

## Decomposition of Sulphates by Ammonium Chloride in Analysis according to Fresenius.

By

Masumi Chikashigé, *Rigakushi*,

College of Science, Impérial University.

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The accuracy in all respects of Fresenius' standard treatises on analysis is usually so unimpeachable, that it seems proper to call attention to a misleading statement contained in a footnote to § 153 A of the seventh and latest English edition of the *Quantitative Analysis*, and also to be found in the earlier editions of this work (4th, 5th, 6th). Having given in the text the method of separating from magnesium and alkali salts the small quantity of barium left in solution by ammonium carbonate, namely, by adding three or four drops of dilute sulphuric acid, Fresenius states in the footnote to it that the gentle ignition there directed to be made in order to expel ammonium salts, will also effect the removal of any small quantity of sulphuric acid which may remain after precipitating the barium. It is this statement which needs correction.

Even in § 68, *a*, and § 74, *a*, of the same work we find enough to cause us to doubt the accuracy of the later statement, for it is there mentioned that magnesium sulphate is not decomposed by igniting it with ammonium chloride, and, on the authority of Rose, that potassium and sodium sulphates, which are decomposable by this treatment, need for it to be effective its repeated application at a red heat inducing effervescence. Obviously, such ignition as this is not that gentle

ignition directed to be used in § 153, and would entail serious loss of alkali chlorides by spiriting and volatilisation. But to place the inaccuracy of the statement in the footnote beyond doubt, I have made a few simple trials of the method.

Magnesia, 0.5 gram, was dissolved in a little hydrochloric acid ; to the solution were added two drops of dilute sulphuric acid (1 to 10 water by volume), a solution of about two grams of ammonium chloride, and ammonia in small excess ; and the whole was then evaporated to dryness and all ammonium salts expelled at a barely red heat. Again, a solution of two grams of ammonium chloride was added, and the evaporation and ignition repeated. The residue was dissolved in dilute hydrochloric acid and mixed with barium chloride, which gave a precipitate. On comparing this with that thrown down by barium chloride from two drops of the same dilute sulphuric acid in about the same volume of water, the ignited salts were found to have lost but very little, if any, of their sulphuric acid. The experiment was repeated three times with fresh magnesium chloride, and the same results obtained.

Similar experiments were made with sodium chloride, and no better removal of the sulphuric acid effected than when magnesium chloride was taken.

It is thus quite evident that other steps must be taken to remove sulphuric acid before it is allowable to calculate the weighed alkali salts as chlorides or to resort to ways of separating magnesia from the alkalis which require the absence of sulphates.

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