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RESEARCH ARTICLE

STUDY OF SOLUTE-SOLVENT INTERACTION OF DI METHYL PHENYL AMINE WITH AQUEOUS ORGANIC SOLVENT.

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Key words:-
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Abstract

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Ultrasonic velocity , Density and viscosity measurements have been used to calculate Isentropic Compressibility (βS) , Intermolecular free length (Lf) , Ultrasound velocity (V) , Density (ρ) , Excess Viscosity (η) , Shear's Relaxation Time (τs) of solution of Di Methyl Phenyl Amine in aqueous organic solvent as Benzene . In each case ultrasound velocity increase and isentropic compressibility (βS) Decreases , Intermolecular free length (Lf) Decreases , Density (ρ) increase and viscosity increases with increases in molar concentration of Di Methyl Phenyl Amine. The Result has been interpreted in terms of ion-solvent interaction on the basis of acoustic properties.

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Introduction:-

Di Methyl Phenyl Amine - Any class of Aromatic yellow compounds including several that are important as anti-oxidants or fungicides; use in making dyes and Pigments. Present work covers extensive survey of physic-chemical and solvolytic studies of Di Methyl Phenyl Amine in aqueous organic solvent. Such Benzene system study at various temp. (20^0C, 25^0C, 30^0C) with various parameter. Qualitative determination of the degree of association in liquids to study the behavior of binary liquid mixture by measuring the sound velocity and related properties. Present work is reporting of the dissolved ion with water molecules and reporting the finding of a study of a ultrasound velocity, density and viscosity measurement to calculate isentropic compressibility (βS) , intermolecular free length (Lf) , molar volume (Mv) , Shear's Relaxation Time (τs) of Di Methyl Phenyl Amine in solvent.

Wave interferometric technique was employed for the measurement of ultrasonic Velocity. The Density and Viscosity were determined using a vibrating Pyknometer. The Experiment was Repeated and result were reproducible with experimental error of 0.0002 KgM^{-3} and 0.0002 mPas respectively

Details of Various Physical Parameters:-

$Z= [V. \rho.10^3]$	, $Lf = K\sqrt{\beta S}$, $\tau s= 4/3Ŋ. \beta S$,	,	$\beta S = [1/V^2. P]$
$\rho =M/v$			

Where , V- Ultra Sound Velocity , Z – specific Acoustic Impedance , Mv – Molar Sound Velocity , τ_s – Shear's Relaxation Time , ρ_0 and β_{So} are Density and Compressibility of pure solvent , ρ and β_S are Density and Compressibility of the solution , C is the Concentration in Mol/L of Solute , M is the molecular Weight of solute and n_1 , n_2 are moles of solute and solvent.

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Result and Discussion:-

Present work covers an extensive survey of physic-chemical and solvolytic study of Di Methyl Phenyl Amine in aqueous organic solvent such as Benzene. All the system studied at various temperatures (20, 25, 30^{0}C).we have reported ultrasound velocity (V) and Viscosity (η) of binary liquid mixture with experimental data, The following thermodynamic and acoustic properties like Isentropic compressibility (βS) , intermolecular free length (Lf) , Molar Volume (Mv) , Shear's Relaxation Time (τs) have been calculated.

The ultrasound velocity and concentration and Molar sound velocity Reported in Table 1-3 as well on Fig. 1-4. The ultrasound velocity of the solution of Di Methyl Phenyl Amine in Benzene increase with increasing Molar Concentration of Di Methyl Phenyl Amine in Benzene Solvents.

Table 1:- Di Methyl Phenyl amine + Benzene at 20 ^{0} C

C (mole/L)	ρ (gm/ml)	V (m/sec)	$β_S$ (cm^2/dyne.10^{12})	$β_{S-}$ $β_{SO}$ (cm^2/dyne.10^{12})	η (CP)	τs (Sec.)	Zx10^{-5}	L_f	M_v
0.0000	*0.8756*	*1320*	*65.54*	0.00	0.6173	53.9437	1.1557	0.5003	89.21
0.0726	*0.8897*	*1331*	65.44	-1.00	0.6767	57.2397	1.1841	0.4922	91.31
0.1497	*0.9010*	*1342*	*61.62*	-1.65	0.7422	60.9791	1.2091	0.4851	93.85
0.2318	*0.9121*	*1353*	*59.89*	-2.14	0.8078	64.5055	1.2340	0.4782	96.58
0.3194	*0.9210*	*1365*	*58.27*	-2.44	0.8739	67.8962	1.2571	0.4717	100.72
0.4131	*0.9312*	*1377*	*56.63*	-2.66	0.9383	70.8479	1.2822	0.4650	102.99
0.5136	*0.9362*	*1390*	*55.28*	-2.49	1.0076	74.2668	1.3013	0.4594	107.06
0.6216	*0.9418*	*1403*	*53.94*	-2.21	1.0754	77.3427	1.3213	0.4538	111.36
0.7379	*0.9449*	*1416*	*52.78*	-1.74	1.1444	80.5352	1.3379	0.4489	116.30
0.8637	*0.9506*	*1429*	*51.51*	-0.98	1.2142	83.3912	1.3584	0.4435	121.30
1.0000	*0.9560*	*1440*	*50.44*	-0.00	1.2849	86.4138	1.3766	0.4389	126.76

