# STUDIES IN THE CONDUCTROMETRIC EXAMINATIONS OF 5-*P*-TOLYL-THIOCARBAMIDO-1-NAPHTHOL AT DIFFERENT CONCENTRATIONS OF SOLUTE IN 75% ETHANOL-WATER MIXTURE AT CONSTANT TEMPERATURE

**S.Z.Jadhao**
Department of Chemistry, Rajaram College Kolhapur, 416004 (M.S.) India.

**Abstract:** Recently in this laboratory conductrometric examination of 5-p-tolylthiocarbamido-1-naphthol have been carried out at different concentrations of solute in 75% ethanol-water mixture at constant temperature for the determinations of G, K and μ values and thermodynamic parameters as ΔH, ΔS and ΔG at constant temperature. This investigation provided valuable information regarding to solute-solvents, solute–solute and solvent-solvent interactions, effect of various substituent's of drugs and effect of dilution from the conductometric measurements of 5-p-tolylthiocarbamido-1-naphthol.

**Key words:** Ion association constants, thermodynamic parameters, 5-p-tolylthiocarbamido-1-naphthol (L1).

**Introduction**:

Number of ions of electrolyte in solution decides the conduction of electrolytic solution. Conductrometric measurments of electrolytic solution provides valuable information related to solubility and permeability of medicines, 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 and dissociation rate and oral bioavailability of weakly water soluble drugs[2]. Hydrot
ropic solubalisation is considered as one of the sophisticated methods of solubalisation[3]. Enhance the aqueous solubalisation of insoluble drugs by adding hydrotropic agents. Number of researchers work on the effect of solubility enhancers[4-5] and due to that increase solubility of drugs but no detail explanation available regarding to these improving solubility. `The split of electrolyte conductivities into the ionic components ideally requires transference numbers, the accurate measurements of which present serious experimental problems in many non-aqueous solvents. Conductometric measurements provided valuable information about solute-solute and solute-solvent interactions which are useful for drug activity and drug effect[6]. Conductrometrically investigation of the ionic association of divalent asymmetric electrolyte $Cu(NO_3)_2$ with Kryptofix-22 in mixed (MeOH-DMF) solvents at different temperatures was carried out by Gomma and Al-Jahdalli[7]. Many researchers were studied the alkali metal at different proportion of mixed solvents by conductometrically [8-10]. Very few researchers investigated the thermodynamic parameter and Walden product of different complexes and they also examine the comparison of transition metal complexes among the halide group [11-12].

In this research work conductometric properties were examined to study the, thermodynamic behavior and Walden product of 5-p-tolylthiocarbamido-1-naphthol in 75% ethanol-water mixture at different concentrations and at constant temperature i.e. 415 K. Shedlovsky method[17] is used for the data analysis. Recently observed values of association constant at various concentrations which help to examine the thermodynamic parameters like ΔH; ΔS and ΔG for the formations. Resultant values help to examine the nature of different interactions.

**Experimental Section**

In present investigation used all the freshly prepared solution. All the chemicals and solvents used for the synthesis were of A.R. grade. The solvents were purified by standard method. Different concentration solutions of 5-p-tolylthiocarbamido-1-naphthol as, 0.01M, 0.005M. 0.0025M and 0.0012M were prepared by using 75% ethanol-water mixture. Maintain the thermal equilibrium (415 K) of drugs solution by using thermostat. After getting thermal equilibrium, conductivity of that electrolyte solution was measured.

**Result and Discussion**

Firstly the solution of 0.01 M concentration was prepared then by the serial dilution method the solutions of 0.005M, 0.0025M and 0.0012M with 75% ethanol-water mixturesw were prepared. Conductance of the each solution was measured by using conductivity bridge at 415 K.

The result obtained are given in **Table-1 and Table-2**

From the data observed conductance (G), specific conductance (k) and molar conductance (μ) were determined by known literature method.

**Table –1 Conductometric Measurements At Different Concentration of [P-MPTCN]**

**Determination of G, K and μ AT Different Concentrations At 415 K**

| % of solution (Water- ethanol) | Concentration C (M) | Observed conductance (G) | Specific conductance (k) | Molar conductance (μ) |
|---|---|---|---|---|
| 75% | 0.01 | 0.01928 | $2.289 \times 10^{-6}$ | 0.228851 |
| | 0.005 | 0.01279 | $1.577 \times 10^{-6}$ | 0.315261 |
| | 0.0025 | 0.00888 | $1.117 \times 10^{-6}$ | 0.446645 |
| | 0.0012 | 0.00842 | $1.056 \times 10^{-6}$ | 0.879626 |

**Table-1** showed that the observed conductance (G), specific conductance (k) decreases while molar conductance (μ) were increases continuously. The specific conductance decreases and molar conductance increases along with decreasing molar concentrations.

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 - Conductometric Measurements At Different Concentration Of Drug [P-MPTCN] | | | | | | |
|---|---|---|---|---|---|---|
| Determination OF Ksp, Log Ksp, ΔG,ΔH and ΔS AT Different Concentrations and at Same Temperature | | | | | | |
| System: [p-MPTCN] | | | Medium - 75% Ethanol-Water | | | |
| Temp T (K) | Conc. C (M) | Ksp | Log Ksp | ΔG | ΔH | ΔS |
| 298K | 0.01 | 0.019291 | -4.7174 | 27368.95 | -87959.8 | -380.612 |
| | 0.005 | 0.00910 | -5.04131 | 29247.65 | -93997.3 | -406.738 |
| | 0.0025 | 0.004577 | -5.34077 | 30984.99 | -99581.4 | -430.901 |
| | 0.0012 | 0.004097 | -5.38961 | 31268.35 | -100492 | -434.840 |

**Table-2** Showed that, when we moving from molar concentration 0.01M to 0.0012M concentration solutions the value of Ksp, log Ksp , ΔH and ΔS decreases continuously while ΔG increases. These parameters directly influence by the structure as well as nature of drugs. The change in thermodynamic parameters values closely affected by the temperature, molar concentrations and percentage compositions. 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.

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