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Conductometric Measurments of 3-(2-hydroxy-3-nitro-5-methyl) phenyl-6-amino-1,2,5-thioxazine in 50% Ethanol–Water Mixture at Different Temperatures

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Abstract

Recent research work deals with the conductometric measurement of 3-(2-hydroxy-3-nitro-5-methyl) phenyl-6-amino-1,2,5-thioxazine at different temperatures by keeping constant concentration(0.1M) .These measurements provide information regarding with solute-solvent interaction, effect of temperatures and effect of dilution and solvent. The various thermodynamic parameters viz. ΔH^0; ΔS^0 and ΔG^0 for the ion pair formation are determined from the value of ion association constant at constant concentration (0.1M). These also revealed that solvent-solvent, solute-solvent and solute-solute interactions and the effects of various substituent's.

Keywords

3-(2-hydroxy-3-nitro-5-methyl)phenyl-6-amino-1,2,5-thioxazine, thermodynamic parameters, ion association constants

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INTRODUCTION

Conductometric measurements of the electrolyte in the solution gives valuable information regarding the solubility and permeability of the drugs, these two are prime biopharmaceutical parameters which are accountable for effective bioavailability and good in vitro and vivo correlation[1]. Now a days pharmaceutical technologists have a great challenge to improve the solubility, dissolution rate and oral bioavailability of weakly water soluble drugs[2]. Hydrotropic solubilization is considered as one of the sophisticated methods of solubalisation[3]. It enhances the aqueous solubility of insoluble drugs by addition of hydrotropic agents. The researchers have worked 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 measurement of which presents serious experimental problems in many non-aqueous solvents. The valuable information about solute-solute and solute-solvent interaction are obtained through conductometric measurements[6]. Gonna and Al-Jahdalli[7] investigated the ionic association of divalent asymmetric electrolyte $Cu(NO_3)_2$ with Kryptofix-22 in mixed (MeOH-DMF) solvents at different temperatures by conductometric measurements. Conductometric measurements of alkali metals in different proportions of mixed solvents were carried out by Izonfuo and Obunwo[8] and Roy et al[9]. Very few researchers investigated the thermodynamic parameter and Walden product of different complexes and they also examined the comparison of transition metal complexes among the halide groups[10,14] . The ion pair formation and thermodynamic parameters of glycine bis-1-amidino-o-methylureacobalt(III) halides in water-methanol mixture at different temperatures were investigated by Singh *et al*[15]. Solanki *et al*[16] investigated the conductance of Nimesulide in aqueous solutions of hydrotropic agents at different temperatures. Shedlovsky method[17] was used for the data analysis. Observed value of ion associated constant at different temperatures helps to study of the various thermodynamic parameters viz. ΔH^0; ΔS^0 and ΔG^0 for the formation. The nature of different interactions to examine in detail from the observed values .

The present work is carried out for investigation of conductometric properties, thermodynamic behavior and Walden product of 3-(2-hydroxy-3-nitro-5-methyl) phenyl-6-amino-1,2,5-thioxazine in 50% ethanol-water mixture at different temperatures keeping the concentration constant (0.1M).

MATERIALS AND METHODS

For the present investigation all freshly prepared solution were used. All the chemicals and solvents used for the synthesis were of analytical grade. The solvents were purified by standard methods. A concentrated (0.1M) solution of 3-(2-hydroxy-3-nitro-5-methyl)phenyl-6-amino-1,2,5-thioxazine by using 50% ethanol-water

mixture. Maintain the thermal equilibrium of drugs solution by using thermostat at different temperatures. After getting thermal equilibrium, conductivity of electrolyte solution was measured.

RESULTS AND DISCUSSION

The conductance of each electrolyte solution of drug was measured at different temperatures with help of Conductivity Bridge. In this investigation 50% mixture of water-ethanol was used for the conductance measurements. A 0.1M solution of 3-(2-hydroxy-3-nitro-5-methyl)phenyl-6-amino-1,2,5-thioxazine was prepared by using 50% mixture of water-ethanol. All the results obtained are computed in **Table 1** and **2**.

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

Table 1 reveals that the observed conductance (G), specific conductance (k) and molar conductance (μ) increases along with increase in temperature. The specific conductance increases with increasing temperature.

Calculated values of specific constant (Ksp), log (Ksp) and thermodynamic parameters viz., (ΔG), (ΔS) and (ΔH) of 3-(2- hydroxy-3-nitro-5-methyl)phenyl-6-amino-1,2,5-thioxazine were complared by known literature methods at different temperatures with same concentration(0.1M). Obtained result computed in **Table 2**.

Table 1 Conductometric measurements at different temperatures determination of G, k and μ at different temperatures.

% of solution	Concentration (M)	Temperature (°C)	Observed conductance (G)	Specific conductance (k)	Molar conductance (μ)
50%	0.1 M	23°C	$1.019X1O^{-3}$	0.001260	12.62
	0.1 M	26°C	$1.259\ X1O^{-3}$	0.001255	12.71
	0.1 M	29°C	$1.378\ X1O^{-3}$	0.001341	13.10

Table 2 Conductometric measurements at different temperatures determination of Ksp, log Ksp, ΔG,ΔH and ΔS at different temperatures keeping the same concentration.

SYSTEM:LIGAND [CPHDD]		MEDIUM - 50% WATER ETHANOL				
Conc. [M]	Temp T(°C)	Ksp	Log Ksp	ΔG	ΔH	ΔS
0.1 M	23	0.001264	-2.8990	1776343	0.003945	-55511.37
	26	0.001269	-2.9015	1644341	0.003744	-54951.57
	28	0.001341	-2.9752	1541773	0.003433	-5467.60
	32	0.001395	-2.9768	1476364	0.002423	-54311.39

Table-2 reveals that the values of Ksp, log Ksp, ΔH and ΔS increases continuously while ΔG decreases with gradually increase in temperature. These parameters are directly influenced by the structure as well as nature of drugs. The change in thermodynamic parameters values are 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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