many of the lessons which are so needed by one who has to make a careful analyst.

A short sojourn in the iron and steel business brought the attention to the time of action very prominently before me. To finish an analysis while they held the melt in the cupels gave an importance to it that years in a commercial laboratory or college would never have brought out. Here skill and the attention to details were necessary, that without both, a failure would be inevitable.

SODIUM CARBONATE AS AN ALKALIMETRIC STANDARD

By H. C. Moore, Armour Fertilizer Works,
Chicago, Ill.

Fertilizer and cotton-seed products chemists have for a long time desired a reliable standard for checking their standard acid and alkali solutions. While there are now available some good standards of high purity and known value, as, for example, pure select calcium carbonate (Iceland spar) and the benzoic acid put out by the Bureau of Standards, yet neither of these is very widely or generally used. The former chemical is rather expensive, and the latter seems to be not generally liked.

Most chemists who have used an alkalimetric or acidimetric standard have resorted to the use of either so-called C. P. reagents, or have prepared their own standards. Among the latter are acid potassium phthalate, an excellent standard, and other acid standards, such as oxalic and acid salts; also alkali standards, mainly sodium carbonate prepared by various methods.

But there has long existed a desire for an inexpensive standard of higher purity, simple and easy of use, requiring no further preparation or treatment before use, and, most important of all, that it be the same standard as used by other chemists engaged in the same line of work, in order to furnish a uniform basis for comparing standard solutions.

Sodium carbonate seems to more nearly fit the need and convenience of fertilizer and cotton-seed products chemists in supplying a standard for testing their principal standard solutions used in their ammonia work. The various lots of so-called C. P. sodium carbonate are not of sufficiently high or uniform purity to serve as satisfactory standards. An effort was made by the Ammonia Committee for 1920-1921 to induce the Bureau of Standards to undertake the preparation of standard sodium carbonate, but this attempt was not successful, as the Bureau did not see their way clear to undertake this work at the present time. Various other plans were considered, and finally one of the leading chemical manufacturers agreed to prepare for the American Oil Chemists' Society a large quantity of sodium carbonate of high purity and uniform quality, following in manufacture the method described by Scott—"Standard Methods of Chemical Analyses," page 501—which briefly states that a good grade of sodium bicarbonate is washed with cold water until free from chlorides, sulphates, etc., when the resulting purified bicarbonate is dried and finally calcined at from 290° C. to 300° C. in an electric oven. Bicarbonate is thus converted into the normal carbonate and all moisture removed. Sodium carbonate of the very highest degree of purity is prepared by this method.

Arrangements have been made for the preparation of a large quantity of this chemical, which is to be packed in one-quarter-pound bottles. It is recommended that in using this, small quantities at a time be transferred to a small, tightly stoppered bottle from which weigh-

ings are made, in order to avoid absorption of moisture. Should it be suspected that for any reason the sodium carbonate has taken up moisture from the air, it should be heated, in a platinum dish preferably, about 300° C. for one-half hour to one hour. This may be done conveniently by imbedding the platinum dish in a sand bath, having the whole surrounded by a metal shield and thermometer bulb imbedded in the sodium carbonate. In lieu of this method, sodium carbonate may be put into a platinum crucible and the latter heated for a few minutes over a burner to only a dark red.

The committee does not recommend the use of sodium carbonate exclusively as a standard—not that pure sodium carbonate like this is not deserving of this distinction, but rather, at first at least, as a supplementary to the gravimetric methods as barium sulphate or silver chloride. Most chemists prefer to determine the value of their main standard acid solution by at least two different methods, results of which should agree very closely.

Sodium carbonate may be used in various ways in titrating against the standard acid. Some prefer direct titration, using methyl orange as indicator, but many do not. The following procedure, adapted from the method in Scott, page 503, is recommended as very convenient:

Transfer 0.7897 gr. or 1.3197 gr. sodium carbonate (equal respectively to 29.80 c. c. and 49.80 c. c. half normal solution), preferably into a 500 c. c. Pyrex Erlenmeyer flask, and add from 50 to 100 c. c. of distilled water. The acid solution, approximately half normal, 30.00 c. c. or 50.00 c. c., is carefully run in and the solution heated gently to boiling, continuing boiling for 15 minutes to expel CO₂. A small filtering funnel inserted in the neck of the flask prevents loss during the boiling of acid and carbonate mixture. Add from one-half to one c. c. phenolphthalein and add caustic soda solution N/4 or N/10 until a faint permanent pink is obtained. If N/4 caustic soda is used, the number of c. c. required, divided by two and added to 29.80 or 49.80, gives the equivalent in terms of N/2 solution of the quantity of acid solution taken.

NOTE: Phenolphthalein solution contains one gr. of the compound per liter of grain or denatured alcohol. In case denatured alcohol is used, formula No. 30 is preferable.

AMMONIUM SULFATE AS AN AMMONIA STANDARD

By H. C. Moore, Armour Fertilizer Works,
Chicago, Ill.

Chemists engaged in making determinations of ammonia have been seeking for a long time a universal and reliable standard for use in proving the accuracy of their work.

Various standards have been suggested for this purpose, but no one of them has been uniformly or generally used. Organic materials, either animal or vegetable, are impractical for various and obvious reasons. Only inorganic chemicals are well to consider for this purpose. It is quite obvious that a suitable standard should have at least the following qualifications: "That it be easily obtained, of high purity, stable, and be dried without chemical change."

There are other desirable qualifications, of course, such that the ammonia content be possibly not over 10 per cent. There seems to be no chemical that corresponds to this latter requirement which can be had pure and of stable composition, and probably no salt will more nearly meet all of the requirements than will