

Letter to the Editor

Comments on “Equilibrium studies for the adsorption of Acid dye onto modified hectorite”

Abstract

The present letter discusses the significance of the dimensionless separation factor of solid/liquid adsorption systems. The present letter also explain citing the original paper for using the term separation factor ‘*R*’.

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Keywords: Separation factor; Langmuir isotherm; Citation accuracy

Nomenclature

<i>c</i>	fluid phase concentration
<i>c</i> ₀	initial fluid phase concentration
<i>K</i>	Langmuir constant
<i>q</i>	solid-phase concentration of the solute being adsorbed
<i>q</i> ₀	ultimate sorptive capacity at higher concentrations
<i>R</i> _L	separation factor (as used by Baskaralingam et al.)
<i>R</i>	separation factor (as used in the original paper by Hall et al.)
<i>X</i>	dimensionless liquid concentration
<i>Y</i>	dimensionless solid phase concentration

Recently, Baskaraligam et al. [1] had published a paper entitled above. In the above-referred paper in Table 2, the authors reported the dimensionless factor, *R*_L as one of the Langmuir constant. Further the authors presented the *R*_L value without mentioning the corresponding initial dye concentration. However, I would like to point out that *R*_L is not a Langmuir constant, instead it is a factor that can be used for isotherms obeying the Langmuir isotherm [2].

The adsorption equilibrium behavior can be classified into four ideal types as follows:

- (1) irreversible equilibrium (Type 1);
- (2) favourable equilibrium (Type 2);

- (3) linear equilibrium (Type 3);
- (4) unfavourable equilibrium (Type 4).

Out of the four different equilibrium types, a Langmuir isotherm can be used to represent the Types 1–3 equilibrium. The Langmuir isotherm was given by [2]:

$$\frac{q^*}{Q_m} = \frac{Kc}{1 + Kc} \quad (1)$$

The relation for saturation conditions that explain the equilibrium between the feed concentration *c*₀ and the saturation concentration *q*₀^{*} was given by [2]:

$$\frac{q^*}{q_0^*} = \frac{c(1 + Kc_0)}{c_0(1 + Kc)} \quad (2)$$

Introducing the term separation factor, *R* (dimensionless), dimensionless concentrations (*Y* = *q/q*₀) and (*X* = *c/c*₀), Eq. (2) becomes [2]:

$$Y^* = \frac{X}{R + (1 - R)X} \quad (3)$$

The asterisks denotes equilibrium could be applied to either *Y* or *X*, where *R* is defined by [2]:

$$R = \frac{1}{1 + Kc_0} \quad (4)$$

Eq. (4) can be solved explicitly solved for *R*, which is given by:

$$R = \left[\frac{X(1 - Y)}{Y(1 - X)} \right]_{\text{equilibrium}} \quad (5)$$

Based on Eqs. (4) and (5), *R* = 0 for the irreversible case; 0 < *R* < 1 for favourable equilibrium; *R* = 1 for linear case and *R* > 1 for unfavourable equilibrium. Further from Eqs. (4) and (5), it can

DOI of original article: 10.1016/j.jhazmat.2006.01.011.

be observed that the R value will vary with varying initial dye concentration irrespective of the shape of the isotherm. In addition, Eqs. (2)–(5) clearly indicates the significance of R value with respect to the Langmuir isotherm. Further based on Eqs. (3) and (4), it can be noticed that the R value at different initial dye concentration should be computed using the Langmuir constant and cannot be computed directly from the Langmuir isotherm. Thus, I would like to suggest the authors to recalculate the R -values at different initial dye concentration and report the appropriate discussions.

In addition the authors had wrongly cited the papers by Al-Degs et al. [3] and Namasivayam et al. [4] while defining the term separation factor. I would like to point out that the term separation factor R was firstly introduced by Hall et al. [2]. Thus, I would like to suggest Baskaralingam et al. [1] to cite the original papers by Hall et al. [2] to refer the separation factor.

Acknowledgement

Thanks are due to the CSIR, India, for their financial support.

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K. Vasanth Kumar

Department of Chemical Engineering, AC College of Technology, Anna University, Chennai 600025, TN, India

E-mail address: vasanth_vit@yahoo.com

27 March 2006

Available online 7 April 2006