Sonar AN. / Vol 5 / Issue 2/ 2015 / 49-51.

International Journal of

Innovative Drug Discovery

e ISSN 2249 - 7609
Print ISSN 2249 - 7617

www.ijidd.com

STUDIES OF ACOUSTIC PROPERTIES OF SUBSTITUTED HETEROCYCLIC DRUGS IN DMSO

A.N. Sonar*

Shri V.S. Naik College, Raver, Jalgaon, Maharashtra, India.

ABSTRACT

Acoustical properties have been measured for substituted heterocyclic drug (Lovastatin) in DMSO at different temperature. The measurement have been perform to evaluate acoustical parameter such as adiabatic compressibility, Partial molal volume (P_v), intermolecular free length (L_f), apparent molal compressibility, specific acoustic impedance (Z), relative association (R_A), salvation number (Sn) and also studied the molar polarization.

KEY WORDS: Molar polarization, Polarizability constant, Ultrasonic velocity, Intermolecular free length, Relative association.

INTRODUCTION

The substituted heterocyclic drug (1*S*,3*R*,7*S*,8*S*,8a*R*)-8-{2-[(2*R*,4*R*)-4-hydroxy-6-oxooxan-2-yl]ethyl}-3,7-dimethyl-1,2,3,7,8,8a-hexahydronaphthalen-1-yl(2*S*)-2-methyl butanoate (Lovastatin). Lovastatin used in combination with diet, weight-loss, and exercise for lowering cholesterol (hypolipidemic agent) in those with hypercholesterolemia to reduce risk of cardiovascular disease [1,2].

In the recent years, measurements of the Ultrasonic velocity are helpful to interpreted solute-solvent, ion-solvent interaction in aqueous and non aqueous medium [3]. Fumio Kawaizumi [4] 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 [5]. 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 [6]. Palani have investigated the measurement of ultrasonic velocity and density of amino acid in aqueous magnesium acetate at constant temperature [7]. 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 [8]. Syal et al has been studied the ultrasonic velocity of PEG-8000, PEG- study of acoustical properties of substituted heterocyclic compounds under suitable condition [9]. Tadkalkar et al have studied the acoustical and thermodynamic properties of citric acid in water at different temperature [10]. Mishra et al have investigated ultrasonic velocity and density in non aqueous solution of metal complex and evaluate acoustic properties of metal complex [11]. 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[12].S.K. Thakur et al have studied the different acoustical parameters of binary mixture of 1-propanol and water [13].

The refractive index is an important additive property of molecular structure of liquid. The extent of refraction depends on –i) the relative concentration of atom or molecule ii). The structure of atom or molecule. So refractive index gives idea about geometry and structure of molecule. Refraction of light is additive property, but also

Corresponding Author:- **A.N. Sonar** Email:- ansonar1968@rediffmail.com

depends on the structural arrangement of atom in molecule. This can some time be used to determine the structure of an unknown compound whose molecular formula is known.

Sangita Sharma et al [14] has been studied density and refractive index of binary liquid mixture Eucalyptol with Hydrocarbon at different temperature. Oswal et al [15] have been studied refractivity properties of some homologous series such as n-ethanoate, methyl alkanoates, ethyl alkanoates etc. were measured in the temperature range from 298.15 to 333.15^{0}K

After review of literature survey the detail study of substituted heterocyclic drugs under identical set of experimental condition is still lacking. It was thought of interest to study the acoustical and thermodynamic properties of substituted heterocyclic drug under suitable condition.

Experimental

The constant temperature was maintained by circulating water through the double wall measuring cell, made up of glass. The flow time was also measured by using digital clock (0.01 Sec).The substituted heterocyclic lovastatin is used in the present study. The density was determined by using specific gravity bottle by relative measurement method with accuracy 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, apparent molal volume, intermolecular free length, apparent molal compressibility, specific acoustic impedance (Z), relative association (R_A), Solvation number (S_n) were studied.

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

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

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

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

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

$$\text{Intermolecular free length } (L_f) = K\sqrt{\beta} ds$$

$$\text{Relative association } (R_A) = x\ 1\left(\frac{d_s}{d_o}\right)^{1/3}$$

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

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

Temperature(K)	Density (ds) Kg m-^{3}	Ultrasonic velocity (Us) m s^{-1}	Adiabatic compressibiliy x10^{-10}m^{2}N^{-1}	Intermolecular free length (L_f) x10^{-11}m	Specific acoustic impedance (Zx10^6)kg m^{-2} s^{-1}
Lovastatin + 20% Dmso					
298	1100.48	1602.00	3.54070	3.78446	1.76297
303	1097.98	1608.84	3.51868	3.77266	1.76641
308	1094.82	1618.67	3.48579	3.75498	1.77232
313	1088.81	1626.52	3.47160	3.74733	1.77097
318	1084.97	1635.26	3.44636	3.73368	1.77441

