

LETTERS TO THE EDITOR

APPLICATION OF Cu (II)-THIOMALLIC ACID COMPLEX AS AN INDICATOR IN THE COMPLEXOMETRIC DETERMINATION OF Al (III), Ga (III) AND In (III)

SEN SARMA¹ has reported the use of thiomallic acid and Fe (II)-thiomallic acid as an indicator in the estimation of Fe (II), Cu (II), Mn (II) and Ca (II), Mg (II) and Pb (II) respectively. Since then, little effort has been put, to utilize the comparatively cheaper indicator to estimate other metal ions. Here is an attempt towards the estimation of Al (III), Ga (III) and In (III) using Cu-thiomallic acid complex as an indicator.

Cu (II) forms a violet complex with thiomallic acid (TMA) in the pH range 4.8 and 5.0. The complex is stable up to 40°C, above which it decomposes. The aliquots of the solution containing 7 to 20 mg of In (III), when titrated against a standard EDTA solution in the presence of Cu (II)-TMA complex, gives a sharp colour change from violet to greenish blue at the end point. In the case of Al (III) and Ga (III) the method of back titration was employed when the colour change was from blue to violet at the end point. The results, when compared with those obtained by the standard methods described in the literature², are found to be nearly the same (Table I).

TABLE I

Metal ion	Amount of metal ions in mg.	
	Taken	Found (mean of 4 values)
Al (III)	(1) 4.58	4.583
	(2) 11.14	11.145
	(3) 20.27	20.265
Ga (III)	(1) 8.40	8.45
	(2) 17.81	17.75
	(3) 28.24	28.10
In (III)	(1) 6.84	6.85
	(2) 12.44	12.46
	(3) 21.10	21.04

The ions like Pb (II), Cd (II), Zn (II), Fe (II), Co (II), Th (IV), CNS⁻, I⁻, CrO₄²⁻ interfere seriously and should be absent. The special feature of the proposed method is the use of a relatively cheaper reagent (TMA) and the sharp end point which helps in the accurate determination of the cations under study.

Experimental

Solutions of Al (III), Ga (III) and In (III) were standardized by the usual methods².

Reagent.—One per cent solution of thiomallic acid was prepared in double distilled water.

Estimation of In (III)

An aliquot of the solution containing 7 to 20 mg of In (III) is mixed with 1 ml of the standardized Cu (II) solution and 1 ml of TMA. The pH of the mixture is adjusted between 4.8 and 5 using sodium acetate acetic acid buffer. The mixture is titrated with a standard solution of EDTA until the colour changes from violet to greenish blue. The amount of EDTA required for 1 ml of Cu (II) solution being known, the amount of In (III) in the aliquot can be calculated.

Estimation of Al (III) and Ga (III)

An aliquot of the solution containing 5 to 30 mg of Al (III) or Ga (III) is added to a known excess of EDTA and 10 ml of buffer solution (pH 4.8 to 5). The mixture is heated to near boiling and cooled. The pH of the mixture is then adjusted between 4.8 and 5 as above. The TMA solution (1 ml) is added and the mixture is titrated against the standard solution of Cu (II) until the colour changes from blue to violet. The amount of EDTA initially added being known, that consumed by Al (III) and Ga (III) can be calculated.

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1. Sen Sarma, R. N., *Sci. and Cult.*, 1958, 23 (8), 434.
2. Vogel, A. I., *Quantitative Inorganic Analysis*, III Edn., Longmans Green and Co. Ltd.