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NOTE

Acoustical Parameters on Certain Benzoyl Cotarnine Derivatives

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Ultrasonic studies are conducted in benzoyl cotarnine derivatives. From the ultrasonic studies acoustical parameters such as compressibility factor, free length, acoustical impedance, ultrasonic velocity are calculated and discussed.

Key Words: Benzoyl cotarnine, Compressibility factor, Free length, Acoustical impedance, Ultrasonic velocity.

The ultrasonic technique has been used for studying the solute-solvent interactions in a number of systems, including organic[1] low melting solids[2] and complex formulation[3]. The propogation of ultrasonic waves and the measurement of velocity[4, 5] and absorption[6] in inorganic, organic and organo-metallic binary systems have been used to access the molecular interactions in these systems. The variation of ultrasonic velocity and other acoustic parameters with temperature has been studied using a diffraction technique[7]. Several workers[8, 9] have used ultrasonic velocity measurements for studying ion-solvent neractions. Ultrasound has been used by several workers to determine the solute-solvent interactions in aqueous solutions.

A multi-frequency ultrasonic interferometer (Mittal Enterprises, New Delhi, Model MX-4) operating at a frequency of 3 MHz was used to measure ultrasonic velocity of the experimental solutions.

The ultrasonic parameters of cotarnine derivatives are given in Tables 1–3. The ultrasonic sound velocity in all cotarnine increases with increase of concentration and decrease of free length Kaulgud[11] has shown that the ultrasonic sound velocity in a liquid decreases with increase of concentration.

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TABLE-1
ACOUSTICAL PARAMETERS OF BENZOYL COTARNINE-CHLOROFORM SYSTEM AT 303 K

Concentration (10^{-4} M)	U (m/s)	β (10^{-10} m^2 N^{-1})	Z (10^6 kg m^2 s^{-1})	L_f (nm)
1	972	11.12	0.925	0.6610
2	995	10.27	0.970	0.0634
3	1027	9.44	1.027	0.0608
4	1048	8.82	1.075	0.0587
5	1072	8.35	1.109	0.0572
6	1100	7.86	1.148	0.0554
7	1130	7.38	1.186	0.0538
8	1160	7.02	1.228	0.0524
9	1194	6.62	1.275	0.0509
10	1222	6.20	1.320	0.0482

TABLE-2
ACOUSTICAL PARAMETERS OF BENZOYL COTARNINE OXIME-CHLOROFORM SYSTEM AT 303 K

Concentration (10^{-4} M)	U (m/s)	β (10^{-10} m^2 N^{-1})	Z (10^6 kg m^2 s^{-1})	L_f (nm)
1	959	11.66	0.890	0.066
2	970	11.14	0.923(s)	0.659
3	993	10.25	0.968	0.0634
4	1026	9.42	1.025	0.0610
5	1046	8.80	1.072	0.0586
6	1098	7.85	1.144	0.550
7	1126	7.36	1.182	0.0532
8	1158	6.98	1.220	0.0519
9	1196	6.60	1.270	0.0504
10	1220	6.22	1.334	0.0478

The increase of ultrasonic sound velocity suggests that there may be strong solute-solvent interaction[11-15] in all cotarnine derivatives.

In all benzoyl cotarnine derivatives, the adiabatic compressibility factor decreases with increase of concentration. Compressibility factor may affect the structural orientation, *i.e.*, the intermolecular attraction leads to structural arrangement of the constituent particles, which may be one of the reasons for increase in adiabatic compressibility factor.

Acoustic impedance (z)[16] in liquids can also be used to assess the strength of intermolecular attraction. In all the coteries the acoustic impedence increases, which suggests that the intermolecular attraction increases with increase of ultrasonic velocity.

Free length (L_f)[17] is a measure of the strength of molecular interaction. If the molecular interaction increases the free length decreases. Hence in all the coterie

derivatives the free length decreases with increase of concentration. This suggests in all cotarnine the molecular interaction is more, as a result that at low concentration cotarnine-solvent interaction dominates whereas at high concentration cotarnine-cotarnine interaction dominates.

TABLE-3
ACOUSTICAL PARAMETERS OF BENZOYL COTARNINE AZINE-CHLOROFORM SYSTEM AT 303 K

Concentration (10^{-4} M)	U (m/s)	β (10^{-10} m^2 N^{-1})	Z (10^6 kg m^2 s^{-1})	L_f (nm)
1	962	11.64	0.892	0.067
2	988	10.76	0.940	0.065
3	1010	10.05	0.985	0.062
4	1024	9.77	1.025	0.059
5	1048	8.86	1.076	0.054
6	1064	8.53	1.101	0.051
7	1082	8.18	1.129	0.047
8	1108	7.78	1.158	0.042
9	1130	7.59	1.185	0.039
10	1146	7.25	1.203	0.036

Compressibility factor shows a unique behaviour confirming higher molecular interaction, hence all cotarnine used are capable of undergoing degradation in suitable solvent.

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