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TO STUDY THE THERMODYNAMIC PARAMETERS OF 5-p-CHLOROPHENYLTHIOCARBAMIDO-1-NAPHTHOL AT DIFFERENT CONCENTRATIONS AND DIFFERENT TEMPERATURES IN 70% ETHANOL-WATER MEDIA

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Abstract:

Conductivity play vital role in drug diffusion. Thermodynamic parameters affected by substituent's of drug. Thus recently in laboratory, conductometrically have been investigated thermodynamic parameters of 5-p-Chlorophenylthiocarbamido-1-naphthol [p-CPTCN] or L_3 have been studied at different concentrations in 70% ethanol-water mixture at different temperatures. This work highlights investigation of G, K and μ values. The thermodynamic parameters viz. ΔH, ΔS and ΔG for ion pair formation determined from the value of ion association constant at 298K and 303K. This investigation provided valuable information regarding to solute-solvents, solute–solute and solvent-solvent interaction and effect of dilution from conductrometric measurements of 5-p-Chlorophenyl -thiocarbamido-1-nahthol.

Key Words: Thermodynamic parameters, Dissociation constant, 5-p-Chlorophenylthiocarb -amido-1-nahthol.

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INTRODUCTION:

Conductivity play vital role in drug diffusion. Number of ions of electrolyte in solution influence conduction of electrolytic solution. Conductrometric measurments of electrolytic solution provided valuable information concerned to solubility and permeability of drugs, which are essential biopharmaceutical parameters. Solubility and permibility played an important role in pharmacokinetics and pharmacodynamics. These can be used for correlation in vivo and vitro bioavailability of any drugs [1]. Enhancement of solubility and dissolution rate of oral bioavailability of poorly water soluble drugs are still challenging aspects for pharmaceutical technologists [2]. Hydrotropic solubalisation is considered as one of secure method of solubalisation [3]. Many researchers investigated stability of drugs by solubility enhancers (hydrotropic agents) [4,5] but no one give proper explanation of this phenomenon. Recently, Gomma and Jahadalli[6] carried out conductometric studies of ionic association of divalent asymmetric electrolyte $Cu(NO_3)_2$ with kryptofix-22 in mixed methanol-DMF solvents at different temperatures. Solanki *et al [7]* carried out conductometric study of nimesulide in aqueous solutions of hydrotropic agents at different temperatures. Study of ternary complexes using quinolone antibiotics as a primary ligand was carried out by Imran *et al[8]*. Alanajjar [9] studied simultaneous determination of o-floxacin and cefixime in their combined dosage by conductometric technique. Valuable information of ion-ion and ion–solvents interactions obtained from conductometric studies of solutes at definite and infinite dilution in solvent systems. Walden product of ionic solutions as a function of size, nature, temperature and composition of solvent from study of molar conductivity and association constants provide information for solute-solvent interactions which is helpful to understand interactions in solutions. Elway *et al[10]* studied dropopizine and trizanidine hydrochloride in their pharmaceutical formation by this technique. Stability of 2-(4-amino-1,5-dimethyl-2-phenyl)-1,2-dihydro-pyrazol-3-ylide namino)phenol with metal ions was investigated by Gauda *et a[11]*. Hashem *et al[12]* carried out conductometrically investigation of antihistaminic diphenhydramine hydrochloride using silver nitrate as a titrant. Surface and thermodynamic investigation of micellization of surfactants in binary mixture of 1,2-ethanediol and 1,2,3-propanetriol with water was carried out by Fenta[13]. Micellization behavior of bile salt with disprine was studied by Sing and Sar[14]. Shedlovsky and Kay[15] used experimental data from conductometric study of aqueous solutions of sodium benzoate, sodium salicylate, sodium bromide and nicotinamide with and without nimesulide for its effect on water. Conductometric investigations are very useful to determine thermodynamic parameters such as ΔG, ΔH, ΔS.

Present work concern to study of thermodynamic parameters of 5-p-chlorophenyl- thiocarbamido-1-naphthol at different concentration and different temperatures (298K and 303K). Shedlovsky method used for data analysis. Recently observed values of association constant at various concentrations which help to examine thermodynamic parameters like ΔH; ΔS and ΔG. Resultant values help to study of different interactions.

