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Solubility of dibenzothiophene in nine organic solvents: Experimental measurement and thermodynamic modelling

Bao Tao, Xiuqing Li, Mengqi Yan, Weiping Luo*

Department of Chemical Engineering, Hunan University, Changsha, 410082 Hunan, P. R. China

ABSTRACT

In this study, the solubility of dibenzothiophene (DBT) in N,N-dimethylformamide, 2-(2-butoxyethoxy)ethanol, n-propanol, n-octane, diethylene glycol, decahydronaphthalene, sulfolane, dimethyl sulfoxide and acetone, were measured by using the method of dynamic laser at atmospheric pressure. The experimental temperature ranged from 282.75 K to 341.15 K. The results show that within the temperature range studied, the solubility of DBT increased with increasing temperature. The experimental data were correlated by the Apelblat model, λh model and the modified non-random two liquid (NRTL) activity coefficient model, and the calculated solubility agree satisfactorily with the measured results. The result of Akaike Information Criterion (AIC) analysis showed that the Apelblat model was the best model to correlate the solubility of DBT in diethylene glycol, n-octane, sulfolane and decahydronaphthalene, the λh model was the best model to correlate the solubility of DBT in 2-(2-butoxyethoxy)ethanol and the modified NRTL model was the best model to correlate the solubility of DBT in N,N-dimethylformamide, acetone, dimethyl sulfoxide and n-propanol. Furthermore, the thermodynamic functions including dissolution enthalpy, entropy and Gibbs energy were obtained from the solubility data by using the van't Hoff equation.

Keywords : Solubility; Dibenzothiophene; Apelblat model; λh model; modified NRTL model; van't Hoff equation

* To whom correspondence would be addressed. Tel: +86-731-88821314; fax: +86 731 88821448. E-mail: luowp2002@163.com.

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