Composition of the Uranium

Chromotropic Acid Salt Chelate by Absorptiometric Measurements

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With 2 Figures

Abstract

Determination of the composition between uranium and Chromotropic Acid salt chelate (λ_{max} 435 mμ) has been described. The composition as determined by the absorptiometric measurements using the mole ratio method and the slope ratio method has come out to be 1:1.

BANERJI and DEY[1]) reported that uranium(VI) forms a yellowish red chelate (λ_{max} 435 mμ) with Chromotropic Acid Salt. They established the composition of the chelate by the method of continuous variations only using absorbance data. In this communication the composition of the chelate has further been confirmed by the mole ratio method of YOE and JONES[2]) and the slope ratio method of HARVEY and MANNING[3]) using spectrophotometric measurements.

Experimental

Materials

Stock solutions of disodium 1:8 dihydroxy 3:6 sulphonate (Chromotropic Acid Salt) B. D. H. and uranyl sulphate (B. D. H. Analar) were prepared in double distilled water. Solutions of different concentrations were prepared by suitable dilution.

Instruments

The absorbance of the solutions was measured with a Unicam SP 500 spectrophotometer operated by a DORAN's mains unit connected to 220 V/50 cycles a. c. mains, further stabilised by a constant voltage transformer. 1 cm thick matched glass cells were used in all cases.

[1]) S. K. BANERJI and A. K. DEY, Nature **197**, 1002 (1963).

[2]) J. H. YOE and A. L. JONES, Ind. Engng. Chem. Analyt. Ed. **16**, 111 (1944).

[3]) A. E. HARVEY and D. L. MANNING, J. Amer. chem. Soc. **72**, 4488 (1950); **74**, 4744 (1952).

Hydrogen ion concentrations were adjusted with a LEEDS and NORTHRUP direct reading pH indicator using glass calomel electrodes of the same manufacturer.

All experiments were carried out in an air conditioned room maintained at 25 ± 1 °C.

Results and Discussion

Nature of the complexes formed

The method of VOSBURGH and COOPER[4]) was employed by DEY and BANERJI to determine the nature of the complexes formed, and they found that only one complex having λ_{max} at 435 mμ was formed under the conditions of study.

Stoichiometry of the components

The stoichiometry of the components was determined absorptiometrically using the mole ratio method and the slope ratio method.

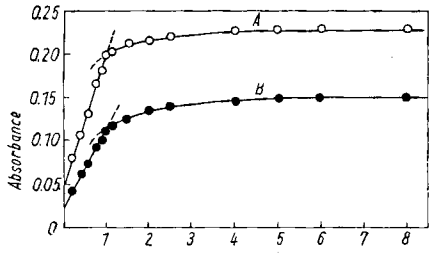

Fig. 1. Determination of the composition by absorption spectra study using mole ratio method at pH 3.5, and 435 mμ. Final concentration of Chromotropic Acid Salt Curve A $8.0 \cdot 10^{-4}$ M, Curve B $4.0 \cdot 10^{-4}$ M

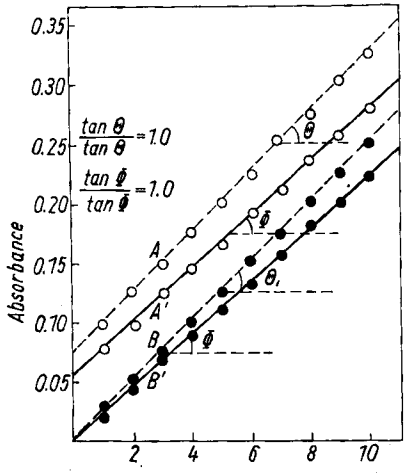

Fig. 2. Determination of the composition by absorption spectra study using slope ratio method at pH 3.5. AA' Chromotropic Acid Salt in Excess, BB' Uranyl Sulphate in Excess, Broken line 435 mμ, Solid line 445 mμ. 10 ml ($2.0 \cdot 10^{-3}$ M) excess component + x ml ($6.67 \cdot 10^{-4}$ M) variable component + (15—x) ml H_2O

In the mole ratio method a series of solutions were prepared containing a constant amount of Chromotropic Acid Salt and increasing ratio of metal to the reagent. Absorbance of the solutions were measured against distilled

[4]) W. C. VOSBURGH and G. R. COOPER, J. Amer. chem. Soc. **63**, 437 (1941); **64**, 1630 (1942).

water blanks at different wavelenghts and were plotted against concentration ratios of the metal to ligand. In the slope ratio method two series of solutions were prepared. In the first series varying amount of uranyl sulphate were added to a constant excess of Chromotropic Acid Salt. The other series contained a constant excess of uranyl sulphate and varying concentrations if Chromotropic Acid Salt. Absorbance reading of the solutions were noted against a distilled water blank at different wavelength.

The results of the mole ratio method (Fig. 1) and the slope ratio method (Fig. 2) show that the ratio of uranium to Chromotropic Acid Salt is 1:1 as obtained by DEY and BANERJI[1]).

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