VISCOMETRIC STUDIES OF MOLECULAR INTERACTIONS INPHENOTHAZINE DRUG IN ACETONE-WATER SOLVENT AT DIFFERENT TEMPERATURES

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ABSTRACT

Measurements of density and viscosity have been carried out for Phenothiazine drug at different temperatures in acetone water medium. Viscosities and densities of present system have been measured at 298K,303K,308 & 313 K. Using above data various parameters such as relative viscosity,Falkenhagen coefficient A, Jones Doles coefficient B and thermodynamicparameters have been computed. The results are interpreted on the basis of solute-solvent and solute-solute interactions.

Keywords: *Phenothazine drug, thermodyanamic parameters.*

Introduction

The studies on viscometricmeasurements has been regarded as a sensitive tool for understanding various interactions occurs in the solutions of liquid mixtures and their dependence on composition and temperature are of importance in many fields of applied research. Viscosity and its derived parameters provide the valuable information regarding molecules.

Viscometry[1-2] is an important tool in order to elucidate the solute – solvent interaction and nature of a solute as a structure maker or a structure breaker. Viscosity provides an insight into the stage of association of the solute and extent of its interaction with solvent. The nature and degree of molecular interaction in different solution depends upon several factors i.e. the nature of the solvent, the structure of the solute and also the extent of solvation taking place in the solution.Viscosity is one of the physical properties of the liquid and gas as it implies resistance to flow, as fluid exhibit a characteristics property of flowing under applied force, even the force of their own weight, physical properties of liquid and binary mixture have been the subject of interest in research laboratories. [3-5]In recent years, considerable efforts have been given for the elevation of ideal and excess thermodynamic quantities of binary and ternary liquid mixtures [6-7]

The study of molecular interaction in the liquid mixtures is of considerable in the elucidation of the structural properties of the molecules.The nature and degree of molecular interactions in different solutions depend upon the nature of the medium, the structure of the solute molecule and also the extent of solvation taking place in solution.For the present study drug *10- [3- (4- Methyl- 1- piperazinyl)propyl]- 2- (trifluoro methyl)- 10 H-phenothiazine]* is selected. This drug is used as neuroleptic. Acoustic parameters provide a better insight into molecular environment to liquid mixtures, it seemed important to study molecular interactions, which motivated theauthors to carry out the present investigation in the binary liquid mixtures of *Phenothazine drug*with acetone-water solvent at different temperatures.

Materials and Methods

Solventacetone used in the present work was of AR grade, purified and dried by the usual procedure. Densities, viscosity, relative viscosity and specific viscosity were measured at different temperatures over a wide range of composition. Densities were determined by using bicapillarypyknometer. The Viscosities (η) of pure compounds and their mixtures were determined using Oswald's Viscometer calibrated with double distilled water [8,9]. All the measurements were carried out at different temperatures.

Ligand solutions of different concentration were prepared in 20% acetone-water of *Phenothazinedrug*. For each measurement sufficient time was allowed to attain thermal equilibrium in thermostat.

Table 1

System-TFP in 20% Acetone – Water medium

Conc mol dm^{-1}	At 298 K					At 303 K				
	Density $x10^3$ Kg m^{-3}	Time flow in sec	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp Viscosity	Density $x10^3$ Kg m^{-3}	Time flow in sec	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp Viscosity
0.02	0.99461	65.1	0.50508	0.93514	-0.84277	0.99399	63.3	0.49831	0.96024	-0.68908
0.04	0.99482	65.5	0.50829	0.94109	-0.56793	0.99404	63.4	0.49912	0.96181	-0.47990
0.06	0.99502	65.7	0.50995	0.94415	-0.45194	0.99408	63.5	0.49993	0.96336	-0.38586
0.08	0.99537	65.8	0.51090	0.94592	-0.38549	0.99419	63.7	0.50156	0.96650	-0.32373
0.1	0.99584	65.9	0.51192	0.94780	-0.33918	0.99421	63.9	0.50314	0.96956	-0.28047
	At 308 K					At 313 K				
0.02	0.99253	59.7	0.46820	0.93790	-0.84307	0.99041	57.9	0.44871	0.95467	-0.72939
0.04	0.99286	59.8	0.46914	0.93978	-0.58729	0.99088	58	0.77969	0.95677	-0.50588
0.06	0.99309	60.1	0.47160	0.94471	-0.46061	0,99108	58.1	0.45056	0.95862	-0.40598
0.08	0.99332	60.3	0.47328	0.94808	-0.38773	0.99124	58.3	0.45218	0.96207	-0.34011
0.1	0.99354	60.5	0.47495	0.95143	-0.33683	0.99158	58.5	0.45389	0.96570	-0.29341

Table 2

Values of Falkenhagen coefficient A, Jones – Dole coefficient B, at different temperatures in acetone water medium

System-TFP

Temp T (K)		298 K	303 K	308 K	313 K
20% Acetone-	A	-1.188	-0.978	-1.204	-1.037
Water medium	B	2.832	2.306	2.872	2.457

Results and Dscussion

The densities and viscosities of Trifluoperazine hydrochloride (TFP), 20% acetone- water medium at 298K,303K , 308K and 313 K have been measured in the concentration range 0.02 to 0.1 mol/dm^3. The viscosity data were analyzed for A and B coefficients using Jones – Dole equation. The viscosity A and B coefficients have been computed by the least squares method from the plot of (ηr -1/ $\sqrt{c}$) vs$\sqrt{c}$. A is measure of ion-ion interactions and B is measure of solute-solvent interaction has been calculated and listed in table.

In the present study viscosity of liquid solutions increases with increase in concentration of antipsychotic drugs salts solution in 20% acetone-water mixture and decreases with increase in temperature. The increasing values of density and viscosity shows that there is a moderate attraction with solute and solvent molecules The decrease values with increase of temperature shows a decrease in intermolecular forces due to increase thermal energy of the system. The increase in viscosity with increase in concentration may be attributed to the increase in solute solvent interactions.

Observation of above data shows that the viscosity A- coefficients are found to be negative. The viscosity A coefficient represent the ion ion interactions and negative values have shown some physical significance. However negative A values have also been reported to be in other solvents in some studies.[10-13]

The large and small value of 'A' shows the stronger and weaker solute – solute interactions respectively. When solute is introduced in to solvent of organic-water mixture it will interfere with the ordered structure of water in the solutes co-sphere. As only one solute is present so such variation in the values of A can be explained.

It is evident from table 2 that the B coefficient is an adjustable parameter, which may be either positive or negative and it is a measure of the effective hydrodynamic volume of solute which accounts for the solute solvent interactions. Viscosity B coefficients have been established to arise from ion- solvent interactions and are responsible for introducing order or disorder in the structure of the solvent. Solute with negative B Coefficient is characterized as structure breakers indicating weak solute -solvent interactions.The values of viscosity A and B coefficients responsible for solute - solute and solute - solvent interactions.

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