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Ultrasonic Measurements of PTP At 70% Ethanol-Water Composite

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ABSTRACT: Recently in last four decades many evolutions and new theories in applied, agricultural, medicinal, industrial and forensic sciences and biochemical sciences were observed and updated through ultra sound and ultrasonic wave's measurements. Recently ultrasonic velocity and density for solutions of PTP at different molar concentrations and 303K, in 70% compositions ethanol-water mixtures have been investigated for determination of acoustic parameters viz. β , ϕ_k , ϕ_v , L_f , R_A and Z , which provide important and versatile information regarding internal structure, molecular association.

KEYWORDS: 4-(p-Chloro)phenylthiocarbamidophenol (PTP), interferometric measurements, acoustic properties, solute-solvent interaction.

I. INTRODUCTION

Ultrasonic is the branch of acoustic, which consists of waves of high frequencies. Ultrasonic is the technique used for the study of molecular interaction in liquids. The study of molecular interaction in liquids provides valuable information regarding internal structure, molecular association, complex formation, internal pressure and stability of molecule¹. Ultrasonic parameters are used extensively to study molecular interactions in pure liquids²⁻⁴, liquid mixture⁵⁻⁶ and electrolyte solution⁷⁻⁹. Aswaleet al¹⁰ determined acoustic properties of substituted ketonic compounds in ethanol-dioxan composite. An acoustical study of toluene-cyclohexane-nitrobenzene was successfully carried out¹¹. Ultrasonic study of binary liquid mixture of diethyl ether with three non-polar solvents viz. as CCl_4 - CS_2 - C_6H_6 was studied¹².

Now-a-days dynamic studies in the research of ultrasonic are continuously going on due to its gigantic scope in chemical, physical, mechanical and biological sciences. Taking all these things into consideration, present investigation was carried out for the determination of ultrasonic velocity and density for solutions of PTP at different molar concentrations and 303K, in 70% compositions ethanol-water mixtures have been investigated for determination of adiabatic compressibility (β), apparent molal compressibility (ϕ_k), apparent molal volume (ϕ_v), intermolecular free length (L_f), relative association (R_A) and specific acoustic impedance (Z).

II. MATERIALS AND METHODS

AR grade chemicals were used during present investigation. 0.1M, 0.075M, 0.050M and 0.025M solutions of PTP in 70% ethanol-water mixture were prepared. Ethanol was purified by standard procedure¹³. Densities were measured with the help of bicapillary pycnometer ($10.1 \text{ \% kg m}^{-3}$). Weighing were made on Citizen CY 104 one pan digital balance ($\pm 0.0001 \text{ gm}$). A special thermostatic arrangement was done for density and ultrasonic velocity measurements. Elite thermostatic bath was used, in which continuous stirring of water was carried out with the help of electric stirrer and temperature variation was maintained within $\pm 0.1 \text{ }^\circ\text{C}$. The speed of sound waves was obtained by using variable path, Single crystal interferometer (Mittal Enterprises, Model MX-3) with accuracy $\pm 0.03\%$ and frequency 1 MHz was used in the present work. The densities and ultrasonic velocity of liquids in ethanol solvent were measured at 303 K for the calculation of intermolecular free length and the value of Jacobson's constant¹⁴ ($K = 631$) was taken.

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III.RESULTS AND DISCUSSION

In the present investigation measurement of densities and ultrasonic velocities of PTP in 70% ethanol-water mixture had been carried out and given in Table No.1

Table no. 1: Acoustic Parameters at Different Concentration of [L2] at 303K

W-E Mix. %	Conc. C (Mole/lit)	Average Ultrasonic Velocity Us (m/sec)	Density d _s (Kg.m ⁻³)	βs×10 ⁻¹⁰ (pa ⁻¹)	φ _v (m ³ mol ⁻¹)	φ _k ×10 ⁻¹⁰	L _r (A ₀)	R _A	Z * 10 ⁴ (Kgm ⁻² sec ⁻¹)
70	0.1	1489.587	1030.32	4.3235	0.2845	-2.3711	0.0163	1.004	150.319
	0.075	1322.591	1028.32	5.4854	0.3229	11.775	0.018	1.040	132.491
	0.050	1217.366	1021.32	6.4901	0.3256	33.577	0.0193	1.063	121.016
	0.025	1072.416	1016.22	8.3733	0.3763	89.430	0.0216	1.102	105.582

IV. CONCLUSION

Table-1 reveals resultant values of acoustic parameters of PTP at (0.1M, 0.075M, 0.050M and 0.025M) and 303K in 70% ethanol-water mixture, from Table-1 it was concluded that Ultrasonic Velocity: (Us), Density: (ds) decreases while Adiabatic compressibility: (βs), Apparent molar volume: (φ_v), Apparent molar compressibility: (φ_k), Intermolecular free length: (L_r), Relative association: (R_A) and Specific acoustic impedance: (Z) increases along with decreasing concentration of PTP at 303 K. By using ultrasonic interferometric study Us, ds, βs, φ_v, φ_k, L_r, R_A, z etc. acoustic properties were determined, which explain how these interactions occur and responsible for breaking and making of the structure in the solution.

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