XX.—*Notes upon the General Routine of Qualitative Analysis for Metals.*

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Reduction of Binoxide of Tin (Stannic Oxide) by Fusion with Cyanide of Potassium.—When stannic oxide is fused with cyanide of potassium of commerce, the whole of the tin is frequently not obtained in the globule of metal, a portion of it being converted into a sulphide by the sulphate of potash present in the cyanide. If the proportion of sulphate of potash be small, the rest of the tin is converted into stannous sulphide (SnS), which separates as a black powder on treating the fused mass with water; but if there be much sulphate of potash present, a portion of the tin assumes the form of stannic sulphide (SnS_2), which is found in the aqueous solution of the fused mass, from which it may be precipitated by hydrochloric acid.

10 grs. SnO_2 were fused with 50 grs. commercial cyanide of potassium (containing a little sulphate). The liquid mass had a clear yellow colour. The globule of tin weighed 7.1 grs. (calculated 7.8 grs.). On treating the slag with hot water, a considerable quantity of black SnS separated. The solution gave a very slight yellow precipitate with hydrochloric acid.

10 grs. SnO_2 were fused with 50 grs. of the same cyanide and 5 grs. sulphate of potash. The liquid mass had a brown yellow colour. The globule of tin weighed 6.6 grs. only. The slag, when treated with hot water, gave no black deposit, but the solution furnished an abundant yellow precipitate of SnS_2 when mixed with hydrochloric acid.

Since, in the final confirmation of the presence of tin, it is usual to fuse the supposed binoxide with cyanide of potassium, it is important, when using the commercial salt, to examine not only for metallic tin, but for any black sulphide separating during the solution of the fused mass in water, and for any yellow sulphide which may exist in the aqueous solution.

In the absence of cyanide of potassium, the ferrocyanide answers the purpose for reducing the stannic oxide, an alloy of iron with tin being obtained, which dissolves in hydrochloric acid, and responds to the test with mercuric chloride.

Detection of Zinc in Qualitative Analysis.—The absence of well-marked characters in the zinc-precipitates, and the dingy appearance of the sulphide when obtained in the ordinary course of analysis, combine to render the detection of minute quantities of this metal uncomfortable and unsatisfactory. To resolve any doubt, the analyst generally resorts to the blow-pipe test with nitrate of cobalt, but when this is applied in the ordinary manner, upon charcoal, to the sulphide of zinc, which is usually the last form assumed by the metal at the close of the analysis, it often fails to give satisfactory results. I have found the following mode of operating far more decisive:—The supposed sulphide of zinc is dissolved off the filter in hot nitric acid (dilute), the solution mixed with a very small quantity of nitrate of cobalt (not even enough to impart a pink colour), then with carbonate of soda in slight excess. The solution is boiled for a minute or two, the precipitate collected on a filter, washed, and the filter incinerated on platinum foil. The green colour is very bright if an excess of cobalt be avoided, and is best seen after the gritty residue has been powdered under a glass rod.

$\frac{1}{10000}$ th of zinc can be at once precipitated by yellow hydrosulphate of ammonia from an ammoniacal solution. This proportion is not immediately indicated by ferrocyanide of potassium, though the solution becomes quite opaque on standing.

With $\frac{1}{5000}$ th of zinc, the precipitate by ferrocyanide of potassium was formed immediately.

Detection of Magnesium.—Every analyst has remarked the frequent occurrence of a slight flocculent precipitate by phosphate of soda, where the characteristic crystalline precipitate of the ammonio-magnesian phosphate is expected. I have proved that this precipitate consists of phosphate of alumina, which is not mentioned, I think, in treatises upon qualitative analysis, as being likely to occur in this place.

Mineral Constituents of Filter-paper.—Having met with some unexpected results in the course of qualitative analyses to test methods of effecting the separation of metals, I made a careful analysis of a considerable quantity of the ash of ordinary white filter-paper, bearing the name of "J. McA. and Co." (mill num-

ber, 37). The ash consisted chiefly of silica and alumina, but contained considerable quantities of the carbonates of lime and magnesia, and of ferric oxide. There were also present small quantities of the sulphates of lime, potash, and soda, and mere traces of phosphoric acid, oxide of cobalt, and oxide of lead. Inasmuch as a single sheet of paper contained appreciable quantities of these constituents, and such a quantity is often employed in the course of an analysis, where it is exposed to the solvent action of acids, it appears to be necessary, in exact analysis, that the composition of the filter-paper should be recorded, with respect to the quality, as is now generally done with respect to the quantity of the mineral constituents.