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REFRACTOMETRIC STUDY OF DIFFERENT CHLORO SUBSTITUTED AZETIDIN-2-ONE AT DIFFERENT CONCENTRATION AND TEMPERATURE IN 90% (EtOH+WATER) SOLVENT

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ABSTRACT

β-Lactam nucleus containing drugs created their own identity. The substituted azetidin-2-one has great significances in medicinal and organic chemistry.Hence, this class of compounds has served an important and highly successful role in the pharmaceutical industries. We investigate the densities, molar refraction and polarizability constant of different chloro substituted azetidin-2-one drugs of different concentration in 90% (EtOH+water) solvent at various temperatures in the present work. The experimental data study the effect of concentration of solute on refractive index in ethanol-water mixtures. The experimental data study gives the idea about effect of temperature on the molar refraction and polarizability constant.

Keywords: *chloro substituted azetidin-2-one, Density, molar refraction (Rm), polarizability constant (α), refractometry*

I. INTRODUCTION

The refractive index is an important additive property of liquid. When a light of beam passes from one substance to another, the beam is bending so that it travels in different direction. If it is passed from less dense to high denser medium it is refracted toward normal to form angle of refraction which is less than angle of incident. The refractive index is the ratio of angle of incident to the angle of refraction. It depends on the temperature and wave length of light. These compounds have wide range of medicinal and pharmaceutical properties viz. anti-cancer[1], anti-diabetic and anti-oxidant[2] anti-psychotics[3], anti-coccidial[4],cardiovascular[5]. Determination of molar refraction and polarizability constant provide valuable information to understand molecular interaction. Volumetric and refractive index of the ternary mixture methanol/formamide/acetonitrile at 298.15 K are observed by Filomena Martins et al.[6]. Liu et al. [7] observed the molar enthalpy of mixing and refractive indices of cholinechloride-based deep eutectic solvents with water.Many workers[8-10]was

II. METHOD & MATERIAL

The 0.1M concentrated solution of compound these were prepared in 90% ethanol-water mixture. In the same way, 0.075M, 0.056M and 0.042M solutions for the compounds C1and C2 were prepared. The compound used during investigations is as depicted below, studied the properties of liquid such as viscosity, refractive index and ultrasonic velocity of binary mixtures. A. M. Kshirsagar[11] was stuied refractrometrycally of s-trizinothiocarbamides in 80% dioxane-water mixture at different temperature. Effect of change in concentration of solute and solvent on molar refraction and polarizability constant of some thiopyrimidine derivatives was stuied by M. P. Wadekar et al.[12].H. Doweidar[13] are determined structural study of density and refractive index of Sb2O3–B2O3 glasses. Density and refractive index of binary mixtures of two1-alkyl-3-methylimidazolium ionic liquids with 1,4-dioxane and ethylene glycol studied by Ciocirlan et al.[14]. Begum et al. [15] observed Excess molar volumes, refractive indices and transport properties of aqueous solutions of poly(ethylene glycol)s at (303.15–323.15) K.

1.**(C_1)**3-Chloro-4-(4-hydroxyphenyl)-1(4nitrophenyl) azetidin-2-one

2.**(C_2)**3-chloro-4(4-chlorophenyl)-1(4hydroxyphenyl) azetidin-2-one

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All weighing were made on Mechaniki Zaktady Precyzying Gdansk Balance [Poland make, (±0.001gm)]. The densities of solutions were determined by a bicapillary Pyknometer (±0.2%) having a bulb volume of about 10cm^3 and capillary having an internal diameter of 1mm. The refractive indices of solvent mixture and solutions were

III. CALCULATION

The molar refraction of solutions of compound in ethanol-water mixture were determined by a following equation,

$$R_{mixture} = [(\acute{\eta}^2-1)/(\acute{\eta}^2+2)]\{[X_1M_1+X_2M_2+X_3M_3]/d\} \quad (1)$$

Where,

[1] is the refractive index of solution,

X_1 is mole function of Ethanol, X_2 is mole function of Water, X_3 is mole function of Solute,

M_1, M_2, M_3 are molecular weights of Ethanol, water and solute respectively, measured by Abbe's refractometer (±0.001). The temperature of the prism box was maintained at 27°C. Initially, the refractometer was calibrated with glass piece (n=1.5220) provided with the instrument

D is density of solution

The molar refraction of compound is calculated as -

$$R_{lig} = R_{mixture} - R_{Ethanol\text{-}Water} \quad (2)$$

Where,

$R_{Ethanol\text{-}Water}$ - The molar refraction of solvent, Dioxane-Water mixture

The polarizability constant (α) of compound is calculated from the following relation,

$$R_{lig} = (4/3)\,\pi\, N_o\, \alpha \quad (3)$$

Where, N_o is Avogadro's number.

