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STUDIES ON REFRACTIVE INDEX OF 1, 3-DIARYL CARBAMIDES IN DIFFERENT PERCENTAGE OF BINARY LIQUID MIXTURE

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ABSTRACT

Refractive indices of binary liquid mixtures and 1, 3 diaryl carbamides in different percentage of binary liquid mixture such as acetone-water, dioxane-water & DMSO-water at 27± 0.1^{0}Cwere measured by Abbes' refractrometer. The data obtained was utilized to calculate molar refraction & polarizability constant which explain solute-solvent, solvent-solvent interactions.

Keywords: Refractive index, molar polarization, polarizability constants.

INTRODUCTION

Prediction of refractive indices of binary liquid mixture is essential for determination of composition of binary liquid mixtures. Refractive index measurements in combination with density, boiling, melting point and other analytical data have wide applicability in chemical analysis and industry.

Oswal and M.V. Rathanam[1] studied dielectric constants and refractive indices of binary mixture of ethyl acetate with toluene, ethyl benzene, o- xylene, p- xylene and p- xylene. Rita Mehta [2] studied application of refractive index in binary systems of hexadecane and hepadecane with n-alcohols at different temperatures, Sangeeta Sharma et al [3] have studied refractive index. on mixing properties of binary liquids mixture of Eucalytol with hydrocarbons at different temperatures. A.N. Sonar, N.S. Pawar [4] studied refractive index of substituted heterocyclic compound in different media. The properties of liquids such as viscosity, refractive index and ultrasonic velocity of binary mixture was studied by many workers [5-8] Mahajan et[9] al have studied molar refraction and polarizability constants of 2-amino-5chloro-benzene sulphonic acid in different % of dioxane-water mixtures.

The present study deals with refractive index measurement of 1,3-diaryl carbamides in different % of binary liquid systems.

EXPERIMENTAL

Nitrogen-containing heterocyclic compound have maintained the interest of researchers through decades of historical development of organic synthesis.

Some of most common nitrogen containing heterocyclic compounds includes Pyrimidines[10, 11] and thiadizoles[12, 13] exhibits antimicrobial, anticancer and antiviral activity. For the synthesis of these compounds Urea/Carbamides is used as material. As we well known that the monoarly, 1, 3-diaryl thiocarbamide, 1, 3-diaryl carbamide[14] have role in the synthesis of numerous 5and 6 membered hetrocyclic system. Due to the wide applicability of these compounds their physical parameter study with respect to refractive index measurement is implemented.

Acetone–water, dioxane–water, and DMSO-water mixture of varying compositions as well as solutions of 1, 3- diaryl carbamoides in different percentage of binary mixture were prepared. All weighing were made on contech Electronic balance (± 0.001 g). The accuracy of density measurements was within 0.1 kg m^{-3}. The refractive indices of solvent mixture and solutions were measured by Abbes' refractrometer was within (± 0.001 units). The temperature of prim box was maintained constant by

circulating water from thermostat mentioned at 306 K. Initially refractrometer was calibrated with a glass piece (n=1.5220) provided with the instrument.

Table-1: Values of Molar refraction and Polarizability constant at 306K
System – 1, 3 di *o*- tolyl carbamide

% of solvent	Medium					
	Acetone – water		Dioxane-water		DMSO- water	
	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3
75	1.04073	0.041272	1.17720	0.046684	1.16487	0.046195
80	1.15874	0.0549522	1.317215	0.05223	1.294130	0.051321
85	1.292160	0.05124	1.498169	0.05941	1.4559	0.057737
90	1.43037	0.05672	1.726579	0.06847	1.663645	0.065975
95	1.58363	0.06280	2.0254014	0.080321	1.920051	0.0761419

Table-2: Values of Molar refraction and Polarizability constant at 306K
System – 1, 3 di *m*- tolyl carbamide

% of solvent	Medium					
	Acetone – water		Dioxane-water		DMSO- water	
	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3
75	1.02956	0.040829	1.15473	0.0457933	1.173704	0.046545
80	1.12567	0.044640	1.30005	0.051556	1.302969	0.051671
85	1.22822	0.0487075	1.469142	0.0582616	1.463855	0.058052
90	1.385563	0.05494	1.684779	0.0669202	1.66228	0.06591
95	1.53940	0.0611048	1.987627	0.078823	1.921643	0.076206

The molar refraction of solvent, acetone–water, dioxane–water, DMSO-water were calculated from determined from-

$$Rs - w = x_1\ R_1 + x_2\ R_2$$

Where; R_1, R_2 are the molar refractions of solvent and water respectively.

