

# Studies of Stability constant of Mixed Ligands with Transition metal Ions in Aqueous Medium at 303K.

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## ABSTRACT

The interaction of transition metal ion with Mixed ligand (Ramipril+Lovastatin) drugs have been investigated by pH metric titration at 0.1 M ionic strength at room temperature in aqueous medium. The data obtained use to estimate the values of proton-ligand stability constant ( $P^k$ ) and Metal -ligand stability constant ( $\log K$ ). It is observed that transition metal ion form 1:1, 1: 2 complexes with all the systems.

**keyword: Formation Constant, pH Metry**

## I. INTRODUCTION

The studies of metal-ligand complexes in solution of a number of metal ions with carboxylic acids, oximes, phenols etc. would be interesting which throw light on the mode of storage and transport of metal ion in the biological kingdom.

In the earlier papers extensive data base on metal complexes with substituted heterocyclic drugs was presented.

Number of researchers<sup>1-2</sup> studied the Formation and Stability constant of metal complexes with transition metals. Mathieu W.A. Steenland et.al.<sup>3</sup> studies stability constant of Cu (II) and Ni (II) complexes of trans -dioxopentaaza macrocycles in aqueous solution by different technique. Hong-Wen Gao et.al.<sup>4</sup> has studied the stability constant of Cu (II) and Co (II) complexes with CNBAC in water sample spectrophotometrically. Tuba Sismanoglu<sup>5</sup> have studied the stability constant of binary complexes of Nicotinamide with Mn (II) by pH metrically. He also determines change in free energy, change in enthalpy and change in entropy from stability constant at different temperature. Tekade et.al.<sup>6</sup> have been studied complex formation of Cu (II) and Co (II) metal ion complex with substituted isoxazolines. O.Yamauchi et.al.<sup>7</sup> studied stability constant of metal complexes amino acids with charged side chain by pH-metrically. Hayati Sari et.al.<sup>8</sup> studied the stability constant of glyoxime derivative and their Nickel, Copper, Cobalt and Zinc complexes potentiometric and theoretically.

After review of literature survey the detail study of complex under identical set of experimental condition is still lacking. It was thought of interest to study the chelating properties of substituted heterocyclic drugs under suitable condition with lanthanide by pH metrically.

## II. MATERIAL AND METHOD

pH measurement were carried out with equip-tronic EQ-610 pH meter (accuracy  $\pm 0.01$  units)-using combine glass electrode at room temperature. Metal ions solution were prepared in triply distill water and concentration estimated by standard method.<sup>9</sup> The solution of drug prepared in solvent .The pH metric reading in 30% ethanol



water mixture were converted to  $[H^+]$  value by applying the correction proposed by Van Uitert Haas.

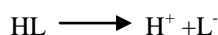
The overall ionic strength of solution was constant and calculated by the equation

$$\mu = 1/2 \sum C_i Z_i^2$$

The concentration of other ion in addition to  $Na^+$  and  $ClO_4^-$  were also taken into consideration.

### III. RESULT AND DISCUSSION

Substituted heterocyclic drugs may be ionized as acid having replaceable  $H^+$  ion from -OH group. Therefore it is represented as HL i.e.



The titration data used to construct the curves between volume of NaOH and  $P^H$ . They are called acid-ligand titration curves.

It is observed from titration curves for all systems ligand start deviating from the free acid curves at  $P^H$  2.5 and deviating continuously up to  $P^H=11$ . The deviation shows that dissociation of proton in substituted drugs.

The average number of proton associated with the ligand

( $n_A$ ) was determined from free acid and acid – ligand titration curves employing the equation of Irving and Rossotti<sup>10</sup>. The  $P^k$  values were determined from formation curves ( $n_A$  vs  $P^H$ ) by noting the  $P^H$  at which  $n_A = 0.5$ .

The accurate values of  $p_k$  were calculated by point wise calculations which are presented in table -1. The  $p_k$  values are found.

**Table-1 DETERMINATION OF PROTON-LIGAND STABILITY CONSTANT (pK) OF SOME SUBSTITUTED HETEROCYCLIC DRUGS AT 0.1M IONIC STRENGTH.**

System	Constant pK	
	Half integral	Point wise calculation
Ligand-1	5.70	5.680 ± 0.05

### METAL -LIGAND STABILITY CONSTANT (Log k):-

Metal-ligand stability constant of transition metal ion chelate with drug were determined by employing Bjerrum calvin  $P^H$  metric titration method as adopted by Irving and Rossotti. The formation of chelate between transition metal ion with drug was indicated by the significant separation starting from  $pH = 2.5$  for transition metal ion with ligand -1.

**Table-2 Determination of metal –ligand stability constant (logK) of transition metal ion WITH drugs at 0.1M ionic strength .**

System	Logk <sub>1</sub>	Logk <sub>2</sub>	Logk <sub>1</sub> - Logk <sub>2</sub>	Logk <sub>2</sub> / Logk <sub>1</sub>
Cu(II)-Ligand	3.65	5.85	2.20	1.6027
Fe(II)-Ligand	3.80	5.76	1.96	1.5158
Ni(II)-Ligand	3.95	5.65	1.70	1.4303
Mg(II)-Ligand	4.05	5.95	1.90	1.4691
Co(II)-Ligand	4.35	6.30	1.95	1.4483



The result shows the ratio of  $\text{Log}k_2/\text{Log}k_1$  is positive in all cases. This implies that there is little or no steric hindrance to the addition of secondary ligand molecule. The smaller difference may be due to trans structure.

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