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TO STUDY THE THERMODYNAMIC PARAMETERS OF SUBSTITUTED THIOCARBAMIDOPHENOL IN 70% MIXED SOLVENTS AT CONSTANT TEMPERATURE BY CONDUCTOMETRIC METHOD.

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ABSTRACT

Recently in laboratory, thermodynamic parameters of 2-p-chlorophenyl thiocarbamidophenol [p-CPTCP] and 2-tolyl thiocarbamidophenol [TTCP] have been investigated conductometrically at different concentration in 70% ethanol-water mixed solvent at constant temperature. Conductivity play vital role in drug diffusion. This work hightlight investigation of G,k,μ values. The thermodynamic parameters ΔH,ΔG and ΔS for the ion pair formation determine from the value of ion association constant at constant temperature. This measurement revealed that solvent-solvent, solute-solvent and solute-solute interaction and the effects of various substitutents.

KEYWORDS: Substituted thiocabamidophenol, Dissociation constant, Thermodynamic parameters.

INTRODUCTION

Conduction of electrolytic solution explained by number of ions of electrolyte in solution. A Conductometric measurement of electrolytic solution provided valuable information concerned to solubility and permeability of drugs, which are essential biopharmaceutical parameters. These two parameters are accountable for effective bioavailability and good in vitro and vivo correlation.[1] Now a days pharmaceutical technologist has great challenge to

enhance the solubility dissociation rate and oral bioavailability of weakly water soluble drugs.[2] Hydrotropic solubalisation is considered as one of secure method of solubalisation.[3] Many researchers investigated stability of drugs by solubility enhancer[4,5] but no one has given proper explanation of this phenomenon. Conductometric measurements of alkali metals in different proportions of mixed solvents were investigated by Izonfuo and Obunwo[6] and Roy et al.[7] Bald et al[8] investigated thermodynamic and conductometric studies on NaI solutions in water-isobutanol mixtures at 298.15K. Nasrabadi et al[9] investigated conductomtric study of complex formations between some substituted pyrimidines and some metal ions in acetonitrile and the determination of thermodynamic parameters. Conductometric studies of the thermodynamic of complexation of Zn^{2+}, Ni^{2+}, Co^{2+}, Pb^{2+}, Mn^{2+}, Cu^{2+} ions with 1,13-bis (8-quinolyl)-1,4,7,10,13-pentaoxatridecane in binary solvent mixtures were reported by Payehghadr et al.[10]

In this study the investigation of 2-p-chlorophenyl thiocarbamidophenol [p-CTCP] (L_3) and 2-tolylthiocarbamido phenol [TTCP] (L_4) at different concentration at constant temperature (308.15K). The analysis of data done by shedlovasky method. The observed values of ion association constant at various concentrations provide information to examine thermodynamic parameters.

EXPERIMENTAL SECTION

In this research work all solutions are freshly prepared. AR grade chemical are used. The solutions 0.1M, 0.05M, 0.025M and 0.0125M of 2-p-chlorophenyl thiocarbamidophenol [p-CTCP] (L_3) and 2-tolylthiocarbamido phenol [TTCP] (L_4) were prepared in 70% ethanol-water mixtures. Thermostat was used to maintain the thermal equilibrium of drug solution. After thermal equilibrium the conductance of solution was measured.

RESULT AND DISCUSSION

The solution of 0.1M was firstly prepared then after by using serial dilution method the solutions of 0.05M, 0.025M and 0.0125M were prepared in 70% ethanol-water mixture. The conductances of solutions were measured by using conductivity bridge at 303.15K.

With the known literature method observed conductance(G), specific conductance(k) and molar conductance(μ) were determined. The result obtained was presented in **Table-1** and **Table-2**.