The molar refraction of solutes of 1, 3- diaryl carbamide in binary liquid mixture were determined from

$$R_{mixture} = \frac{(n^1 - 1)}{([(n]^2 + 2))\left(\frac{(x_1 M_1 + x_2 M_2 + x_3 M_3)}{d}\right)}$$

Where, n= Refractive index of solution
x_1 = Mole fraction of solvent (acetone and 1,4-dioxane and DMSO)
x_2 = Mole refraction of water
x_3 = mole fraction of solute
m_1,m_2,m_3 = molecular weight of solvent, water and solute respectively.
d = density of solution.

$$R_{comp.} = R_{solution} - R_{s-w}$$

The polarizability constant (α) of compound is determined from-

$$R_{Lig} = \frac{4}{3}\ \pi\ N_A\ \alpha$$

Where, N_A= Avogadro's number.

RESULTS AND DISCUSSION

Refractive index is an important physical parameter of liquids. The potential of refractometry depends on sensitivity and time of measuring. The value of refractive index of blood[12] can serve as objective

parameter for estimating the level of inflammatory process both at the stage of identification and studying dynamics of liquid.

Table-3: Values of Molar refraction and Polarizability constant at 306K
System – 1, 3 di *p*- tolyl carbamide

% of solvent	Medium					
	Acetone – water		Dioxane-water		DMSO- water	
	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3	R_m $x10^3m^3$/ mole	$\alpha \times 10^{-26}$ m^3
75	1.03794	0.041161	1.159650	0.0459881	1.176813	0.04666
80	1.186795	0.047064	1.305573	0.051775038	1.30773	0.05186
85	1.28915	0.0511240	1.480022	0.058693	1.46773	0.076455
90	1.40494	0.055715	1.69997508	0.067415	1.67009	0.076455
95	1.54804	0.061390	1.98966	0.0789039	1.927913	0.076455

Molar refractivity is a measure of total polarizability of a mole of substance. It depends on refractive index of substance, temperature & pressure.

In the present study refractive index of solvent water mixture and 1, 3 diaryl carbamides in solvent-water mixture were determined. Molar refraction and polarizability was determined for variation in percentage of solvent-water mixture for fixed amount of compound.

For acetone –water, dioxane-water and DMSO-water mixtures, increase in % of solvent, molar refraction as well as polarizabily constant increases. The variation in molar refraction & polarizability constant observed for different solvents (Table 1-3) follows following trend-

Acetone water < DMSO-water < dioxane water

Though DMSO is having high dipole moment as compound to acetone and dioxne, the above mentioned result are observed due to solute solvent interaction and change in dielectric constant of medium.

The reason might be the attractive force may arise from temporary dipole formation in solvent which may produce weak intermolar force like dispersion force. The stronger deviation in electron cloud and the dispersion force result in increased polorizability with increase in % of more polar solvent. This may attributed due to the solute-solvent interaction and dipole orientation.

REFERENCES

1. S.L. Oswal and M.V. Rathnam, *Indian J. Chem*., **26**, 29 (1987).
2. R. Mehata, *Proc. Indian Acad. Sci. (Chem. Sci.)*, **115**, 147 (2003).
3. S. Sharma, P.B. Patil, R.S. Patil and J.J. Vora, *E-Journal of* Chemistry,**4**,343 (2007)
4. A.N. Sonar and N.S. Pawar, *Rasayan J.Chem*., **3**, 250 (2010).
5. K.M. Sonune, Y.K. Meshram, V.N. Saoji and G.D. Tambatkar, *Acta Ciencia India*, **XXXIIIC**,131(2007).
6. A.S. Burghate , P.B. Agrawal, S.W. Quazi and M.L. Narwade, *Asian J. Chem*., **13**, 1652 (2001).
7. S.A. Gonchukor and Yu.B. Lazarev, *Laser Physics*, **13**, 749 (2003).
8. P.B. Agrawal, A.S.Burghate and M.L. Narwade, *Asian J. Chem*., **13,** 1641(2001).
9. D.T. Mahajan, Ph.D. Thesis, Amravati University (1997).
10. K.S. Atwal, *J. Med. Chem*., **34**, 806(1991).
11. L.H. Schmidt and S. Clara, *J. Pharm. Exptl.,Therap*., **107**, 61(1953).
12. F.P. Invidiata, S. Grimaudo, P. Giammanco and L. Giammanco, *Farmaco*, **46**, 1489 (1991).
13. S.N. Sawhney and P.K. Sharma, *Bioorg. Med. Chem. Lett*., **3**, 1557 (1993).
14. N.K. Khendelwal: "Synthesis & Structural Organic Chemistry of 5 and 6- Membered Nitrogen, Sulphur and Oxygen Containing Compounds". Ph.D. Thesis submitted to Nagpur University, (1983).

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