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Study of Acoustic Parameters of Rabeprazole Sodium in Different Solvents at 298.15K.

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ABSTRACT
Ultrasonic speed and density of rabeprazole sodium have been measured in the aqueous solution and ethyl alcohol at 308.15 K. From the experimental data various acoustical and thermo dynamical parameters such as; adiabatic compressibility(β), intermolecular free length(L_f), acoustic impedance(Z), have been calculated. From these parameters effect of solvent on molecular interaction will be predicted. the presence of electron-donar and electron-accepter group affects on the strength of molecular interaction

Keywords: interaction, thermodynamic, ultrasonic , Rabeprazol

INTRODUCTION

Ultrasonic and viscometry is accepted technique to study the physical, chemical and thermodynamic properties of the polymeric solutions, liquids, liquid mixtures and electrolytic solutions And polymeric solutions[1-5]. The ultrasonic study of liquid mixtures have of greater significance in under-standing intermolecular interactions between the component molecules.

A drug isany substance thatcausesachangeinaorganism's physiology or psychology when consumed[6-7]. Interaction of drugs with different additives was carried out in order to increase their properties and applications[8-9]. Rabeprazole, sold under the brand name Pariet among others, is a medication that decreases stomach acid.[10] It is used to treat peptic ulcer disease, gastroesophageal reflux disease, and excess stomach acid production such as in Zollinger–Ellison syndrome.[10}

In the present study ultrasonic velocity of rabeprazole sodium was measured in water as well as ethyl alcohol solution . From theses values acoustical parameters such as adiabatic compressibility(β), intermolecular free length(Lf), acoustic impedance(Z), and cohesive energy have been calculated. The effect of solvent on theses parameters was studied& hence molecular interaction in the solutions was predicted. From the molecular interaction reactivity of drug was predicted.

METHODOLOGY

The ultrasonic velocity (U) of rabeprazole in aqueous solution and in ethyl alcohol which 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 298.15 K. The accuracy of sound velocity was ±0.1 ms-1. An electronically digital operated 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 liquids and liquid mixtures was determined using density bottle by relative measurement method with an accuracy of ±0.1Kgm-3.

RESULTS AND DISCUSSION

As concentration increases number of molecules in the medium increases, making the medium to be denser, this leads to greater compressibility resulting in slow transfer of sound waves and hence ultrasonic velocity increases with increase of concentration as shown in Figure-1. This increase in ultrasonic velocity in aqueous solution with increase in concentration shows more interaction between rabeprazol in water as compared to in ethyl alcohol. It is due to formation of strong hydrogen bonding in water.

FromFigure-2 it is observed that adiabatic compressibility decreases with increases in concentrationshowing that strong molecular interaction exists in the aqueous solution of rabeprazole . It shows that there is more possibility of formation of hydrogen bond.

Figure-3 shows that intermolecular free length decreases with increase in concentration. The decrease in freelength is due to the close packing of the molecules inside the shield, which may be brought bystrengthening of molecular interactions. This may be due to the fact that the intermolecular interactions may be resulted in a decreased intermolecular free length and compact structural arrangement.

Acoustic impedance increases with increase in concentration. Specific acoustic impedance is directly proportional to ultrasonic velocity and inversely proportional toadiabatic compressibility and shows similar behaviour to that of ultrasonic velocity and opposite to that of adiabatic compressibility[11]. Specific impedance has high value in aqueous solution of rabeprazole with increasing concentration shows high molecular interaction existing in it.

Table1: Ultrasonic velocity, density, adiabatic compressibility, intermolecular free length, specific acoustic impedance of rabeprazole sodium in different solvents at 298.15K

Concentration	Ultrasonic velocity U(m/s)	Density ρ (kg/m3)	Viscisity $\eta*10^{-3}$ (CP)	Adiabatic Compressibility $\beta_a *10^{-10}(Pa^{-1})$	Intermolecular free length $L_f *10^{-10}(m)$	Acoustic Impedance $Z*10^4(kg/m^2s)$
				T=298Kwater		
0.00025	1501.21	1302.05	0.9201	3.40	0.0117	195.465
0.0005	1515.28	1305.68	0.9215	3.33	0.0116	197.840
0001	1564.15	1310.15	0.9255	3.12	0.0115	204.90
		T=298K ethyl alcohol				
0.00025	1468.25	1301.25	0.9116	3.56	0.0120	191.08
0.0005	1487.36	1299.45	0.9136	3.47	0.0118	193.274
0.001	1531.23	1301.20	0.9236	3.32	0.0115	197.942

