affected in the same direction by the introduction of 1,3-dioxolane. The parameters λ_{12} and λ_{21} are about the same magnitude for the three systems but vary differently with temperature.

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Received for review April 28, 1981. Revised manuscript received September 21, 1981. Accepted November 24, 1981. This work was partially supported with Grant No. 8100812/97, Progetto finalizzato Chimica Fine e Secondoria del C.N.R, Roma, Italy.

Supplementary Material Available: Table A, listing refractive index-composition data of 1,3-dioxolane with *o*-, *m*- and *p*-xylenes; and Table B, listing values of γ_k, calculated from the Wilson equation, for the systems 1,3-dioxolane/*o*-, *m*-, or *p*-xylenes at 300, 500, and 740 mmHg (10 pages). Ordering information is given on any current masthead page.

Vapor–Liquid Equilibrium in Binary Mixtures of Nitrogen and Quinoline

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Compositions of saturated vapor and liquid mixtures of nitrogen and quinoline at equilibrium were experimentally determined at 462, 542, 624, and 704 K at pressures of 20–254 bar. A flow apparatus was employed to minimize residence time and thermal decomposition of quinoline in the high temperature zone.

Introduction

This work is part of a continuing study of phase equilibrium in asymmetric mixtures of light solutes and heavy solvents. The objective is to enlarge the state of knowledge in the direction of high temperature for high-pressure systems and to extend it to new solutes and solvents. In this work we report the phase behavior of mixtures of nitrogen + quinoline. There are no previous investigations of this binary system.

Experimental Method and Materials

A flow apparatus was used in this work to achieve short residence time and thereby to minimize thermal decomposition of quinoline at high temperature. The experimental apparatus and procedure were described by Simnick and co-workers (*1*, *2*). A minor change has been made in the apparatus with the addition of a Heise gauge (Model CMM) which reads pressures below 34 bar to an increased accuracy of ±0.03 bar.

The temperature of the equilibrium cell was kept constant within 0.2 K during the course of measurement of a complete isotherm. Nitrogen gas was supplied by Airco with a reported purity of 99.995+%. Quinoline purchased from Fisher Scientific Co. was certified reagent grade of 99+% purity. Samples from the condensates of both the overhead and the bottom cell effluents were collected at all conditions studied and analyzed for thermal decomposition by gas chromatography. The analysis showed a small amount of impurities in the condensates from experiments at the higher temperatures. The sum of the peak areas of the impurities amounted to about 1.5% of the total peak areas at the highest temperature of this work. The samples from the cell bottom effluent showed a dark brown color.

Table I. Nitrogen + Quinoline Vapor-Liquid Equilibrium Data

p, bar	x_N	y_N	K_N	K_Q
		462.1 K		
20.82	0.00868	0.98375	113.34	0.0164
30.34	0.01294	0.98795	76.38	0.0122
50.9	0.01985	0.99204	49.98	0.0081
101.3	0.03873	0.99470	25.69	0.0055
150.8	0.05589	0.99513	17.81	0.0052
202.0	0.07331	0.99522	13.58	0.0052
252.7	0.08884	0.99497	11.20	0.0055
		541.9 K		
20.38	0.0103	0.8975	87.13	0.1036
30.36	0.0158	0.9272	58.85	0.0739
50.20	0.0264	0.9523	36.11	0.0490
101.7	0.0533	0.9701	18.21	0.0316
152.3	0.0774	0.9758	12.61	0.0263
203.0	0.1019	0.9775	9.594	0.0251
253.7	0.1243	0.9782	7.868	0.0249
		623.9 K		
20.37	0.0107	0.6037	56.47	0.4006
30.17	0.0178	0.7145	40.20	0.2907
51.0	0.0335	0.8156	24.35	0.1907
101.5	0.0704	0.8886	12.63	0.1198
151.6	0.1055	0.9037	8.566	0.1077
201.8	0.1397	0.9212	6.596	0.0916
253.7	0.1738	0.9260	5.330	0.0895
		703.7 K		
30.80	0.0124	0.2661	21.40	0.7431
51.2	0.0357	0.4889	13.70	0.5300
102.1	0.0926	0.6784	7.330	0.3544
153.4	0.1465	0.7421	5.065	0.3022
203.0	0.2014	0.7682	3.814	0.2902
252.9	0.2516	0.7831	3.112	0.2898

Results

Measurements were made at four temperatures: 462.1, 541.9, 623.9, and 703.7 K. Seven pressures were observed from 20 to 254 bar at each of the three lower temperatures. Observation started at a higher pressure of 30 bar at the highest temperature owing to the elevated vapor pressure of quinoline.

