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Supplementary material

SUPPLEMENTARY MATERIAL TO

Waste hemp and flax fibers and cotton and cotton/polyester yarns for removal of methylene blue from wastewater: Comparative study of adsorption properties

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TABLE S-I. Theoretical models used for data examination

Model	Equation	Reference
Pseudo-first-order	$q_t = q_e \cdot \left(1 - e^{-k_1 t}\right)$	1
Pseudo-second-order	$q_t = q_e - \left(\frac{1}{q_e} + k_2 \cdot t\right)^{-1}$	2
Elovich	$q_t = \frac{1}{\beta} ln(\alpha\beta) + \frac{1}{\beta} \ln t$	3
Intra-particle diffusion	$q_t = k_{id} t^{1/2} + C$	4
Langmuir isotherm	$q_e = \frac{Q_o \cdot b \cdot C_e}{1 + b \cdot C_e}$	5
Freundlich isotherm	$q_e = K_F \cdot C_e^{1/n}$	6

– q_e and q_t (mg g^{-1}) are the amounts of MB adsorbed at equilibrium, and at the time t (min), respectively;

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- k_1 (min^{-1}), k_2 (g mg^{-1}min^{-1}), and k_{id} (mg g^{-1} min$^{-1/2}$) are the rate constants,
- C (mg g^{-1}) is the intra-particle diffusion constant;
- α (g (mg min)$^{-1}$) and β (g mg^{-1}) are Elovich constants related to the initial adsorption rate and the extent of surface coverage and activation energy for chemisorption, respectively;
- C_e (mg dm^{-3}) is the MB equilibrium concentration,
- Q_o (mg g^{-1}) is the amount of solute adsorbed per unit mass of adsorbent required for monolayer coverage of the surface,
- b (dm^3 mg^{-1}) is a constant related to the heat of adsorption,
- K_F (mg$^{1-1/n}$L$^{1/n}$g^{-1}) Freundlich constant that indicates the adsorption capacity, and
- $1/n$ Freundlich parameter that indicates the heterogeneity of the adsorbent surface.

Table S-II. Kinetic parameters for MB adsorption onto H_f, F_f,C_y, C_y/PES

Sample	H_f	F_f	C_y	C_y/PES
$q_{e,exp}$ / mg g^{-1}	13.01	13.94	9.49	6.31
Pseudo-first order model				
$q_{e,cal}$ / mg g^{-1}	12.73	13.63	8.83	5.78
k_1 / min^{-1}	0.06396	0.10777	0.19994	0.15134
R^2	0.96336	0.95320	0.67875	0.73348
Pseudo-second order model				
$q_{e,cal}$ / mg g^{-1}	14.21	14.73	9.38	6.22
k_2 / g mg^{-1}min^{-1}	0.00585	0.01102	0.03718	0.03795
R^2	0.98165	0.98712	0.93527	0.93455
Elovich model				
α / g (mg min)$^{-1}$	3.4699	17.078	262.30	23.473
β / g mg^{-1}	0.3930	0.48668	1.1194	1.3413
R^2	0.94105	0.8817	0.96306	0.97511
Intraparticle diffusion model				
$k_{i,1}$ / mg g^{-1} min$^{-1/2}$	1.76973	1.80789	0.93665	0.74877
C_1 / mg g^{-1}	0.63086	2.95116	4.15123	1.92006
R_1^2	0.98976	0.97795	0.96235	0.99202
$k_{i,2}$ / mg g^{-1} min$^{-1/2}$	0.82096	0.44953	0.16184	0.15323
C_2 / mg g^{-1}	5.89448	10.1698	7.45919	4.37612
R_2^2	1	1	0.90578	0.92013
$k_{i,3}$ / mg g^{-1} min$^{-1/2}$	0.13769	0.05198	-	-
C_3 / mg g^{-1}	11.2638	13.2772	-	-
R_3^2	0.73376	0.74817	-	-

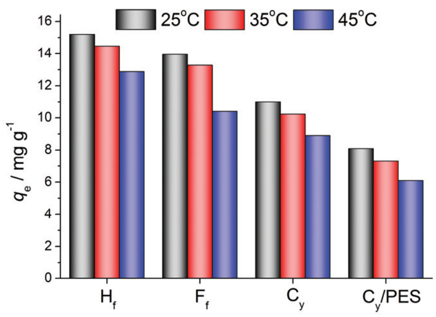

Fig. S-1. Effect of the initial temperature on the adsorption capacity.

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