IV. RESULT & DISCUSSION

Table 1: Values of Molar Refraction of Different % of Ethanol -Water Mixture

Percentage of Ethanol	[Rm]
90	5.33885
80	7.871479
70	8.232405

Table 2: The values of refractive index (n) and density(d), molar refraction (Rm), polarizability constant (α) of different molar solution of ligand in 90% (Ethanol - Water) solvent at 293K of C_1

Conc in Mol/Lit	Refractive index (n)	Density(d) gm/cm^3	Rm x10^3 cm^3/mole	α x10^{-24} cm^3
0.01	1.5978	1.0498	13.29288	3.15
0.005	1.5871	1.0478	12.94734	3.02
0.0025	1.5798	1.0465	12.74385	2.94
0.00125	1.562	1.0455	12.39083	2.80

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Table 3: The values of refractive index (n) and density(d), molar refraction (Rm), polarizability constant (α) of different molar solution of ligand in 90% (Ethanol - Water) solvent at 298K of C_1

Conc in Mol/Lit	Refractive index (n)	Density(d) gm/cm^3	Rm x10^3 cm^3/mole	α x10^{-24} cm^3
0.01	1.5894	1.0495	13.14474	3.09
0.005	1.5786	1.048	12.79171	2.95
0.0025	1.5653	1.0461	12.48669	2.83
0.00125	1.5539	1.0453	12.24557	2.74

Table 4: The values of refractive index (n) and density(d), molar refraction (Rm), polarizability constant (α) of different molar solution of ligand in 90% (Ethanol - Water) solvent at 293K of C_2

Conc in Mol/Lit	Refractive index (n)	Density(d) gm/cm^3	Rm x10^3 cm^3/mole	α x10^{-24} cm^3
0.01	1.5561	1.044	12.58583	2.87
0.005	1.5421	1.043	12.17434	2.71
0.0025	1.538	1.041	12.04096	2.66
0.00125	1.511	1.04	11.50519	2.45

Table 5: The values of refractive index (n) and density(d), molar refraction (Rm), polarizability constant (α) of different molar solution of ligand in 90% (Ethanol - Water) solvent at 298K of C_2

Conc in Mol/Lit	Refractive index (n)	Density(d) gm/cm^3	Rm x10^3 cm^3/mole	α x10^{-24} cm^3
0.01	1.5321	1.042	12.15625	2.70
0.005	1.5289	1.041	11.94956	2.62
0.0025	1.5198	1.039	11.72187	2.53
0.00125	1.5164	1.038	11.62983	2.49

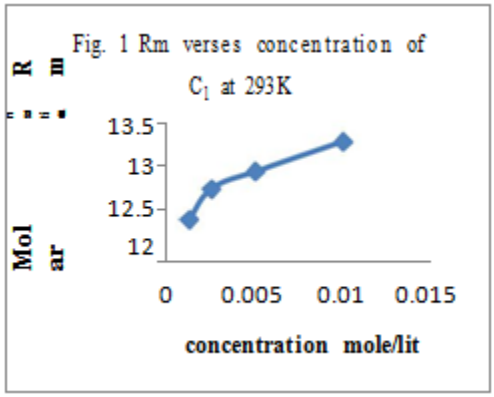

Fig. 1 Rm verses concentration of C_1 at 293K

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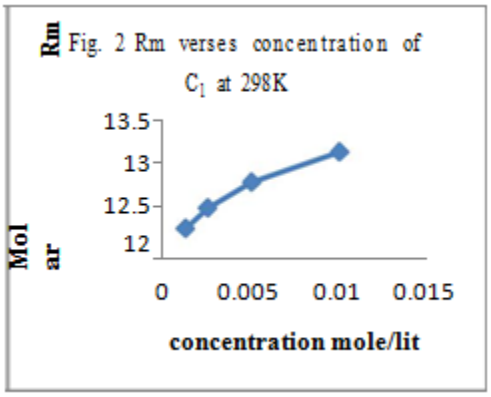

Fig. 2 Rm verses concentration of C_1 at 298K

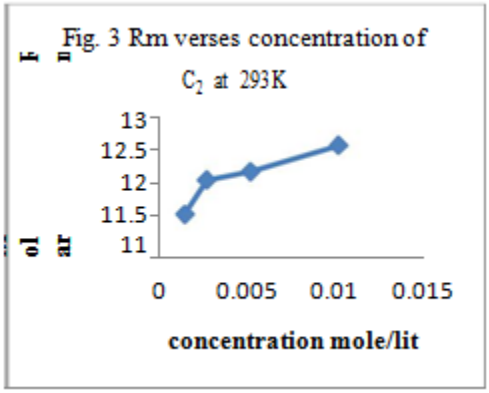

Fig. 3 Rm verses concentration of C_1 at 293K

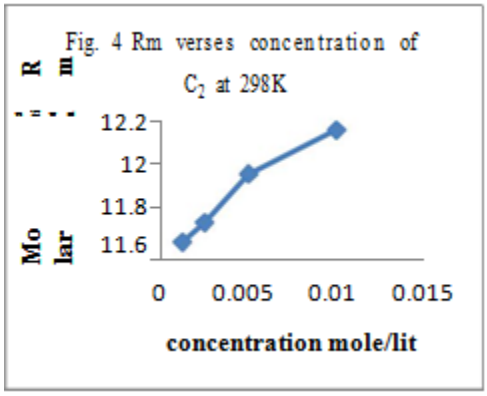

Fig. 4 Rm verses concentration of C_1 at 298K

Table-1 represent values of molar refraction of pure solvent in different percent composition. The refractive index (n), density (d), molar refraction n (Rm) and polarizability constant (α) of chloro substituted azetidin-2-one derivatives in different percentage of solvent are presented in table no. 2 -5.

It is observe that thevalues of molar refractivity and polarizability constant decreases with decreasing concentration of chloro substituted azetidin-2-one drugs in 90% (Ethanol -Water) solvent. Graphical representation of molar refraction and concentration are shown in fig (1 to 4)at 293K and 298K

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V. CONCLUSION

It could be seen that there is linear relationship between molar refraction and concentration. From above discussion molar refraction of compound C_1 was greater than C2.It is observed that the substance containing more polar groups normally have higher refractive index than substance containing less polar .

VI. ACKNOWLEDGEMENTS

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