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Letter to the Editor

Comments on the paper "Application of Mn/MCM-41 as an adsorbent to remove Methyl Blue from aqueous solution"

Recently, Shao et al. published the paper entitled "Application of Mn/MCM-41 as an adsorbent to remove methyl blue from aqueous solution" [1]. In Section 3.9. Adsorption kinetics, authors mentioned "In this respect, the pseudo-first-order, pseudo-second-order and intra-particle diffusion equations were used to test the experimental data shown in Eqs. (10)–(12), respectively. Equations can be written as follow:" and cited a paper to be reference [2].

$$\frac{1}{q_t} = \left(\frac{k_1}{q_1}\right)\left(\frac{1}{t}\right) + \frac{1}{q_1} \tag{10}$$

$$\frac{t}{q_t} = \frac{1}{k_2 q_2^2} + \frac{t}{q_2} \tag{11}$$

$$q_t = k_i t^{0.5} + C \tag{12}$$

This is a quotation error. Eqs. (10)–(12) could not be found in the reference [2]. In fact, Eqs. (10) and (12) are not correct. Units of parameters in Eq. (10), also cannot agree each other. Thus results and conclusion in "Application of Mn/MCM-41 as an adsorbent to remove methyl blue from aqueous solution" might not be correct. Indeed, in 1898, Lagergren presented the first order rate equation for the adsorption of oxalic acid and malonic acid onto charcoal [3]. In order to distinguish kinetics equation based on concentration of solution and adsorption capacity of solid, Lagergren's first order rate equation has been called pseudo-first order since 1998 [4,5]. Details of Lagergren rate equation for adsorption reactions were published in 2004 [6]. The most popular form used is:

$$\log(X - x) = \log(X) - \frac{k}{2.303}t \tag{2}$$

Furthermore, the pseudo-second-order kinetic expression for the adsorption systems of divalent metal ions using sphagnum moss peat has been presented by Ho in 1995 [7]. The pseudo-second order kinetic model has a non-linear form $q_t = \frac{q_e^2 kt}{1+q_e kt}$ and four linear forms namely $\frac{t}{q_t} = \frac{1}{kq_e^2} + \frac{1}{q_e}t, \frac{1}{q_t} = \left(\frac{1}{kq_e^2}\right)\frac{1}{t} + \frac{1}{q_e}, q_t = q_e - \left(\frac{1}{kq_e}\right)\frac{q_t}{t}$, and $\frac{q_t}{t} = kq_e^2 - kq_e q_t$ [8]. It is clear that the pseudo-first-order model Eq. (10) is just one of linear forms of the pseudo-second order kinetic model.

In order to stop the proliferation of the mistake of the pseudo-first order model, a comment has been made [6]. Citing the original paper not only respects the work of the authors who presented a novel research idea but also discussed this idea in detail in the body of their paper [9]. In my view, Shao et al. should have cited the original paper for the pseudo-first order, pseudo-second order, and intra-particle diffusion kinetic models and thereby provided greater accuracy and information details about the kinetic expression they employed.

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