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INFLUENCE OF THE IONIC STRENGTH OF MEDIUM ON THE COMPLEX EQUILIBRIA OF CHLOROSUBSTITUTED PROPANEDIONE

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ABSTRACT

In the present investigation the effect of change of ionic strength of medium on proton ligand and metal ligand stability constant of complex of- 1-(5-chloro-2-hydroxyphenyl)-3-(4-nitrophenyl) propane-1,3-dione with Co(II) metal ion have been studied by ph metrically at different ionic strength 0.1,0.08,0.06,0.04. The dependence of ionic strength on the protonation and stability constants was evaluated using a simple Debye - Huckel type equation.

Keywords: *Stability constant, ionic strength propanedione.*

I. INTRODUCTION

Ionic strength is the one of the crucially important property of solvent which influences the rate of reaction and also the mechanism of reaction.Also we can say that Ionic strength is an electrical current produced by the ions of inert salt in solution. It affects proton-ligand stability constants pK and metal-ligand stability constants (log K). To understand the thermodynamic properties of electrolytic solutions, the knowledge of both, the long interaction forces and short range interactions between ion and solvent molecules is necessary. The net effect of inter ionic attractions and repulsions is to decrease the free energy of solute as compared to that of the uncharged particles and hence to decrease the activity coefficient. The forces between ion and solvent dipoles will tend to hold the solvent in the solution with a consequent decrease in the solvent vapour pressure from the ideal value and corresponding increased in the activity coefficient of the state. Debye and Huckel have given a theory of ion-ion interaction of dilute solutions.

A.A. Ramteke et.al.[1] have studied the effect of ionic strength on stability constants of of complexes of 3–(4–chlorophenyl)–4-(3– pyridine)–5-(2–hydroxy phenyl)–pyrazole with Cu (II), Tb (III), and Nd (III) metal ions at various ionic strengths in 70% dioxane-water medium . Mohammad Hamidi, and Mehdi Vadi[2] have studied the stability constants of the complexes between iron ion and leucine potentiometrically at various ionic strengths of I=0.1, 0.3, 0.5, 0.7 and 0.9 mol.dm-3 and 20°C. S. D Thakur, and M.W.Shaikh[3] have studied the Proton-ligand stability constants and metal-ligand stability constants of reported ligand 1-(5-bromo-2-hydroxyphenyl)-5-phenylpenta-2,4-dien -1- One (L3) studied with transition metal ions like Cu(II) and Ni(II) were determine by pH-metric study at 0.1 M ionic strength. (30±1 0C) in 70% Dioxane- water mixture by Bjerrum method as adopted by Calvin Wilson. Vivek Kumar and Raj Kumar[4] have determined the strength of interaction between reagents that make the final product after the formation of bonds. In general, stability means that a complex may be stored for a long time under suitable conditions or the compound may be existing under suitable conditions. Regarding how much is the concentration of complexes in solution, stability constant provides this information via calculations. Patil N.R and Thakur S.D.[5] have studied the interaction of Cu (ii), Ni (ii) and Co (ii) metal ions with hydroxy-substituted chalconeimines, at 0.1 m ionic strenghth pH metrically. Varun Sharma et.a.l[6] has studied the effect of ionic strength on porphyrin drugs interaction with quadruplex DNA Formed by the promoter region of C-myc and BCl_2 bncogenes. Effect of temperature and ionic strength on the formation constants of 2-acetylpyridine (nbenzoyl)glycine hydrazone with lanthanide(iii) ions was studied by Ranita Devi Naosekpam[7].

