Prominent biosorption of anionic and cationic dyes via raw and chitosan oligosaccharide-modified Huai Flos Chrysanthemum at different condition☆[1]

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TEXT, Figure and Table Captions


a


b
e
c
d

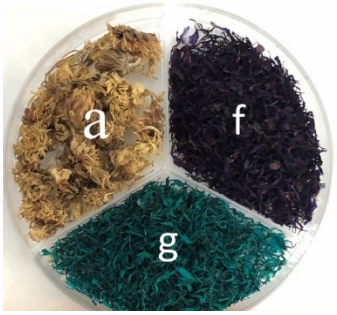
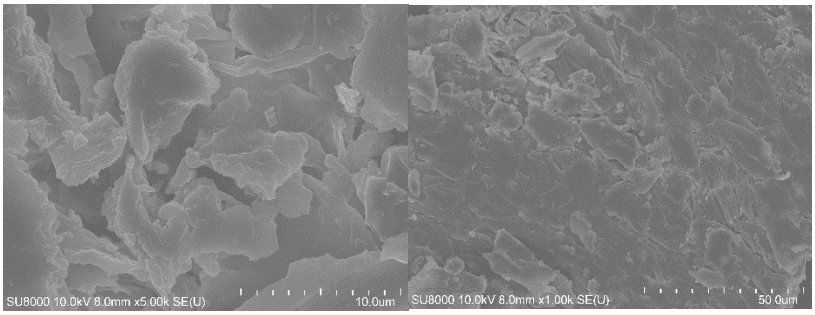
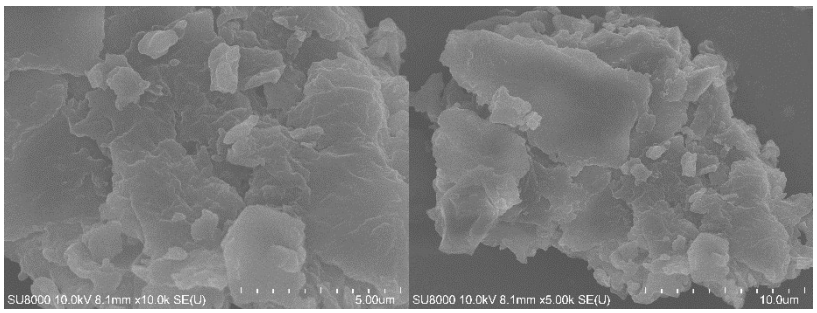

a
f
g

Fig. S1 Image of (a) raw HFC, (b) HFC@CO, (c-e) HFC@CO after adsorption



5000× 1000×

(a) HFC



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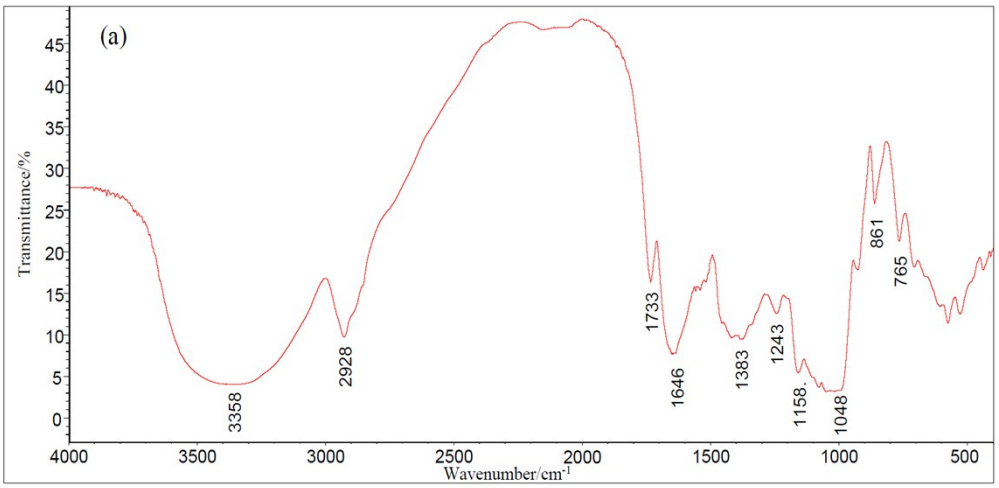
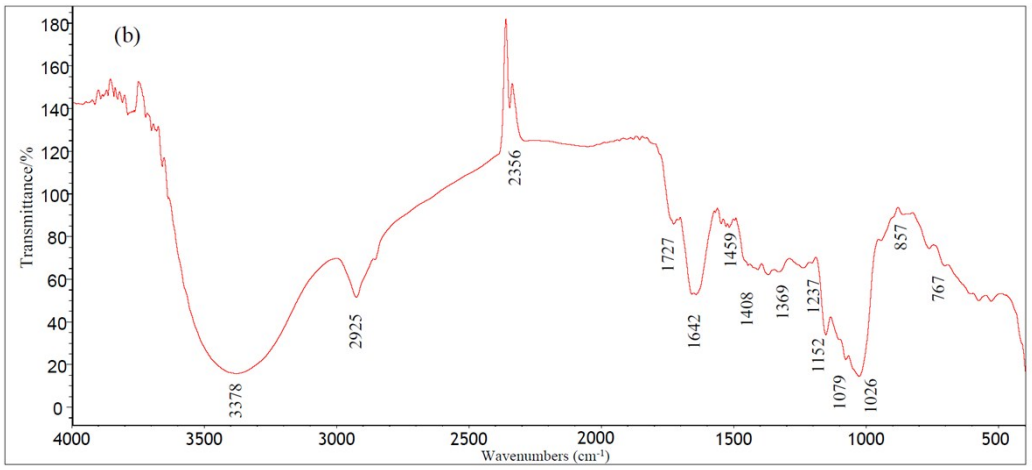
(b) HFC@CO

