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volumetric and viscometric studies of Sucrose in Aqueous Medium,5%&10% Ethanol- Water Medium at 313.15 K with different concentration.

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Abstract: *Density and viscosity studies of sucrose in aqueous medium and in non aqououes 5% ,10 % ethanol -water medium were measured at 313.15 K. The concentration ranges were 0.1-0.9 M. The results obtained from volumetric and viscometric studies measurement have been utilized to calculate the Falkenhagen coefficient A and Jones-Dole coefficient B. Each data are interpreted in the light of solute-solvent and solute-solute interactions.*

Keyword :- *Sucrose, Ethanol, Water,density, viscosity,jones-Dole coeff.B,Falkenhagen coeff.A.*

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I. Introduction

Sucrose is a non reducing sugar and in this respect it differs from the other disaccharides. Moreover sucrose does not form an osazone does not exist in anomeric forms and does not show mutarotation in solution.All these facts indicate that sucrose does not contain a free aldehyde or ketone group.vicosity of concentrated aqueous electrolyte solution at various concentration[1] .volumetric and viscometric studies of solute –solvent and solute-solute interactions of glycine in aqueous in aqueous electrolytes at 30^0 c[2].The viscometric study of lysozyme solution with sugar and urea at various tempratuer[3].The behavior of electrolyte in aqueous carbohydrate solutions recently has been a subject of interest [4-6].viscosity and its derived parameters provide valuable information regarding the shape and size of molecules[8].viscometric and thermodynamic studies of interactions in ternary solutions containing sucrose and aqueous alkali metal halides at 293.15,303.15,313.15 k[9] Volumetric and transport properties of aqueous sulphuric acid[17] ,study of solute-solute and solute-solvent interactions of L-threonine in aqueous-glucose solutions at different temperetures by using volumetric and viscometric methods[19] .Aim of present work ,much or large work has not been done on sucrose in different percentage of non aqueous medium viscometrically.Hence present work is try to make systematic study of sucrose in aqueous and non aqueous medium of different percentage and concentration ranges 0.1-0.9 M[water-ethanol] to determine viscosity and jones-Dole coefficient B,Falkenhagen coefficient A .This work also deals with the study of interaction between solute-solvent and solute-solute in different medium and different concentration at 313.15 k.

II. Materials And Methods

All the chemicals were A.R. grade sucrose from merck chemicals purity of 99.8% ethanol from S.D. fine chemical minimum assay of 99.9% which are used without further purification .The purities of the chemicals were checked by density determination at 313.15 k the uncertainty is less than $\pm 1\times10^{-4}gcm^{-3}$.The water used for the preparation of solution was double distilled.The molar aqueous and non Aqueous solution of sucrose, 5%,10 % ethanol-water system were prepared by utilizing digital electronic balance[Model-HR300 japan]. of concentration 0.1-0.9 M at temperature 313.15 K.

The density of aqueous and non aqueous solution of sucrose were measured by utilizing specific gravity bottle by relative measurement method with accuracy of $\pm 0.1\ kgm^{-3}$.

The viscosities were measured by means of ostwald's viscometer which was kept in equilibrium with elite thermostate water bath ($\pm$ 0.1^{o}c).sucrose solution of different concentration were prepared in aqueous medium, 5%, 10% ethanol-water medium.For each measurement sufficient time was allotted to attend thermal equilibrium in thermostate.

III. Results And Discussion

To measure density and viscosity in different concentration of sucrose solution with the following mathematical equation.

$$ή = \frac{d_s \times t_s}{d_w \times t_w} x\ ή_w \text{----------(1)}$$

Where
ή= Viscosity of sucrose solution.
d_s=Density of sucrose solution.
t_s =Time flow of sucrose solution.
d_w =density of water.
t_w=time flow for water
$ή_w$= Viscosity of Water
The relative viscosity of sucrose in aqueous medium and 5% and 10% ethanol-water medium at different concentration at a temperature 313.15 K are listed in table (1) (2) and (3).
The viscosity data have been interpreted by Jones-Dole equation [18].

$$(ήr-1)/\sqrt{c} = ήsp\sqrt{c} = A + B\sqrt{c} \text{ ----------(2).}$$

Where,

A = Falkenhagen coefficient
B = Jones- Dole coefficient
C = Concentration

The Falkenhagen coefficient (A) measures the solute- solute interaction while Jones-Dole coefficient (B) measures the solute- solvent interaction.

Table 1. Density, Viscosity,relative viscosity of Sucrose of aqueous solution

Conc.	**Temp. in K.**	**ρ (kgm^{-3})**	**η**	**ηr**
0.1	313.15	1.0020	0.8756	1.0806
0.2	313.15	1.0101	1.0334	1.3048
0.3	313.15	1.0200	1.1878	1.4973
0.4	313.15	1.0299	1.3324	1.6470
0.5	313.15	1.03963	1.4798	1.7926
0.6	313.15	1.04885	1.6144	1.9027
0.7	313.15	1.06647	1.7593	2.0269
0.8	313.15	1.07992	1.8930	2.1251
0.9	313.15	1.0999	2.0232	2.213

Table 2 : Density, Viscosity, reletive viscosity of 5% Ethanol-Water Solution of Sucrose

Conc.	**Temp. in K.**	**ρ (kgm^{-3})**	**η**	**ηr**
0.1	313.15	1.01836	0.8945	1.3707
0.2	313.15	1.02777	1.1.0641	1.6306
0.3	313.15	1.03887	1.2189	1.8678
0.4	313.15	1.04911	1.3762	2.1088
0.5	313.15	1.06888	1.5288	2.3426
0.6	313.15	1.09977	1.6693	2.5579
0.7	313.15	1.1111	1.8105	2.7743
0.8	313.15	1.12448	1.9558	2.9969
0.9	313.15	1.14934	2.0934	3.2027

Table 3 : Density Viscosity,relative viscosity of 10% Ethanol-Water Solution of Sucrose.

Conc.	Temp. in K.	$\rho_{(kgm^{-3})}$	η	ηr
0.1	313.15	1.02866	0.9399	1.4402
0.2	313.15	1.04791	1.1213	1.7182
0.3	313.15	1.06977	1.2970	1.9874
0.4	313.15	1.0888	1.4731	2.2573
0.5	313.15	1.1112	1.6244	2.4891
0.6	313.15	1.14553	1.7882	2.7401
0.7	313.15	1.17866	1.9326	2.9614
0.8	313.15	1.18984	2.0992	3.2167
0.9	313.15	1.22666	2.2578	3.4597

Table-4 A=Falkenhagen coefficient,B=Jones-Dole coefficient values at 313.15 k.

system	A	B
Water+Sucrose	0.504345	1.810227
5% water+Ethenol	0.590345	1.83405
10%Water+Ethenol	0.771209	1.902623

The experimental results obtained from density, viscosity of aqueous solutions of sucrose at 313.15K of concentration 0.1-0.9 M are listed in Table(1) while for non aqueous solution of sucrose such as 5%, 10%, ethanol-water medium at 313.15 K are listed in Table(2) and (3) respectively. Viscosity increases as shown in table (2) and(3) due to increasing the concentration furthermore velocity of ions decreases and it is concentration dependent. therefore solute-solute interaction is more for table (3) Falkenhagen coefficient A and Jones –Dole coefficient B are listed in table(4) it indicate that solute- solvent interaction is more in table(4) when percentage of ethanol increased while solute –solvent interaction is weak for table(1).

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