

metal condensers B are drawn down so that they can enter the downward projections on the tube C. Short pieces of heavy-walled rubber tubing are slipped over these, and over the pieces of tubing are passed bored rubber stoppers which clasp them and the outside of the downward projections of tube C. The stopper projects considerably above the tubing so as to form a cup (about the tip) which holds sufficient mercury to produce a perfect seal over the rubber and between the two glass parts.

In setting up the apparatus the extractors P may be inserted in the condensers B before the latter are clamped in position.

The flask F is connected with the inner tube of condenser A by an ordinary cork coated with plaster of Paris. The only vent to the apparatus during the extraction and distillation is through the calcium chloride tube R attached to flask F which is kept closed the entire time after the apparatus has first been charged with ether vapor. By this arrangement no odor of ether can be detected except when the flasks are being changed and for a few moments after the extraction begins. After removing a flask from the extractor another should either be attached immediately or else the lower end of the extractor closed by means of a stopper to prevent unnecessary escape of ether vapor. It is desirable to insert a second flask at once in order that oxidation of the mercury by exposure to the air may be avoided as far as possible. In case the bath E is full of water, the extraction tube may be introduced or removed from the extractor without wetting by sliding it partially into a test-tube.

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[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF LAFAYETTE COLLEGE.]

METHOD FOR PREPARING STRICTLY TENTH-NORMAL, FIFTH-NORMAL, ETC., HYDROCHLORIC OR NITRIC ACID.

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IN a paper before the Lehigh Valley Section of the Society,¹ the writer described a method for preparing strictly normal, semi-normal, decinormal, etc., sulphuric acid by decomposing copper sulphate with the electric current. Since the publication of this

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paper, the following method, depending primarily upon the same reaction, has been tried and found successful, for preparing one-fifth and one-tenth normal hydrochloric and nitric acid.

The method of procedure in making tenth-normal hydrochloric acid is as follows :

12.487 grams of pure crystallized copper sulphate are dissolved in 500 cc. of distilled water in a lipped beaker capable of holding about a liter. Into this solution, after cooling if necessary, is introduced a cylinder of copper foil attached to the negative wire of an electric circuit, and a platinum rod attached to the positive wire. Both the cylinder and rod should reach to the bottom of the beaker. The copper cylinder is made from copper foil. The writer used foil 0.015 inch thick and 3 inches wide. The foil is cut the required length, which will be about three times the diameter of the beaker plus $\frac{1}{2}$ inch for a lap. The foil is curled so that the ends lap. Holes are punched through the two thicknesses of foil with a sharp nail and wire run through these so as to fasten the two ends together. The beaker is covered with a watch-glass perforated to allow the rod to enter, and a current of from one to one and a half amperes passed through the solution for from six to eight hours or all night if the decomposition is begun in the afternoon. At the expiration of this time, the watch-glass is removed and rinsed off together with the cylinder and rod into the beaker. The solution is then transferred to a liter-graduated flask and any copper that may have dropped off the cylinder into the beaker is well washed by decantation, rinsing the beaker at the same time into the flask. Now weigh, accurately, exactly 12.215 grams of crystallized barium chloride into a small beaker, dissolve in water and pour into the flask. Dilute the latter to the mark, add 2.6 cc. of water and mix well. Allow the precipitate to settle, siphon off the clear liquid through a dry tube, upon a dry filter and funnel, and catch the filtrate in a dry beaker or stock-bottle.

The method depends upon the decomposition of the copper sulphate solution by the electric current into copper and sulphuric acid. Upon adding barium chloride to this latter, double decomposition takes place, and barium sulphate and hydrochloric acid are formed. The addition of the 2.6 cc. of water after the solution has been made up to the mark, is to correct for the volume of water displaced by the precipitate.

In preparing tenth-normal nitric acid by this method, the only change that is made is in the substitution of 13.076 grams of barium nitrate for the barium chloride. The quantity of copper sulphate, of course, remains the same.

In preparing large quantities of the acid it would probably be simpler to pour the solution into a stock-bottle, provided with a siphon, immediately after adding the barium chloride or nitrate, making up to the proper volume and mixing. The solution can then be drawn off for use as wanted, after the precipitate has settled. The siphon tube must not reach so near the bottom of the bottle as to stir up the precipitate. Graduated flasks as large as two liters are carried in stock by dealers in such ware. When it is desirable to make up larger quantities of acid, ungraduated flasks can be purchased, holding as much as 10 or 12 liters. Their exact volume to any point on the neck can be found either by weighing water into them if a sufficiently large delicate balance is at hand or even by measuring water into them; the proper amounts of copper sulphate and barium chloride or nitrate can then be calculated and used to make this volume. In calibrating the flask by measuring water into it, it must be borne in mind that the ordinary flask is graduated to hold, not to deliver, the given volume. To find the volume a given flask will deliver, weigh into it say 100 grams of water from a weighing-bottle, revolve the flask so as to wet the sides, then pour the water back and drain the flask into the weighing-bottle for one minute. The loss in weight, on again weighing the water, may be taken as the correction to be subtracted from the volume which the flask is graduated to contain for the volume it will deliver. This method will be sufficiently accurate for the present purpose.

