

Thermodynamic alternative calculations on a published work on adsorption of methyl orange using chitosan intercalated montmorillonite

ABSTRACT

Pollutant treatment methods are available for membrane isolation, exchange of ions, precipitation, transformation and biosorption. Biosorption has many positive aspects of all this technology, including low running costs, very effective toxicant detoxification at low concentrations, low levels of disposal materials. In many applications, adsorption plays an important role in concentrating useful compounds or eliminating contaminants. The thermodynamic parameters of the adsorption are often obtained from the relation between the adsorption constant (KC in Lmol⁻¹ unit) and the Gibbs free adsorption energy. When the van't Hoff plot for the temperature range 298.2 K to 328.2 K was plotted, a nonlinear curve was obtained with poor R² value (R=0.491). In order to calculate the ΔH° and ΔS° more accurately, the thermodynamics parameters were analysed at two processes: one between 298.2 and 301.2 K and another at between 301.2 and 328.2 K which gave a better R² values of 1.00 and 0.995, respectively. The ΔG° , ΔH° (kJ/mol) and ΔS° (kJ/mol \cdot K) values for temperatures between 298.2 and 301.2 K and between 301.2 and 328.2 K were -29.4524 , 14.65 , 0.145 and -30.4787 , -14.88 and 0.049 , respectively. This paper depicts with the proposed workflow in the analysis of liquid-phase adsorption data from the data acquisition to data analysis and thermodynamics appropriate calculation of the dimensionless KC parameter.

Keyword: Adsorption; Methyl orange; Langmuir; Thermodynamics; Chitosan