materials

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Supplementary Materials

Preparation and Characterization of Magnetite Talc (Fe_3O_4@Talc) Nanocomposite as an Effective Adsorbent for Cr(VI) and Alizarin Red S Dye

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In Langmuir isotherm model, the linear form is represented by the following equation:

$$\frac{1}{q_e} = \frac{1}{Q_{max}} + \frac{1}{bQ_{max}}\left(\frac{1}{C_e}\right) \quad \text{(S1)}$$

where, q_e is the amounts of Cr(VI) ions and (ARS)-dye per unit mass of Fe_3O_4@Talc nanocomposite (mgg^{-1}), C_e is the Cr(VI) ions and (ARS)-dye concentrations at equilibrium (mgL^{-1}), and Q_{max} and b are Langmuir constants related to the sorption capacities and binding energies between the sorbent with the sorbate, respectively.

One of the essential characteristics of Langmuir isotherm is a dimensionless constant that is called separation factor or equilibrium parameter R_L and can be estimated by the following equation;

$$R_L = \frac{1}{1 + bC_o} \quad \text{(S2)}$$

The value of separation factor R_L indicates either the adsorption isotherm to be unfavorable ($R_L > 1$), favorable ($0 < R_L > 1$), irreversible (RL=0) or linear (RL=1).

The Freundlich model is an empirical equation used to describe the sorption occurred on heterogeneous surfaces. The linear equation is commonly demonstrated as:

$$\log q_e = \log K_f + (1/n)\log Ce \quad \text{(S3)}$$

where, q_e (mgg^{-1}) and C_e (mgL^{-1}) are the amounts of Adsorbate per unit mass of Fe_3O_4@Talc nanocomposite and Adsorbate concentrations at equilibrium, respectively. K_f and 1/n are the Freundlich model constants that indicate to the sorption capacities and the sorption intensities, respectively.

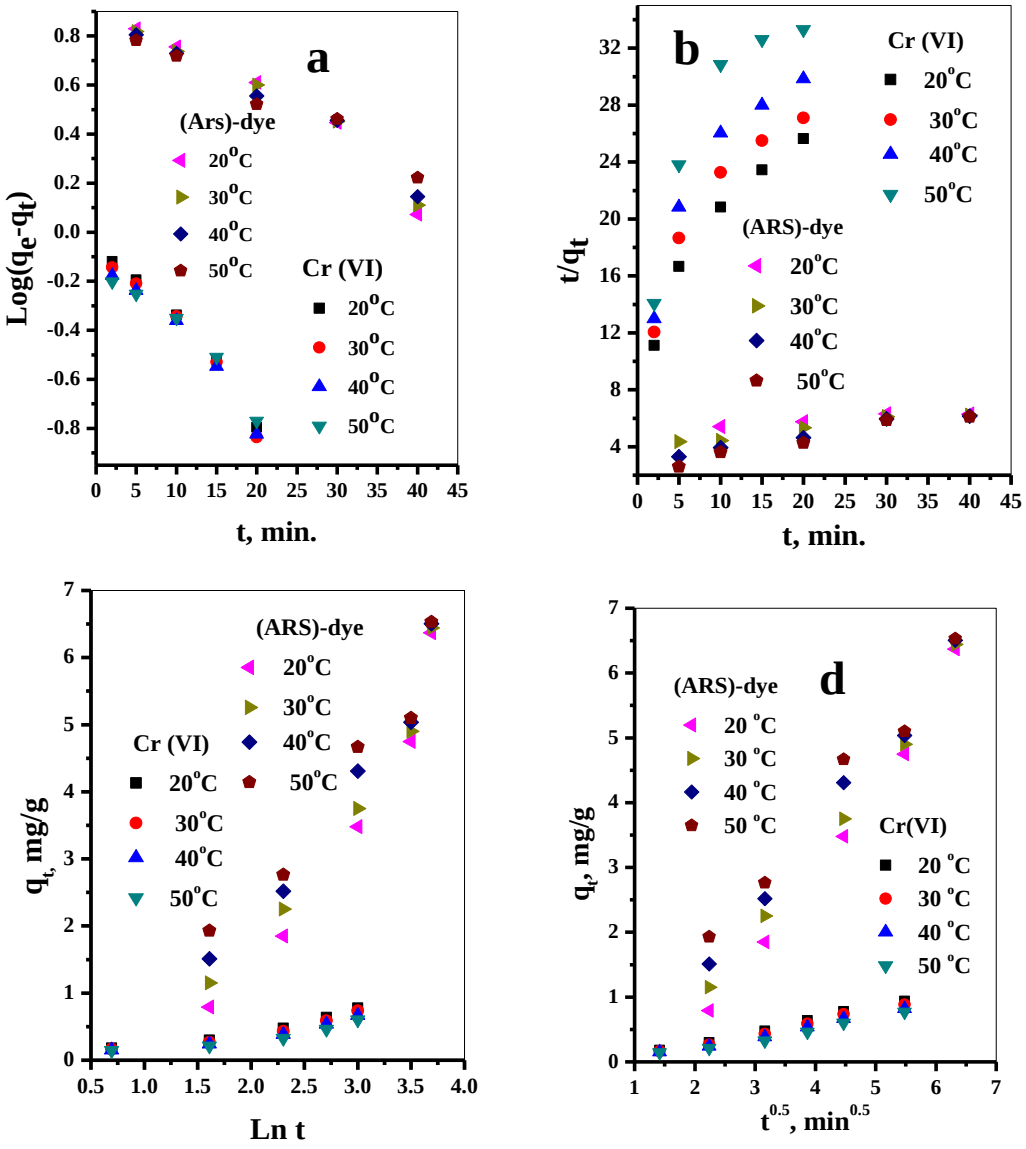

Figure S1. The kinetic models of adsorption for adsorption of both Cr(VI) and (ARS)-dye onto 0.05g/10mL Fe_3O_4@Talc nanocomposite, (**a**) Pseudo-first order, (**b**) and Pseudo-second order, (**c**) Elovich model, and (**d**) intraparticle diffusion.

([Cr(VI)]= 10 mg/L, pH= 3, T = 20 °C; ([ARS-dye]= 50 mg/L, pH= 2, T = 20 °C).