ISOBARIC VAPOUR-LIQUID EQUILIBRIUM STUDIES ON DI (iso) PROPYL ETHER-CARBON TETRACHLORIDE SYSTEM

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Abstract

Isobaric vapour-liquid equilibrium data for the system di (iso) propyl ether—carbon tetrachloride are reported. The system is found to be an ideal one.

Introduction

Vapour-liquid equilibrium data for the system di(iso) propyl ether-carbon tetrachloride are not available in literature. Hence the system has been studied under isobaric conditions at 684 ± 2.5 mm of Hg.

Experimental

The equilibrium still and the experimental procedure has been described earlier[1]. The properties of the reagents used are given in Table 1 along with the literature values. Samples were analysed by the measurement of refractive indices at $25^\circ \pm 0.1^\circ$C.

Thermodynamic Consistency

The experimental vapour-liquid equilibrium data are presented in Table 2. Liquid phase activity coefficients are calculated from the equation.

$$\gamma_i = \frac{y_i \pi}{x_i p_i}$$

Vapour pressure data for the pure components are taken from the literature.[3]

The system does not form an azeotrope. The values of γ_1 and γ_2 are found to be nearly unity which indicates that it is an ideal system. The small deviations that are observed may be attributed to the experimental inaccuracies and do not show any definite trend. The data are correlated with Raoult's law and the calculated values of y_1 are also given in Table 2. The root-mean-square deviation of $y_{exp.} - y_{cal.}$ is found to be 1.013. So for all practical purposes the system can be considered as an ideal one.

TABLE I

Properties of pure components

Compound	Density		Refractive index		Boiling Points °C (760 mm)	
	Exptl.	Lit.[3]	Exptl.	Lit.[3]	Exptl.	Lit.[3]
Di(iso) propyl ether	$0.7250^{20^\circ C}$	$0.7258^{20^\circ C}$	$1.3672^{23^\circ C}$	$1.3678^{23^\circ C}$	67.6	67.5
Carbon tetra-chloride	$1.5840^{20^\circ C}$	$1.5845^{20^\circ C}$	$1.4606^{20^\circ C}$	$1.4607^{20^\circ C}$	76.9	76.8

TABLE II

Vapour-liquid equilibrium data (Pressure : 684 ± 2.5 mm)

No.	Temp. °C	Mole% of di(iso) propyl ether in		γ_1	γ_2	y_1 calculated
		Liquid	Vapour			
1	72.5	6.3	8.2	1.0009	0.9914	8.19
2	71.5	14.0	17.7	1.0030	1.0004	17.65
3	70.6	20.8	26.2	1.0270	1.0030	25.51
4	69.6	30.5	36.5	1.0062	0.9938	36.28
5	69.0	36.4	43.0	1.0116	1.0153	42.51
6	68.3	43.7	50.3	1.0069	1.0207	49.96
7	67.8	49.4	56.0	1.0079	1.0244	55.56
8	67.0	58.5	64.6	1.0069	1.0308	64.16
9	66.3	67.2	72.7	1.0082	1.0283	72.11
10	65.9	73.2	77.7	1.0011	1.0386	77.62
11	65.1	86.2	89.3	1.0020	0.9933	89.12
12	64.6	94.8	96.0	0.9994	1.0048	96.06

NOMENCLATURE

p = Vapour pressure of pure component.
x = Mole fraction in liquid phase.
y = Mole fraction in vapour phase.
γ = Activity coefficient.
π = Total pressure
t = Temperature °C.

SUBSCRIPTS

1 – Di(iso) propyl ether.

2 – Carbon tetrachloride.

REFERENCES

1. Vijayaraghavan, S. V., Deshpande, P. K. and Kuloor, N. R. *Indian J. Tech.* 1964, 2, 249.
2. Ellis, S. R. M. and Garbett, R. D. *Ind.Eng.Chem.*, 1960, 52, 385.
3. . . . . . . Handbook of Chemistry and Physics, Edited by Charles D. Hodgman, 44th Edition, Chemical Rubber Publishing Co. (1962-63).