Table 2:- Di Methyl Phenyl amine + Benzene at 25 ^{0} C

C (mole/L)	ρ (gm/ml)	V (m/sec)	$β_S$ (cm^2/dyne.10^{12})	$β_{S-}$ $β_{SO}$ (cm^2/dyne.10^{12})	η (CP)	τs (Sec.)	Zx10^{-5}	L_f	M_v
0.0000	*0.8736*	*1303*	*67.42*	0.00	0.6033	54.2326	1.1383	0.5131	89.41
0.0726	*0.8836*	*1315*	*65.44*	-0.80	0.6493	57.5697	1.1619	0.5055	92.14
0.1497	*0.8875*	*1327*	*63.98*	-1.01	0.6929	61.1563	1.1777	0.4999	95.28
0.2318	*0.9002*	*1340*	*61.86*	-1.81	0.7392	63.8312	1.2062	0.4915	97.86
0.3194	*0.9081*	*1353*	*60.15*	-2.10	0.7889	66.6622	1.2286	0.4847	101.16
0.4131	*0.9176*	*1366*	*58.40*	-2.33	0.8418	69.1767	1.2534	0.4776	104.51
0.5136	*0.9232*	*1379*	*56.96*	-2.15	0.8986	71.7847	1.2730	0.4716	108.57
0.6216	*0.9278*	*1392*	*55.62*	-1.75	0.9597	74.3454	1.2914	0.4661	113.04
0.7379	*0.9328*	*1404*	*54.38*	-1.11	1.0255	76.8280	1.3086	0.4608	117.81
0.8637	*0.9475*	*1417*	*52.56*	-0.89	1.0967	78.2653	1.3426	0.4569	121.70
1.0000	*0.9540*	*1430*	*51.26*	0.00	1.1738	80.2253	1.3642	0.4474	127.02

Table 3:- Di Methyl Phenyl amine + Benzene at 30 ^{0} C

C (mole/L)	ρ (gm/ml)	V (m/sec)	$β_S$ (cm^2/dyne.10^{12})	$β_{S-}$ $β_{SO}$ (cm^2/dyne.10^{12})	η (CP)	τs (Sec.)	Zx10^{-5}	L_f	M_v
0.0000	*0.8682*	*1282*	*70.08*	0.00	0.5950	55.5968	1.1130	0.5282	89.97
0.0726	*0.8762*	*1293*	*68.26*	- 0.51	0.6401	58.2576	1.1329	0.5213	92.71
0.1497	*0.8829*	*1305*	*66.50*	- 0.87	0.6909	61.2598	1.1521	0.2145	95.77
0.2318	*0.8926*	*1318*	*64.49*	- 1.41	0.7414	63.7505	1.1764	0.5067	98.69
0.3194	*0.9007*	*1332*	*62.57*	- 1.75	0.7915	66.0322	1.1997	0.4991	101.99
0.4131	*0.9076*	*1347*	*60.72*	- 1.91	0.8392	67.9416	1.2225	0.4916	105.66
0.5136	*0.9145*	*1361*	*59.03*	- 1.80	0.8902	70.0646	1.2446	0.4848	109.60

0.6216	*0.9223*	*1374*	*57.43*	-1.45	0.9389	71.8947	1.2682	0.4781	113.72
0.7379	*0.9353*	*1395*	*54.94*	- 1.85	0.9868	72.2863	1.3047	0.4677	117.49
0.8637	*0.9408*	*1405*	*53.84*	- 0.65	1.0338	74.2130	1.3218	0.4630	122.57
1.0000	*0.9520*	*1420*	*52.09*	0.00	1.0807	75.0582	1.3518	0.4554	127.29

