The melting points of the semihydrate and anhydrous crystals were found to be 29.32° and 42.35°, respectively; and their rates of crystallization, respectively, 2.6 cm. and 33.3 cm. per minute at 20°.

Washington, D. C.

# NOTES

**Preparation of Nitric Oxide from Sodium Nitrite.**—The usual method of preparing nitric oxide by the action of nitric acid on copper is rather tedious in operation and gives a product contaminated with nitrogen dioxide or nitrous oxide unless the concentration of the acid and the conditions are carefully controlled. The gas may be generated rapidly and in nearly pure condition by dropping concd. sulfuric acid into a flask or distilling bulb containing sodium nitrite covered with two or three times its weight of water. The nitrous acid liberated decomposes almost quantitatively according to the equation, $3HNO_2 = HNO_3 + 2NO + H_2O$.

A small amount of nitrogen dioxide which the gas contains may be removed by passing it through a wash bottle containing concd. sulfuric acid or by collecting it over water.

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Received May 18, 1925
Published August 5, 1925

**The Solubility of Urea in Water.**—While working with concentrated aqueous solutions of urea at various temperatures, it was found that the solubility of urea as recorded in Seidell's "Solubilities of Inorganic and Organic Compounds,"[1] is considerably too low. Upon examining the original reference,[2] it was found that the results were expressed as "per cent. gram molecules, that is, to the number of gram molecules of solute in 100 gram molecules of solution." In recalculating these results for Seidell's book, this expression had been misconstrued, the data being calculated as moles of solute in 100 moles of solvent, instead of solution.[3] We have recalculated Speyers' data and have also determined the solubility of urea in water at various temperatures.

Our method consisted in heating about 300–400 cc. of urea solution in a water-bath in the presence of solid urea[4] to a temperature a few degrees above that at which the solubility was to be determined. The solution

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[1] W. Seidell, "Solubilities of Inorganic and Organic Compounds," D. Van Nostrand Co., New York, N. Y., 2nd ed., **1919**, p. 737.

[2] Speyers, *Am. J. Sci.*, [IV] **14**, 293 (1902).

[3] Speyers determined the solubilities of a number of carbon compounds in various solvents; we find that the same error has been made in recalculating the solubility data for Seidell's book.

[4] Synthetic urea purified by two recrystallizations from water was used.

was gradually cooled to the desired temperature and, after being maintained at this point for about ten minutes, a sample (25–35 g.) was taken by immersing a hot weighing bottle suspended from a copper wire. Samples were taken at approximately 10° intervals, between 0° and 70°, weighed, and the urea was determined by the urease method.[5] The solubilities at 0° and 10° agree very well with Speyers' values, but increasing differences occur with rise in temperature.

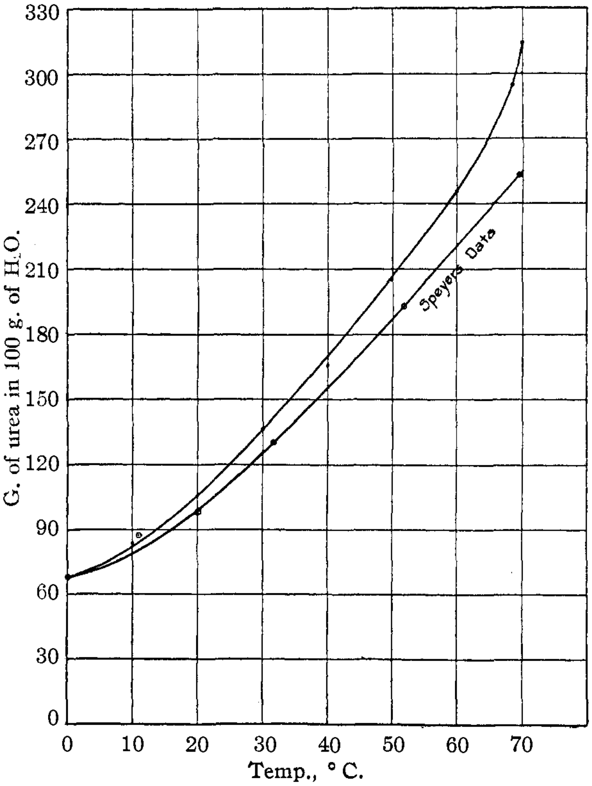

Fig. 1.

TABLE I

SOLUBILITY OF UREA IN WATER

Speyers' data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | Temp., °C. | 0.0 | 11.0 | 19.8 | 31.7 | 51.4 | 69.5 |
| 2. | G. of urea in 100 g. of $H_2O$ | 67.4 | 87.5 | 97.5 | 131.0 | 193.0 | 253.0 |

Data obtained in this study

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 0.0 | 10.0 | 20.0 | 30.0 | 39.7 | 50.0 | 50.6 | 60.0 | 68.5 | 70.0 |
| 2. | 67.0 | 84.0 | 104.7 | 136.0 | 165.4 | 205.0 | 206.4 | 246.0 | 295.0 | 314.6 |

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[5] Fox and Geldard, *Ind. Eng. Chem.*, **15**, 743 (1923).

In order to check the results obtained, determinations were repeated at a few of the higher temperatures, using Speyers' apparatus with slight modifications. The results obtained with this apparatus agreed closely with the first determinations. A comparison of Speyers' data and those obtained in this study is shown in Fig. 1 and Table I.

CONTRIBUTION FROM THE
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RECEIVED MAY 25, 1925
PUBLISHED AUGUST 5, 1925

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**Electrode Vessel for Liquids Heavier and Lighter than the Liquid Junction Potential Eliminator.**—In the electrode vessel to be described the hydrogen-ion concentration of solutions having a density equal to or greater or less than that of the bridge solution can be measured. Sharp and reproducible liquid junctions or flowing junctions can also be conveniently and rapidly made between the electrode solution and the bridge solution by including the feature embodied in the apparatus of F. A. Elliott[1] and Elliott and Acree.[2]

The ground-glass joints and the intricate stopcocks of the Elliott-Acree apparatus, which can be made and repaired only by well equipped and highly skilled glass blowers, are not used, thus making the new apparatus less expensive and more durable. Furthermore, solutions containing suspended matter, such as quinhydrone in quinhydrone electrode work or soil suspensions which would settle down into the bridge liquid in the Elliott or Elliott-Acree apparatus, may be tested without developing this difficulty.

## Electrode Vessel

The tube *d* for holding the electrode solution is connected by a loop *a*, *b*, *c* to the bridge tube *e*, which contains the bridge solution, in such a way that the liquid junction can be made at either of two points in the loop, depending upon the densities of the two solutions making contact.

At *a* and *c* on the loop are connected horizontal branch tubes, with stopcocks for making liquid junctions at these points. At *b* is another branch tube, with a stopcock, through which air may be removed from the loop when the latter is being filled. For liquids denser than the bridge solution the junction contact is made at *a* by filling the empty loop *a*, *b*, *c* to the stopcock *h* with bridge solution and allowing the denser solution from *d* to rise from *h* to *a* by drawing off solution through Stopcock *a*. For liquids

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[1] "Elliott Ion-O-Meter," The Will Corporation, Rochester, N. Y., Bulletin 100, **1921**.

[2] "Hydrogen-ion Determinations," *Pyrolectric Bi-monthly Bulletin*, **14**, September, 1920, pp. 3–8 (Pyrolectric Instrument Company, Trenton, N. J.). Slagle and Acree, *Abstracts of Bacteriology*, **5**, 5 (1921).