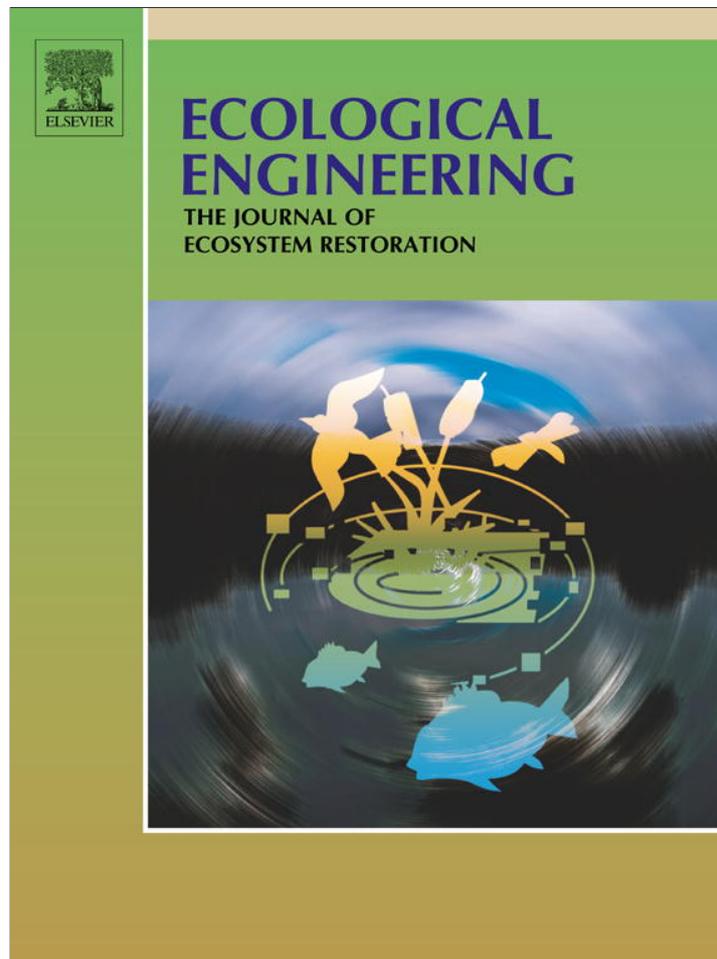


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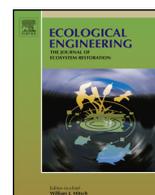
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Letter to the Editor

Comments on “Removal of zirconium(IV) from aqueous solution by *Coriolus versicolor*: Equilibrium and thermodynamic study”



Recently, Bhatti and Amin (2013) published their paper entitled “Removal of zirconium(IV) from aqueous solution by *Coriolus versicolor*: Equilibrium and thermodynamic study”. In section 3.2 (effect of contact time on zirconium biosorption), the authors mentioned “to understand the controlling mechanism of biosorption, kinetic models were used to interpret the experimental data. The pseudo first-order Lagergren model (Lagergren, 1998) is generally expressed as”. This is a citation error. The first-order rate equation was presented by Lagergren in 1898 instead of 1998 (Lagergren, 1898). Furthermore, it is well known that the rate of reaction is defined as the concentration change of a reactant or product per unit time. Concentrations of products do not appear in the rate law because the reaction rate is studied under conditions where the reverse reactions do not contribute to the overall rate. The reaction order and rate should be determined by experiments. In order to distinguish the kinetic equation based on solution concentration from the solids adsorption capacity in the traditional definition of rate, Ho and McKay (1998a,b) defined Lagergren's first-order rate equation as pseudo-first-order. The citation of the original publication was “Lagergren, S. (1898), Zur theorie der sogenannten adsorption gelöster stoffe. Kungliga Svenska Vetenskapsakademiens Handlingar, Band 24, No. 4, 1–39” [“Lagergren, S. (1898), About the theory of so-called adsorption of soluble substances. Kungliga Svenska Vetenskapsakademiens Handlingar, Band 24, No. 4, 1–39”], with the abbreviation style as “Lagergren, S. (1898), Zur theorie der sogenannten adsorption gelöster stoffe. K. Sven. Vetenskapsakad. Handl., Band 24, No. 4, 1–39.”. The citation of Lagergren kinetic rate equation on adsorption reactions has also been reviewed by Ho (2004). Ho pointed out that Lagergren's equation was widely cited by different authors with lots of mistakes in their reference sections, including the authors' name, journal title, year, volume, and page number (Ho, 2004). What is more, numerous researchers cited Lagergren's article from the reference section of these publications without correcting these mistakes.

Bhatti and Amin also mentioned “the pseudo-second-order model” as the equation below:

$$\frac{t}{q_t} = \frac{1}{k_{2,eds} - q_e^2} + \frac{1}{q_e} t$$

This equation is not correct. Ho (1995) presented this pseudo-second-order kinetic expression for the adsorption systems of divalent metal ions using sphagnum peat moss in 1995. A modification of this model was further made in 1998 to correct the mistake (Ho and McKay, 1998a,b). The review of second-order models for adsorption systems was published in 2006 (Ho, 2006a). The linear

pseudo-second-order kinetic models (Ho, 2006b) and non-linear model (Ho, 2006a) are given as below:

$$\frac{t}{q_t} = \frac{1}{kq_e^2} + \frac{1}{q_e} t,$$

$$\frac{1}{q_t} = \left(\frac{1}{kq_e^2} \right) \frac{1}{t} + \frac{1}{q_e},$$

$$q_t = q_e - \left(\frac{1}{kq_e} \right) \frac{q_t}{t},$$

$$\frac{q_t}{t} = kq_e^2 - kq_e q_t,$$

and

$$q_t = \frac{q_e^2 kt}{1 + q_e kt}.$$

To create an argument from citing the references of other publications instead of from the original information is a common mistake (Taylor and Mc Brown, 2001). An article's academic value exists not only in its originality and creativity, but also in its accuracy and inspiration to the other researches. The reference section was of great importance to the researchers who were interested in a publication's paper and would like to follow the study or gain further useful information in this specialty (Ho, 2004). When a scientific publication copied previously published idea, text, equations, or figures without any citations, it was usually regarded as plagiarism (Noè and Batten, 2006). It is strongly suggested that researchers should cite the original paper of the pseudo-first and pseudo-second order kinetic models with accuracy and integrity in the future publications.

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