System: Di Methyl Phenyl Amine + Benzene

Molar Velocity Vs Concentration

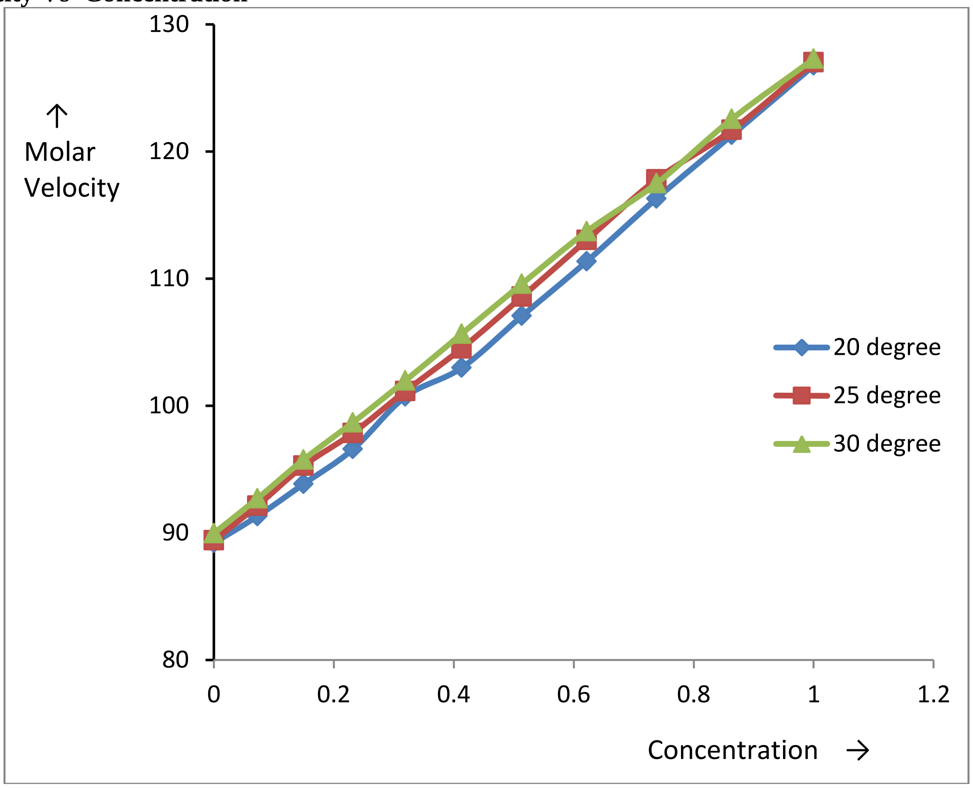

Fig.-1

System: Di Methyl Phenyl Amine + Benzene Ultra Sound Velocity Vs Concentration.