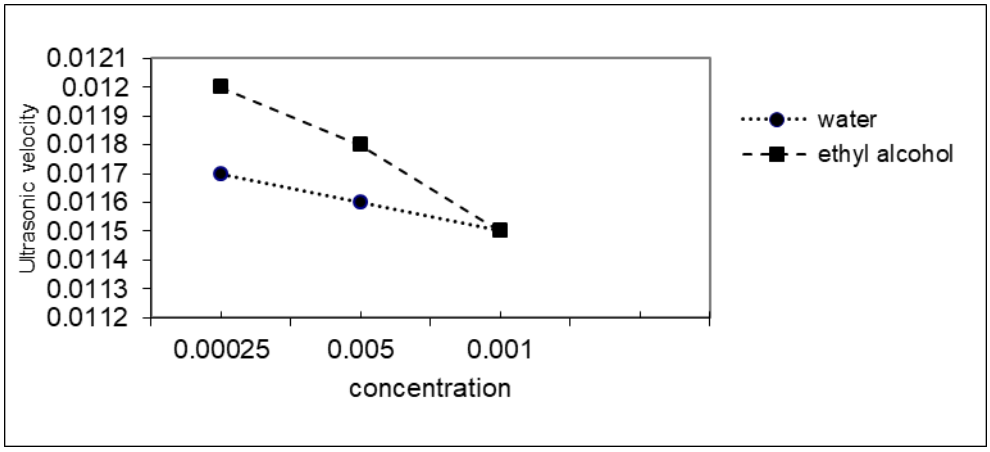

Fig. 1 ultrasonic velocity in different solvents

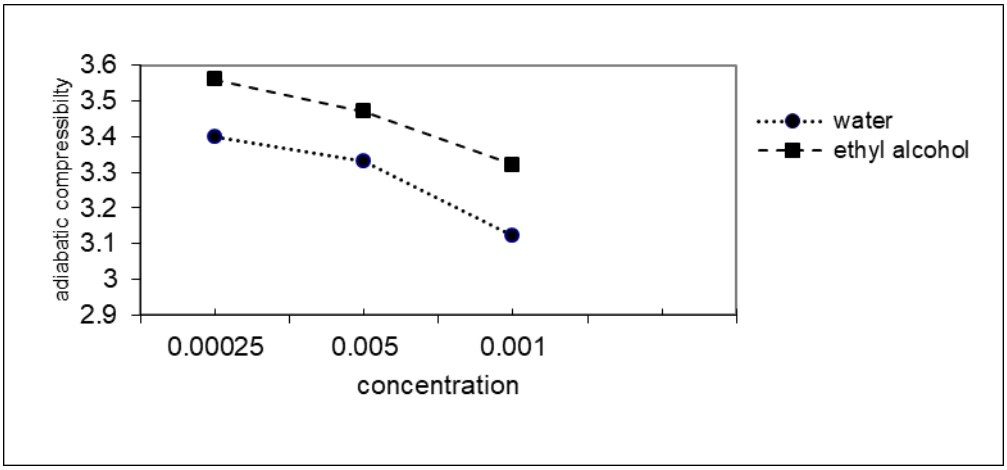

Fig. 2 Adiabatic compressibility in different solvents.

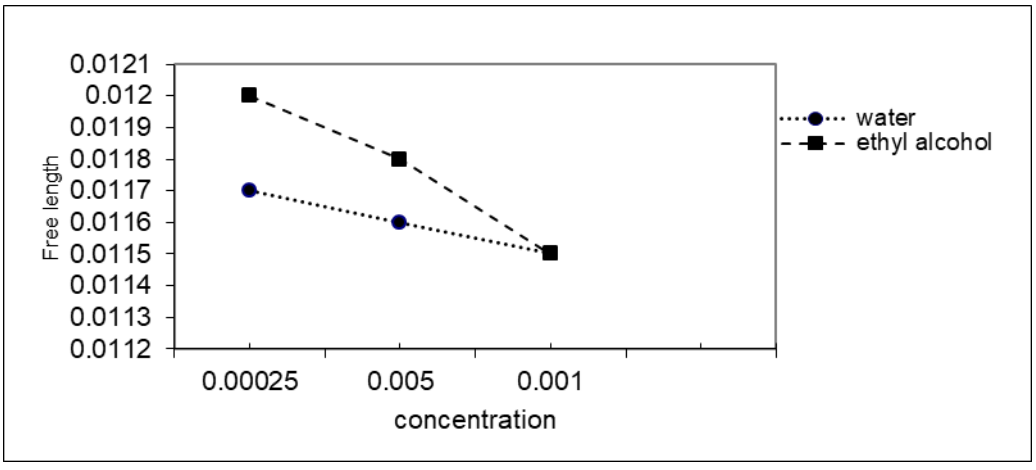

Fig. 3 Intermolecular free length in different solvents.

CONCLUSION

Ultrasonic velocity, viscosity is more with increasing concentration in aqueous solution of rabeprazole as compared to in ethyl alcohol solution shows strong solute solvent interaction exist in it. Which further confirmed by the decreasing values of adiabatic compresiibility,free length and increasing acoustic impedance. It shows that reactivity of the rabeprazole sodium is more in water to that of ethyl alcohol.

Conflicts of interest: The authors stated that no conflicts of interest.

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