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STUDY OF MOLECULAR INTERACTION OF THIOXANE IN PENTANOL-1 AND HEXANOL-1 AT 303K ULTRASONICALLY

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ABSTACT

Densities, ultrasonic velocities and viscosities of binary mixtures of thioxane in pentanol-1 and hexanol-1 have been measured over entire range of composition at 303K and atmospheric pressure. From experimental values of ultrasonic velocity, density and viscosity, the excess isentropic compressibility (βs^E) and excess viscosity (η^E) have been computed. Deviation in βs^E and η^E throw light on the molecular interaction between molecules.

Keyword: Molecular Interaction, Thioxane, Pentanol-1, Hexanol-1, Ultrasonically.

I. INTRODUCTION

Ultrasonic velocity, density and viscosity related parameters such as isentropic compressibility, molar volume and available volume yield valuable information about molecular interaction between non-polar and polar molecules. The interaction behavior is due to deviation from ideality cause the solvent interaction [1-3] ,Subbarangaiah et al [4] and Erying & Hirchfelder [5] investigated ultrasonic behavior of aqueous solution and discuss the results by hydrogen bonded complex formation. Verma et al [6-10] reported various thermodynamic compressibility, molar volume and viscosity for binary mixtures of thioxane in alcohols.

II. EXPERIMENTAL

Thioxane, pentanol-1 and hexanol-1 were used after single distillation.. Care were was taken to avoid contamination during mixing. Ultrasonic velocity was measured by Ultrasonic Interferometer M-80 manufactured by M/S Mittal Enterprises, New Delhi having accuracy of about 0.015.Density of pure liquid and mixtures were measured by using double walled picknometer. The picknometer was calibrated with distilled water. The value obtained were tally with the literature value. The viscosities have been determined by using Ostwald viscometer. The accuracy in viscosity measurements was 0.0002cp.

Isentropic compressibility were calculated using following relation

$$Bs=1/v^2\ \rho$$

Where v is ultrasonic velocity and ρ is density

Excess isentropic compressibility have been calculated by formula

$$' = \beta s exp - (X_1 \beta s_1 + X_2 \beta s_2)$$

Where βs exp and are isentropic compressibility of mixture and pure component 1 an respectively and are mole fraction of component 1 and 2.Excess viscosity has been calculated by using the relation,

$$= \eta exp - (X_1\eta_1 + X_2\eta_2)$$

III. RESULT AND DISCUSSION

The ultrasonic velocity, density, excess isentropic compressibility and excess viscosity of thioxane with pentanol-1 and hexanol-1 are given in Table-1 and Table-2.

Table-1 Mole fraction (X1) of thioxane, ultrasonic velocity, density, excess isentropic compressibility and excess viscosity of thioxane with pentanol-1 at 303K

Molefraction (X1)	Ultrasonic velocity v(m/s)	Density ρ(gm/l)	Excess isentropic compressibility β_s^E (cm2/dyne) 1012	Excess viscosity ηE(cp)
0.0000	1260	0.8248	0.00	0.0000
0.1213	1380	0.8543	-11.28	0.0119
0.2370	1381	0.88366	-9.92	0.0222
0.3475	1382	0.9115	-8.50	0.0261
0.4531	1383	0.9380	-8.04	0.0280
0.5541	1384	0.9633	-5.55	0.0319
0.6508	1385	0.9894	-4.15	0.0277
0.7436	1386	1.0144	-2.75	0.0239
0.8325	1387	1.0385	-1.34	0.0196

0.9179	1388	1.0617	-0.06	0.0195
1.0000	1410	1.0948	0.00	0.0000

Table-2.Mole Fraction(X1) of thioxane,ultrasonic velocity,density,excess isentropic compressibility and excess viscosity of thioxane with hexanol-1.

ole Fraction of Thioxane X1	**rasonic velocity v m/s**	**nsity ρ gm/l**	**cess isentropic compressibility βsE cm2/dyne.1012**	**cess viscosity ηE cp**
000	5	356	0	000
338	4	572	30	108
579	3	971	34	217
733	9	246	50	249
310	2	503	24	286
316	9	746	30	311
759	9	989	12	274
644	9	221	43	228
476	7	439	60	179
260	4	646	60	102
000	0	348	0	000

As it can be seen from Table-1 that ultrasonic velocity increases

With increase in mole fraction of thioxane. It is obvious that the moles of thioxane are so dense that their density is more in comparable to pentanol-1.

As it can be seen from Table-2 that ultrasonic velocity increases with increase in mole fraction of thioxane. It is obvious that the moles of thioxane are so dense that their density is more in comparable to hexanol-1.

The βsE values are negative for thioxane with pentanol-1 as well as thioxane with hexanol-1.

The ηE values are positive for thioxane with pentanol-1 as well as thioxane with hexanol-1.

The negative deviation in isentropic compressibility i.e., -ve βsE expects nonspecific molecular interaction between the unlike molecules. The tabulated experimental and computed data throw light on molecular interaction. The nature and extent of acoustic properties define molecular interaction between the binary mixtures.

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