
LETTERS TO THE EDITOR

URANYL ION-ITACONIC ACID
COMPLEX

DETAILED studies on Uranyl ion-Itaconic acid complex have not been reported so far except those by Tsai-Teh Lai and Bi-cheng Wang¹ who have concluded formation of 1:1 and 1:2 complexes as well as their polymers in a polarographic study in the pH range 2 to 4. We have followed the titration of uranyl perchlorate-itaconic acid-perchloric acid-sodium perchlorate system at an ionic strength of 0.1 and at 28° C. against standard sodium hydroxide solution with a view to determine the number and stability constants and polymerizing

tendencies of the complexes of UO_2^{++} -itaconic acid, from pH titration data. The chemicals employed were all of AnalaR grade and Leeds and Northrup pH meter (Cat. 7666) with glass and calomel electrodes was employed for pH measurements. Data of pH > 3.5 in which hydroxy complexes intervene were not considered. The amount of ligand (itaconic acid) bound to the uranyl ion was calculated from pH data and values for Bjerrum's formation function, \bar{n} , were plotted against log of reciprocal free ligand concentration ($-\log A$). The required first and second dissociation constants of itaconic acid were determined by the standard slope and intercept method.² The stability constant of the 1:1 complex was also calculated from the relation:

$$K_1 = (T_m - [A]x) / [A]^2 x$$

in which T_m = total metal ion concentration and 'x' is a function of first and second dissociation constants of itaconic acid and $[\text{H}^+]$. The titration was carried out when the total metal ion or ligand concentrations in 1:1 molar ratio was 2×10^{-2} M; 3.2×10^{-3} M and 1.6×10^{-3} M.

We conclude from our results that (i) Uranyl ion-itaconic acid complex (1:1) is formed and

$K_1 = 4.849$ from \bar{n} vs. $-\log A$ plot and $K_1 = 4.9 \pm 0.05$ from calculation; (ii) In the pH range, 2.2-3.5 and for concentrations of metal ions, 3.2×10^{-3} M and 1.6×10^{-3} M, \bar{n} values do not go beyond 0.4 and 0.3 respectively and K_1 calculated at these concentrations are 4.58 and 4.73 respectively; (iii) The trend of K_1 values with changes in concentrations of metal ion ligand does not warrant any conclusion with regard to polymerization of the complexes; (iv) The slope ratio method yields $\text{p}K_1 = 3.61$ and $\text{p}K_2 = 5.075$ (cf. $\text{p}K_1 = 3.68$ and $\text{p}K_2 = 5.14$)³ for itaconic acid.

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