Supporting Information for

Chemical Synthesis of Chitosan-Mimetic Polymers via Ring-Opening Metathesis Polymerization and Their Applications in Cu^{2+} Adsorption and Catalytic Decomposition

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Kinetic study is of great significance for understanding the whole adsorption process. By analyzing the relationship between adsorption quantity and time in solid-liquid system, not only the adsorption rate can be calculated, but also the adsorption mechanism can be discussed in depth. The absorption data of PHNI-PHNIA hydrogel toward Cu^{2+}

were fitted with Pseudo-first order, Pseudo-second order and Fickian diffusion models, respectively.

Pseudo-first order model:

$$lg(q_e\text{-}q_t) = lgq_e - k_1t/2.303 \quad (1)$$

Pseudo-second order model:

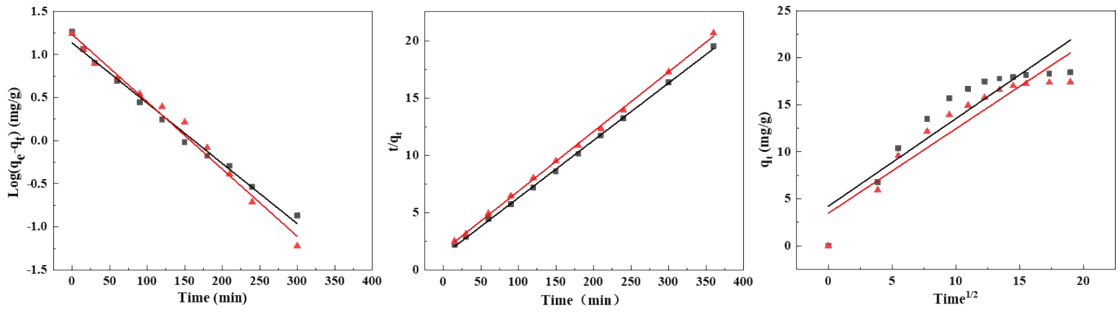
$$t/q_t = 1/(k_2q_e^2) + t/q_e \quad (2)$$

Fickian diffusion model:

$$q_t = k_{id}t^{1/2} + X \quad (3)$$

In the Eqs, (1)-(3), q_e and q_t (mmol/g) are the quantities of Cu^{2+} adsorbed at equilibrium and time t, respectively, k_1 (min^{-1}) and k_2 (g/mol·min) are the adsorption rate constant of pseudo-first order and pseudo-second order, respectively, k_{id} is the diffusion rate su

The fitting curves of the above models are shown in **Fig. S1.**



a. Pseudo-first order model. b. Pseudo-second order model. c. Fickian diffusion model

■PHNI-PHNIA; ▲Chitosan

Fig. S1. *Fitting curves for adsorption kinetic*

The adsorption isotherm can be used to describe the relationship between adsorbents and the adsorbates in the adsorption process, as well as the surface characteristics and affinity of adsorbents. The Langmuir model, Freundlich model, Dubinin-Radushkevich model and so forth are the most widely used models in adsorption research.

Langmuir model, also known as monolayer adsorption theory, is based on the concept of ideal adsorption layer and reflects the law of ideal adsorption. The Langmuir model assumes: (ⅰ) adsorption occurs only at empty adsorption sites; (ⅱ) Each adsorption site can only absorb one molecule or atom, that is to say, when the adsorption molecule reaches the monolayer, the surface reaches the saturation coverage; (ⅲ) The adsorption heat is independent of the coverage, that is to say, there is no interaction between the adsorbed molecules; (ⅳ) The adsorption and desorption processes are generally in equilibrium. The Eqs. is:

$$C_e/Q_e = C_e/Q_{max} + 1/K_L Q_{max} \quad (4)$$

The Freundlich model is generally used to describe the multi-layer adsorption process on heterogeneous surfaces. It believes that the adsorption process takes place on the strong binding sites on the adsorbent surface first, and then may react with the weak binding sites. The Eqs. is:

$$lnQ_e = b_F ln\ C_e + lnK_F \quad (5)$$

The Dubinin-Radushkevich model is commonly used to fit the adsorption data of porous adsorption materials. It is usually expressed as the following three Eqs.:

$$lnQ_e = K\varepsilon^2 + lnQ_{D\text{-}R} \quad (6)$$

$$\varepsilon = RTln(1 + 1/C_e) \quad (7)$$

$$E = (-2\,K)^{-1/2} \quad (8)$$

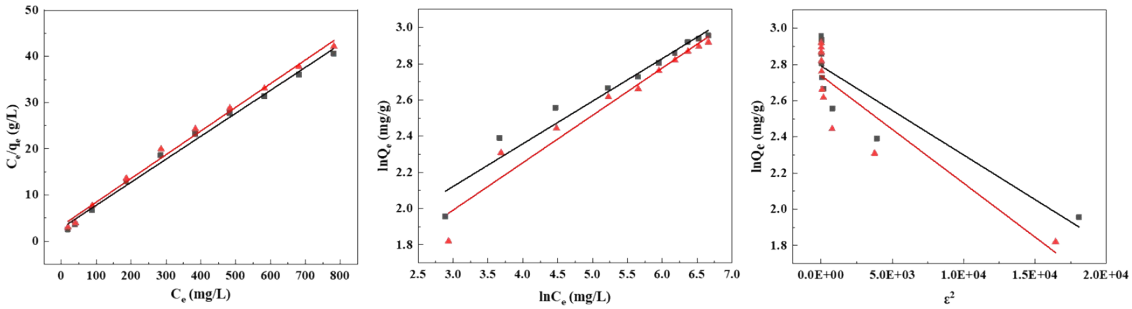
In the Eqs. (6)-(8), Q_e is the equilibrium quantity of the adsorbed Cu^{2+} (mmol/g), C_e is the equilibrium concentration of the Cu^{2+} in the solution (mmol/L), K_L is the Langmuir binding constant that is related to the adsorption energy (L/mmol), K_F and b_F are the Freundlich constants related to the adsorption capacity and intensity, respectively, Q_{max} and $Q_{D\text{-}R}$ are the Langmuir and D-R maximum Cu^{2+} adsorption quantities (mmol/g), respectively, and K is the D-R constant that provides valuable information of the mean adsorption energy E, ε is the Polanyi potential, R is the gas constant (8.314 J/(K·mol)) and T is the temperature (K).

In addition, the separation constant R_L can be used to evaluate the adsorption of adsorbents to adsorbates, and its Eqs. is:

$$R_L = 1/(1 + K_L C_0) \quad (9)$$

Where, K_L is the Langmuir equilibrium constant and C_0 is the initial concentration of the Cu^{2+}. R_L value can reflect the tendency of the adsorption process. It is irreversible if R_L=0, facile if $0<R_L<1$, hard if $R_L>1$.

The fitting curves of the above models are shown in **Fig. S2.**



Langmuir model Freundlich model Dubinin-Radushkevich model

■PHNI-PHNIA; ▲Chitosan

Fig. S2. *Fitting curves for adsorption isotherms at 298K*