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Research Article

**TO DETERMINE THE STABILITY CONSTANT OF Cu(II)
WITH SUBSTITUTED THIOCARBAMIDOPHENOL BY
SPECTROPHOTOMETRIC MEASUREMENTS.**S.O.Mohod^{1*} D.T.Tayade²¹Department of Chemistry, Government Vidarbha Institute of Science and Humanities, Amravati
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444 604, Maharashtra State, India.E-mail: skdtayade@gmail.com**Received:** 20 January 2017**Accepted:** 3 February 2017**Published:** 28 February 2017**Abstract:**

In the study the stability constant of Cu(II) metal ion with 2-phenyl thiocarbamidophenol (L₁), 2-methyl thiocarbamidophenol (L₂), 2-p-chloro thiocarbamidophenol (L₃) and 2-tolyl thiocarbamidophenol (L₄) were determined by Job's variation method. The measurement of absorbance was done by spectrophotometer. The conditional stability constants (logK) were calculated from the equilibrium constant (K) which obtained from the measured absorbance. The logK values were used to study the confirmation of complex formation.

Key Words: *Substituted thiocarbamidophenols, stability constant, spectrophotometry***Corresponding Author:****S.O.Mohod,**

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INTRODUCTION:

Spectrophotometry facilitates the determination of the concentration of coloured substances in a solution and has been employed for the analysis of metal at the trace levels. Spectrophotometry is based on the quantitative study of absorption of radiation. It is applied for the identification of aromatic hydrocarbons, vitamins, heterocyclic and conjugated aliphatic compounds. This method are found to be simple, rapid, sensitive and can be carried out in small laboratories in the absence of the other costly and sophisticated instrumental facilities. The evaluation of stability constant of complex was studied by Janssen¹. The stability constants of binary complexes of alizarin with Ca(II) and Zn(II) by spectrophotometric method was investigated by Bilgic *et al*². The study of stability constants of mixed ligand complexes of Cu(II) with creatinine and ethylenediamine tetraacetic acid or I-glutamic acid done spectrophotometrically by Karaderi *et al*³. The determination of stability constants of complexes were carried out by spectrophotometric method⁴. Argueso *et al*⁵ investigated the conditional stability constant of the cupric thiosemicarbazones by spectrophotometrically. The spectrophotometric determination of iron (III)-glycine formation constant in aqueous medium with the use of competitive ligand binding was done by Prasad *et al*⁶. Reddy *et al*⁷ studied the determination of nickel(II) with 2-hydroxy-3-methoxy-benzaldehyde thiosemicarbazone. Ramteke *et al*⁸ investigated the stability constant of chlorosubstituted pyrazoles with Cu(II), Nd(II) and Tb(III) metal ions at 0.1 M ionic strength by spectrophotometric method. Singh *et al*⁹ investigated the stability constants of copper(II) complex with 1-amidino-o-methylurea spectrophotometrically. Ghasemi *et al*¹⁰ determine the acidity constants of 4-(2-pyridylazo)resorcinol in binary methanol-water mixtures by spectrophotometric technique. All this things are taken into consideration this research scheme is designed. In this present work, an attempt has been made to study the interaction between Cu(II), and 2-phenylthiocarbamidophenol (L₁), 2-methylthiocarbamidophenol (L₂), 2-p-chlorophenyl

thiocarbamidophenol (L₃) and 2-tolylthiocarbamidophenol (L₄) at constant ionic strength spectrophotometrically.

EXPERIMENTAL SECTION:

In this research work all AR grade chemical are used. In the laboratory the ligands (L₁), Ligand (L₂), ligands (L₃) and Ligand (L₄) synthesized. Required amount of ligands were dissolved in 70% ethanol water mixture. The nitrate of copper was used and their solutions were prepared in double distilled water. Spectrophotometric measurements were performed on a UV-1800 Shimadzu double beam spectrophotometer using matched 10mm quartz cells

Job's Method

Job's variation method was used to know the nature of complexes. The composition of metal ion solution (1x10⁻⁵ M) and ligands (2x10⁻⁵ M) where prepared in series. Ionic strength was maintained (0.1M) by adding an appropriate amount of 1M KNO₃ solution in 10ml volume λ_{max} was determined using one of the composition at which there is maximum absorption.

The absorption for all the compositions was recorded at a constant wavelength (λ_{max}). The data of absorption and percentage composition of metal ion and ligand solution at constant pH can be used and curves were constructed. Each solution diluted upto 15ml and recorded absorption at same (λ_{max}). The conditional stability constant of metal-ligand complexes were calculated for all the systems using following equation.

$$K = \frac{X}{(a_1 - x)(b_1 - x)} = \frac{X}{(a_2 - x)(b_2 - x)}$$

K = Conditional stability constant of complex.

X = Concentration of complex.

a₁ and a₂ = Concentration of metal ions.

b₁ and b₂ = Concentration of ligand.

Conditional stability constant of metal ligand complexes were calculated and presented in **Table 1**

Table 1: Determination of conditional stability constant of metal-ligand complex

System	Conditional stability constant K	Log K
L ₁ +Cu(II)	2.3809 X 10 ⁻³	0.37668
L ₂ +Cu(II)	2.3310 X10 ⁻³	0.36754
L ₃ +Cu(II)	3.4732 X 10 ⁻³	0.54072
L ₄ +Cu(II)	1.2010 X 10 ⁻³	0.7954

CONCLUSION:

Table 1. Indicates that LogK value is greater for $L_4+Cu(II)$ than $L_3+Cu(II)$, $L_1+Cu(II)$ and $L_2+Cu(II)$ respectively which gives information that Cu(II) forms the most stable complex with L_4 than with L_3 , L_1 and L_2 . This type of investigation helps to study of drug activity and drug effect of newly synthesized drugs.

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