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Studies of Ultrasonic Velocities and Acoustic Parameters of Trifloxystrobin in Ethanol Water System At 300K.

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Abstract: *Ultrasonic velocities at various concentration of trifloxystrobin in aqueous ethanol mixture have been measured at 300K by using single crystal interferometer at a frequency of 3MHz. By using velocity density, viscosity and concentration data, various acoustic parameters are calculated and the results are interpreted in terms of solvents-solute & solute-solute interaction. The positive value of solution number is encourage.*

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I. Introduction

Ultrasonic studies provide a lot of information understands the molecular behaviour and either molecular interaction. Trifloxystrobin is a well known pesticides. Based upon its physiochemical proportion, it's use under the given condition can be selected the physical and chemical properties strongly dependent on the structure of pesticides. Further more knowledge of acoustical properties of any solution provides information about the interaction occurring in solution[1-3]. The present work describe the ultrasonic velocity and some acoustical properties of trifloxystrobin in pure water & varying proportional of ethanol (10, 30 & 50%) at 300K
The acoustic parameters were computed as follows:
The ultrasonic velocity is calculated as

$$v = f\,\lambda\,c \qquad \text{............. (I)}$$

Where "f" is the frequency of the ultrasonic waves and 'λ' is the measured wavelength value of ultrasonic waves in a given solution.

The viscosity of the solution is calculated using

$$\eta = \frac{d_l t_l}{d_w t_w}\ \boldsymbol{\eta_w} \qquad \text{............. (II)}$$

Where d_l and t_l are density and time flow of liquid whereas d_w $andt_w$ are density and time flow of water.
Adiabatic compressibility β has been calculated from ultrasonic velocity v and density ρ

$$\beta = \frac{1}{\rho v^2} \qquad \text{............. (III)}$$

Intermolecular free path length (Lf) has determined as follows

$$L_f = k\beta^{1/2} \qquad \text{............. (IV)}$$

Where k is the temperature dependence jacobson's Constant $(205.35 \times 10^{-8}\ at\ 300K)$
Acoustic impedance (Z) is given as follows:

$$R, A = \left(\frac{\boldsymbol{\rho}}{\boldsymbol{\rho_0}}\right)\left(\frac{\boldsymbol{v_0}}{\boldsymbol{v}}\right)$$

Where $\boldsymbol{\rho_0}$ **and** $\boldsymbol{v_0}$ are density & velocity of solvent

II. Results and Discussion

Various acoustical parameters like adiabatic compressibility (β), acoustic impedence (Z), intermolecular free length (L_f), Row's molar sound function R, relaxation strength (τ), vander walls constant (b), internal pressure π, relative association R A, salvation no. S_N were calculated using velocity (v), density (p) and viscosity (τ) with the help of standard equation.

Table 1 Variation of ρ, U, Z, β, b and R with concentration at 30^0

Conc.	ρ	$10^5 \cdot U$	$10^5 \cdot Z$	$10^{11}\beta$	b	R
M	$g\ cm^{-1}$	$cm\ s^{-1}$	$g\ cm^{-2}$	$cm^2\ dyn^{-1}$	cm^3	
Water						
0.00	1.0004	1.5134	1.5134	4.3687	16.309	959.19
0.20	1.0050	1.5224	1.5294	4.2975	20.926	1223.6
0.40	1.0140	1.5344	1.5553	4.1929	25.340	1476.2
0.60	1.0285	1.5390	1.5730	4.1334	29.640	1719.9
0.80	1.0317	1.5456	1.5939	4.0616	33.766	1954.1
1.00	1.0406	1.5582	1.6208	3.9620	37.788	2184.6
10% Ethanol						
0.00	0.9847	1.5710	1.5464	4.1189	19.278	1140.5
0.20	0.9932	1.5763	1.5650	4.0562	23.850	1403.0
0.40	1.0017	1.5804	1.5825	4.0010	28.288	1656.7
0.60	1.0106	1.5760	1.5921	3.9879	32.564	1897.7
0.80	1.0186	1.5822	1.6110	3.9256	36.762	2137.2
1.00	1.0300	1.5964	1.6436	3.8134	40.640	2361.6
30% Ethanol						
0.00	0.9514	1.6025	1.5252	4.0914	25.513	1506.6
0.20	0.9650	1.6014	1.5446	4.0460	30.034	1764.0
0.40	0.9745	1.5999	1.5584	4.0138	34.476	2016.5
0.60	0.9835	1.6014	1.5740	3.9707	38.784	2261.2
0.80	0.9934	1.6005	1.5892	3.9343	42.870	2491.8
1.00	1.0037	1.5997	1.6038	3.9030	46.778	2711.5
50% Ethanol						
0.00	0.9116	1.4712	1.3411	5.0682	32.309	1853.1
0.20	0.9270	1.4870	1.3776	4.8859	36.870	2111.9
0.40	0.9368	1.4908	1.3960	4.8090	41.411	2365.2
0.60	0.9480	1.4917	1.4132	4.7480	45.664	2601.3
0.80	0.9574	1.4887	1.4245	4.7201	49.847	2830.2
1.00	0.9655	1.4866	1.4344	4.7217	53.955	3052.9

