## Letter to the Editor

# Comment on equilibrium and kinetics studies of adsorption of copper(II) on chitosan and chitosan/PVA beads

In Section 3.6 of the paper "Equilibrium and kinetics studies of adsorption of copper(II) on chitosan and chitosan/PVA beads" [1], published by Wan Ngah et al., the authors cited two and three papers, respectively, as secondary references for first- and second-order equations. In the first reference [2] for first-order equation, the authors discussed the first-order rate equation of Lagergren without citing Lagergren's paper. In the second reference [3], the authors cited two papers published by Lagergren [4] and Annadurai and Krishnan [5]. Here, incorrect references were cited. A citation review of the Lagergren rate equation for adsorption reactions has been presented before [6]. The correct reference citing the original Lagergren paper was first presented by Ho and McKay in 1998 [6,7]; "Lagergren, S., Zur theorie der sogenannten adsorption gelöster stoffe, *Kungliga Svenska Vetenskapsakademiens. Handlingar*, Band 24, No. 4, (1898), 1–39." Its English translation is "Lagergren, S., about the theory of so-called adsorption of soluble substances, *Kungliga Svenska Vetenskapsakademiens. Handlingar*, Band 24, No. 4, (1898), 1–39." and the abbreviation style is "Lagergren, S., Zur theorie der sogenannten adsorption gelöster stoffe. *K. Sven. Vetenskapsakad. Handl.*, Band 24, No. 4, (1898), 1–39." In order to distinguish a kinetics equation based on the adsorption capacity of a solid from one based on the concentration of a solution, Lagergren's first-order rate equation has been called pseudo-first-order [6,7]. Ho [6] pointed out that the Lagergren's equation has been widely cited, there are far more mistakes made in the reference section of a paper than anywhere else, such as author, journal title, year, volume and page number. It is clear that most of the papers citing Lagergren's 1898 original paper have cited it incorrect. However, numerous researchers have taken reference citation straight from secondary reference without knowing that mistakes had already been made in reference citation in the secondary source.

For second-order equation, authors cited three secondary references which cited Ho and McKay's original publications. In fact, the second-order kinetic expression for the adsorption systems of divalent metal ions using sphagnum moss peat has been reported by Ho [8]. In order to distinguish kinetics equation based on adsorption capacity of solid from one based on the concentration of solution, Ho's second-order rate expression has been called pseudo-second order [7–10]. The most frequently cited papers for the pseudo-second-order expression were published in *Chemical Engineering Journal* [9], *Process Biochemistry* [10], and *Water Research* [11]. In addition, similar comments have also been published in *Journal of Membrane Science* [12], *Journal of Industrial and Engineering Chemistry* [13], and *Biochemical Engineering Journal* [14]. The pseudo-second-order rate expression of Ho has been widely applied to the sorption of metal ions, dyes, herbicides, oil and organic substances from aqueous solutions [15,16].

Contribution of research papers comes not only from its originality and creativity, but also from providing continuity towards further researches. Thus, the reference section plays a key role in allowing future researchers who were interested in the topic to follow the past development of the research topic. Calne and Calne [17] suggested that authors should cite relevant work of others, as well as their own. A correct and updated reference list can serve as road map to help other researchers to find relevant and useful information [6]. Because of its importance, researchers should place a great deal of attention to ensure the accuracy and appropriateness of reference citations. Authors should not rely on secondary source without going back to the primary source to verify the information. To provide accurate citations, I would suggest that Wan Ngah et al. cite Lagergren's pseudo-first order kinetic model paper and Ho's original pseudo-second order kinetic expression paper, or relevant works.

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Yuh-Shan Ho[*]
*Department of Environmental Sciences,*
*College of Environmental Sciences,*
*Peking University, Beijing 100871,*
*People's Republic of China*

[*] Tel.: +86 10 62751923; fax: +86 10 62751923.
*E-mail address:* dr_ysho@hotmail.com

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