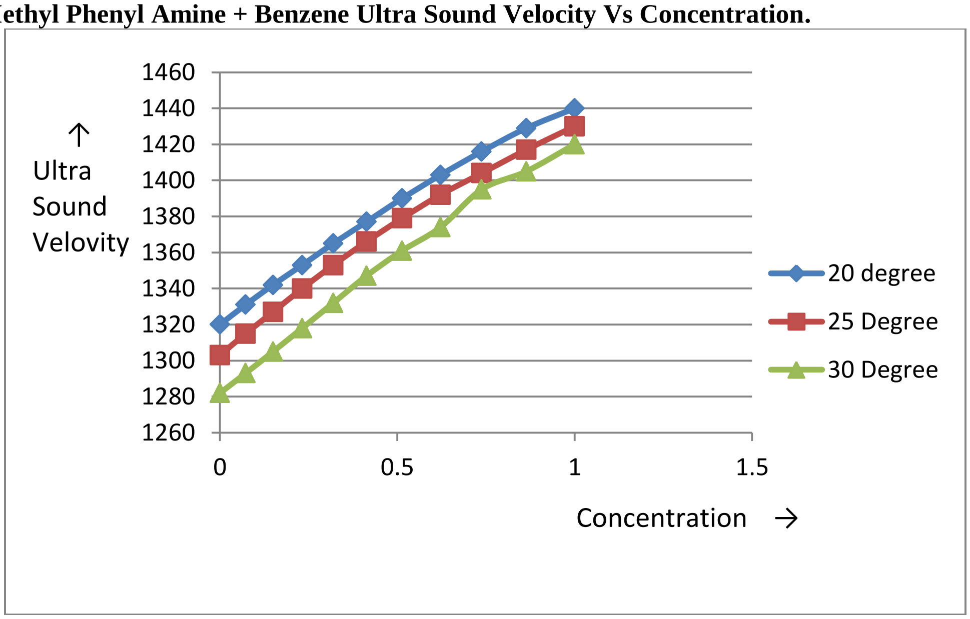

Fig.-2

System: Di Methyl Phenyl Amine + Benzene Viscosity Vs Concentration

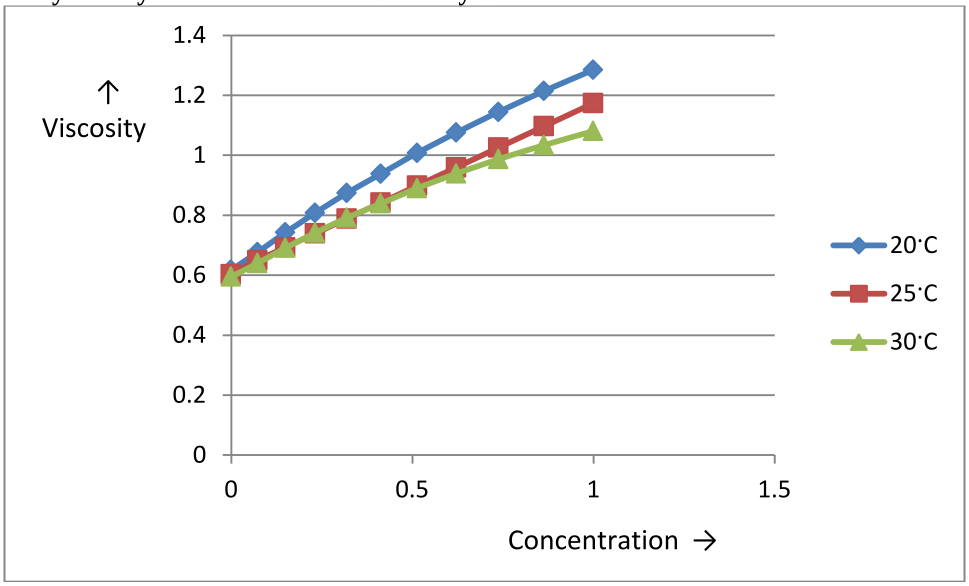

Fig.-3

System: Di Methyl Phenyl Amine + Benzene Lowering Compressibility Vs Concentration

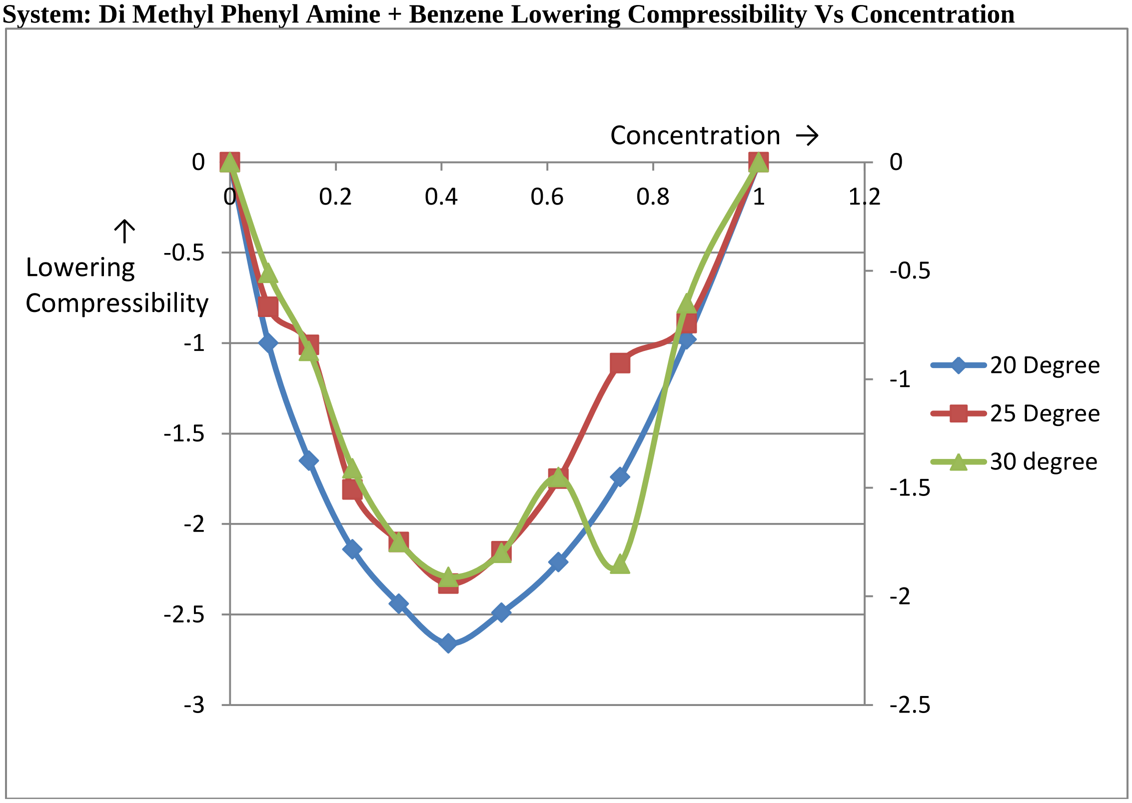

Fig.-4

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