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VISCOSITY AND REFRACTIVE INDEX STUDIES OF AMINO ACID IN MIXED SOLVENT.

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ABSTRACT
Refractive index ,molar refractivities and molar polarizability constant of amino acid such as DL-tryptophan in solution of sodium benzoate prepared in 30% ethyl alcohol at 303 K ± 0.1^0C temperature and different concentrations (0.01 to 0.09M).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 refractivities, molar polarizability constant and Viscosity coefficient

INTRODUCTION

Amino acid is common compounds of all organisms. All proteins are constructed from amino acids. Tryptophan is an α-amino acid that is used in the biosynthesis of proteins. Tryptophan is also a precursor to neurotransmitters serotonin and melatonin.[1] Tryptophan is a routine constituent of most protein-based foods or dietary proteins. It is particularly plentiful in chocolate, oats, dried dates, milk, yogurt, cottage cheese, red meat, eggs, fish, poultry, sesame, chickpeas, almonds, sunflower seeds, pumpkin seeds, buckwheat, spirulina, bananas, and peanuts. Contrary to the popular belief.[2-4]

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.

Thirumaran et al have been studied the viscosity, density of some amino acid in aqueous sodium butyrate Solution.[5] Yasin Akhtar had investigated the Solute-solvent and Solute-solute interaction of glycin in aqueous solution of electrolytes by viscosity measurement.[6] In recent years, a number of researchers have studied the density and viscosity data to deduce the thermodynamic properties (Jones –Dole coefficient) for a number of mixtures solutions.[7-9] Amalia ŞTEFANIU et al have been studied the refractive index for L-alanine and L-histidine in NaCl aqueous solutions at different salt and amino acid concentrations and at constant temperature.[10] Abdolhossein Haghani et al have been studied the viscosity of three amino acids, glycine, l-alanine, and l-valine in aqueous solutions of sodium benzoate at temperature and concentrations.[11]

After review of literature, the present work is undertaken to make the systematic study of above amino acid refractometrically and viscometrically at 303 K.

EXPERIMENTAL

Above amino acid have most important. The solution of above compound is prepared in solvent like 30% ethyl alcohol 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 (0.01 to 0.09M) 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 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.

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

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 aminoacid in 30% ethyl alcohol media at 303 K ± 0.1^0C temperature and different concentrations (0.01 to 0.09M) under identical set of experimental condition. This could cover mini fold aspect of solute-solvent interactions scanty.

RESULTS AND DISCUSSION

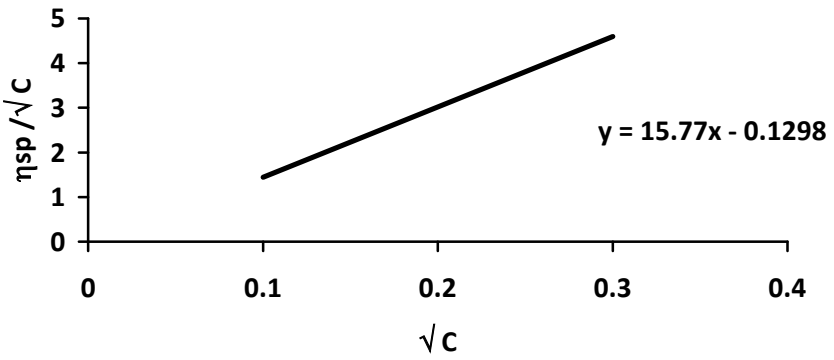
Table-1: The values of Molar polarization and polarizability constant at 303K.

Conc^n in Moles/lit.	Density gm/Cm^3	R.I.(n)	R_m x10^{-2} cm^3/mole	α x10^{-26} cm^3
0.01	0.9873	1.3374	4.3059137	1.71
0.02	0.9838	1.3383	4.3316743	1.72
0.03	0.9820	1.3405	4.3651588	1.73
0.04	0.9811	1.3448	4.4190289	1.75
0.05	0.9738	1.3491	4.502251	1.78
0.06	0.9689	1.3500	4.5355399	1.80
0.07	0.9631	1.3501	4.5640294	1.81
0.08	0.9583	1.35213	4.6108551	1.83
0.09	0.9494	1.35615	4.7018842	1.86

Table 2: The values of η_r, Density, $\eta_{sp}/\sqrt{C}$, A and B-coefficent of amino acid in 30% ethanol.

Conc. Mol./lit	Density gm/Cm^3	Flow time (Sec)	η_r	$\eta_{sp}/\sqrt{C}$	A	B
0.01	0.9873	86	1.1389	1.3890	-0.1298	15.77
0.02	0.9838	99	1.3064	2.1667		
0.03	0.9820	110	1.4489	2.5918		
0.04	0.9811	123	1.6187.	3.0933		
0.05	0.9738	135	1.7634	3.4139		
0.06	0.9689	146	1.8975	3.6638		
0.07	0.9631	159	2.0540	3.9839		
0.08	0.9583	173	2.2238	4.3266		
0.09	0.9494	188	2.3941	4.6471		

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 negative in all system studied. 'A' is measure of ionic interaction. The value of A is negative, it indicates that there is a weak 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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