

Fluorine occurs in the soils examined in amounts averaging 0.03 per cent, approximately the same concentration as some of the rarer elements, namely, vanadium, zirconium, and strontium. The soils carrying with them stones made up of mica schist (Hagerstown loam, York silt loam, and Gloucester stony loam) contained the relatively higher amounts of fluorine.

SUMMARY

The original source of fluorine in the soil (average

composition 0.03 per cent fluorine) in such minerals as biotite, tourmaline, muscovite, apatite, fluorite, and phlogopite. Higher content of fluorine may be expected in soils carrying larger amounts of mica. The roots of the plants absorb it and transmit it to the animals consuming these plants. Animals also obtain fluorine from spring water.

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LABORATORY AND PLANT

A SCRUBBER FOR AMMONIA DISTILLATIONS

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Received January 21, 1919

Two of the most glaring errors encountered in ammonia distillations are those from entrained alkali and the soft glass used in the construction of distilling bulbs and adapters. It becomes necessary to eliminate these errors when determining small amounts of nitrogen where it is of importance to determine small differences, as in plant and bacterial nutrition studies.

The error from the solubility of the soft glass can be eliminated by using apparatus made of Pyrex glass. This glass has been found to be superior to any other glass for use with weak acids and, furthermore, it does not show a tendency to become brittle on continued use.

The Hopkins bulb, which has been long in use, does not prevent alkali from passing into the receiving acid. It has been found in this laboratory that the entrained alkali can be satisfactorily removed when the vapors are scrubbed through water previous to condensation. Several scrubbers have, therefore, been constructed. The one found most suitable is made of Pyrex glass and is shown in Fig. 1. The large bulb has a capacity of 200 cc., which gives it a satisfactory condensing surface. The small bulb on the inlet tube has three openings in the same horizontal plane.

The first steam, which passes into the scrubber, condenses on the surface of the bulb and flows down about the small bulb and there acts as a scrubbing solution for the remaining vapors. As soon as the water becomes hot it is subjected to a long period of steam distillation. A period of 30 min. in which about 90 cc. of distillate are collected in the first 20 min. permits the accumulation of about 15 to 20 cc. of solution in the scrubber. This solution is, of course, neutral or slightly alkaline and the long period of steam distillation removes all the ammonia from the solution. A great many of these solutions have been tested with Nessler's at the end of the distillation and in no case was ammonia found. As soon as the distillation is finished and the flame removed, the solution is sucked back into the distilling flask.

The procedure of distillation used in this laboratory consists in steaming for 15 min. after draining the condensers, and it is desirable, although not essential, that the adapter be provided with a small

perforated bulb. This will insure better scrubbing of the steam than is accomplished with a straight tube. The adapter recommended is shown in Fig. 2.

Some data are presented here to show the errors of the distilling apparatus commonly employed for ammonia distillation and for the accuracy obtainable with the new devices attached to the tin condenser. The tin condenser used for obtaining these data had never been employed for ammonia distillations but had been used for preparing distilled water. The solutions were distilled at such a rate that about 90 cc. of distillate were collected in 20 min. The condenser was then drained and the distillation continued for 15 min. The receivers were removed, cooled, and the contents titrated. *N*/50 sulfuric acid and sodium hydroxide were used as titrimetric standards.

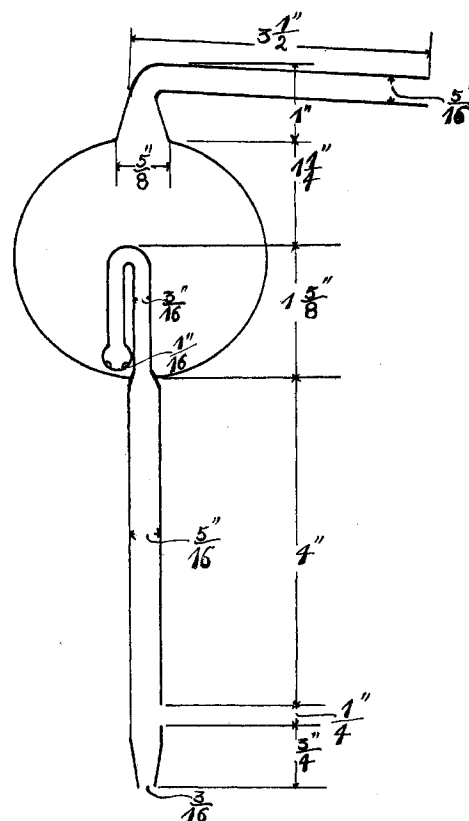


FIG. 1

The data recorded in Table I were obtained by distilling ammonia-free water, and the error shown is due to the solubility of the soft glass of the Hopkins

bulb and the adapter. The average, 0.33 cc., is equivalent to 0.09 mg. of nitrogen.

