Isolation of aqueous pesticides on surface-functionalized SBA-15: glyphosate kinetics and detailed empirical insights for atrazine

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SI 1: Data analysis

Adsorption kinetics models in their nonlinear forms used to interpret the data include the Pseudo-First Order (PFO) model (Eq. 1), Pseudo-Second Order (PSO) model (Eq. 2), and the homogeneous Fractal Pseudo-Second Order (FPSO) model (Eq. 3) [1].

$$q_t = q_e(1 - e^{-k_1 t}) \qquad 1$$

$$q_t = \frac{q_e^2 k_2 t}{1 + q_e k_2 t} \qquad 2$$

$$q_t = \frac{k_f q_e^2 t^{\alpha}}{1 + k_f q_e t^{\alpha}} \qquad 3$$

The models' parameters t, q_t, q_e, and k denote time, equilibrium adsorption at a particular time and equilibrium, model rate constants, and the amount of contaminant adsorbed on adsorbent surface, respectively.

The adsorption isotherm models employed are Langmuir (Eq. 4) [2] and Freundlich [3] (Eq. 5). The fittings of the various experimental data to the different models were carried out on OriginPro 2015 software. The models' parameters Q_o, b, k_f, and n are the optimum adsorption capacity per gram, energy-related parameter, Freundlich constant, and Freundlich linearity parameter, respectively.

$$q_e = \frac{Q_O b C_e}{1 + b C_e} \qquad 4$$

$$q_e = k_f C_e^n \qquad 5$$

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3. H. M. F. Freundlich, *Zeitschrift für Physikalische Chemie*, 1906, **57A**, 57A, 385-470.