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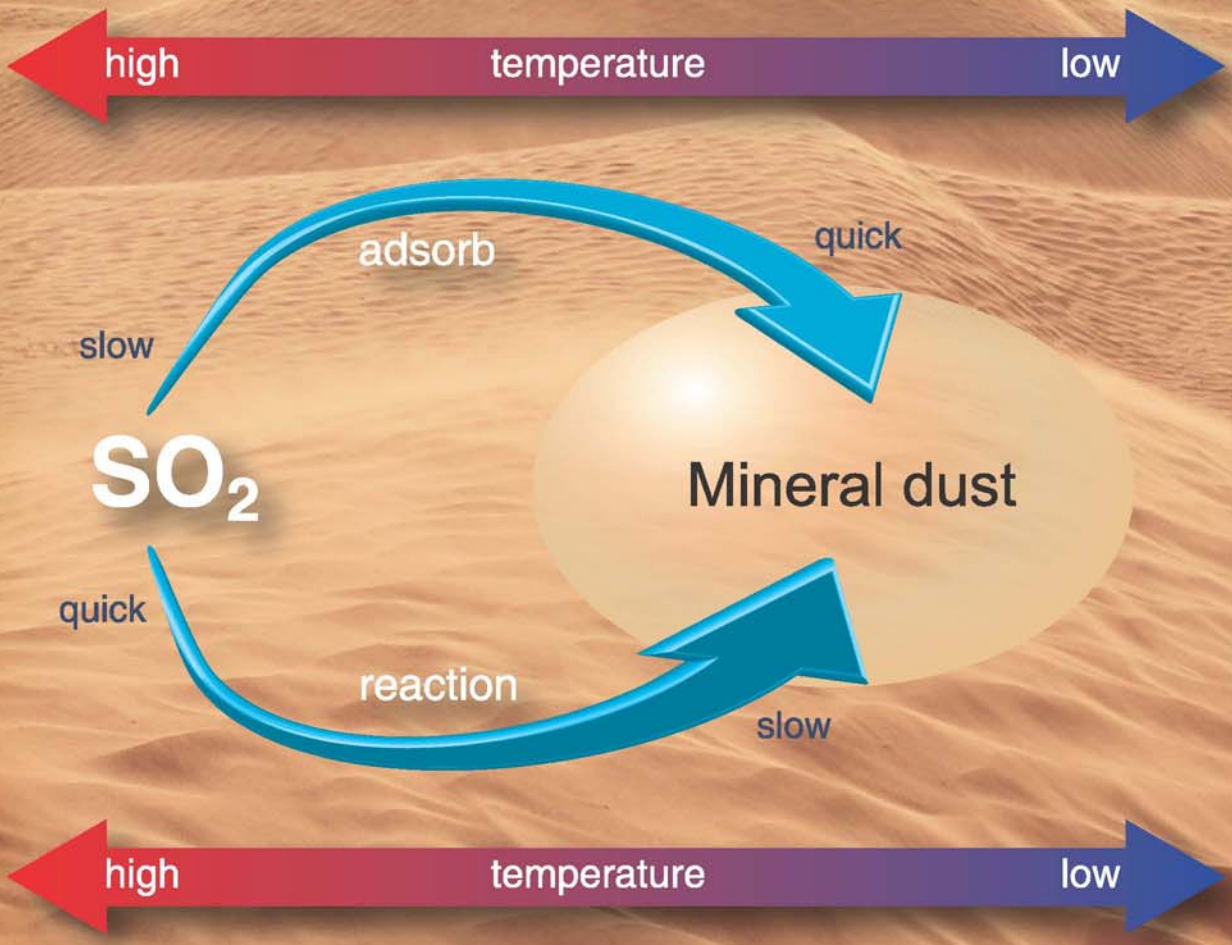

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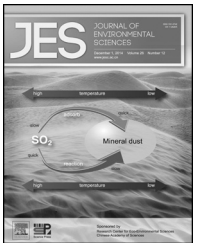

Comments on "Adsorption of 2-mercaptobenzothiazole from aqueous solution by organo-bentonite" by P. Jing, M.H. Hou, P. Zhao, X.Y. Tang, H.F. Wan

Recently, Jing et al. (2013) published the paper entitled as above. In Section 2.3, Adsorption kinetics of MBT, authors noticed that "The pseudo first-order kinetic model (Eq. (1)) and the pseudo second-order kinetic model (Eq. (2))" were used (Doğan et al., 2007; Eftekhari et al., 2010):

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

$$\frac{t}{q_t}=\frac{1}{k_t q_2^2}+\frac{1}{q_2}t. \quad (2)$$

This is a quotation error. Eqs. (1) and (2) could not be found in references Doğan et al. (2007) and Eftekhari et al. (2010).

In 1898, Lagergren presented the first order rate equation for the adsorption of ocalic acid and malonic acid onto charcoal (Lagergren, 1898). 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 the pseudo-first order since 1998 (Ho and McKay, 1998a, 1998b). Details of the Lagergren rate equation for adsorption reactions were published in 2004 (Ho, 2004). The most popular form used is:

$$\log(X-x)=\log(X)-\frac{k}{2.303}t. \quad (3)$$

A review of second-order models for adsorption systems has also been presented in details (Ho, 2006a). The correct expression for the pseudo-second order kinetic model was reported by Ho and McKay (1998a, 1998b) and may be written as:

$$\frac{t}{q_t}=\frac{1}{kq_e^2}+\frac{1}{q_e}t. \quad (4)$$

However Eq. (1) is the same as Eq. (4) when q_1/k_1 in Eq. (1) is equal to kq_e^2 in Eq. (4). Thus results in "Adsorption of 2-mercaptobenzothiazole from aqueous solution by organo-bentonite" might not be corrected.

In the same section, the authors also presented a pseudo-second order kinetic model with Eq. (2). In fact, the pseudo-second order kinetic expression for the adsorption systems of divalent metal ions using sphagnum moss peat has been presented by Ho (1995). 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 such as: $\frac{t}{q_t}=\frac{1}{kq_e^2}+\frac{1}{q_e}t$, $\frac{1}{q_t}=\left(\frac{1}{kq_e^2}\right)\frac{1}{t}+\frac{1}{q_e}$, $q_t=q_e-\left(\frac{1}{kq_e}\right)\frac{q_t}{t}$, and $\frac{q_t}{t}=kq_e^2-kq_e q_t$ (Ho, 2006b). The model was also used in numbers of adsorption systems in subsequent years (Ho, 2005). A review of second-order models for adsorption systems gave more details (Ho, 2006a). Furthermore an article entitled "pseudo-second order model for sorption processes" by Ho and McKay (1999) has been ranked top one in annual citations in Web of Science category of chemical engineering since 2008 (Ho, 2012).

In recent years, the same mistakes can be also found in *Separation Science and Technology* (Liu et al., 2013), *Desalination and Water Treatment* (Salman et al., 2013), and *Food Chemistry* (Li et al., 2014). In order to stop the proliferation of the mistake of the pseudo-first order model, a comment has been made (Ho, 2004). 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. When a scientific publication duplicates previously published idea, text, equations, or figures without any citations, it frequently is regarded as a sign of possible plagiarism (Noè and Batten, 2006). In my view, Jing et al. should have cited the original paper for the pseudo-first and pseudo-second order kinetic models and thereby provided greater accuracy and information details about the kinetic expression they employed.

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