

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; C<sub>0</sub> (mg/L) is the initial concentration of solution and C (mg/L) is the remaining concentration of solution after adsorption. Equilibrium adsorption capacity (Q<sub>e</sub>, mg/g)

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

Where C<sub>0</sub> and C<sub>e</sub> 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<sub>e</sub> (mg/L) is the equilibrium concentration during adsorption; Q<sub>e</sub> and Q<sub>m</sub> (mg/g) are the equilibrium adsorption capacity and Langmuir monolayer maximum adsorption capacity; K<sub>L</sub> is the Langmuir constant; K<sub>F</sub> 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<sub>e</sub> and Q<sub>m</sub> (mg/g) are the equilibrium adsorption capacity and the maximum adsorption capacity of Langmuir monolayer, respectively; K<sub>1</sub> (/min) and K<sub>2</sub> (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).

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

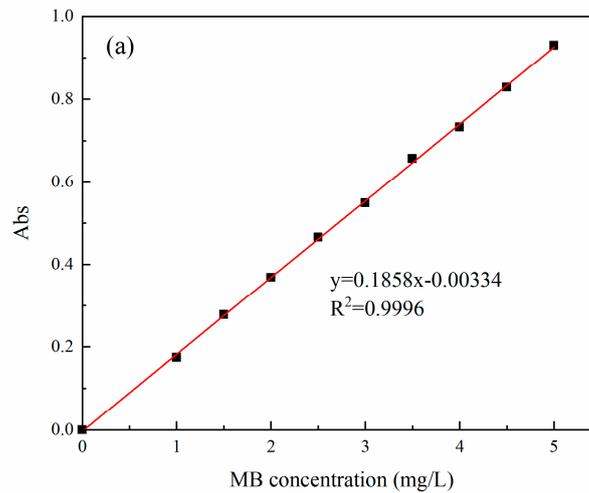
$$\Delta G = -RT \ln K_d \quad (S4-2)$$

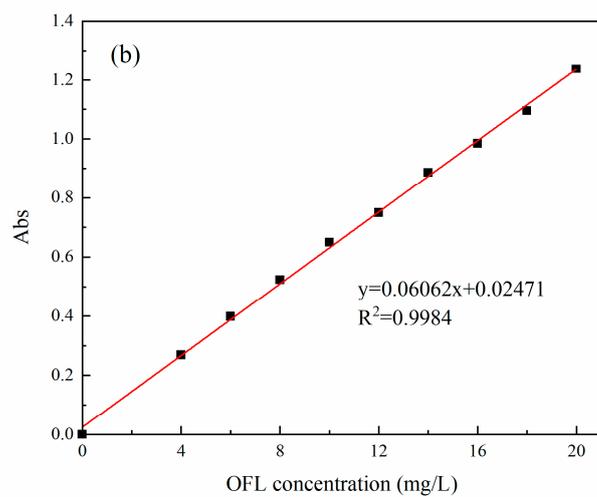
$$\Delta G = \Delta H - \Delta S \quad (S4-3)$$

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

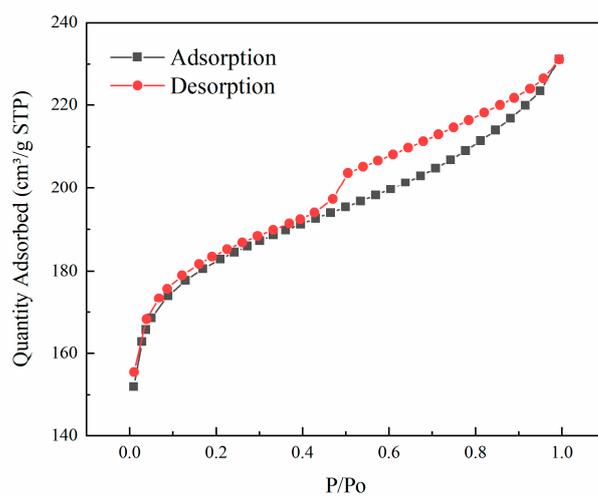
Where  $K_d$  is the adsorption equilibrium constant;  $Q_e$  (mg/L) and  $C_e$  (mg/L) are the equilibrium adsorption capacity and concentration of the adsorbent, respectively;  $R$ (8.314, J-mol-1K-1) is the gas constant;  $T$ (K) is the adsorption temperature;  $\Delta G$ (KJ/mol) is the Gibbs free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

Figure:

