NOTES

A Note on the Density of Glycine.—A search of the literature and various handbooks reveals considerable confusion with reference to the density of glycine.

Landolt–Börnstein–Roth–Scheel give the density as 1.60. In the "International Critical Tables" the density is given as 1.160 at 20°. The value given by the "Handbook of Chemistry and Physics" is 1.161 at 15°. Beilstein gives the density of glycine as 1.161. Curtius[1] determined the density of glycine, obtaining the values of 1.1607.

The density of glycine was desired at 50°. The pycnometer method using xylene as the liquid being displaced was employed. Data were obtained with three different materials.

Eastman practical glycine gave an average value of 1.623 as the density at 50°, Eastman purified 1.5767, and Pfanstiehl purified 1.5740, the mean of the purified materials being 1.5753.

These results indicate a value of 1.5753 as the density, at 50°, of purified glycine. The results also seem to point to a typographical error in the original publication of Curtius, this value apparently being the source of the values given in the various handbooks.

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Differential Fractional Distillation.—Several authors[1] have shown that the original method of plotting potentiometric titration data (the electromotive force, E, against the volume of reagent, V) could be improved upon by plotting the slope of the above curve, $\Delta E/\Delta V$, as a function of V. The point of interest in the first type of curve is the point of inflection, while in the second type the point of interest is a sharp maximum. It seems that the common practice in plotting data from fractional distillation is to plot the volume of the distillate, V, against the temperature, T. In this curve, the boiling point of a component is a point of inflection. By direct analogy to the potentiometric titration, the author wishes to suggest that the fractional distillation data can be more readily interpreted if the slope of that curve, $\Delta V/\Delta T$, is plotted against T. In this derived curve the boiling point of each component would be a sharp maximum,

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[1] Curtius, *J. prakt. Chem.*, **26**, 158 (1882).

[1] Hostetter and Roberts, THIS JOURNAL, **41**, 1341 (1919); Cox, *ibid.*, **47**, 2138 (1925); MacInnes and Jones, *ibid.*, **48**, 2831 (1926); Hall, Jensen and Baeckström, *ibid.*, **50**, 2217 (1928).

instead of a point of inflection, much more easily interpreted in the author's opinion.

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Inorganic Lubricants. I. Amalgams.—The great specific gravity and the fluidity of mercury have long permitted its use as a floating and lubricating liquid in the support of astronomical and other heavy moving instruments. Bearings have been operated in a bath of mercury as lubricant.[1]

It has been proposed also to use a film of mercury or amalgam as lubricant on metal bearings,[2] as well as "soft metals" such as copper–zinc amalgams.[3]

For some laboratory operations, such as those involving gases from which aqueous and organic vapors must be excluded, mercury or its fluid amalgams would be found useful as a lubricant for glass stopcocks and ground joints, except for the difficulty in obtaining an adherent film of the metal over the ground-glass surface and so securing the sealing of the joint. This difficulty may, however, be largely overcome in the following manner.

Carefully clean and dry the ground surfaces and then heavily silver them with ammoniacal silver nitrate and rochelle salt solution. Surfaces not to be silvered and passage openings may be protected by a thin layer of paraffin or ceresin wax. Immersion in as many as three to five fresh silvering solutions is usually necessary in order to secure the thickness of silvering required, although this depends upon the exact silvering formula used; too thick deposits obviously lessen the tightness of fit. After each deposition of metal the surface should be well rinsed in distilled water, but otherwise not disturbed.

The silvered surfaces finally obtained are then allowed to dry. Wax coatings on the passage openings should be entirely removed at this time. Amalgam paste or liquid is then dropped on the concave ground surface and the grinding parts are brought together and rotated gently with little contact pressure. Amalgamation of the silver rapidly takes place, and is complete when the motion is smooth and non-gritty, yielding a coherent film over the parts in contact, and tight lubrication.

These amalgamated surfaces are, as a rule, not permanent, but with care will endure through a number of operations lasting over several days, particularly if more amalgam is occasionally applied. They are rapidly destroyed on contact with aqueous solutions of many salts or with acid gases, and may not be used successfully with such materials, although when pure

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[1] Harper, U. S. Patent 994,920 (June 13, 1911).

[2] Sherwood, U. S. Patent 1,544,488 (June 30, 1925); 1,598,321 (Aug. 31, 1926).

[3] DeLattre and Hardy, U. S. Patent 1,559,077 (Oct. 27, 1925).

mercury is employed instead of an amalgam, an acid-resisting film is formed the ordinary life of which, however, is shorter than that of films formed with complex liquid amalgams.

The complex amalgam employed may be almost any dilute mercury solution. One such is a mixture of 5 g. of solder, 5 g. of Wood's metal, 2.5 g. of zinc and 80 g. of mercury, solution being effected with heat. Such a liquid also has the curious property of wetting clean, polished glass surfaces with ease.

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STUDIES IN QUINOLINE SYNTHESES

BY WILLIAM LYALL BARR

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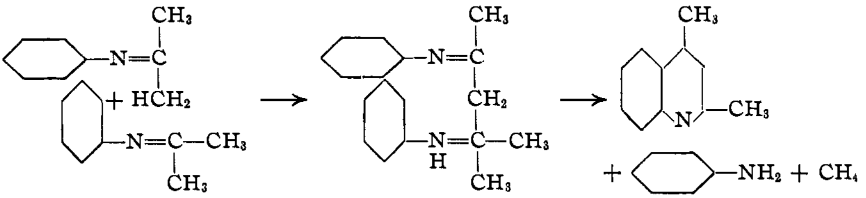
Historical.—The Skraup synthesis is variously formulated as involving intermediate formation of (I) acrolein anil, (II) β-anilinopropionaldehyde or (III) the anil of this aldehyde. The literature affords no definite evidence for the formation of a type I intermediate; there are results compatible with the formation of an intermediate of either type II or type III, but not of type I. Thus Murmann[1] obtained 2-phenylquinoline, not 4-phenylquinoline, by the condensation and oxidation of cinnamaldehyde and aniline, and Blaise and Maire[2] formed 4-ethylquinoline from anilinoethyl ethyl ketone heated with aniline hydrochloride.

From the work of Beyer, Engler and Riehm, and Knoevenagel, the last named investigator has shown[3] that quinoline formation from simple ketones or aldehydes and aromatic amines proceeds by the intermediate formation of ketylidene or alkylidene anils, which form dimerides and then quinoline derivatives; *e. g.*, from aniline and acetone



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[1] Murmann, *Monatsh.*, **25**, 621 (1904).

[2] Blaise and Maire, *Bull. soc. chim.*, [4] **3**, 658, 667 (1908).

[3] Beyer, *J. prakt. Chem.*, [2] **31**, 47 (1885); **32**, 125 (1885); **33**, 393 (1886); *Ber.*, **20**, 1767 (1887); Engler and Riehm, *ibid.*, **18**, 2245 (1885); Knoevenagel and v. Baehr, *ibid.*, **55**, 1912 (1922); Knoevenagel and Goos, *ibid.*, **55**, 1929 (1922); Knoevenagel, Wagner and v. Baehr, *ibid.*, **56**, 2414 (1923).