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TO STUDY THE THERMODYNAMIC PARAMETERS OF SUBSTITUTED THIOCARBAMIDOPHENOL IN 60% ETHANOL WATER MIXTURE.

S.O.Mohod[1*] D.T.Tayade[2]

[1]Department of Chemistry, Government Vidarbha Institute of Science and Humanities, Amravati 444 604, Maharashtra State, India.
E-mail: seemamohod7@gmail.com, Mb.8149653713.

[2]Department of Chemistry, Government Vidarbha Institute of Science and Humanities, Amravati 444 604, Maharashtra State, India.
E-mail: skdtayade@gmail.com

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Abstract:

Recently in the laboratory conductometric investigation of 2-methyl thiocarbamidophenol (L_2) have been carried out at different concentration of solute in 60% ethanol-water mixture at constant temperature. G, k, μ values are determined. The thermodynamic parameters ΔH, ΔG and ΔS for the ion pair formation determine from the value of ion association constant at different temperature i.e. 298.15K and 303.15 K. This measurement revealed that solvent-solvent, solute-solvent and solute-solute interaction and the effects of various substituents.

Key Words: *Substituted thiocarbamidophenol, ion association constant, thermodynamic parameters.*

Corresponding Author:

S.O.Mohod,

Department of Chemistry,
Government Vidarbha Institute of Science and Humanities,
Amravati 444 604, Maharashtra State, India.
E-mail: seemamohod7@gmail.com, Mb.8149653713

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INTRODUCTION:

The conduction of electrolytic solution can be explained by number of ions of electrolyte in solution. The theory of the electrolytic solution introduced by Shedlovsky. System in which electric current conveyed by the ions (monoatomic or polyatomic) which are electrically charged called as electrolytic solution. Chemical structure and composition of the electrolyte alongside its concentration impact the properties of electrolytic solutions. Aqueous solutions of electrolytes are essentially classified as strong electrolyte and weak electrolyte for a given stoichiometric concentrations. By using conductance measurements methods characteristic parameters of a given electrolyte can be investigated. Rounghi and Kakhki[1] investigated thermodynamic study of complex formation between dibenzo-18-6 and UO_2^{2+} cation in different non-aqueous binary solutions. Chandra and Maisuria[2] investigated thermodynamic parameters of metal complexes of Fe(II), Co(II), Ni(II) and Cd(II) with 1,10-phenanthroline in water, methanol and water-methanol binary solvent systems at 298.15K and 308.15K by conductometric method. Thermodynamic study of complex formation between azamacrocyclic ligand with Cu^{2+} and Fe^{2+} cations in MeOH-H_2O binary solvents were investigated by Rezayi *et al*[3]. Burghate *et al*[4] investigated thermodynamic study of complex formation of N-Benzothiazol-2-yl-3,5-disubstituted pyrazolines with some transition metals. Conductometric study of complex formation between Cu(II) ion and 2-hydroxyimino-3-(2-hydazonopyridyl)-butane was reported by Gomaa and Hassan[5]. Ahmadzadeh *et al*[6] studied thermodynamic parameters of complexation of p-isopropylcalix[6]arene with Cs^+ cation in dimethylsulfoxide-acetonitrile binary media. Tarahomi *et al*[7] investigated thermodynamic parameters of interaction of Na^+ cation with benzo-15-crown-5 in binary mixed non-aqueous solvents. Smetana and Popov studied[8] the influence of ionic strength on the equilibrium constant of a non-molecule reaction. Thermodynamic studies on metal complexes of Co^{2+}, Ni^{2+}, Cu^{2+} and Cd^{2+} with 8-hydroxy-5-quinolinesulfonic acid in water, methanol and water-methanol binary solvent systems at 303.15K, 313.015K and 323.15K conductometrically by Maisuria *et al*[9]. Asghar *et al*[10] investigated complex formation between Cu(II) ion and 4-amino-3-ethyl-1,2,4-triazol-5-thione in binary ethanol-water mixtures.

In this study, the investigation of 2-methyl thiocarbamidophenol at different concentration at different temperature (298.15 K, 303.15 K). 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-methyl thiocarbamidophenol were prepared. 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 60% ethanol-water mixture. The conductances of solutions were measured by using conductivity bridge at 298.15 K and 303.15 K .

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_2 [MTCP]

DETERMINATION OF G, k and μ AT DIFFERENT CONCENTRATIONS AND TEMPERATURE 298.15K and 303.15K

% of solution (Ethanol-water)	Concentration C (M)	Observed conductance (G)	Specificconductance(k) x 10^{-3}	Molar conductance (μ)
60%	0.1 M	0.007	0.000725	0.007249
	0.05 M	0.005	0.000617	0.012334
	0.025 M	0.003	0.000386	0.01545
	0.0125 M	0.002	0.000266	0.021264
60%	0.1 M	0.008	0.000933	0.009333
	0.05 M	0.008	0.000963	0.019263
	0.025 M	0.007	0.000891	0.035655
	0.0125 M	0.006	0.000767	0.061397

TABLE 2- CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF L_2[MTCP]						
DETERMINATION OF Ksp, log Ksp, ΔG,ΔH and ΔS AT DIFFERENT CONCENTRATIONS AND TEMPERATURES						
SYSTEM:LIGAND-2 [MTCP]			MEDIUM - 60% Ethanol-Water Mixture			
Temp T (°C)	**Conc. C (M)**	**Ksp**	**Log Ksp**	**ΔG**	**ΔH**	**ΔS**
298.15K	0.1	0.0026808	-2.57173	14427.71	161180.76	500.86
	0.05	0.0019403	-2.71213	15215.33	105110.25	306.81
	0.025	0.0007612	-3.11850	17495.12	-8279.97	-87.97
	0.0125	0.0003605	-3.44314	19316.38	-73354.96	-316.28
303.15K	0.1	0.0008835	-3.05379	17424.44	-55086.27	-243.32
	0.05	0.0009408	-3.02649	17268.67	-54591.86	-241.14
	0.025	0.0008059	-3.09373	17652.38	-55810.59	-246.52
	0.0125	0.0005974	-3.22375	18394.22	-58156.61	-256.88

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 [MTCP] at various molar concentration at different temperature which is shown in **Table-2**

CONCLUSION:

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

Table-2 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 increases with increasing temperatures. 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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