Engineering a Sustainable cadmium sulfide/polyethyleneimine-functionalized biochar/chitosan Composite for Effective Chromium Adsorption: optimization, co-interfering anions, and mechanism

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Table S1. Non-linear equations of the applied adsorption isotherm models.

Model	Equation	
Langmuir	$q_e = \frac{q_{max} K_L C_e}{1 + K_L C_e}$	(1)
Freundlich	$q_e = k_F C_e^{1/n}$	(2)
Temkin	$q_e = \frac{R\,T}{b_T} \ln k_T C_e$	(3)

Where, q_e and C_e are the adsorption capacity and the concentration of the un-adsorbed Pb(II) at equilibrium, respectively. q_{max} and k_L are the monolayer adsorption capacity and Langmuir constant, respectively. n and k_F are Freundlich constants. k_T is the equilibrium binding constant and b is Temkin constant related to heat of adsorption.

Table S2. Non-linear equations of the applied adsorption kinetic models.

Kinetic Model	Equation	
PFO	$q_t = q_e\left(1 - e^{-k_1 t}\right)$	(4)
PSO	$q_t = \frac{t\, k_2\, q_e^2}{1 + t\, k_2 q_e}$	(5)
Elovich model	$q_t = \frac{1}{\beta} ln(\alpha\beta t + 1)$	(6)

Where, q_t and q_e are adsorbed amounts of Cr^{VI} at time t and equilibrium, respectively. k_1 and k_2 are the rate constants of PFO and PSO, respectively. Furthermore, α and β are Elovich coefficients that represent the initial adsorption rate and the desorption coefficient, respectively, also related to the extent of surface coverage and activation energy for chemisorption.