

NOTE

Spectrophotometric Determination of Lead(II) with 3-Hydroxy-3-*m*-Tolyl-1-*o*-Chlorophenyltriazene

USHA MAROO, KAVITA SHARMA, PRADEEP MAROO,

A.K. GOSWAMI and D.N. PUROHIT*

*Department of Chemistry**Mohanlal Sukhadia University, Udaipur-313 001, India*

3-Hydroxy-3-*m*-tolyl-1-*o*-chlorophenyltriazene has been used for the spectrophotometric determination of Pb(II). The reagent forms yellow lead complex composition 1 : 2 (Pb : R) between pH 6.9–7.3. Absorbance measurements were made at 404 nm. Values of molar absorptivity, Sandell's sensitivity, stability constant (log K) and free energy of formation were found to be 14,500 L mol⁻¹ cm⁻¹, 14.3 ng/cm², 9.65 and 13.247 kcal/mol respectively. Beer's law is obeyed in the entire concentration range studied, *i.e.*, 1.0 × 10⁻⁵ M to 6.0 × 10⁻⁵ M. It was possible to determine lead (8.28 mg) in presence of twofold molar excess of twenty cations and anions.

Hydroxytriazenes have been widely used for spectrophotometric and complexometric determination of large number of metal ions¹⁻⁵. Survey of literature reveals that so far no hydroxytriazene has been used for spectrophotometric determination of lead. In the present communication the result of spectrophotometric determination of lead with 3-hydroxy-3-*m*-tolyl-1-*o*-chlorophenyltriazene have been reported. The present communication is the first report regarding utility of hydroxytriazenes for spectrophotometric determination of lead. The reagent was prepared as per the reported method⁶.

A 1.0 × 10⁻² M stock solution of lead(II) was prepared by dissolving required quantity of lead acetate trihydrate (BDH, AR grade) in double distilled water and was standardised complexometrically using xylenol orange⁷ as an indicator. Solutions of lower concentration were prepared by proper dilution of the stock solution. The reagent solution of desired concentration was prepared by dissolving the required quantity of 3-hydroxy-3-*m*-tolyl-1-*o*-chlorophenyltriazene in acetone. Lead(II) formed yellow acetone soluble complex under optimum condition of lead to reagent ratio (1 : 6) and at pH between 6.9–7.3. The yellow complex exhibited λ_{max} at 396 nm. However, working wavelength was chosen at 404 nm such that the difference between absorbance of the complex and the reagent was

*For correspondence: 25, North Sundervas, Vidya-Vihar Colony, Udaipur-313 001, India.

maximum. Absorbance measurements were made on 108 syntonric UV visible spectrophotometer.

The composition of lead(II) complex with 3-hydroxy-3-*m*-tolyl-1-*o*-chlorophenyltriazene was determined using Job's method⁸, mole ratio method⁹ and slope ratio method¹⁰ and was found to be 1 : 2 (Pb : R). Beer's law was studied in the concentration range 1.0×10^{-5} M to 6.0×10^{-5} M and was obeyed in the entire concentration range studied. The molar absorptivity of the complex was found to be $14,500 \text{ L mol}^{-1} \text{ cm}^{-1}$ and Sandell's sensitivity as 14.3 ng/cm^2 . The standard deviation (σ) was obtained as 0.01 ppm by measuring the absorbance of ten solutions containing 8.28 ppm of Pb(II).

The conditional stability constant of the complex was determined by Harvey and Manning's¹¹ method (using mole ratio curve) and Purohit's method¹² (using Job's curves). The values of $\log \beta$ were found to be 9.25 and 9.65 respectively using the above two methods respectively.

Using this reagent under optimum conditions it was possible to determine 8.28 mg of lead in presence of twofold molar excess of twenty cations and anions, namely: Na(I), K(I), NH_4^+ , Mg(II), Ca(II), Cd(II), Sn(II), Hg(II), Ba(II), Th(IV), Cl^- , Br^- , CH_3COO^- , CO_3^{2-} , I^- , $\text{S}_2\text{O}_3^{2-}$, NO_2^- , SO_3^{2-} , F^- , NO_3^- .

However, Co(II), Ni(II), Cu(II) and Zn(II) were found to interfere.

REFERENCES

1. D.N. Purohit, *Talanta*, **14**, 353 (1967).
2. D. Chakrovorty and A.K. Majumdar, *J. Indian Chem. Soc.*, **54**, 258 (1977).
3. R.L. Dutta and R. Sharma, *J. Sci. Ind. Res.*, **40**, 715 (1981).
4. D.N. Purohit, Nizamuddin and Arun K. Golwalkar, *Revs. Anal. Chem. (Israel)*, **8**, 76 (1985).
5. D.N. Purohit, M.P. Tyagi, Rita Bhatnagar and I.R. Bishnoi, *Revs. Anal. Chem. (Israel)*, **11**, 269 (1992).
6. Ochieng Ombaka, "Analytical applications and activities of hydroxytriazene", Ph.D. Thesis, M.L. Sukhadia University, Udaipur (1995).
7. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denny, *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Edn., ELBS, p. 319 (1994).
8. P. Job, *Ann. Chim.*, **9**, 113 (1928).
9. Y.H. Yoe and A.I. Jones, *Ind. Engg. Chem. Anal. Ed.*, **16**, 111 (1944).
10. A.E. Harvey and D.L. Manning, *J. Am. Chem. Soc.*, **72**, 4488 (1950).
11. _____, *J. Am. Chem. Soc.*, **74**, 4744 (1952).
12. D.N. Purohit, A.K. Goswami, R.S. Chauhan and S. Ressleran, *Asian J. Chem.*, **11**, 123 (1999).