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SUPPLEMENTARY MATERIAL TO

Biosorptive removal of cobalt (II) ion from wastewater using pomegranate peel activated carbon as biosorbent

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Adsorption capacity was calculated using the Eq. S-1

$$q_e = \frac{C_i - C_e}{W} V \quad \text{(S-1)}$$

*q*e denotes the amount of Co(II) ions adsorbed at equilibrium per unit mass of the adsorbent (mg g-1)

*C*i represents the initial concentration of cobalt (II) ion (mg L-1)

*C*e represents the final concentration of cobalt (II) ions (mg L-1)

V represents the volume of the solution (ml)

W represents the mass of PPAC (adsorbent**)** (g)

Cobalt metal ion removal efficiency (*R*) was calculated using Eq. S-2

$$R\,(\%) = \frac{C_i - C_e}{C_i} \times 100 \quad \text{(S-2)}$$

ISOTHERM AND KINETIC MODEL

Langmuir Isotherm Model (linear form)

$$\frac{C_e}{q_e} = \frac{1}{q_m K_L} + \frac{C_e}{q_m} \quad \text{(S-3)}$$

*q*m denotes the maximum adsorption capacity (mg g-1)

*K*L represents the empirical constant corresponding to the affinity of the binding sites and the adsorption energy (L mg-1)

Langmuir Isotherm Model (Non linear form)

$$q_e = \frac{q_m K_L C_e}{1 + K_L C_e} \quad \text{(S-4a)}$$

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Separation Factor

$$R_L = \frac{1}{1+K_L C_i} \quad \text{(S-4b)}$$

*R*L = Separation factor, which gives the information whether the adsorption is favourable or not. *R*L ranging between 0 and 1 represents the feasibility of adsorption process.

Freundlich Isotherm Model (Linear form)

$$\log q_e = \log K_f + \frac{1}{n}\log C_e \quad \text{(S-5)}$$

Kf = Freundlich constant related to adsorption capacity (mg g-1)
n = adsorption density parameter relating the degree of surface heterogeneity

Freundlich Isotherm Model (Nonlinear form)

$$q_e = K_f c_e^{\frac{1}{n}} \quad \text{(S-6)}$$

Temkin Isotherm Model (Linear form)

$$q_e = B\ln A + B\ln C_e \quad \text{(S-7)}$$

A = Temkin constant (L g-1)

Temkin Isotherm Model (Non-linear form)

$$q_e = B\ln AC_e \quad \text{(S-8a)}$$

B refers to the heat of adsorption, which is defined below

$$B = \frac{RT}{b} \quad \text{(S-8b)}$$

b is the Temkin constant (J mol-1).

KINETIC STUDY

Pseudo first order model

$$\ln(q_e - q_t) = \ln(q_e) - K_1 t \quad \text{(S-9)}$$

*q*t = capacity of adsorption at a particular time '*t*' (mg g-1)
*K*1 = pseudo first order rate constant (min-1)

Pseudo second order model

$$\frac{t}{q_t} = \frac{1}{K_2 q^2_e} + \frac{t}{q_e} \quad \text{(S-10)}$$

K2 = pseudo second-order rate constant (g mg-1 min-1)

Intra particle diffusion model

$$q_t = K_{int}\, t^{0.5} \quad \text{(S-11)}$$

*K*int = intra particle diffusion rate constant (mg g-1 min-1/2)

Thermodynamic parameters were obtained from the following equation

$$lnK_d = \frac{-\Delta H}{RT} + \frac{\Delta S}{R} \quad \text{(S-12)}$$

$$K_d = \frac{q_e}{C_e} \quad \text{(S-13)}$$

$$\Delta G = \Delta H - T\Delta S \quad \text{(S-14)}$$

*K*d = distribution coefficient (L g-1)
Δ*G* = Gibbs free energy (kJ mol-1)
Δ*H*= change in enthalpy (kJ mol-1)
Δ*S*= change in entropy (kJ mol-1 K-1)

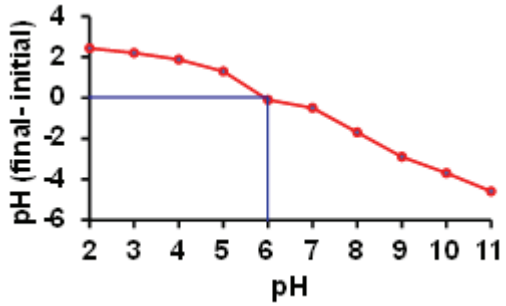

Fig. S1. Point of zero charge on PPAC using NaCl of 0.01 mol/L.