Table 2. Relative association (R_A), apparent molal compressibility, apparent molal volume, Solvation number (S_n) –

Temp. (K)	Apparent molal volume m^{3}mole^{-1}	Apparent molal compressibility m^2 N^{-1}	Relative association (R_A)	Adiabatic compressibiliy x10^{-10}m^{2}N^{-1}	Solvation number (S_n)
	Lovastatin + DMSO				
298	0.36099	1.30153	0.99863	3.56150	0.99406
303	0.35351	1.29636	0.99832	3.54539	0.99226
308	0.35278	1.28979	0.99690	3.53258	0.98649
313	0.35045	1.28772	0.99616	3.52953	0.98326
318	0.34648	1.28469	0.99489	3.52277	0.97790

CONCLUSION

In the present study mentions the experimental data for ultrasonic velocity, density at different temperature for substituted heterocyclic drug in ethyl alcohol. From experimental data calculated acoustical parameters and studied to explanation solute-solvent interaction and ion-

ion/ solute-solute interaction are existing between drugs and organic solvent mixture.

From experimental data it can be conclude that weak solute-solvent interaction in all systems.

ACKNOWLEDGEMENTS

The Authors is thankful to Prin. Dr. R.T. Chaudhari, Shri. V.S. Naik Arts, Commerce and Science College, Raver (M.S.) for kindly cooperation.

REFERENCES

1. The American Society of Health-System Pharmacists. Retrieved 3 April 2011.
2. Mediline net.com.
3. Bedare GR, Bhandakkar VD and Suryavanshi BM. Molecular interaction by ultrasonic velocity , density and veiscosity measurementsin binary mixtures at 303K and 4 MHz frequency. *Science Park,* 1(4), 2013, 1-3.
4. Kawaizumi F, K Matsumoto and H Nomura, Partial molar compressibilities of halogeno complexes of platinum and palladium in aqueous solutions at 25°C. *J Phys. Chem*, 87(16), 1983, 3161-3166.
5. Ali A and Nain AK**.** Ultrasonic investigations of ion-solvent interactions of sodium chloride in aqueous dimetylformamide mixtures. *J Pure Appl Ultrason*, 16, 1994, 74-77.
6. Vasantrani P, Pandiyan V and Kannappan AN. Ultrasonic Velocity, Viscosity, Density and Excess Properties of Ternary Mixture of N-Methylcyclohexylamine+Benzene+1-Propanol**.** *Asian J of Appl Sci***,** 2(2), 2009, 169-176**.**
7. Palani R and S Saravanan, Volumetric, Compressibility and Transport Studies of Some Amino Acids in Aqueous Magnesium Acetate at 298.15K. *Research J Phy*, 2(1), 2008, 13-21.
8. Voleisiene B and A Voleisis. Ultrasonic velocity, density,and viscosity measurement of lanthanide salts. *J Ultrasound* **,** 63(4), 2008, 7-18.
9. Syal VK, A Chauhan and S Chauhan. Ultrasonic velocity, density,and viscosity measurement of PEG-8000, PEG. *J Pure Ultrasound***,** 27, 2005, 61-69.
10. Tadkalkar A, P Pawar and G.K Bichile. Ultrasonic studies on molecular interaction of substituted thiazolidines in acetone using pulse-echo technique. *J Chem Pharm Res*, 5(11), 2013, 762-767.
11. Dhote A, Aswale S and Aswale S. Nondestructive evaluation of dichlofenac sodium by ultrasonic technique. *Pilagia Res Lib Advances in Applied Science Research*, 3(4), 2012, 2299-2302.
12. Alamelamangai and Santhi N. Acoustical studies of some 1,3,4-thiadiazole derivatives in acetone at 303.15 k. *Int J of Adv Chem*, 2(1), 2014, 34-38.
13. Thakur SK and Chauhan S. Ultrasonic Velocity and allied parameters of drug Colimax in aqueous 1-propanol at 298.15K, *J Chem Pharm Res*, 3(2), 2011, 657.
14. Thirumaran S and Karthikeyan **N.** Thermo – Acoustical Studies on Interionic Interactions of Some α-Amino Acids in Aqueous Sucrose Solution at Varying Mass Percentages. *Oriental J of Chem*, 30(1), 2009, 87-96.
15. Oswal SL, P Oswal, PS Modi, JP Dave and RL Gardas. Acoustic, volumetric, compressibility and refractivity properties and Flory's reduction parameters of some homologous series of alkyl alkanoates from 298.15 to 333.15 K. *Thermochemic Acta*, 410, 2004, 1.