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STUDIES OF MOLECULAR INTERACTION OF COMBINE DRUG IN 0.01M SODIUM CHLORIDE

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ABSTRACT
Acoustical properties have been studied for combine drug in solution of 1% sodium Chloride at different temperature. The measurement have been perform to evaluate acoustical parameter such as adiabatic compressibility (βs), Partial molal volume (ϕ_v), intermolecular free length (L_f), apparent molal compressibility (ϕ_κ), specific acoustic impedance (Z), relative association (R_A), solvation number (Sn) and also studied the molar polarization.

KEYWORD: Ultrasonic velocity, intermolecular free length, relative association.

INTRODUCTION
In the recent years, measurements of the Ultrasonic velocity are helpful to interpreted solute-solvent, ion-solvent interaction in aqueous and non aqueous medium.[1] Fumio Kawaizumi[2] have been studied the acoustical properties of complex in water. Jahagirdar et. al. has studied the acoustical properties of four different drugs in methanol and he drawn conclusion from adiabatic compressibility. The four different drugs compress the solvent methanol to the same extent but it shows different solute-solvent interaction due to their different size, shape and structure.[3] Meshram et al studies the different acoustical properties of some substituted Pyrazolines in binary mixture acetone-water and observed variation of ultrasonic velocity with concentration.[4] Palani have investigated the measurement of ultrasonic velocity and density of amino acid in aqueous magnesium acetate at constant temperature.[5] The ion-dipole interaction mainly depends on ion size and polarity of solvent. The strength of ion-dipole attraction is directly proportional to the size of the ions, magnitude of dipole. But inversely proportional to the distance between ion and molecules. Voleisines has been studied the structural properties of solution of lanthanide salt by measuring ultrasonic velocity.[6] Syal et al has been studied the ultrasonic velocity of PEG-8000, PEG- study of acoustical properties of substituted heterocyclic compounds under suitable condition.[7] Tadkalkar etal have studied the acoustical and thermodynamic properties of citric acid in water at different temperature.[8] Mishra et al have investigated ultrasonic velocity and density in non aqueous solution of metal complex and evaluate acoustic properties of metal complex.[9] M. Arvinthraj et al have determined the acoustic properties for the mixture of amines with amide in benzene at 303K-313K. They also determined thermodynamic parameters.[10] Thakur et al have studied the different acoustical parameters of binary mixture of 1-propanol and water.[11]

After review of literature survey the detail study of combine drug of aceclofenac, paracetamol, serratiopeptidase in solution of 0.01M sodium Chloride under identical set of experimental condition is still lacking. It was thought of interest to study the acoustical properties of combine drug system under suitable condition.

Experimental
The solution of 2% is prepared in 0.01M sodium Chloride solution. This sodium chloride solution in double distilled water. The constant temperature was maintained by circulating water through the double wall measuring cell, made up of glass. The density was determined by using specific gravity bottle by relative measurement method with accuracy $\pm 1x10^{-5}$ gm/cm^3. The ultrasonic velocity was measure by using ultrasonic interferometer having frequency 3MHz (Mittal Enterprises, Model No F-82). The constant temperature is mentioned by circulating water through the double wall measuring cell made up of steel.

In the present investigation different parameters such as adiabatic compressibility (βs), apparent molal volume (ϕ_v), intermolecular free length (L_f), apparent molal compressibility (ϕ_κ), specific acoustic impedance (Z), relative association (R_A), Solvation number (S_n) were studied.

$$Adiabetic\ comprressibility(\beta o) = \frac{1}{Uo^2 do}$$

$$Adiabetic\ comprressibility(\beta s) = \frac{1}{Us^2 ds}$$

$$\text{Apparent molal volume}(\phi_v) = \left(\frac{M}{ds}\right) x\ \frac{(d_0 - d_s)x10^3}{m\ x\ d_s\ x\ d_0}$$

$$\text{Apparent molal compressibility}(\phi_k) = 1000x\ \frac{(\beta_s d_0 - \beta_0 d_s)x10^3}{m\ x\ d_s\ x\ d_0} + \frac{\beta_s M}{d_0}$$

$$\text{Specific acoustic impedance } (Z) = U_s d_s$$

$$\text{Intermolecular free length } (L_f) = K\sqrt{\square}d$$

$$\text{Solvation number}(Sn) = \frac{\phi_k}{\beta_0 \left(\frac{M}{d_0}\right)}$$

RESULTS AND DISCUSSION

In the present investigation, different acoustic parameters, such as adiabatic compressibility (βs), Partial molal volume (ϕ_v), intermolecular free length (L_f), apparent molal compressibility (ϕ_κ), specific acoustic impedance (Z), relative association (R_A), salvation number(Sn).