Table 2 Variation of $L_f, W, \boldsymbol{\eta}, \pi$ and S_n with concentration at 30^0

Conc.	L_f	W	$10^3\eta$	π	S_n
M	A		$poise$	$atoms$	
			Water		
0.00	0.4024	543.539	7.977	2596.715	....
0.20	0.3991	693.475	8.226	1979.595	20.2
0.40	0.3942	837.412	8.837	1639.529	19.9
0.60	0.3914	976.742	9.657	1427.574	19.4
0.80	0.3880	1110.919	10.107	1252.251	20.1
1.00	0.3832	1243.036	11.335	1158.246	19.7
10% Ethanol					
0.00	0.3907	643.499	10.686	2465.921	.....
0.20	0.3877	792.527	11.308	1982.626	19.0
0.40	0.3851	936.891	11.856	1664.597	20.7
0.60	0.3845	1074.703	12.967	1479.684	28.5
0.80	0.3815	1211.461	13.783	1322.189	26.6
1.00	0.3760	1340.238	14.869	1214.321	21.6
30% Ethanol					
0.00	0.3894	845.431	16.756	2263.670	....
0.20	0.3872	991.662	17.736	1925.136	20.9
0.40	0.3857	1135.156	18.115	1656.777	25.1
0.60	0.3836	1274.461	15.5098	1334.964	25.0
0.80	0.3818	1406.702	19.834	1341.088	26.3
1.00	0.3803	1532.894	18.922	1181.111	28.1
50% Ethanol					
0.00	0.4334	1037.724	20.330	2020.238	......
0.20	0.4255	1184.607	22.585	1811.686	5.9
0.40	0.4221	1328.311	22.382	1571.749	8.3
0.60	0.4194	1463.413	33.997	1723.241	10.3
0.80	0.4182	1594.868	25.048	1334.036	12.9
1.00	0.4170	1724.238	25.048	1214.738	15.1

Table 1 and 2 shows the variation of these parameters with concentration (C) in all the ethanol water system. It is observed that a non linearly increae in velocity in 10% solution almost similar to pure water increase of U valves is indication of their molecular association. Possibility of hydrogen bonding between oxygen of solvent and solute molecules can't be ignored. This hydrogen bonding is responsible for strengthening of intermolecular forces that results in decrease of compressibility and increase of v and z it furthers a structure promoting tendency of added electrolyte in 10% ethanol & water. Study in 30% ethanol solution reveals the velocity to be almost constant except at 1M where slight decrease is observed. Further more in 50% ethanol water system, slight decrease in U is observed after 0.6M this reveal that the reverse phenomena occurs with the increase of the concentration of pesticides in 50% ethanol water system. In this system the interaction becomes more significant and plays an important role in the change in the behaviour of solution.

The decrease in β value with increasing concentration of solute results from aggregation of solvent molecules around the solute molecules. This indicates strong solvent-solute interaction. The value of R, W and b shows linear behaviour with concentration in all the solvent system studied exemplifying the solute-solvent interaction. Internal pressure decreases with increase in concentration results from the decrease of cohesive forces.

The salvation number (S_n) gives an information about structure making and structure breaking tendency of electrolyte added in solvent. Table 2 shows a positive variation of S_N in all the concentrations for all the compositions of ethanol. Water mixtures, therefore the structure making tendency of pesticides in all the solvents compositions the increase in S_N value is due to decrease in ion-ion interaction and allows occurrence of association with solvent molecules in pure water an almost constant S_n value over the whole range of concentration indicates that ion-ion interaction or association of pesticides with solvent molecules is not changed with concentration. in case of 50% ethanol salvation is minimum that shows a greater interaction between water and ethanol.

III. Experimental

Distilled water and distilled ethanol were used for the purpose. Different concentration of pesticides solution were prepared in pure water and in ethanol water composition. Ultrasonic interferometer, specific gravity bottle & Ostwald viscometer were used to measure the ultrasonic velocities,dencities and viscosity respectively. Other data were calculated with the helps of standard equation.

References

[1]. P. B. Agrawal, I. M. Siddiqui and M. I. Narwade...........and Indian Journal of chemistry, Vol. 42 no. 5, pp-1050 – 1057, Year 2003.
[2]. M. Fujimato. Bull chem. Soc. Jpn 1967,32,294
[3]. Ch.J.Burton J. Acoust. Soc. Am 1948,20,86

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