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Acoustic Behavior of Aqueous Solution of Rabeprazole Sodium, Pantoprazole Sodium and Omeprazole Sodium at Different Temperatures.

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Abstract: *The aqueous solution of the drugs which are used as proton pump inhibitor to reduce stomach acid has been investigated using ultrasonic interferometer. The experimental values of density and ultrasonic velocity (U) Rabeprazole sodium, Pantoprazole sodium and Omeprazole sodium at different concentration and temperature were reported. From the experimental values acoustic parameters such as adiabatic compressibility, intermolecular free length (Lf) and acoustic impedance (Z) were computed. The results were useful to study various interactions such as solute – solvent interactions, and structure – making, hydrogen bonding of the solutes in aqueous solution at different temperatures. The reactivity of the drug can be predicted from acoustic parameters.*

Key words: *hydrogen bonding, solute – solvent interactions, Rabeprazole sodium, structure – making*

I. Introduction

The structural changes associated with the liquid mixtures having strongly interacting [1]components as well as weakly interacting components[2] can be studied by variation of ultrasonic velocity and related parameters. Molecular interactions in different liquid mixtures changes depending upon the nature of solvent, the structure of molecules and the extent of solution[3]. Ultrasonic technique is used to study the nature of molecular interaction in liquids[4] , liquid mixture[5], stability of complexes [6], and electrolyte solution,[7,8].Acoustic parameters are useful to understand the effect of concentration on the interactions of aqueous solution of drugs which are used as anta acids[9-10]. Rabeprazole sodium is a proton pump inhibitor (PPI) to reduce stomach acid and is used for the treatment of gastroesophageal. Pantoprazole sodium is a proton pump inhibitor indicated for the following: short-term treatment of Erosive Esophagitis Associated with Gastroesophageal Reflux Disease Omeprazole sodium is used to treat certain stomach and esophagus problems.

Inthe present work, an attempt have been made to determine the ultrasonic velocities and densitiesat different concentrations and different temperatures of aqueous solution of Rabeprazole sodium Pantoprazole sodium and Omeprazole sodium. The data obtained is used for determining the acoustic parameters like adiabatic compressibility, intermolecular free length, and acoustic impedance.

These parameters gave valuable information about the molecular interaction present in the solution. The effect of concentration and temperature on molecular interaction was predicted from acoustical parameters and also reactivity of the drugs predicted.

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II. Materials And Methods

The ultrasonic velocity (U) in aqueous solution of Rabeprazole sodium, Pantoprazole sodium and Omeprazole sodium which was prepared by taking purified AR grade samples, have been measured using an ultrasonic interferometer (Mittal type, Model F-81) working at 2MHz frequency and at temperature different temperatures and at different concentrations. The accuracy of sound velocity was ±0.1 ms-1. A digital constant temperature water bath has been used to circulate water through the double walled measuring cell made up of steel containing the experimental solution at the desire temperature. The density of pure solvent and liquid mixtures was determined using pycknometer by relative measurement method with an accuracy of ±0.1Kgm-3. An Ostwald's viscometer was used for the viscosity measurement of pure liquids and liquid mixtures with an accuracy of ±0.0001NSm-2. The temperature around the viscometer and pycknometer was maintained within ±0.1K in an constant temperature water bath. All the precautions were taken to minimize the possible experimental error.

III. Result And Discussion

Using the experimental data of ultrasonic ultrasonic velocity (U), density (ρ), various acoustical parameters such as adiabatic compressibility (βa), intermolecular free length (Lf), Acoustic impedance (Z) were calculated by the following equations (1-3).

□ a = (U2 □)1 ….. (1)

Lf = KT □ a ½ ….. (2)

Z = U □ ..…. (3)

From table 1,2 nd3 it is seen that the increase of values of ultrasonic velocities in rabeprozole sodium as compare to patoprazole sodium and omeprazole sodium with concentration and temperature shows a increase in intermolecular forces due to the decrease in the thermal energy of the aqueous solution of rabeprozole sodium.It means that in aqueous solution of rabeprozole sodium more solute solvent interaction is present . The velocity increases with the increase in temperature because the fact that free length decreases with the increase of temperature. Since the association of the interacting molecules varies with he temperature of the ultrasonic wave, cohesive force increases with the increase of temperature.Molecular interactions depend on the strength of the repulsive forces acting among solvent and solute molecules and hence intermolecular motion is affected accordingly. Attractive forces result into molecular association

From the Table it shows that adiabatic compressibility decreases with increase in concentration and temperature. Raboprazole sodium solution has least value of adiabatic compressibility as compare to other two solution indicates that the formation of hydrogen bonding in this solution is more and also London forces as solute solvent interaction is more which result aggregation of solvent molecules around the molecules of raboprazole sodium resulting strong molecular interaction in the solution. The free length depends on the adiabatic compressibility and show a similar behavior to that of the compressibility and inverse to that of velocity. Intermolecular free length decreases with increase in concentration and temperature in raboprazole sodium solution indicates strong solute solvent interaction exists in the solution. Variation of acoustic impedance with concentration and temperature shows that strong molecular interaction Between solute and solvent molecules through hydrogen bonding in the solution of Raboprazole sodium exist.

IV. Conclusion:

ULTRASONIC VELOCITIES ,DENSITIES FOR THE AQUEOUS SOLUTION OF RABEPROZOLE SODIUM, PATOPRAZOLE SODIUM AND OMEPRAZOLE SODIUM WERE EXAMINED AT DIFFERENT CONCENTRATIONS AND TEMPERATURES. THE VALUES OF ULTRASONIC VELOCITIES ,DENSITIES IN AQUEOUS SOLUTION OF RABEPROZOLE SODIUM IS MORE THAN PATOPRAZOLE SODIUM AND OMEPRAZOLE SODIUM INDICTES THAT STRONG MOLECULAR INTERACTION IS PRESENT IN THE SOLUTION. ADIBATIC COMPRESIBILTY, INTERMOLCULATR FREE LENGTH DECREASES IN AQUEOUS SOLUTION OF RABEPROZOLE SODIUM WITH INCREASE IN CONCENTRATIONS AND TEMPERATURES SHOWS STRONG SOLUTE SOLVENT INTERACTION EXIST IN THE SOLUTION .WITH INCREASE IN CONCENTRATIONS AND TEMPERATURES ACOUSTIC IMPEDANCE INCREASES SUPPORTS THAT STRONG MOLECULAR INTERACTION EXIST IN AQUEOUS SOLUTION OF RABEPROZOLE SODIUM. FROM MOLECULAR INTERACTION IT MAY BE PREDICT THAT RABEPROZOLE SODIUM IS MORE REACTIVE PATOPRAZOLE SODIUM AND OMEPRAZOLE SODIUM

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