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

BY S. V. VlJAYARAGHAVAN, P. K. DESHPANDE AND N. R. KULOOR
(Department of Chemical Engineering, Indian Institute of Science, Bangalore-12)

Received on June 5, 1965

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. 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° ± 0.1°C.

THERMODYNAMIC CONSISTENCY

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

\[ \gamma_i^t = \frac{Y_i \pi}{x_i p_i} \]

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

The system does not form an azeotrope. The values of \( \gamma_1 \) and \( \gamma_2 \) 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 \( \gamma_1 \) 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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Di(iso) propyl ether</td>
<td>0.7250&lt;sup&gt;20°C&lt;/sup&gt;</td>
<td>0.7258&lt;sup&gt;20°C&lt;/sup&gt;</td>
<td>1.3672&lt;sup&gt;23°C&lt;/sup&gt;</td>
<td>1.3678&lt;sup&gt;23°C&lt;/sup&gt;</td>
<td>67.6</td>
<td>67.5</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>1.5840&lt;sup&gt;20°C&lt;/sup&gt;</td>
<td>1.5845&lt;sup&gt;20°C&lt;/sup&gt;</td>
<td>1.4606&lt;sup&gt;20°C&lt;/sup&gt;</td>
<td>1.4607&lt;sup&gt;20°C&lt;/sup&gt;</td>
<td>76.9</td>
<td>76.8</td>
</tr>
</tbody>
</table>

TABLE II

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Temp. °C</th>
<th>Mole% of di(iso) propyl ether in Liquid</th>
<th>Mole% of di(iso) propyl ether in Vapour</th>
<th>γ&lt;sub&gt;1&lt;/sub&gt;</th>
<th>γ&lt;sub&gt;2&lt;/sub&gt;</th>
<th>( \gamma_1 ) calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>72.5</td>
<td>6.3</td>
<td>8.2</td>
<td>1.0009</td>
<td>0.9914</td>
<td>8.19</td>
</tr>
<tr>
<td>2</td>
<td>71.5</td>
<td>14.0</td>
<td>17.7</td>
<td>1.0030</td>
<td>1.0004</td>
<td>17.65</td>
</tr>
<tr>
<td>3</td>
<td>70.6</td>
<td>20.8</td>
<td>26.2</td>
<td>1.0270</td>
<td>1.0030</td>
<td>25.51</td>
</tr>
<tr>
<td>4</td>
<td>69.6</td>
<td>30.5</td>
<td>36.5</td>
<td>1.0062</td>
<td>0.9938</td>
<td>36.28</td>
</tr>
<tr>
<td>5</td>
<td>69.0</td>
<td>36.4</td>
<td>43.0</td>
<td>1.0116</td>
<td>1.0153</td>
<td>42.51</td>
</tr>
<tr>
<td>6</td>
<td>68.3</td>
<td>43.7</td>
<td>50.3</td>
<td>1.0069</td>
<td>1.0207</td>
<td>49.96</td>
</tr>
<tr>
<td>7</td>
<td>67.8</td>
<td>49.4</td>
<td>56.0</td>
<td>1.0079</td>
<td>1.0244</td>
<td>55.56</td>
</tr>
<tr>
<td>8</td>
<td>67.0</td>
<td>58.5</td>
<td>64.6</td>
<td>1.0069</td>
<td>1.0308</td>
<td>64.16</td>
</tr>
<tr>
<td>9</td>
<td>66.3</td>
<td>67.2</td>
<td>72.7</td>
<td>1.0082</td>
<td>1.0283</td>
<td>72.11</td>
</tr>
<tr>
<td>10</td>
<td>65.9</td>
<td>73.2</td>
<td>77.7</td>
<td>1.0011</td>
<td>1.0386</td>
<td>77.62</td>
</tr>
<tr>
<td>11</td>
<td>65.1</td>
<td>86.2</td>
<td>89.3</td>
<td>1.0020</td>
<td>0.9933</td>
<td>89.12</td>
</tr>
<tr>
<td>12</td>
<td>64.6</td>
<td>94.8</td>
<td>96.0</td>
<td>0.9994</td>
<td>1.0048</td>
<td>96.06</td>
</tr>
</tbody>
</table>

NOMENCLATURE

\( p \) = Vapour pressure of pure component.
\( x \) = Mole fraction in liquid phase.
\( y \) = Mole fraction in vapour phase.
\( \gamma \) = Activity coefficient.
\( \pi \) = Total pressure
\( t \) = Temperature °C.
SUBSCRIPTS

1 = Di(iso) propyl ether.
2 = Carbon tetrachloride.

REFERENCES