorption-desorption curve

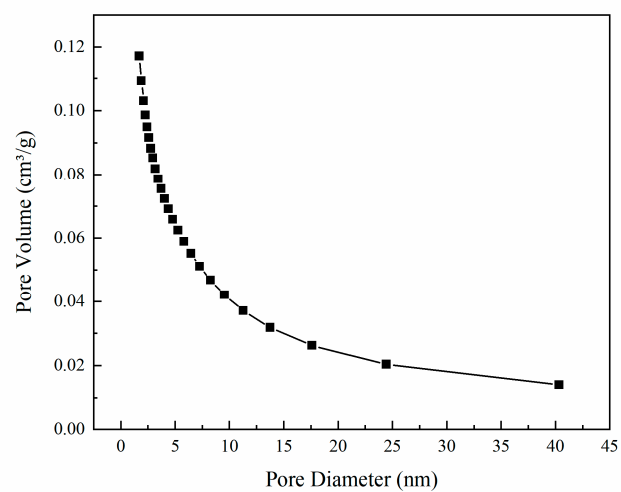
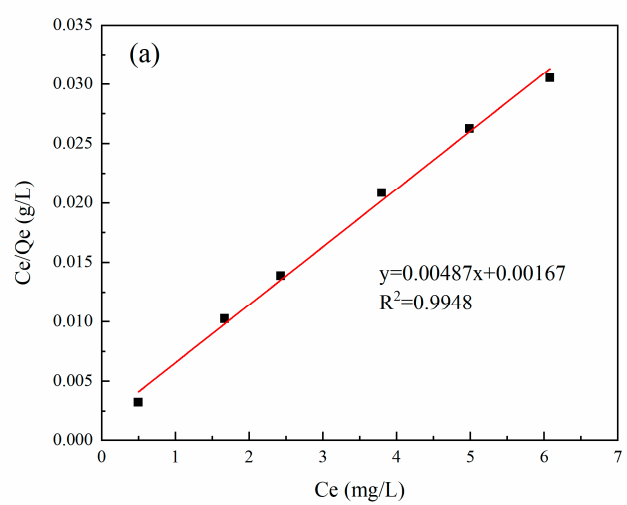


Figure S3. SAC pore size distribution.



