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STUDIES ON VISCOSITY, DENSITY AND REFRACTIVE INDEX OF BICALUTAMIDE IN MIXED SOVENT AT 303.15K.

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ABSTRACT

- Refractive index, molar refractivities and molar polarizability constant of (bicalutamide) ((*RS*)-*N*-[4-cyano-3-(trifluoromethyl)phenyl]-3-[(4-fluorophenyl)sulfonyl]-2-hydroxy-2-methylpropanamide) in 30% ethanol media at 303.15 K ± 0.1$_0$C temperature and different concentrations (0.625x10^{-3} to10.0x 10^{-3}M). The values of molar refraction (Rm) and molar polarizability (α) constant are found to be decreased with decreasing concentration of solute in solvent. Viscosity coefficient (A, B) evaluate by using john–dole equation. These parameters throw the light on the solute-solvent interaction and solute-solute interaction.

KEYWORDS: molar polarizability constant, Molar refractivities and Viscosity coefficient.

INTRODUCTION

Bicalutamide used to treat prostate cancer.[1] It is also used together with a gonadotropin-releasing hormone analogue or surgical removal of the testicles to treat metastatic prostate cancer.[2][3][4] The refractive index is an important additive property of molecular structure of liquid. For pure hydrocarbon, one can get an idea of aromatic content of liquid using refractive index. The refractive index is the ratio of angle of incident to the angle of refraction and it depends on the temperature and wave length of light. The extent of refraction depends on -i) the relative concentration of atom or molecule ii) The structure of atom or molecule. So refractive index gives idea about geometry and structure of molecule. Refraction of light is additive property, but also depends on the structural arrangement of atom in molecule. This can some time be used to determine the structure of an unknown compound whose molecular formula is known.

Sangita Sharma et. al.[5] has been studied density and refractive index of binary liquid mixture Eucalyptol with Hydrocarbon at different temperature. Oswal et.al[6] have been studied refractivity properties of some homologous series such as n-ethanoate, methyl alkanoates, ethyl alkanoates etc. were measured in the temperature range from 298.15 to 333.15^{0}K The properties of liquid such as refractive index , ultrasonic velocity and viscosity of binary mixture are studied by many workers.[7] Yangang Liu[8] has studied relationship of refractive index to mass density and consistency of the mixing rule use to calculate these two quantities of multicomponent mixture like ambient aerosols with the index-density relationship. Yadava[9] has studied refractive indices of binary mixture of bromoalkane and non polar hydrocarbons, also studied molecular interaction between the components of binary mixtures. Sonune et. al.[10] has been studied additive properties such as molar refractivity and molar polarizability constant of allopurinal, acenocoumarol, warfarin and amoxicillin in different media. Syal[11] et.al. has been studied the ultrasonic velocity and viscosity of PEG-8000, PEG- study of acoustical properties, viscosity coefficient of substituted heterocyclic compounds under suitable condition. Number of researchers studied the molar refraction and viscosity coefficient for binary and tertiary system.[12-16]

After review of literature, the present work is undertaken to make the systematic study of above bicalutamide refractometrically and viscometry at 303.15 K.

EXPERIMENTAL

Above substituted heterocyclic compounds have most important. The solution of above compound is prepared in solvent like 20% ethanol by dissolving an appropriate amount by weight. For density measurement all the weight took on contech balance (0.001gm). The refractive index of solvent and solutions are measured at different (0.625x10^{-3} to 10x10^{-2}) by Abbe's refractometer having accuracy with ± 0.0001unit. The constant temperature of the prism box is maintained by circulating water from thermostat at 303.15 K. Refractometer was calibrated using glass test piece of known refractive index supplied with the instrument.

The molar refraction of solvent and solution are determined by using Lorentz-Lorentz equation.

$$R_M = \frac{(n^2-1)}{(n^2+2)} X \frac{M}{d} = 4/3 \square\square\square\square\square\text{----------}\square\square\square$$

The entire viscosity data have been analyzed by using Jones-dole equation.

$$\eta_{sp} / \sqrt{c} = A + B \sqrt{c} \text{ ----------(2)}$$

n- Refractive index M- Molecular weight d- Density of solution R_m- Molar refraction N- Avogadro's number α– Molar polarizability constant X_1 and X_2 Mole fraction of solvent and solute in solution.

The refractive index of solvent and solution at different concentrations are measured by Abbe refractometer. The calculated values of molar refractivities and polarizability constant shown in table-1. For viscosity measurement ostwald viscometer (10ml) was used. The flow time measured by using digital clock (0.01Sec).

However study of molar refractivity, molar polarizability constant and viscosity coefficients of substituted heterocyclic compounds such bicalutamide in 20% ethanol media at 303.15 K ± 0.1^{0}C temperature and different concentrations (0.625x10^{-3} to10.0x 10^{-2}M) under identical set of experimental condition. This could cover mini fold aspect of solute-solvent interactions scanty.

RESULTS AND DISCUSSION

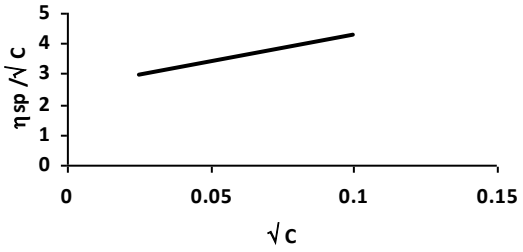
Table-1: The values of Molar polarization and polarizability constant at 303.15K.

Conc^n in Moles/lit.	Density Kg/Cm^3	R.I.(n)	R_m x10^{-5} cm^3/mole	□ x10^{-29} cm^3
10 x10^{-3}	1.0136	1.3813	9.8567	3.91
5 x10^{-3}	1.0121	1.3776	9.7858	3.88
2.5 x10^{-3}	1.0112	1.3744	9.7204	3.86
1.25 x10^{-3}	1.0100	1.3710	9.6529	3.82
0.625 x10^{-3}	1.0085	1.3684	9.6067	3.80

Table-2 - The values of □$_r$, Density, □$_{sp}$/□ C, A and B-coefficent of substituted drug in 20% Ethanol.

Conc. Mol./lit	Density gm/Cm^3	Flow time (Sec)	□$_r$	□$_{sp}$/□ C	□	□
10 x10^{-2}	1.0136	214	1.4055	4.0554	2.4982	17.857
5 x10^{-3}	1.0121	195	1.2789	3.9436		
2.5 x10^{-3}	1.0112	181	1.1860	3.7196		
1.25 x10^{-3}	1.0100	170	1.1126	3.1844		
0.625 x10^{-3}	1.0085	163	1.0652	2.6075		

Fig.1 Plots of ηsp /√ C Vs √ C



From above tables (2), it could be seen that molar refractivity and molar polarizability constants decreases with decreasing the concentration of solution.

From Table-2 it is observed that the value of 'A' (Falkenhagen coefficient) are positive in all system studied. 'A' is measure of ionic interaction. The value of A is positive; it indicates that there is a strong solute-solute interaction in solute molecules. 'B' is Jones-Dole coefficient measures solute-solvent interaction. The value of "B" coefficient is positive in drug. Solute with positive 'B' coefficient is characterized as "Surface former" indicating strong solute-solvent interactions. This may be attributed to strong ion-solvent interaction in system.

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