Table I presents the mole fractions x of the saturated liquid and y of the saturated vapor at various temperatures T and

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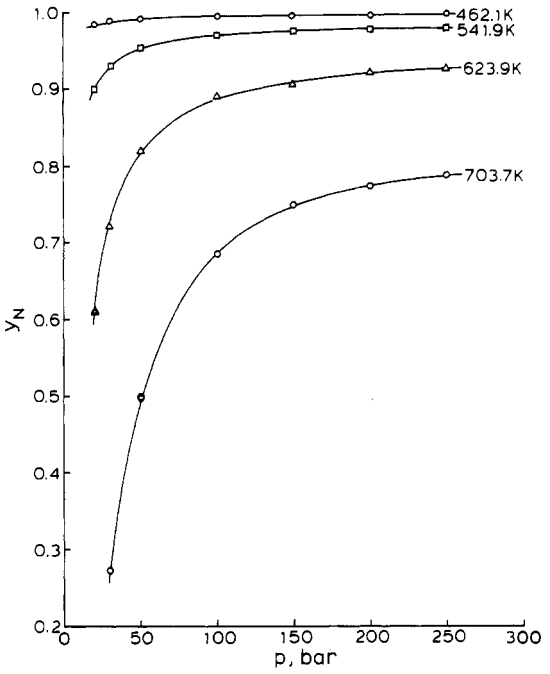

Figure 1. Mole fraction of nitrogen in the saturated vapor of nitrogen + quinoline mixtures.

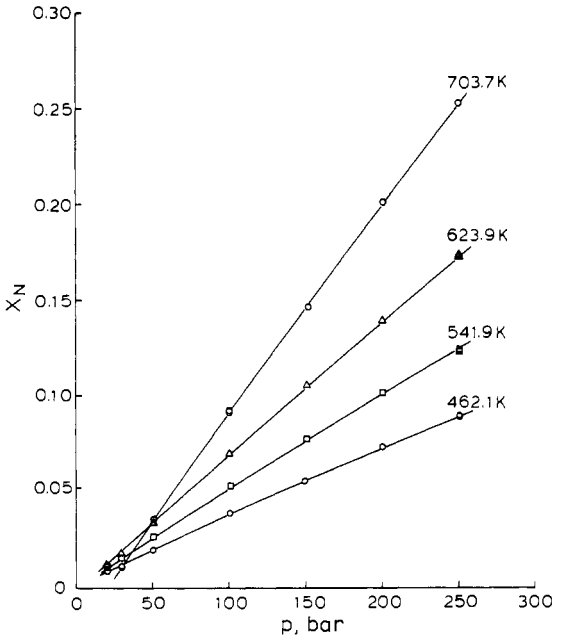

Figure 2. Solubility of nitrogen in quinoline liquid.

pressures p. An x or y value in the table represents the average of at least two duplicate samples at the same T and p. The multiple sample compositions generally agree to within 1%.

Figures 1 and 2 show the x and y values, respectively, as functions of p. Individual sample values are shown as separate points where they can be distinguished. Figures 3 and 4 show the vaporization equilibrium K values of nitrogen and quinoline, respectively.

Glossary

K	vaporization equilibrium ratio
p	system pressure, bar
T	temperature, K

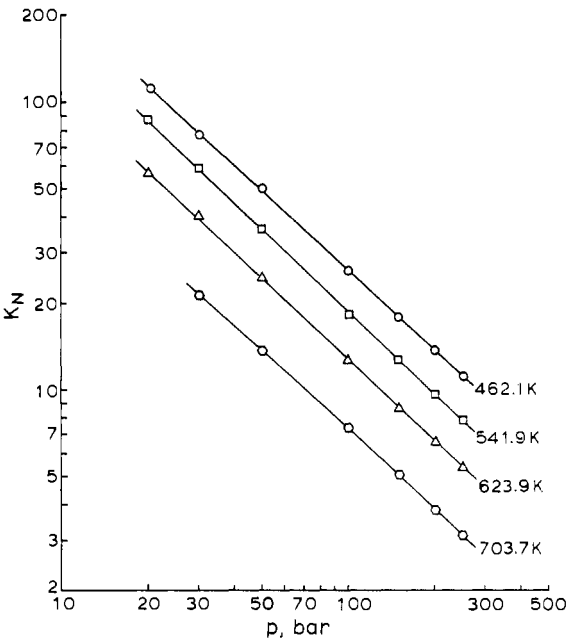

Figure 3. K values of nitrogen.

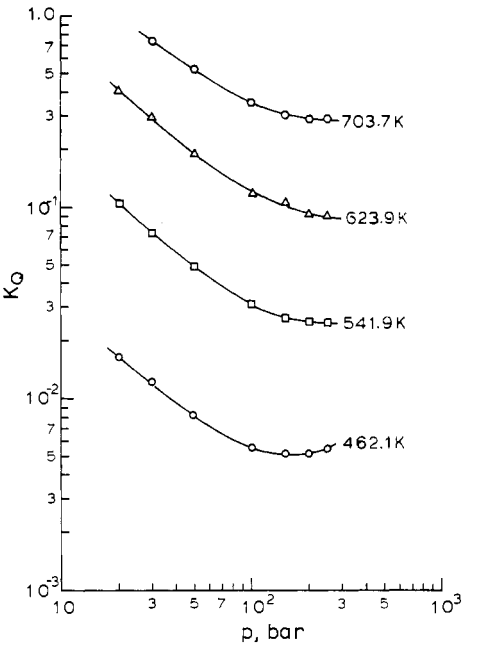

Figure 4. K values of quinoline.

x	mole fraction in the liquid phase
y	mole fraction in the vapor phase

Subscripts

N	nitrogen
Q	quinoline

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Received for review July 20, 1981. Accepted November 2, 1981. Funds for this work were provided by the Electric Power Research Institute, through research project RP-367.