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Effect of Substituent's and Conditional Stability Constant of Substituted Thiocarbamido-1-Naphthols Cu (II), Cd (II) And Cr (III) Metal Ions Complexes in 70% Mixed Solvent Media

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ABSTRACT

Present work deals with Effect of substituents and Conditional Stability Constant of Substituted thiocarbamido-1-naphthols (i.e. 5-phenylthiocarbamido-1-naphthol or (L_2) and 5-p-Tolylthiocarbamido-1-nahthol (L_4)) and Cu (II), Cd (II) and Cr (III) metal ions complexes in 70% ethanol-water media at different proportions spectrophotometrically. This work mainly base on Jobs method of continuous variation. The stoichiometry of complex formation found to be 1:1. This investigation helps to understand drug effect and drug activity of newly synthesized drugs.

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INTRODUCTION

Physical and chemical properties are varied due to complexation. Composition, as well as conformation of complex formation, can be measured from study of various physicochemical properties by spectrophotometric method. Spectrophotometric technique has a great significance in measurements of stability constant and confirmation of complex formation in solution. Wagh[1] and Deshamukh[2] determined log K value of chalcones, pyridine, carboxylic acids and hydroxyl ethyl benzene. Galhan *et al.*[3] studied (E)-2-(mercapto-phenylamino ethylene)-3-oxo-N-p-tolylbutamide with some metal ion by spectrophotometrically. Boldescu *et al.*[4] Spectrophotometrically studied sangurine-bcyclodextrin complex formation. Spectrophotometrically determination of phenylephrine hydrochloride and salbutamol sulfate drugs in pharmaceutical preparation using diazotized metacloprine hydrochloride was carried out by Al-Abachi and Abed[5]. Alsamarrai *et al.*[6] investigated ephedrine-hydrochloride by spectrophotometrically. Saleha *et al.*[7] investigated sulphasalazine antibiotic drugs. Investigation of ion complex formation of anti-hypertensive drug methyldopa was studied[8]. Meshram[9] studied complexation by interaction of Dy (III) with lincomycin and lyrodoxin in 70% ethanol-water medium. Spectrophotometric study of diflunisal febuxostat metaxalone, fexofenadine methyl ester and linezolid pharmaceutical dosages using tetracyanoethylene was carried out by Shrinivas *et al.*[10]. Valtierra –Alvardo *et al.*[11] investigated complex formation equilibrium of Cu (II). Solvent effect on dissociation of ammonium and pyridinium ion was studied by Ohataki[12]. Investigation of effect of dielectric constant on Cu (II) – Complexes of phthalic acid in various percentage of dioxane-water mixture was carried by Palaskar[13]. Metal-ligand stability constant and confirmation of complexes formation of 5-phenylthiocarbamido-1-naphthol and 5-p-Tolylthiocarbamido-1-naphthol with Cu(II), Cd(II) and Cr(III) metal ions had been investigated respectively by Spectrophotometric technique at 0.0001 M ionic strength. This work mainly base on Jobs method of continuous variation. It is especially associated to study of effect of solvents, effect of ligands and group as well as effect of metal ions during formation of complexes.

MATERIALS AND METHODS

EXPERIMENTAL

5-phenylthiocarbamido-1-naphthol and 5-p-Tolylthiocarbamido-1-naphthol have been synthesized in the laboratory by standard method. The nitrate salts of Copper, Cadmium and

Chromium were used & their solutions were prepared in double distilled water. The solutions of potassium nitrate were prepared (1M) & used for maintaining ionic strength constants. Absorption is measured by UV Spectrophotometer model 106, (Systronic make) with an accuracy = ± 0.005 was used.

RESULTS AND DISCUSSION

SPECTROPHOTOMETRIC MEASUREMENT

JOB'S METHOD

Job's method of continuous variation is reliable method for investigation of formation of complex[14]. Job's method consist of equimolar solutions of metal and ligand varying proportion in such manner that total concentration of metal plus ligand is constant in resulting mixtures[15]. The compositions of metal ions solution ($1x10^{-4}$M) & ligand ($5x10^{-4}$M) were prepared in ten series. Ionic strength was maintained constant (0.1M) by adding an appropriate amount of 1M KNO_3 solution in 10 ml volume (λ_{max}) was determined using one of the compositions at which there is maximum absorption. The absorption for all the compositions was recorded at a constant wavelength (λ_{max}). The data of absorption & % composition of metal ion and ligand solutions at constant pH can be used to construct the curves. It was observed that 1:1 complex formation occurs in the pH range of 3 to 6. Each solution is diluted up to 15 ml and recorded absorption at same (λ_{max}). Conditional stability constants of metal-ligand complexes were calculated for all the systems using following expression.

$$K = \frac{X}{(a1-x)(b1-x)} = \frac{X}{(a2-x)(b2-x)}$$

K = Conditional stability constants of complex. X = Concentration of complex.

a1 & a2 = Concentration of metal ions; b1 & b2 = Concentration of ligand.

Conditional stability constants of metal-ligand complexes were calculated and presented in Table-1.

Table – 1: Determination of Conditional Stability of Metal-Ligand Complexes

System	Conditional stability constant	Log K
Cu(II) + L2	1.8382 X 10^{-3}	0.26439 X 10^{-3}
Cr(III) + L2	4.4464 X 10^{-3}	0.64801X 10^{-3}
Cd(II) + L2	2.3809 X 10^{-3}	0.37668X 10^{-3}
Cu(II)+ L_4	5.2911 X10^{-3}	0.72354 X 10^{-3}
Cr(III)+ L_4	3.4732 X 10^{-3}	0.54072 X 10^{-3}
Cd(II)+ L_4	2.0833 X 10^{-3}	0.31875 X 10^{-3}

CONCLUSION

From **Table 1** it was concluded that resultant values obtained in both techniques are fairly good. There is no appreciable change in log K values. This indicated the simultaneously complex formations. Variation in Log K values observed due to direct interfere of dielectric constant, solvent-solvent interaction, solute-solvent interaction and solute-solute-solvent interaction. Table 1 reveals that Log K value of L_2 greater for Cr(III) than Cu(II) and Cd(II). Thus L_2 form more stable complex with Cr(III) than Cd(II) and Cu(II). While Log K value of L_4 greater for Cu(II) than Cd(II) and Cr(III). Thus L_4form more stable complex with Cu(II) than Cd(III) and Cr(III). This investigation helps to study of drug activity and drug effect of newly synthesized drugs.

L_4 form more stable complex with Cu(II) than L_2. This was happened due to +I effect of $–CH_3$ in L_4, while in case of Cd(II) and Cr(III) for L_2 and L_4 very small change was found in Log K.

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