SHORT COMMUNICATIONS

New Photometric Method for Determining Thallium with Rhodamine B

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A satisfactory color or fluorescence reagent for thallium is lacking. The photometric methods available at the present time are either indirect or insensitive. A procedure for detecting traces of thallium with rhodamine B has recently been described by Feigl and his coworkers[1]. It does not appear, however, that a quantitative method based on this reaction has been reported. The difficulty in developing the method was ascribed by MacNulty and Woollard[2] to the instability of the higher valency compounds of thallium. According to them, no oxidizing agent has been found that will consistently retain thallium in a higher valency state until the complex with rhodamine B is formed and extracted.

The present author has found that the oxidation of univalent thallium to trivalent with bromine is a satisfactory method preparatory to rhodamine B-benzene extraction. The absorbance-concentration curve shown in Fig. 1 was obtained by the following procedure: Take 0, 2, 4, 6 and 8 μg. of thallium (as Tl_2SO_4) into beakers respectively, add 5.0 ml. of 2.0 N hydrochloric acid and 0.5 ml. of saturated bromine water. Heat near the boiling point and keep heating until immediately after the color due to bromine has disappeared. Cool to room temperature, transfer the solution to a 10-ml. volumetric flask and dilute to the mark with 2.0 N hydrochloric acid. Transfer the solution to a separatory funnel, add 1.0 ml. of 0.20% (w/v) aqueous rhodamine B solution and mix. Add 10.0 ml. of pure benzene and shake for one minute. When the two phases have separated, drain off the aqueous phase, transfer and centrifuge the benzene phase until a clear solution has been obtained. Measure the absorbance of the benzene extract at 560 mμ.

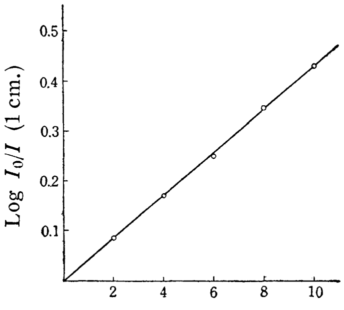

Fig. 1. Absorbance-concentration curve of thallium. Hitachi spectrophotometer, EPB-U, 560 mμ, temperature 18–26°C.

Absorbance is proportional to thallium concentration in the range 0.1 to at least 1 p. p. m. (based on the amount of thallium present originally in the aqueous phase). At 560 mμ the molar extinction coefficient is about 87,000, or 0.0023 μg. Tl/cm² corresponding to log $I_0/I=0.001$. Thus the method appears to offer a good basis for the photometric determination of traces of thallium. Details of the study will be published later.

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[1] F. Feigl, V. Gentil and D. Goldstein, *Anal. Chim. Acta*, **9**, 393 (1953).

[2] B. J. MacNulty and L. D. Wollard, ibid., **13**, 154 (1955).