Fig. S2 SEM analysis


(a)
Transmittance/%
Wavenumber/cm-1
3358
2928
1733
1646
1383
1243
1158.
1048
861
765


(b)
Transmittance/%
Wavenumbers (cm-1)
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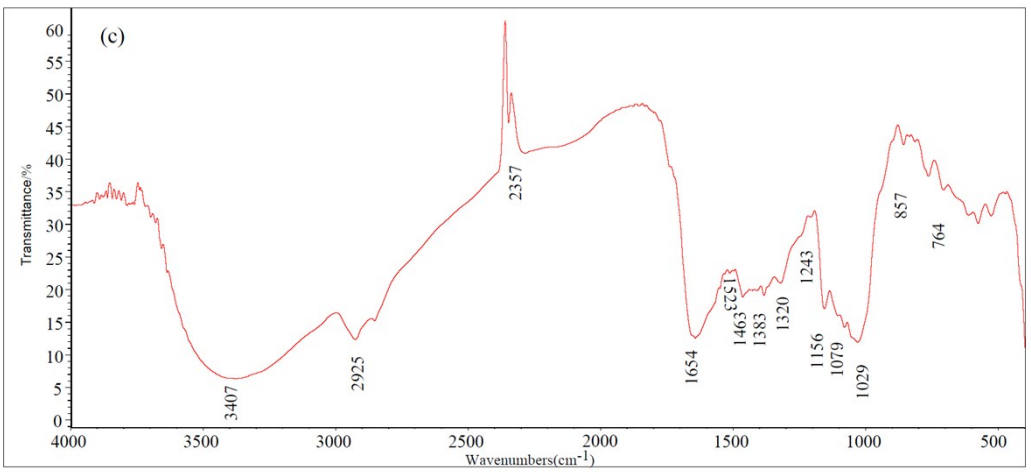
2356
1727
1642
1459
1408
1369
1237
1152
1079
1026
857
767


(c)
Transmittance/%
Wavenumbers(cm-1)
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2925
2357
1654
1523
1463
1383
1320
1243
1156
1079
1029
857
764

Fig. S3 FTIR spectra of biosorbents: (a) HFC, (b) HFC@CO and (c) HFC@CO after adsorption of dyes

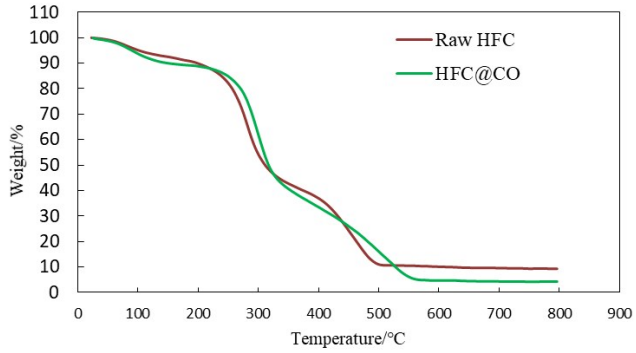

Fig. S4 TG analysis for HFC and HFC@CO

Table S1 The BET and BJH analysis of raw diatomite and DE@C

Name	BET/ $m^2 \cdot g^{-1}$	Average pore/nm	Total pore volume/ $cm^3 \cdot g^{-1}$	N_2 adsorption/desorption
Raw HFC	47.67	21.63	0.4919	Type Ⅳ
HFC@CO	40.17	18.61	0.4398	

TEXT S1 The representation of adsorption equilibrium equations in batch adsorption

The assumed prerequisite of Langmuir Adsorption Isotherm is that: the surfaces of the biosorbent are even and consist of monomolecular layer; and no interaction force exists between the adsorbed molecules.

$$\frac{1}{q_e} = \frac{1}{q_m} + \frac{1}{C_e \times b \times q_m} \tag{7}$$

In this case, C_e is the liquid-phase dye concentration at equilibrium, mg/L; q_e is the equilibrium adsorption capacity of the biosorbent, mg/g; q_m is the maximum adsorbing capacity, mg/g; b refers to Langmuir constant, L/mg.

Freundlich Adsorption Isotherm is an empirical equation to describe heterogeneous systems and adsorption capacity is based on the concentration of dyes at equilibrium. This isotherm is given in the following equation:

$$\ln q_e = \ln K_F - \frac{1}{n} \ln C_e \tag{8}$$

In this case; K_F is the Freundlich constant, $(mg/g)\cdot(L/mg)^{1/n}$, which related to the adsorption capacity. If $0<n^{-1}<1$, the adsorption process is available and works well.

TEXT S2 The representation of kinetics equilibrium equations in batch adsorption

Pseudo-First-Order Kinetic Model was expressed as follows:

$$\log(q_e - q_t) = \log q_{e1} - \frac{k_1 t}{2.303} \quad (9)$$

where q_e is the experimental equilibrium adsorption capacity of the biosorbent, mg/g; q_t is the adsorption capacity during period t, mg/g; $q_{e.cal}$ is the theoretical equilibrium adsorption capacity, mg/g; k_1 is the Pseudo-First-Order Kinetic Model constant, 1/min.

Pseudo-second order kinetic model can be used into deep analysis of kinetic data. The model is expressed as:

$$\frac{t}{q_t} = \frac{1}{k_2 q_{e2}^2} + \frac{t}{q_e} \quad (10)$$

Where k_2 is the Pseudo-Second-Order Kinetic Model constant, g/(mg·min).