Solubilities of *n*-Pentane and 1,3-Butadiene in Liquid Nitrogen

G. T. PRESTON[1] and J. M. PRAUSNITZ[2]
Department of Chemical Engineering, University of California, Berkeley, Calif. 94720

The solubilities of *n*-pentane and 1,3-butadiene in liquid nitrogen are nearly two orders of magnitude smaller than those in liquid methane.

In a recent publication (*1*), we reported solubilities of several hydrocarbons in liquid methane and in liquid argon. Using the apparatus and procedure described previously, we have also measured the solubilities of *n*-pentane and 1,3-butadiene in liquid nitrogen.

Nitrogen was obtained from the Matheson Co. with a stated purity of 99.997%. *n*-Pentane and 1,3-butadiene were obtained from Phillips Petroleum Co. with stated purities of 99.90% and 99.89%, respectively.

Table I presents experimental solubilities x_2 (mole fraction of solute) along with the precision and an estimate of the parameter l_{12} in the modified Scatchard-Hildebrand equation as discussed earlier. Since the measured solubilities are extremely small, difficulties in chemical analysis are responsible for some uncertainty in the results. It is clear, however, that the solubilities of these hydrocarbons in liquid nitrogen are about one order of magnitude smaller than those in liquid argon and nearly two orders of magnitude smaller than those in liquid methane.

Table I. Solubilities in Liquid Nitrogen

Solute	T, K	$10^6 x_2$	No. of samples	Precision, rel %	Scatchard-Hildebrand l_{12}
n-Pentane	90.6	0.63	10	10	0.07
	97.2	1.45	7	4	
1,3-Butadiene	95.4	0.72	4	21	0.06

[1] Present address, Food Machinery Corp., San Jose, Calif. 95108.
[2] To whom correspondence should be addressed.

LITERATURE CITED

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Solubility of Carbon Dioxide in Aqueous Diethanolamine Solutions at High Pressures

JONG IL LEE, FREDERICK D. OTTO, and ALAN E. MATHER[1]
Department of Chemical and Petroleum Engineering, University of Alberta, Edmonton, Alta., Canada

The solubility of carbon dioxide in aqueous solutions of diethanolamine (DEA) has been determined at temperatures between 25° and 120°C in four solutions ranging from 0.5*N* to 5*N* DEA. The partial pressures of CO_2 ranged from 0.1–827 psia. The results have been combined with previous data in the literature and smoothed values are presented. Enthalpies of solution have been calculated from the experimental results.

Aqueous diethanolamine (DEA) solutions are used extensively for the removal of the acid gas components, CO_2 and H_2S, present in gas mixtures. The proper design and operation of amine-treating units require a knowledge of the solubility behavior of the acid gases in DEA solutions.

Determinations of the solubility of carbon dioxide in aqueous diethanolamine solutions have been made by few investigators. Bottoms (*1*) presented a small-scale plot showing the solubility of CO_2 in 50% water solution at temperatures of 25°, 35°, 45° and 55°C, and partial pressures of CO_2 up to 760 mm Hg. Mason and Dodge (*4*) studied the solubility of CO_2 in 0.5, 2.0, 5.0, and 8.0*N* solutions at temperatures of 0°, 25°, 50°, and 75°C and partial pressures of CO_2 ranging from about 10 to 750 mm Hg. Reed and Wood (*6*) presented graphically a few values of the solubility of CO_2 in 2.5*N* DEA solutions at temperatures of 100° and 140°C and partial pressures of CO_2 ranging from 35 to 230 psia. The published results have been summarized by Kohl and Riesenfeld (*3*), and the reliable data available are those for partial pressures of CO_2 below atmospheric. Recently Murzin and Leites (*5*) measured the partial pressure of CO_2 over 0.5, 1.0, 2.0, 5.0, and 8.0*N* solutions at temperatures between 20° and 90°C and presented the results on small-scale plots. Mole ratios of CO_2/DEA ranged from 0.01 to 0.4 with partial pressures of CO_2 from about 0.1 to 700 mm Hg. This study was undertaken to provide data on the solubility of CO_2 in DEA solutions at high partial pressures in the range of temperatures and solution concentrations used industrially.

[1] To whom correspondence should be addressed.