Supplementary Information for:

Facile preparation of polypyrrole modified Chinese yam peel-based adsorbent: Characterization, performance, and application in removal of Congo red dye

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Text S1 Kinetic models

The adsorption kinetic model and their linearization equations were represented as follows:

Pesudo-first-order kinetic model: $$\log\left(q_e - q_t\right) = \log q_e - \frac{k_1}{2.303}t \quad (1)$$

Pesudo-second-order kinetic model: $$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{1}{q_e}t \quad (2)$$

Elovich equation: $$q_t = \frac{1}{b}\ln(ab) + \frac{1}{b}\ln t \quad (3)$$

Intra-particle diffusion equation: $$q_t = k_p t^{1/2} + c \quad (4)$$

where q_e (mg·g^{-1}) and q_t (mg·g^{-1}) are the amount of CR adsorbed on CYP-PPy at equilibrium and at a given time t (min), respectively. k_1 (min^{-1}) and k_2 (g·mg^{-1}·min^{-1}) are the rate constant of pseudo-first-order and pseudo-second-order kinetic equations. The parameter a (mg·g^{-1}·min^{-1}) is the initial adsorption rate constant and b (g·mg^{-1}) is related to the extent of surface coverage and activation energy for chemisorptions. k_p (mg·g^{-1}·min$^{-0.5}$) is the diffusion equation, and c (mg·g^{-1}) is a constant related to the thickness of the boundary layer.

Text S2 Isotherm models

The corresponding isotherm equations are given in Eqs. (5)-(8), respectively.

Freundlich isotherm model: $$\ln q_e = \ln K_f + \frac{1}{n}\ln C_e \quad (5)$$

Langmuir isotherm model: $$\frac{C_e}{q_e} = \frac{1}{K_l q_m} + \frac{C_e}{q_m} \quad (6)$$

D-R isotherm model: $$\ln q_e = \ln q_m - K_D[\mathrm{RT}\ln\left(1+\frac{1}{C_e}\right)]^2 \quad (7)$$

Temkin isotherm model: $$q_e = \frac{\mathrm{RT}}{b_T}\ln A_T + \frac{\mathrm{RT}}{b_T}\ln C_e \quad (8)$$

where q_e (mg·g^{-1}) represents the adsorption capacity at equilibrium, C_e (mg·L^{-1}) is the equilibrium concentration of Mb in solution, K_f and n are the Freundlich constants related to the adsorption capacity and adsorption intensity of the adsorbent, respectively. The value of Freundlich constant 1/n indicates the type of sorption process to be unfavorable (1/n>1), favorable (0<1/n<1), and irreversible (1/n = 0). q_m ($mg{\cdot}g^{-1}$) is the maximum amount of Mb adsorbed per unit mass of adsorbent required for monolayer coverage of the surface, K_l ($L{\cdot}mg^{-1}$) is Langmuir constant related to the adsorption energy. The K_D ($mol^2{\cdot}J^{-2}$) parameter is activity coefficient depending on the mean free energy of adsorption. R (8.314 $J{\cdot}mol^{-1}{\cdot}K^{-1}$) is the gas constant and T (K) is the absolute temperature. A_T ($mL{\cdot}mg^{-1}$) and b_T ($J{\cdot}mol^{-1}$) are the isotherm constant and Temkin-Pyzhev constant, respectively.

The adsorption condition can be interpreted by separation factor R_L, which is defined by the following Eq.(9)

$$R_L=\frac{1}{1+K_lC_0} \tag{9}$$

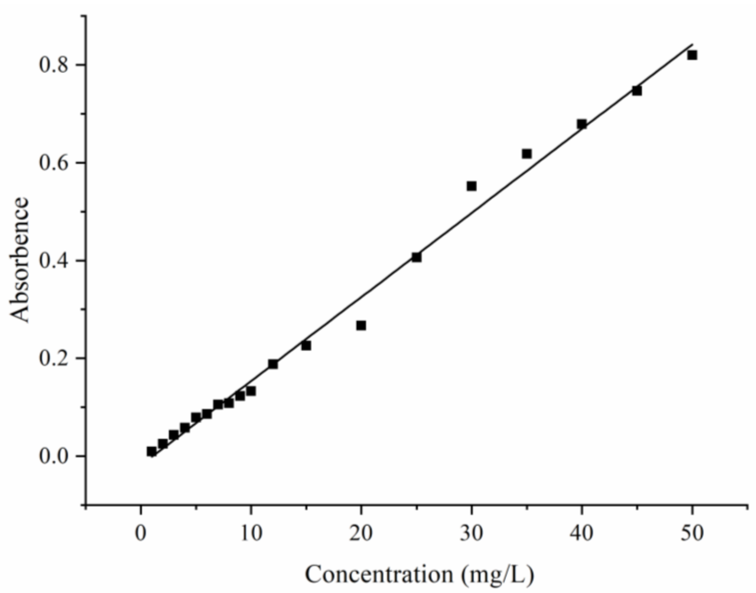

Fig. S1. Standard curve of Congo red

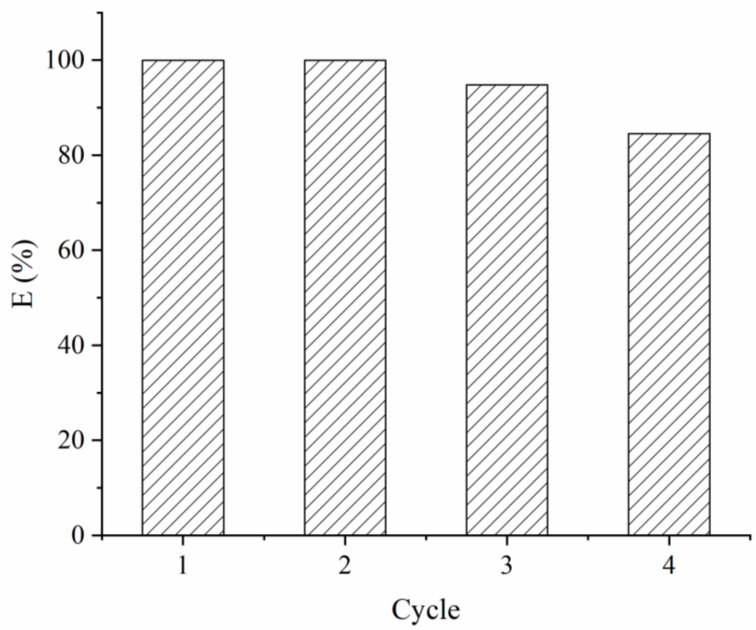

Fig. S2. Comparison of adsorption of CR onto CYP-PPy composite after the regeneration process.