ON THE ANALYSIS OF PLATING AND GILDING SOLUTIONS.

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IN Sheffield and Birmingham, where the electro-deposition of precious metals is carried on extensively, the consulting chemist is frequently called on to assay samples of the liquors used for electro-depositing gold or silver. The liquors consist essentially of double cyanides, but it is erroneous to assume that any particular sample will only contain a single heavy metal. Thus, the ordinary electro-plating liquid—consisting chiefly of the double cyanide of potassium and silver ($\text{KCy} + \text{Ag Cy}$), on being acidified, gives a precipitate nearly always more or less coloured pink by cupric ferrocyanide, the formation of which indicates the presence of both iron and copper in the solution. For this reason also it is impossible to determine the silver as cyanide by adding an acid, and subsequently weighing the precipitate formed, or converting it into metal. In short, the presence of cyanides renders most of the ordinary methods of analysis inapplicable to the assay of silver in plating solutions.

The method I have been in the habit of employing for the determination of silver in cyanide solutions is as follows:—A definite measure of the sample liquid is largely diluted with water, and the whole raised to boiling. Sulphuretted hydrogen is then passed through the liquid, or sulphide of ammonium gradually added. The silver falls as a black sulphide, which filters and washes well, and, according to the books, is free from copper. This, however, is not always the case, while any zinc which may have been present is sure to be thrown down. On this account I never weigh the precipitate, but always treat it further. For a long time I was in the habit of treating it with nitric acid, filtering from undissolved sulphur, and precipitating the silver from the solution as chloride. A more recent and shorter plan, and one which is quite as satisfactory, is as

follows:—The washed sulphide of silver is rinsed off the filter into a flask or beaker, and treated with excess of bromine water, which converts it rapidly and completely into silver bromide.* If any sulphur appear to have separated, a drop of bromine should be added to the residue, so as to ensure complete oxidation. Boiling water is now added, and the silver bromide is washed, dried, fused, and weighed. The high atomic weight of bromine gives this form of weighing silver some little advantage over the chloride.

I have been unable to devise a satisfactory and rapid method of determining, in the wet way, the gold of gilding solutions containing cyanides. The following method, however, leaves nothing to be desired:—A measured quantity of the gilding solution is introduced into a porcelain crucible, and cautiously concentrated; when in a syrupy condition, a few grammes of pure red lead or litharge are added, and the evaporation is continued to complete dryness. There is little or no tendency to spitting. The crucible containing the above residue is covered, and raised for a short time to a moderate red heat. The oxide of lead is reduced by the cyanide present, with production of metallic lead and cyanate, and the reduced metal unites with the gold. The resultant button of metal is separated from the slag, and the gold obtained either by cupellation or treatment with pure nitric acid.

Electro-silvering solutions can be analysed in a precisely similar manner, but of course, in this case, treatment of the rich lead with nitric acid is inadmissible, and cupellation must be resorted to.

The amount of precious metal found in an electro-depositing solution is commonly reported in troy ounces, pennyweights, and grains per pint of solution. Some clients expect to have the excess of solution returned, or else want to deduct its value from the amount of the fee!