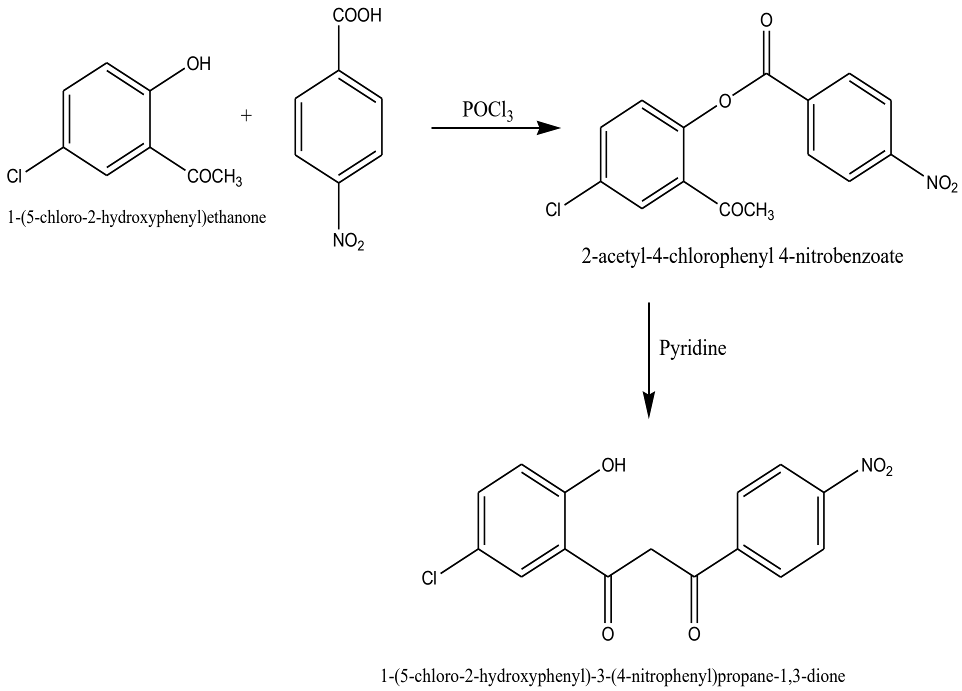
By considering all the existing remarkable work on effect of change of ionic strength on the stability constant in present work we were try to throw light on change of ionic strength of medium on chlorosubstituted propanedione by using P^H metric method.

II. EXPERIMENTAL

Material and method

a) **Synthesis of - 1-(5-chloro-2-hydroxyphenyl)-3-(4-nitrophenyl) propane-1,3-dione [L2]-**

p-nitro substituted benzoyloxy acetophenones prepaired from 4-chloro-2-hydroxy acetophenone (1) (0.04 mol) and chloro substituted benzoic acid (0.05 mol) was dissolved in dry pyridine (40 ml). The solution was warmed up to about 600c and pulverized KOH (0.15 mol) was added slowly with constant stirring. After four hours the reaction mixture was acidified by adding ice cold dilute HCl (1:1). The solid product thus separated was filtered, washed with sodium bicarbonate solution (10%) and finally with water. It is then crystallised from ethanol acetic acid mixture to get 1-(5-chloro-2-hydroxyphenyl)-3-(4-nitrophenyl) propane-1, 3-dione



III. RESULTS AND DISCUSSION

In present investigation, the dependence of stability constants on the ionic strength of the medium was examined by taking concentrations of metal percholates and perchloric acid during pH-metric titrations. The system has been studied at 0.04 M, 0.06 M, 0.08 M and 0.1 M ionic strength by varying the concentrations of sodium perchlorate. In addition to sodium perchorate, the titrating system contained ions from perchloric acid, metal perchlorate and sodium hydroxide. The total ionic strength of the medium is calculated by following expression.

$$\mu = \frac{1}{2}\sum C_i Z_i^2 \qquad \text{……….} (4)$$

Where C_i and Z_i are the concentration and valency of metal ion respectively. The stability constants for the following systems were determined at 0.04 M, 0.06 M, 0.08 M and 0.1 M ionic strengths.

Table 1
pK Values of PS-2(L2) at various ionic strength

μ	$\sqrt{\mu}$	$\frac{\sqrt{\mu}}{(1+\sqrt{\mu})}$	$\frac{\sqrt{\mu}}{(1+\sqrt{\mu})}-0.3\sqrt{\mu}$	pK
0.10	0.3162	0.2402	0.1453	8.5462
0.08	0.2828	0.2204	0.1355	7.8532
0.06	0.2449	0.1967	0.1232	6.5950
0.04	0.2000	0.1666	0.1066	5.7985

Table 2
log K values of Co (II)- PS-2(L2) complexes at various ionic strength

μ	$\sqrt{\mu}$	$\frac{\sqrt{\mu}}{(1+\sqrt{\mu})}$	$\frac{\sqrt{\mu}}{(1+\sqrt{\mu})}-0.3\sqrt{\mu}$	log K_1	log K_2
0.10	0.3162	0.2402	0.1453	8.6905	7.6253
0.08	0.2828	0.2204	0.1355	7.3128	1.6836
0.06	0.2449	0.1967	0.1232	5.697	1.4516
0.04	0.2000	0.1666	0.1066	3.0560	1.1202

IV. CONCLUSION

This change in values of proton ligand and metal ligand stability constant indicates that as the concentration of solvent changes it influence the rate constant by decreasing the value with respect to decrease in concentration .this is happen due to solute solvent interactions.

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