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Short Communication

Spectrophotometric studies on nickel complex of 3-hydroxy-3-phenyl-1-0-carboxyphenyl triazene

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Abstract

Nickel forms a 1:1 yellowish green complex with 3-hydroxy-3-phenyl-1-0-carboxyphenyl triazene at pH 6.0 - 7.7. The complex has λ max at 414 nm with molar absorptivity and Sandell's sensitivity indices as 3.14×10^4 l cm^{-1} $mole^{-1}$ and 0.0018 $\mu g/cm^2$ respectively. It has been found to be a sensitive reagent suitable for nickel (II) estimation.

Key words: Nickel complex, spectrophotometric study, 3-hydroxy-3-phenyl-1-0-carboxyphenyl triazene.

1. Introduction

The reagent 3-hydroxy-3-phenyl-1-0-carboxyphenyl triazene was first synthesized by Purohit[1] whose IR spectrum was later reported by Sadtler Research Laboratory[2]. Subsequently, Mazumdar and Saha[3] also prepared the same compound and reported its utility in the gravimetric determination of Ti (IV), Cu (II) and Pd (II), while Saha *et al*[4] reported the determination in the presence of a large number of other metal ions. Mazumdar and Saha[5] also used this reagent for the spectrophotometric determination of Fe (III), Ti (IV) and V (V) and their separation from each other. The present communication reports estimation of nickel (II) by spectrophotometry using the same reagent.

2. Experimental

Reagent: *3-Hydroxy-3-Phenyl-1-0-Carboxyphenyl triazene* [*HPCPT*]: The reagent was synthesized as per the reported method[1,3] (loc.cit.), m.p. 167°C. Its stock solution (1×10^{-2} M) was prepared by dissolving requisite quantity of the reagent in ethanol and other solutions were made by appropriate dilutions.

Nickel: A stock solution (1×10^{-2} M) of nickel was prepared by dissolving requisite quantity of $NiSO_4.6H_2O$ (A.R., B.D.H.) in water and standardized in the usual manner[6].

Method: Absorbance measurements were made on Beckmann DB spectrophotometer using 1 cm matched quartz and glass cells. The pH measurements were made on a digital Orion Research Model 701 pH meter.

3. Results and discussion

The absorption spectra of nickel (II) complex with HPCPT against reagent blank shows an absorption maxima at 414 nm. It was observed that full colour development was obtained when pH was between 6.0 to 7.7 and the nickel to reagent ratio was 1:10.

The composition of the complex was determined as M:R:1:1: using Job's[7], mole ratio[8] and slope ratio[9] methods. Under optimum conditions of pH (6.0 to 7.7) and reagent concentration (ten fold excess), Beer's law is obeyed for Ni(II) concentration of 1×10^{-6} M to 2×10^{-5} M. The molar absorptivity of the complex was found as 3.19×10^{4} l cm^{-1} $mole^{-1}$ while Sandell's sensitivity was estimated to be 0.0018 $\mu g/cm^2$. The standard deviation 'σ' was obtained by measuring the absorbance of six solutions and estimated as 0.0054 units of absorbance, equal to 1.21%.

A comparison of the values of Sandell's sensitivity number for some of the commonly employed and recently recommended reagents are given in Table I. This table reveals that this reagent has sensitivity more than that for all other reagents except 2-(5-bromo-2-pridylazo)-5-diethylamino-phenol, which has a better sensitivity. Further, it has sensitivity comparable with that of 1-(1,2,4-triazol-3-ylazo)-2-naphthol and hence this seems to be one of the sensitive reagents suitable for nickel (II) estimation.

Table I

Sensitivities of some spectrophotometric methods for Ni(II)

Sl. No.	Reagent	Sandell's sensitivity in $\mu g/cm^2$
1.	Dimethylglyoxime with oxidising agent[10]	0.0042 (465 nm)
2.	Dimethylglyoxime (chloroform extract)[10]	0.017 (375 nm)
3.	α-Furildioxime (in $CHCl_3$)[10]	0.004 (435 nm)
4.	6-Chloro-3-hydrazinopyridine[11]	0.0031 (715 nm)
5.	3-Methoxy-7-methylphenothiazine[12]	0.003 (425 nm)
6.	1-(1,2,4-Tiazol-3-ylazo)-2-naphthol[13]	0.0016 (523 nm)
7.	2-(5-Bromo-2-pyridylazo)-5-diethyl aminophenol[14]	0.0006 (570 nm)
8.	Phenanthrene monosemicarbazone[15]	0.0035 (490 nm)
9.	3-Hydroxy-3-phenyl-1-o-carboxyphenyl triazene	0.0018 (414 nm)

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