From table-1, these found that ultrasonic velocity increases with increase in temperature. Such an increase in ultrasonic velocity clearly shows that molecular association is being takes place in these mixtures.[12] Variation of ultrasonic velocity in solution depends upon the increase or decrease of molecular free length after mixing the component, based on a model for sound propagation proposed by Eyring and Kincaid.[13] It was found that, intermolecular free length decreases linearly on increasing the temperature of solution. The intermolecular free length decrease due to less force of interaction between solute and solvent by forming hydrogen bonding. This was happened because there is less significant interaction between ions and solvent molecules suggesting a structure promoting behavior of the added electrolyte .This may also indicates that increase in number of free ions showing the occurrence of ionic association due to stronger ion-ion interaction. The value of specific acoustic impedance (Z) increases with increase in temperature. The increase of adiabatic compressibility is decrease with increase in temperature may be due to loss of solvent molecule around ions, this supporting stronger ion-solvent interaction. This indicates that there is not significant solute-solvent interaction. The decrease in adiabatic compressibility following a increase in ultrasonic velocity showing there by stronger intermolecular interaction.

From table-2, it is observed that apparent molal volume increases with increase in temperature indicates the existence of weak ion-solvent interaction. The values of apparent molal volume are all positive values indicate the weak of solute solvent interaction.[14] The value of apparent molal compressibility is decrease with increase in temperature. It shows strong electrostatic attractive force in the vicinity of ions. It can be concluded that strong molecular association is found in solution. The value of relative association decreases with increase in temperature of system. It is found that there is weak interaction between solute and solvent.

The Solvation number increase with increase in temperature due to weak solute-solvent interaction. There is regular increase in solvation number with increase temperature indicates the increase in size of secondary layer of Solvation. The Solvation number in all system increases with increase in temperature indicates the solvent molecule forms strong coordination bond in primary layer.

Table 1: Ultrasonic velocity, density, adiabatic compressibility (β_S), Specific acoustic impedance (Z) Intermolecular free length (L_f) at different temperature.

Temp.(K)	Density (ds) Kg m^{-3}	Ultrasonic velocity (Us) m s^{-1}	Adiabatic compressibiliy (β_S) x$10^{-10}$$m^2N^{-1}$	Intermolecular free length (L_f) x10^{-11}m	Specific acoustic impedance (Zx10^6)kg m^{-2} s^{-1}
298.15	1007.3	1315.01	5.74094	4.8189	1.3146
303.15	998.98	1320.86	5.74629	4.8175	1.3185
308.15	995.82	1327.69	5.69673	4.8003	1.3221
313.15	989.81	1338.54	5.63878	4.7758	1.3249
318.15	985.97	1346.27	5.55323	4.7394	1.3376

Table 2: Relative association (R_A), apparent molal compressibility (ϕ_κ), Apparent molal volume (ϕ_v), Solvation number (S_n).

Temp. (K)	Apparent molal volume (ϕ_v) $m^3 mole^{-1}$	Apparent molal compressibility (ϕ_κ)x10^{-10} $m^2 N^{-1}$	Relative association (R_A)	Solvation number (S_n)
298.15	0.4805	1.50081	0.9412	0.84780
303.15	0.4845	1.49185	0.9158	0.86271
308.15	0.4860	1.48865	0.9056	0.87242
313.15	0.4890	1.48470	0.9046	0.89735
318.15	0.4909	1.45525	0.8712	0.92143

CONCLUSION

In the present study mentions the experimental data for ultrasonic velocity, density at different temperature for combine drug in 0.01M sodium Chloride. From experimental data calculated acoustical parameters and studied to explanation solute-solvent interaction and ion-ion / solute-solute interaction are existing between combine drug and 0.01M sodium Chloride solvent mixture. From experimental data it can be conclude that weak solute-solvent interaction in all systems.

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