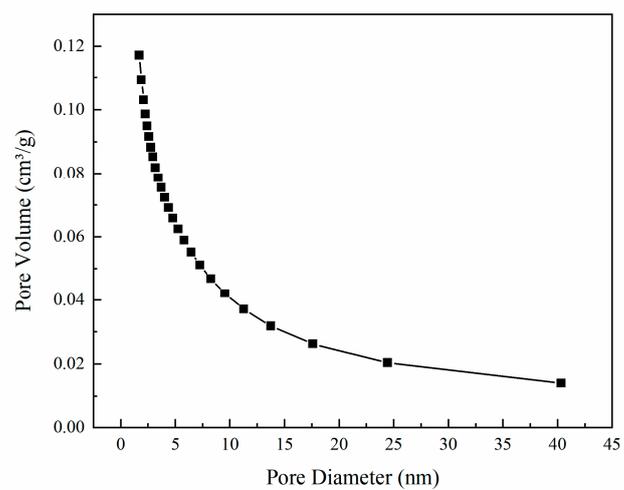




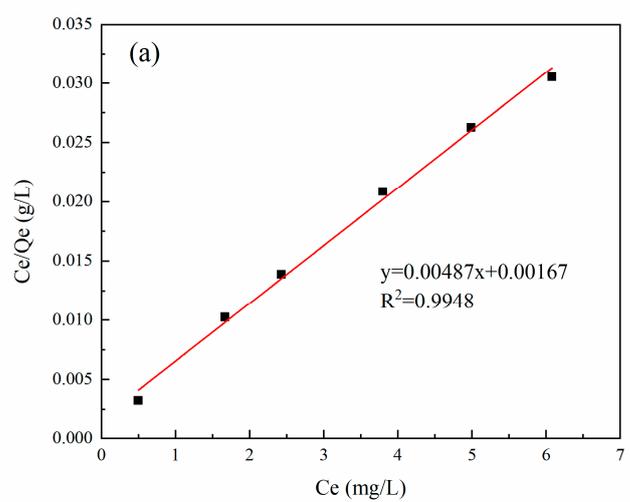
**Figure S1.** Standard curve plots of SAC adsorption of (a) MB and (b) OFL.

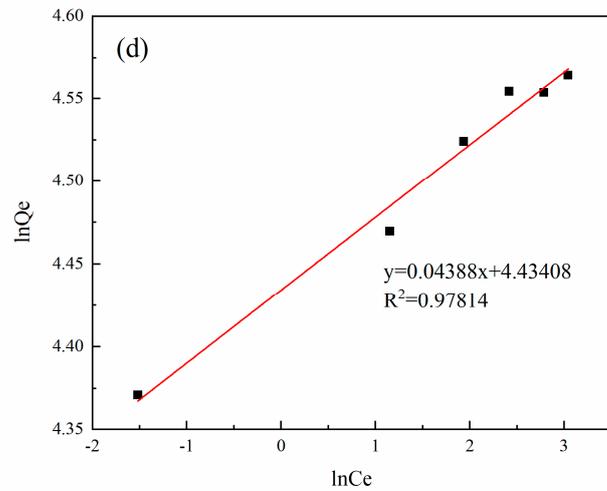
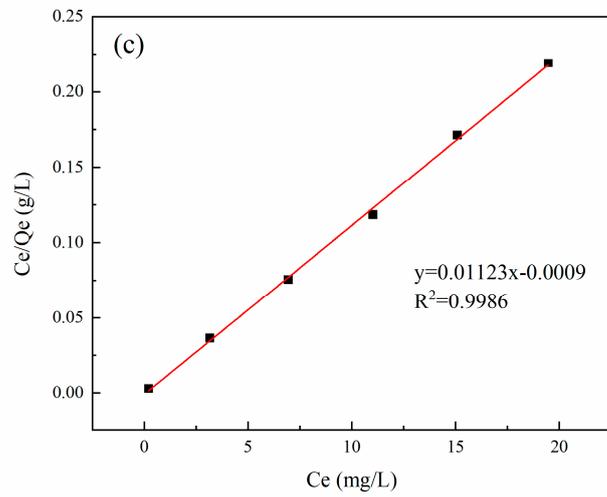
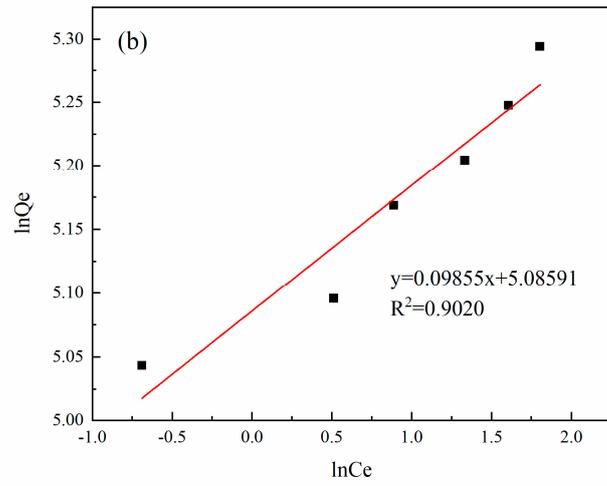


