

FIGURE 4. COMPARISON WITH SANDER'S DATA

It is evident that Henry's law holds fairly well up to solutions as concentrated as 40 mole per cent. Averaging the values of k up to and including x = 0.40 for the first three temperatures, and up to and including x = 0.50 at 60° C., the following values of k, useful for approximate calculations, are obtained: to C

· C.	k
30	1217
4 0	1420
50	1630
30	1913

These data give nearly a straight line when plotted.

If Henry's law in the above form is applied to Sander's data, quite different trends are observed. (Sander reported no vapor compositions and hence it was necessary to assume y = 1 in the Henry-law equation.) At 20°, 35°, and 100° C., k decreases rapidly at first as mole fraction (or pressure) increases and then approaches a constant value. On the other hand, at 60° C., k is substantially constant over the whole range of the experiments to a maximum pressure of about 100 atmospheres. This comparison of our data with those of Sander does not depend on the uncertain value of the volume of benzene used as was the case when we tried to compare the absolute results. We are unable to account for the difference in the trends of the two sets of data.

Literature Cited

- (1) Dilley, J. R., and Edwards, W. L., U. S. Dept. Agr., Circ. 61, (1929).
- Saddington, W. A., and Krase, N. W., J. Am. Chem. Soc., 56, (2)353 (1934). (3)
- Sander, W., Z. physik. Chem., 78, 513-49 (1912).

This paper is based on a dissertation presented by Shen-wu Wan in June, 1935, to the faculty of the Graduate School of Yale University in candidacy for the degree of doctor of philosophy.

2-Aminophenylanthraquinone and 1,2-Phthaloylcarbazole

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FEW years ago the writer reported on the preparation of β -phenylanthraquinone and its derivatives (2). He showed that 4'-chloro- β -phenylanthraquinone could readily be converted to the corresponding amino compound by reacting with aqueous ammonia, giving a product which by titration was about 98 per cent pure. In the case of the similar ammonolysis of 2-chloro- β -phenylanthraquinone, the author was constrained to report that "efforts to titrate the 2-amino derivatives were unsuccessful, the results being uniformly low". The nitrogen content, however, was close to the theoretical.

When 2'-amino- β -phenylanthraquinone was obtained by the cyclization of 2-amino-p-phenyl-o-benzoylbenzoic acid (3), a brown crystalline product, melting at 200-201° C., was obtained. The crude product resulting from the ammonolysis of 2'-chloro- β -phenylanthraquinone with aqueous ammonia containing nitrobenzene and a copper catalyst also gave evidence of the presence of some amine, either by titration with sodium nitrite or by diazotizing and coupling with R salt. When this crude product was recrystallized from toluene and o-dichlorobenzene, long, silky, orange-colored needles (melting at 255° C.) were obtained. This crystalline product is not 2-amino- β -phenylanthraquinone, but 1,2-phthaloylcarbazole:



Obviously a ring closure occurred between the amino group and the 1 position of the anthraquinone nucleus, probably as a result of the oxidizing influence of the nitrobenzene.

Weinmayr of the du Pont Company pointed out to the writer that under the conditions employed, the formation of 1,2-phthaloylcarbazole is not entirely surprising. Weinmayr also noted that the recrystallized product (melting at 255° C.) obtained by us, corresponds to the melting point given for 1,2-phthaloylcarbazole, derived by heating $1-\alpha$ anthraquinonylbenzotriazole in diphenylamine (1). It dissolves in concentrated sulfuric acid with a deep blue color and shows an instantaneous color change when a drop of nitric acid is added to the sulfuric acid solution; this is a reaction characteristic of the carbazole structure.

Literature Cited

- (1) Beilstein's Handbuch der organischen Chemie, Band XXI, p. 428, system 3230, Berlin, J. Springer, 1935.
- Groggins, P. H., IND. ENG. CHEM., 22, 620 (1930).
 Groggins, P. H., U. S. Patent 1,814,149 (1931).