



CONDUCTOMETRIC STUDY OF COPPER (II) AND 3-[(2-[(DIAMINO METHYLIDENE) AMINO] -1, 3-THIAZOL-4-YL} METHYL) SULFANYL]-N'-SULFAMOYL PROPANIMIDAMIDE IN ETHANOLWATER AT 303K.

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ABSTRACT

A conductance study of the interaction between copper (II) and 3-[(2-[(diamino methylidene) amino] -1, 3-thiazol- 4-yl} methyl) sulfanyl]- N'-sulfamoyl propane midamide (Famotidine) in ethanol-water binary solvent systems at 303K. The stability constant of the resulting 1:1 complex was determined by conductometry technique. The free energy change of the studied complex was evaluated at 303K using thermodynamic relations, the negative values of ΔG means that the complex formation process is spontaneously.

KEYWORD: Stability constant, conductometry, Famotidine.

INTRODUCTION

Famotidine used for relief of heartburn, acid indigestion, and sour stomach, treatment for gastric and duodenal ulcers, pathologic gastrointestinal hypersecretory conditions such as Zollinger-Ellison syndrome and multiple endocrine adenomas, gastroesophageal reflux disease, esophagitis. Part of a multidrug regimen for *Helicobacter pylori* eradication, although omeprazole may be somewhat more effective.^[1-6] It used in Prevention of NSAID-induced peptic ulcers.^[7-8] It also used to surgery patients before operations to reduce the risk of aspiration pneumonitis.^[9-11] Famotidine is also given to dogs and cats with acid reflux. Famotidine has been used in combination with an H_1 antagonist to treat and prevent urticaria caused by an acute allergic reaction.^[12] The presence of another group or atoms like O, N, and S created a heterocyclic compound, having wide applications in pharmaceutical chemistry^[13-14]. Mohammad Hakimi^[15] et.al studied the stability constant of complexes of copper(II) ion with 4-amino-3-ethyl-1,2,4-triazol-5-thione in various percentage of ethanol-water mixture conductometrically. Gholam Hossein Rounaghi^[16] have been studied the complexation reaction between Cd^{2+} with 1,13-bis(8-quinolyl)-1,4,7,10,13-penta oxatri decane (kryptofix5) in various binary solvent system. Dhruvi et al.^[17] studied the stability constant for complexes of Cd^{+2} , Cu^{+2} , Co^{+2} and Ni^{+2} with 8-Hydroxy 5- Quinolinesulfonic acid [HQS] in water, methanol and water-methanol binary solvent systems at different temperature. The number of researchers studied the stability constant of metal complex^[18-19]. The various techniques are used for the evaluating the stability constant of metal complex like

pHmetry^[20], potentiometry^[21], conductometry^[22], polarography^[23], spectrophotometry^[24], ion exchange^[25] etc. Out of these techniques, conductometry technique is considered the same study because this technique is a very sensitive, simple, cheap and accurate technique.

After review of literature survey the detail study of substituted heterocyclic drug under identical set of experimental condition is still lacking. It was thought of interest to study the stability constant and free energy change of substituted heterocyclic drug with copper ion under suitable condition.

MATERIAL AND METHOD

The conductance measurements were carried out with equip-tronic EQ-664A using cell with cell constant one at 303 K. The metal ion and drug solution prepared in 20% ethyl alcohol and concentration was estimated by standard method. All chemical reagent used in this work are A.R. grade. The modified Job's method of continuous variation used for determination of stability constant of metal complex.^[22] The both metal ion and ligand concentration was taken equal concentration. Three series C_1 , C_2 , C_3 of solutions were prepared. In set C_1 metal salt solution was filled with volume 1.0ml to 9.0 ml and volume was made to 10.0ml in each solution. Similarly, in C_2 ligand solution and C_3 was prepared by mixing metal ion solution from 1.0ml to 9.0ml and ligand solution from 9.0ml to 1.0ml. Conductance was recorded for each solution. Δ Conductance Was determined as " $C_1+C_2-C_3$ ".^[26] Graphs were plotted between corrected conductance and metal-ligand ratio.

For the evaluation of stability constants, Turner and Anderson's Modified Job's Method were used. The initial concentration of metal ions are 'a' and that of ligands 'b' then the stability constant 'K' is given by

$$K = \frac{x}{(a-x)(b-x)} \quad \text{--- (1)}$$

$$\frac{a_2 - a_1}{a_1 - x} + \frac{b_1 - b_2}{b_2 - x} \quad \text{--- (2)}$$

K= Conditional stability constant, X=Concentration of complex, a_1 and b_1 were concentration of metal ion and ligand before dilution. a_2 and b_2 were concentration of metal ion and ligand after dilution.

By using the of log K values, free energy change of the system can be calculated by using equations

Table-1: Conductance (ms) of Cu(II) with Famotidine

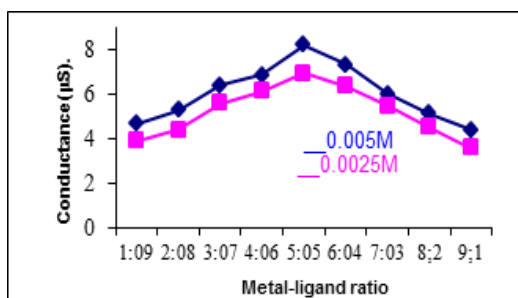
Concentration of metal ion: 0.005M

Concentration of Ligand: 0.005M

Sr.No.	Ratio	M:S (C_1)	S:L (C_2)	M:L (C_3)	Conductance ($C_1 + C_2 - C_3$)
1	1:9	21.8	9.4	26.51	4.69
2	2:8	37.9	9.95	42.564	5.286
3	3:7	54.31	10.5	58.41	6.4
4	4:6	71.2	11.54	75.89	6.85
5	5:5	85.9	12.78	90.48	8.2
6	6:4	94.52	13.25	100.46	7.31
7	7:3	105.64	14.45	114.08	6.01
8	8:2	116.85	15.2	126.91	5.14
9	9:1	127.85	16.51	139.95	4.41
Concentration of metal ion :0.0025M Concentration of Ligand :0.0025M					
1	1:9	15.4	6.07	17.56	3.91
2	2:8	22.3	6.96	24.85	4.41
3	3:7	27.1	7.03	28.52	5.61
4	4:6	34.79	7.03	35.7	6.12
5	5:5	43.07	8.08	44.2	6.95
6	6:4	48.1	9.22	50.96	6.36
7	7:3	54.3	10.02	58.84	5.48
8	8:2	60.91	11.13	67.5	4.54
9	9:1	65.7	12.83	74.7	3.83

Table-2: log K and ΔG of Cu(II) with Famotidine

System	LogK	$\Delta G(\text{JK}^{-1}\text{Mole}^{-1})$
Cu(II)-Famotidine	1.2243	-7102.88



$$\Delta G = -2.303RT \log K$$

RESULT AND DISCUSSION

The value of corrected conductance first increases then decreases with metal-ligand ratio. The value of conductance changes due to change in number of ions. It has been observed that the formation of complex between Cu (II) and famotidine was found to be 1:1. It is proved that the Modified Job's Method of continuous variation was used to calculate stability constants. The free energy change of the studied complex was evaluated at 303K using thermodynamic relations, the negative values of ΔG means that the complex formation process is spontaneously.

CONCLUSION

The stability constant of the resulting 1:1 complex was determined by conductometry technique. The free energy change of the studied complex was evaluated at 303K using thermodynamic relations, the negative values of ΔG means that the complexation process is spontaneously.

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