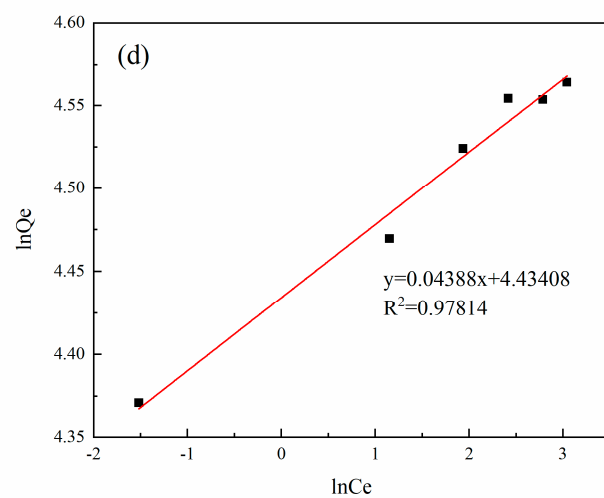
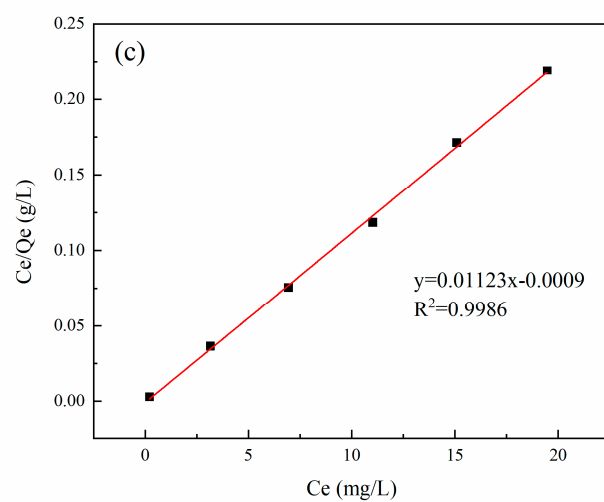
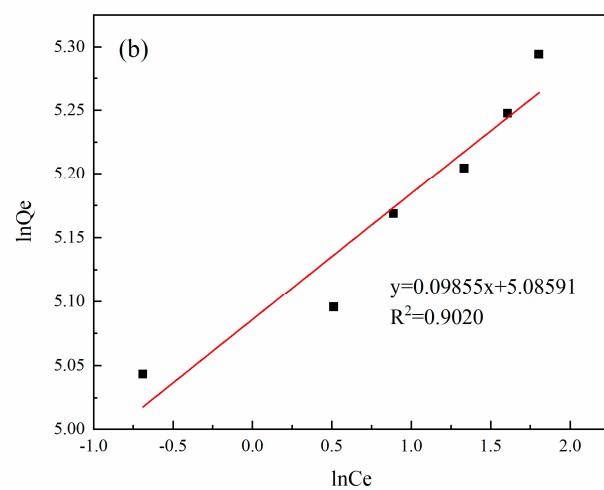
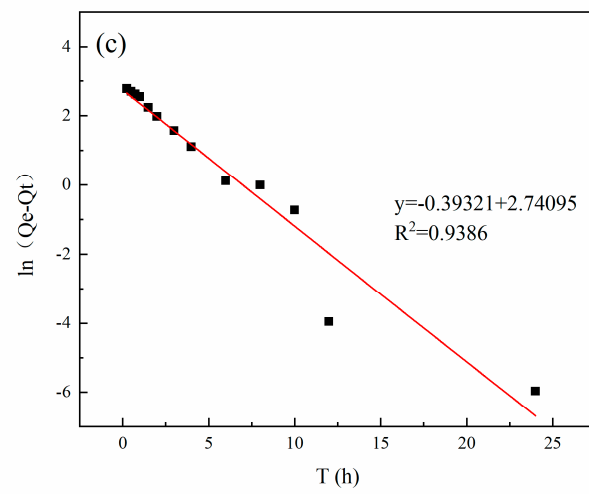
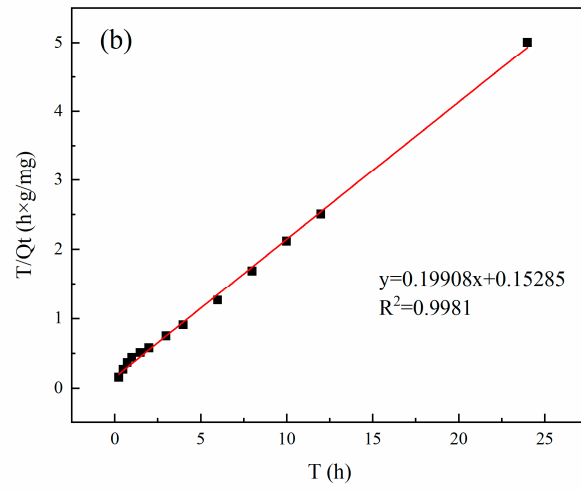
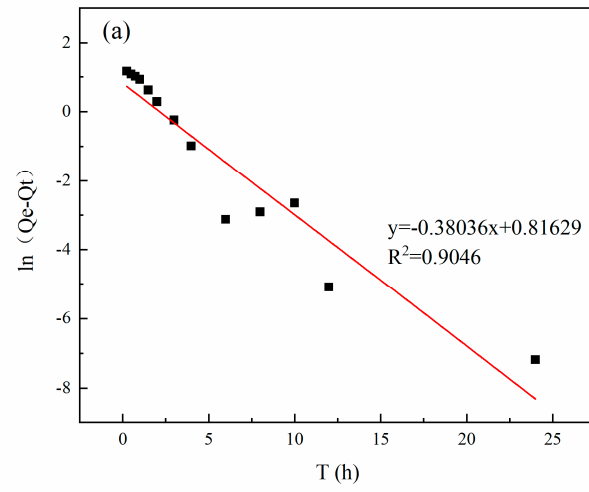


Figure S4. SAC adsorption MB and OFL experiments of (a) MB Langmuir; (b) MB Freundlich (c) OFL Langmuir (d) OFL Freundlich isothermal adsorption fitted curves.



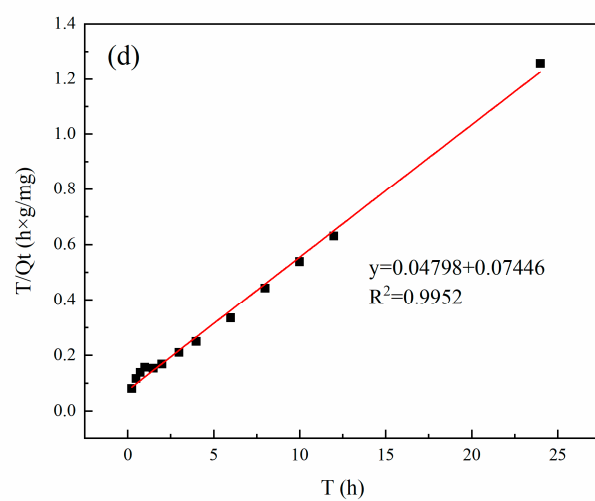


Figure S5. SAC adsorption MB and OFL experiments of (a) MB fitted primary kinetics; (b) MB secondary kinetics; (c) OFL fitted primary kinetics; (d) OFL adsorption secondary kinetics fitted curves.