**Figure S2** SAC adsorption-desorption curve

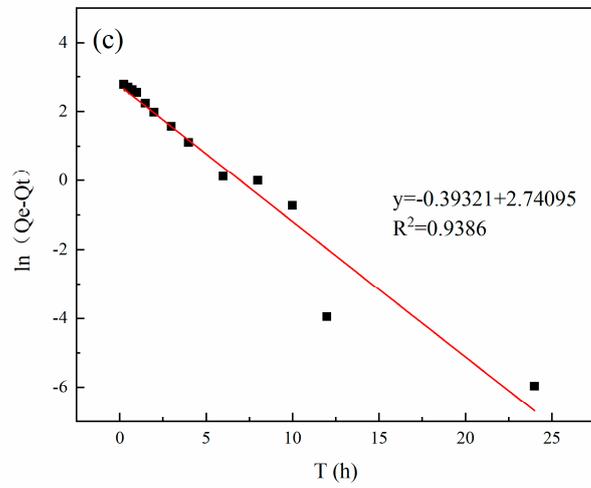
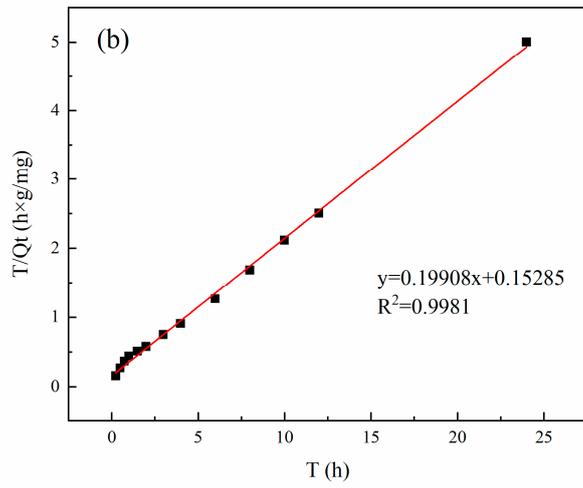
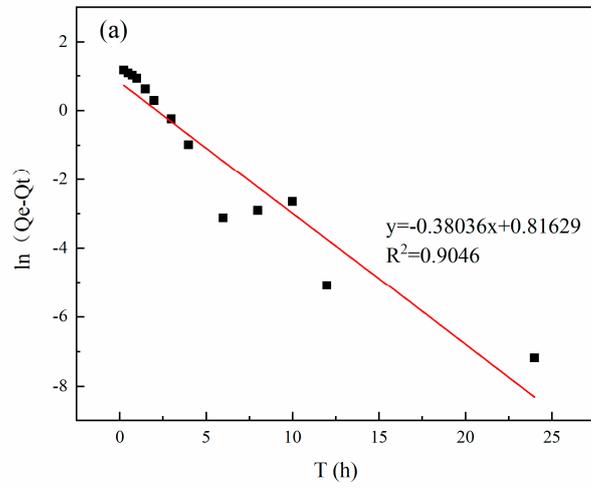


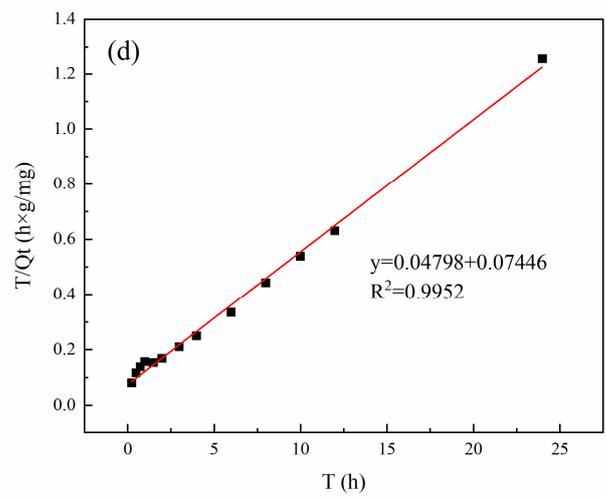
**Figure S3.** SAC pore size distribution.





**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.