TABLE 1 - CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF L_3 [p-CTCP]				
DETERMINATION OF G, k and μ AT DIFFERENT CONCENTRATIONS AND CONSTANT TEMPERATURE 308.15K				
% of solution (Ethanol-water)	Concentration C (M)	Observed conductance (G) mS	Specific conductance (k) x 10^{-3}mS/cm	Molar conductance (μ) $mScm^2mol^{-1}$
70%	0.1 M	0.023	0.002743	0.02742781
	0.05 M	0.020	0.002482	0.04964571
	0.025 M	0.027	0.00343	0.13719273
	0.0125 M	0.030	0.003801	0.30411765

TABLE –2 - CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF L_4[TTCP]				
DETERMINATION OF G, k and μ AT DIFFERENT CONCENTRATIONS AND CONSTANT TEMPERATURE 308.15K				
% of solution (Ethanol-water)	Concentration C (M)	Observed conductance (G) mS	Specific conductance (k) x 10^{-3} mS/cm	Molar conductance (μ) $mScm^2mol^{-1}$
70%	0.1 M	0.025	0.00298	0.029813
	0.05 M	0.025	0.00310	0.062057
	0.025 M	0.026	0.00330	0.132112
	0.0125 M	0.025	0.00317	0.253431

With the known literature method, the specific constant(K_{sp}), log(K_{sp}) and thermodynamic parameters viz. change in free energy(ΔG), change in entropy(ΔS) and change in enthalpy(ΔH) of [p-CTCP] and [TTCP] at various molar concentration at constant temperature which is shown in **Table-3 and Table-4.**

TABLE 3- CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF L_3[p-CTCP]						
DETERMINATION OF Ksp, log Ksp, ΔG,ΔH and ΔS AT DIFFERENT CONCENTRATIONS AND CONSTANT TEMPERATURE						
SYSTEM:LIGAND-4 [TTCP] MEDIUM - 70% Ethanol-Water Mixture						
Temp T (°C)	Conc. C (M)	Ksp	Log Ksp	ΔG $kJmol^{-1}$	ΔH $kJmol^{-1}$	ΔS $kJmol^{-1}K^{-1}$
308.15K	0.1	0.00044858	-3.34816	19424.62	-62444.92	-270.20
	0.05	0.00036742	-3.43484	19927.49	-64056.68	-277.18
	0.025	0.00070146	-3.15400	18298.18	-58804.05	-254.46
	0.0125	0.00086172	-3.06464	17779.74	-57138.04	-247.25

TABLE 3- CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF L_4[TTCP]						
DETERMINATION OF Ksp, log Ksp, ΔG,ΔH and ΔS AT DIFFERENT CONCENTRATIONS AND CONSTANT TEMPERATURE						
SYSTEM:LIGAND-4 [TTCP] MEDIUM - 70% Ethanol-Water Mixture						
Temp	Conc.	Ksp	Log Ksp	ΔG	ΔH	ΔS

T (°C)	C (M)			kJmol^{-1}	kJmol^{-1}	kJmol^{-1}K^{-1}
308.15K	0.1	0.00062764	-3.20229	18578.34	-59693.69	-258.32
	0.05	0.00067988	-3.16757	18376.93	-59046.37	-255.52
	0.025	0.00077031	-3.11333	18062.26	-58052.05	-251.20
	0.0125	0.00070868	-3.14955	18272.40	-58727.77	-254.13

CONCLUSION

Table-1 and Table-2 showed that the observed conductance (G), specific conductance (k) decreases and molar conductance (μ) were increases at constant temperature. The specific conductance (G) decreases and molar conductance (μ) increases along with decreasing molar concentrations.

Table-3 and Table-4 specifies that when we going from molar concentration 0.1M to 0.125M concentration solutions the values K_{sp}, log K_{sp}, ΔH, ΔS decreases while ΔG decreases at constant temperature. These parameters influence by structures and nature of synthesized compounds. The temperatures, molar concentration and percentages composition directly affects the thermodynamic parameters. These parameters links with other like solute-solute, solute-solvent and solvent-solvents interactions. Internal geometry and inter and intra-hydrogen bonding also affects these parameters.

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