then an equal volume of amyl alcohol. The colors of the upper layers were then compared, and were found to be of equal intensity for each dilution. The thiocyanate test was found to be much more sensitive than Treadwell claimed.

Attention is called to the fact that the double ammonium cobalt thioacetate has 2 molecules of ammonium thioacetate to 1 of cobalt thioacetate; this is analogous to the double ammonium cobalt thiocyanate.

QUANTITATIVE LABORATORY,
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# A NOTE ON THE VOLUMETRIC DETERMINATION OF COPPER.

BY S. W. PARR.

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THE volumetric method for copper recently described,[1] wherein the cuprous thiocyanate is titrated directly with permanganate, first in the alkaline and then in the acid condition, is found at times to give an unsatisfactory end reaction. This seems to be due to an incomplete oxidation of the cuprous hydroxide by the permanganate, the latter acting somewhat slowly under the conditions described. Upon acidifying, therefore, any copper remaining in the cuprous condition reverts to the cuprous thiocyanate and in this form is slowly acted upon by the permanganate; hence the occasional indefiniteness at the end.

This difficulty is very easily overcome by the following slight modification: The washed precipitate of cuprous thiocyanate and the asbestos pulp having been returned to the beaker, there is added 10 cc. of a 10 per cent. solution of potassium hydroxide, followed by 10 cc. of ammonia (sp. gr. 0.96) then, without delay, the titration is begun with the standard permanganate solution, continuing until, upon warming, the green color of the supernatant liquid remains. The heating should not be prolonged, 45° to 55° being quite sufficient. Add now a sight excess of permanganate equal to one-third or one-fourth of the quantity needed to produce the permanent green coloration. Allow the mixture to stand for five

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[1] This Journal, 22, 685.

minutes, acidify with about 25 cc. of a mixture of concentrated sulphuric acid and water (1 of acid to 1 or 2 of water, cooled to a moderate temperature), and complete the titration to the usual pink coloration. Some heat is developed upon adding the acid to the alkaline solution, but this is without harmful effect. The end reaction is sharp and the results are concordant. The copper in a solution of copper foil was determined electrolytically and also by the above modification with results as follows:

| | Electrolytically. | Burette readings. |
|---|---|---|
| (*a*) | 0.0442 | 29.3 |
| (*b*) | 0.0443 | 29.3 |
| (*c*) | 0.0442 | 29.3 |
| (*d*) | 0.0443 | 29.25 |
| (*e*) | ... | 29.2 |
| (*f*) | ... | 29.3 |
| (*g*) | ... | 29.3 |

The iron value of the permanganate multiplied by 0.1602, and the resulting copper factor multiplied by the burette reading 29.3, gives 0.04430 gram of copper as against 0.04425 of electrolytic copper.

To show the concordant nature of the results obtained by this procedure, the readings from the titrations on four ores of widely different character are given as follows:

| A. | B. | C. | D. |
|---|---|---|---|
| 23.7 | 10.8 | 16.2 | 12.3 |
| 23.7 | 10.8 | 16.2 | 12.2 |

In case of bearing metals, etc., containing both lead and tin, one or the other must be removed because of the formation presumably of lead stannite, which reduces permanganate.

UNIVERSITY OF ILLINOIS.

## THE AMERICAN ELECTROCHEMICAL SOCIETY.

BY JOSEPH W. RICHARDS.

PURSUANT to a call for a meeting signed by C. J. Reed, Carl Hering, E. F. Roeber, W. H. Wahl, of Philadelphia, and J. W. Richards, of Lehigh University, a preliminary meeting to found the above-named society was held at the Engineers' Club, Philadelphia, on November 1, 1901. As the result of that meeting, the