Potentiometric Determination of Tantalum

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Tantalum has been estimated by Gravimetric, Spectrophotometric, Colorimetric, X-ray Fluorescence and Radioactivation methods[1-6]. Estimation of tantalum in aqueous media by usual methods takes time. Potentiometric titrations of tantalum pantachloride have been carried out using alcohols, ketones and methyl cyanide in non-aqueous media[7]. During the course of the present studies it was found that bis-(8-hydroxyquinolyl) methane reacts with Ta(V) to give a 1(M):4(L) complex soluble in dimethylformide. This reaction has been used to develop a potentiometric method for the estimation of micro-quantities of Ta(V) in DMF media.

EXPERIMENTAL

Pure tantalum pentachloride (Fluka) and distilled DMF were used. Other chemicals used were of A.R. Grade.

A stock solution of tantalum chloride of about $1x10^{-2}$ M strength was prepared by weighing the sample (taking care to avoid water during all operations) and dissolving in DMF. The exact strength of this was determined gravimetrically weighing tantalum as its pentoxide.

Bis-(8-hydroxyquinolyl)-methane (BHQM) was prepared by the reported method[8] and recrystalised from DMF. Requisite quantity of the pure BHQM was dissolved in DMF.

Micro burette reading to 0.01 ml and a digital pH meter in 'mV mode', were used for the titration. Titrations were performed using either of the reagents as titrants. It was found that using $TaCl_5$ as titrand (in the flask) the potential reached a definite value after a long time. So in all tirations 25 ml of BHQM reagent was used

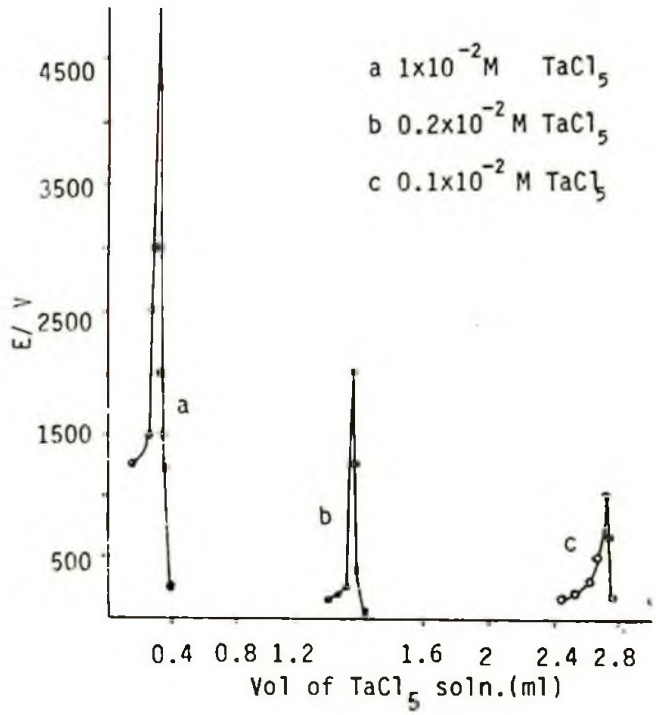


Fig. 1 Potentiometric titration of $0.5x10^{-3}$ M BHQM Soln.

TABLE 1

$TaCl_5$ Soln. vs 25 ml $0.5x10^{-3}$ M BHQM soln.

S. No	Strength of $TaCl_5$ soln	Tantalum present	Tantalum found	% error
1	1×10^{-2}	0.5647	0.5611	0.63
2	0.2×10^{-2}	0.5654	0.5647	0.12
3	0.1×10^{-2}	0.5656	0.5647	0.15

TABLE 2

1 X 10 M $TaCl_5$ Soln. vs 25ml BHQM Soln.

S.No.	Strength of BHQM Soln.	Tantalum Present	Tantalum found	% Error
1.	0.1×10^{-2}	1.1312	1.1222	0.79
2.	0.083×10^{-2}	0.9426	0.9412	0.14
3.	0.066×10^{-2}	0.7529	0.7602	0.95

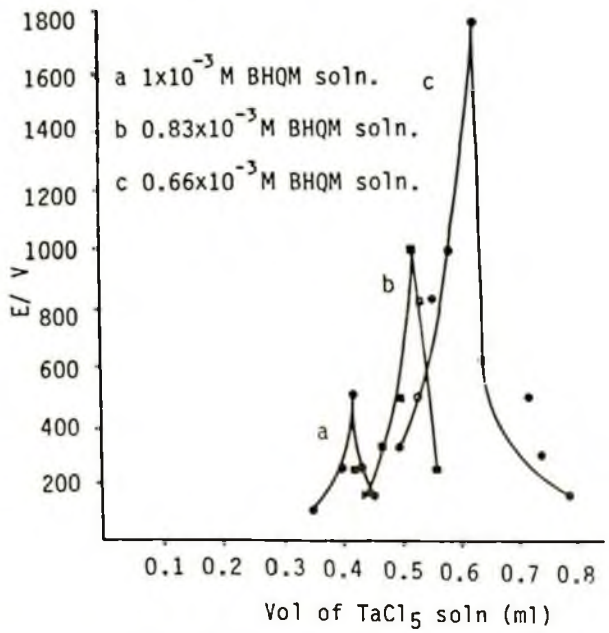


Fig. 2 Potentiometric titrations of 1x10^{-2}M $TaCl_5$ Soln.

as titrand. Solutions of 1x10^{-2} M, 0.2x10^{-2} M and 0.5x10^{-3} , of $TaCl_5$ were used as titrand for a solution of 0.5x10^{-3}M or 0.1x10^{-2} M to 0.06x10^{-2} M BHQW was titrated with 1x10^{-2}M $TaCl_5$ in both cases familar s shaped titration curve results. The end point was obtained from the peak of the curve $\Delta E/\Delta V$. This titration curve is shown in fig (1) and fig (2). The results in Table 1 and 2 show that the recovery is good.

The method described above is rapid and accurate for the estimation of tantalum in its compunds soluble in DMF.

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