y = mole fraction of A in the bulk gas stream

y_1 = mole fraction of A in the gas entering the physical absorption zone of the column

y_2 = mole fraction of A in the gas entering the interior-reaction zone of the column

y_3 = mole fraction of A in the gas entering the surface-reaction zone of the column

y_4 = mole fraction of A in the gas leaving the surface-reaction zone of the column

$\alpha = 1 - \frac{mG_M D_B}{L_M D_A}$

$\beta = \frac{mq_c D_B}{rD_A} + \frac{mG_M D_B y_3}{L_M D_A}$

ρ = molal density of the liquid, lb.-moles/cu. ft.

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Solubility of Cyclohexane in Water

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An experimental study was made on the solubility of cyclohexane in water at pressures to about 425 lb./sq. in. abs. and at temperatures of 100°, 160°, 220° and 280°F. No solubility data for cyclohexane in water have been found in the literature. However the solubility of water in cyclohexane is reported by Tarassenkow and Poloshinzewa (*4*) at temperatures from 14° to 52°C. and at total pressure of the system.

The experimental technique and the analytical procedure have been described in detail previously (*2*). No changes were made in the equipment for the present investigation.

MATERIALS

The cyclohexane used in the present study was pure grade stock and is certified to have a minimum purity of 99.0 mole%. A gas chromatography analysis of the hydrocarbon showed the purity to be about 99.6% cyclohexane. The water was taken from the distilled water source of the laboratory and was boiled to remove any dissolved gases.

EXPERIMENTAL RESULTS

The smoothed data are shown in Table 1.

For comparative purposes the solubilities of cyclohexane and that of cyclopropane in water (*3*) are plotted in Figure 1. These curves show a decrease in solubility with the increase in molecular weight (*1*). The minimum solubility phenomenon is not present in either the cyclopropane-water system or the cyclohexane-water system in the pressure and temperature range of investigation.

TABLE 1. SMOOTHED DATA—SOLUBILITY OF CYCLOHEXANE IN WATER

(Mole Fraction Cyclohexane × 10^5)

Total pressure, lb./sq. in. abs.	100°F. (3.25*)	160°F. (10.93*)	220°F. (28.96*)	280°F. (62.33*)
14.7	0.97	0.58	—	—
20.0	1.34	1.00	—	—
30.0	2.03	1.60	0.72	—
40.0	2.72	2.20	1.32	—
50.0	3.41	2.83	1.92	—
60.0	4.10	3.45	2.51	0.70
80.0	5.48	4.71	3.70	1.91
100.0	6.85	5.92	4.89	3.13
120.0	8.22	7.18	6.05	4.40
140.0	9.6	8.43	7.27	5.62
160.0	11.03	9.71	8.48	6.82
180.0	12.4	10.92	9.69	7.95
200.0	13.8	12.28	10.8	9.08
250.0	17.08	15.41	13.92	12.1
300.0	20.2	18.24	16.68	14.6
350.0	23.11	21.0	19.2	—
400.0	25.84	23.61	21.52	—
450.0	28.35	25.98	23.46	—

* Vapor pressure of pure cyclohexane.

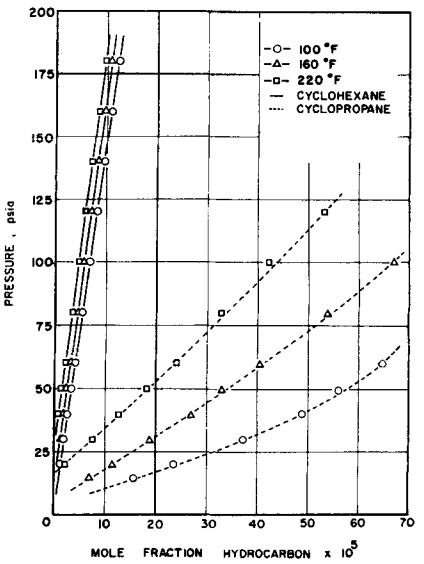

Fig. 1. Comparative solubility of cycloparaffins in water.

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