TABLE I—ERROR FROM SOLUBILITY OF SOFT GLASS

Acid Taken Cc.	Recovered Cc.	Error Cc.
25.62	24.99	-0.63
25.20	24.92	-0.28
25.07	24.74	-0.33
25.03	24.75	-0.28
25.05	24.78	-0.27

Using the same apparatus with 100 cc. of 50 per cent sodium hydroxide (ammonia-free) and 150 cc. of distilled water for each distillation, the data in Table II were obtained to show the ineffectiveness of the Hopkins bulb for preventing entrained alkali from passing into the receiving acid. The error shown

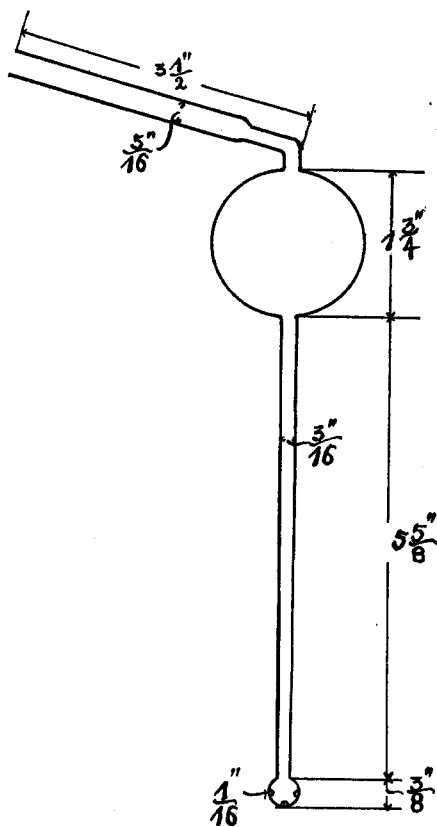


FIG. 2

here is the combined error of the soft glass and entrained alkali. The average, 0.78 cc., is equivalent to 0.216 mg. of nitrogen. This error is too large to be tolerated in any analytical work. Furthermore, it is not a constant error and cannot, therefore, be corrected for by blank distillations.

TABLE II—ERROR FROM ENTRAINED ALKALI AND SOFT GLASS

Acid Taken Cc.	Recovered Cc.	Error Cc.
25.05	24.35	-0.70
25.05	24.32	-0.73
25.30	24.39	-0.91
25.07	24.24	-0.83
25.00	24.27	-0.73

The Hopkins bulb and the adapter were then replaced by the new devices and distillations again made as above. The results are found in Table III and they show that the errors from the soft glass and entrained alkali have been eliminated by the employment of the scrubber and adapter made of Pyrex glass. The error is approximately the same as that found for

TABLE III—DISTILLATION OF DISTILLED WATER

Acid Taken Cc.	Recovered Cc.	Error Cc.
25.04	25.00	-0.04
25.03	25.05	+0.02
25.00	24.99	-0.01
25.00	24.98	-0.02
25.00	24.99	-0.01

DISTILLATION OF STRONG ALKALI

Acid Taken Cc.	Recovered Cc.	Error Cc.
25.14	25.14	-0.00
25.00	24.97	-0.03
25.00	24.97	-0.03
25.00	24.97	-0.03
25.10	25.12	+0.02

titration alone, 0.02 cc., which is equivalent to 0.005 mg. of nitrogen. To show further that no alkali passes through the scrubber, 100 cc. of ammonia-free 50 per cent sodium hydroxide and 250 cc. of distilled water were subjected to distillation and 3 portions of 80 cc. each of distillate were collected, leaving at the end of the distillation 110 cc. of strong alkali. The distillates were then boiled until free of carbon dioxide, cooled, and were found to be neutral to methyl red, less than one drop of *N*/100 sulfuric acid being sufficient to impart a distinct acid reaction to the solution. Three such distillations gave identical results.

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RECOVERY OF PLATINUM AND ALCOHOL FROM THE POTASH DETERMINATION

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Received December 16, 1918

There have been worked out several methods for the recovery of platinum used in the potash determination, but never has there been one, at least to the author's observation, for the recovery of the alcohol. At the current price of alcohol, where grain alcohol is used in the determination, it proves to be quite an item where large numbers of the potash estimations are made. It is true, however, that in some instances part of the alcohol has been redistilled, but it was found that the slight amount of acetaldehyde present had the tendency to lower the potash results on the subsequent determinations. With this thought in mind, the author has worked out a method whereby the platinum is reduced to platinum black as by the zinc and hydrochloric acid method, and with a little additional attention the alcohol is also recovered.

The alcoholic washings are saved in the usual manner until a few liters have accumulated, 5 liters or more being advisable. A 2-liter distilling flask is connected with a condenser, preferably a coil condenser, and the alcoholic washings are transferred to the flask and distilled with the usual precautions. The electric hot plate is the most reliable source of heat and will eliminate the fire risk. A small metal disk which will accommodate the bottom of the flask is partly filled with sand and the flask allowed to stand in this. If a hot plate with three heats is used it can be so regulated as to meet the demand of the operator. Small pieces of glass rod $\frac{1}{4}$ inch in length rounded over at each end will prevent bumping and can be easily washed free of any adhering platinum black which is reduced upon boiling of the solution.