MATERIAL AND METHOD:

Experimental Section

In present investigation used all freshly prepared solution. All A.R. grade chemicals used during experiment. Solvents were purified by standard method. Prepared 0.01M, 0.005M. 0.0025M and 0.0012M solutions of 5-p-Chlorophenylthio - carbamido-1-naphthol. Maintain thermal equilibrium (298K and 303K) of drugs solution by using thermostat. To measured conductance after getting thermal equilibrium,

RESULT AND DISCUSSION:

Firstly prepared 0.01 M solution then by serial dilution method prepared solutions of 0.005M, 0.0025M and 0.0012M with 70% ethanol-water mixture respectively. Measured conductance of each solutions by using conductivity bridge at 298K and 303K respectively . Resultant data tabulated in **Table-1.** Observed conductance (G), specific conductance (k) and molar conductance (μ) were determined by known literature method.

TABLE – 1- CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF 5-p-CHLOROPHENYLTHIOCARBAMIDO-1-NAPHTHOL DETERMINATION OF G, k and μ At 70% Ethanol-Water Mixture				
Temp.	**Concentration C (M)**	**Observed conductance (G)**	**Specific conductance (k)**	**Molar conductance (μ)**
298k	0.01	0.01493	0.001741 X 10^{-3}	0.174183333
	0.005	0.01145	0.001378 X 10^{-3}	0.275697005
	0.0025	0.01044	0.001329 X 10^{-3}	0.531771429
	0.0012	0.00982	0.001256 X 10^{-3}	1.046729245
303k	0.01	0.01772	0.002113 X 10^{-3}	0.211313369
	0.005	0.01352	0.001678 X 10^{-3}	0.335605029
	0.0025	0.01226	0.001557 X 10^{-3}	0.622956606
	0.0012	0.01052	0.001333 X 10^{-3}	1.110874183

Determine the specific constant (Ksp), log (Ksp) and thermodynamic parameters viz. change in free energy (ΔG), change in entropy (ΔS) and change in enthalpy (ΔH) of [p-MPTCN] at various molar concentration and at same temperature by known literature methods. The results obtained were given in **Table-2.**

TABLE-2 : CONDUCTOMETRICALLY DETERMINATION OF Ksp, Log Ksp, ΔG, ΔH and ΔS AT DIFFERENT CONCENTRATION and DIFFERENT TEMPERATURES IN 70% ETHANOL-WATER MIXTURE SYSTEM: 5-p-CHLOROPHENYLTHIOCARBAMIDO-1-NAPHTHOL L_3-[p-CPTCN]						
Temp	**Conc. C (M)**	**Ksp 10^{-3}**	**Log Ksp**	**ΔG**	**ΔH**	**ΔS**
298 K	0.01	0.01312	-4.88404	27867.62	-88108.3	-389.181
	0.005	0.008181	-5.08725	29027.1	-91774.2	-405.374
	0.0025	0.007610	-5.11873	29206.69	-92341.4	-407.879
	0.0012	0.006790	-5.16803	29487.98	-93229	-411.802
303K	0.01	0.01630	-4.78672	27770.54	-89248.9	-386.203
	0.005	0.01031	-4.98697	28932.35	-92982.8	-402.36
	0.0025	0.008881	-5.05178	29308.3	-94191.3	-407.589
	0.0012	0.006521	-5.18688	30092.12	-96710.2	-418.49

CONCLUSION:

Table-1 showed that observed conductance (G), specific conductance (k) decreases while molar conductance (μ) were increases continuously along decreasing molar concentrations from 0.01 to 0.0012 M. The observe conductance, specific conductance and molar conductance increases along with increasing temperature from 298 K to 303 K.

Table-2 revel that when value of Ksp, log Ksp , ΔH and ΔS decreases continuously while ΔG increases along with decreasing molar concentration from 0.01M to 0.0012M, While the value of Ksp, log Ksp , ΔH and ΔS decreases continuously while ΔG increases along with increasing temperature. The

positive values of change in free energy (ΔG) indicate non-spontaneous dissociation reaction. The negative values of change in enthalpy (ΔH) for the dissociation process suggest that all the dissociation reactions are exothermic and favorable. These parameters directly influence by structure as well as nature of drugs. The change in thermodynamic parameters values closely affected by molar concentrations and Temperature. These parameters shackle by another factors viz. the solute (drug)-solvent interactions, solvent-solvent interactions, solvent-solvent-solute interactions and solute-solute-solvent interactions. Variation in these parameters affected by the internal geometry as well as internal and intra hydrogen bonding. This investigation supporting to pharmacodynamics and pharmaco - kinetics study of drugs.

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