I have prepared only tenth-normal and fifth-normal acids by this method. Probably normal acid could also be prepared though the waste, due to the solution retained in the precipitate, would, of course, be greater owing to the larger volume of the latter.

In the first attempts to prepare tenth-normal acid by this method the barium chloride was added to the solution after the cylinder and rod had been removed and before making up to the liter. The solution was then filtered into the graduated flask after the precipitate had settled, and the latter brought upon the

paper and washed with hot water until the mark on the neck of the flask was reached. The solution was then cooled and made up to the liter. The solution, on testing, however, proved to be a little below the desired strength, due no doubt to the "holding back" of some of the acid by the precipitate. The method first given was then tried and gave a solution of the exact strength desired with much less labor and in much less time.

Both the nitric and hydrochloric acid solutions were tested as follows:

Fifty cc. of the acid were made alkaline with ammonia, heated to boiling, and ammonium oxalate added. No precipitate formed in any case.

Fifty cc. were heated to boiling and barium chloride added. Only a very slight cloud formed. The precipitate was allowed to stand over night in a warm place, filtered, washed, ignited, and weighed. The results on the five solutions were as follows:

No.	Solution.	BaSO ₄ in 50 cc. Gram.	H ₂ SO ₄ in 50 cc. Gram.	H ₂ SO ₄ in 1 liter. Gram.
1	0.1 N HCl	0.0004	0.00017	0.0034
2	0.1 N HCl	0.0008	0.00034	0.0068
3	0.2 N HCl	0.0030	0.00126	0.0252
4	0.1 N HNO ₃	0.0025	0.00105	0.0210
5	0.2 N HNO ₃	0.0038	0.00160	0.0320

Where the standard hydrochloric acid is intended for use in determining the alkaline earths, it would, of course, be necessary to add a little in excess of 12.215 grams of barium chloride, the theoretical quantity necessary to convert the sulphuric acid to tenth-normal hydrochloric acid. Indeed it would, perhaps, be better in all cases to add a slight excess of the salt since a trace of it in the solution can certainly, in most cases, do no harm.

When checked against nearly tenth-normal sodium hydroxide solution (which had been prepared from metallic sodium, carefully standardized, and kept free from carbon dioxide), using phenolphthalein as an indicator, the results showed each solution prepared to be of exact strength, as the following will show:

No.	Solution.	Standard acid taken for the test. cc.	Standard sodium hydroxide re- quired. cc.	Equivalent vol- ume of 0.10 N NaOH. ¹ cc.
1	0.1 N HCl	10.0	10.2	10.01
		10.0	10.2	10.01
		10.0	10.2	10.01
		20.0	20.4	20.02

¹ Factor for converting standard sodium hydroxide to 0.1 N NaOH = 0.9813.

No.	Solution.	Standard acid taken for the test. cc.	Standard sodium hydroxide re- quired. cc.	Equivalent vol- ume of 0.10 N NaOH. cc.
2	0.1 N HCl.....	10.0	10.2	10.01
		10.0	10.2	10.01
		20.0	20.4	20.02
3	0.2 N HCl.....	10.0	20.4	20.02
		10.0	20.35	19.97
		20.0	40.75	40.00
4	0.1 N HNO ₃	10.0	10.2	10.01
		10.0	10.2	10.01
		20.0	20.4	20.02
5	0.2 N HNO ₃	10.0	20.4	20.02
		10.0	20.4	20.02
		20.0	40.7	39.94
		20.0	40.75	40.00

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THE COMPOSITION OF JELLIES AND JAMS.

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AS preliminary to the examination of a large number of samples of commercial fruit preserves, it was thought desirable to have, as a basis of comparison, the analyses of fruits and fruit products of known origin, as the work with this class of foods has been largely confined to the detection of adulterations rather than to the proximate analysis. Accordingly, such whole fruits as were to be obtained were purchased, and from these the juices, jellies, and jams were prepared. The juices were prepared by cooking the cleaned fruit, with enough water to prevent scorching, till it became soft, and straining through a jelly-bag. In the preparation of the jellies, equal parts of the strained juice and cane-sugar were used and were heated to the point of boiling, which required about twenty minutes.

With the jams approximately one part of sugar was used to two parts of the crushed fruit, heated to boiling, and this temperature maintained for about twenty minutes. In all cases the original fruit and sugar, as well as the final products, were weighed which gave a basis for estimating the amount of added cane-sugar in the finished product.

It is to be regretted that the fruits selected were not in all cases of typical composition. This is especially true of the apples and grapes. This, however, will not lessen their value for studying the sugar content. In comparing the composition of jellies