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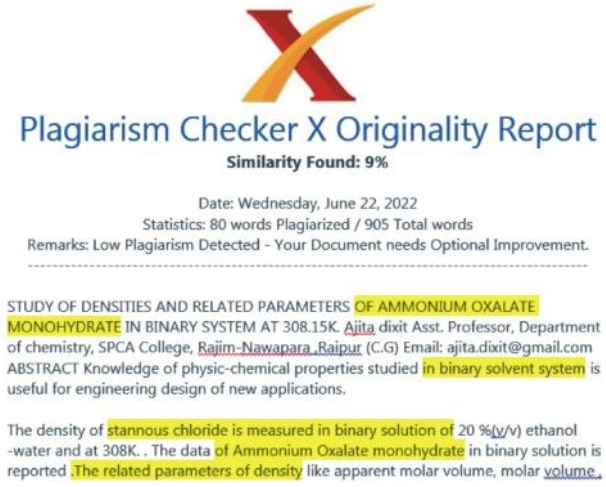

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STUDY OF DENSITIES AND RELATED PARAMETERS OF AMMONIUM OXALATE MONOHYDRATE IN BINARY SYSTEM AT 308.15K. Ajita dixit Asst. Professor, Department of chemistry, SPCA College, Rajim-Nawapara ,Raipur (C.G) Email: ajita.dixit@gmail.com ABSTRACT Knowledge of physic-chemical properties studied in binary solvent system is useful for engineering design of new applications.

The density of stannous chloride is measured in binary solution of 20 %(v/v) ethanol -water and at 308K. . The data of Ammonium Oxalate monohydrate in binary solution is reported .The related parameters of density like apparent molar volume, molar volume ,

ABSTRACT

Knowledge of physic-chemical properties studied in binary solvent system is useful for engineering design of new applications. The density of stannous chloride is measured in binary solution of 20 %(v/v) ethanol –water and at 308K. The data of Ammonium Oxalate monohydrate in binary solution is reported. The related parameters of density like apparent molar volume, molar volume , experimental slope calculated and reported. Data of density and their parameter shows interaction between solute and solvent system.

KEYWORDS

Molar volume, Density & Apparent molar volume.

INTRODUCTION

Volumetric properties of binary mixtures are complex because they not only depend on solvent-solvent and solute-solvent interactions, but also are the result of the structural effects arising from interstitial accommodation due to the difference in molar volume and free volume between components present in solution. Ammonium oxalate monohydrate has been used for the detection and determination of calcium , lead, fluoride and rare earth metals. This compound is has many pharmaceutical uses and employed as chelators and forms complexes with metals etc . The data of densities is used to study parameters of Apparent molar volume (ϕ_v), limiting apparent molar volume ($\phi 0$ v0 v), experimental slope (S* v* v), molar volume (V) and excess molar volume (V^E) at 310K different temperature.

Experimentation

A stock solution of 0.10M of each of of ammonium oxalate monohydrate is prepared in 20% (v/v) ethanol- water system at 308.15K. Mass dilution technique used for preparation of other concentrations. The concentration of the solutions involved in the experiment was taken in range from 0.01M to 0.10M. Mass dilution technique was applied to prepare the solution of different concentration; ranges from 0.01 M to 0.10 M. Densities of solutions are determined using 10 cm^3 double armed pycnometer at temperatures 303.15 K. The pycnometer was calibrated at these temperatures with distilled water and benzene. The estimated accuracy of density measurement of solution was 0.00004 g cm^{-3}.

Results and Discussion

Densities of ammonium oxalate monohydrate in 20%(v/v) ethanol-water (2)

$$\rho/\rho_1 = W/W_1 \qquad [1]$$

Where,

W and W_1 are weight of ammonium oxalate monohydrate in ethanol -water respectively. ρ is density ammonium oxalate monohydrate and ρ_1 is density of ethanol-water solution . Densities of ammonium oxalate monohydrate solutions, determined as a function of their concentration a 308.15 $^{\circ}$K temperature in 20 %(v/v) ethanol-water solution . The densities of solute were obtained as an intercept of plot between concentration and density of solutions (using Microsoft Excel). The data is reported in Table -1.

Table 1: Densites of Ammonium Oxalate Monohydrate in Ethanol - Water System at 308.15K

Concentration(mol.L^{-1})C	Density AT308.15K (Kg.m^{-1}) ρ
0.0100	1.0603
0.0200	1.0652
0.0300	1.0701
0.0400	1.0710
0.0500	1.0817
0.0600	1.0933
0.0700	1.0972
0.0800	1.0981
0.0900	1.1176
0.1000	1.1185

Apparent molar volume, ϕ_v, is calculated by following the equation (3)

$$\phi_v = (\rho_1-\rho)/c\rho\rho_1 + M/\rho \qquad [2]$$

Where,

c is Morality of the solution, M is Molar mass of the solute,ρ andρ_1 Density of solution and solute. The result of ϕ_v of ammonium oxalate monohydrate are reported in Table- 2.The apparent molar volume at infinite dilution $\phi 0\ v0\ v$ were calculated by the method of least square and fit to plot of ϕ_v vs $c^{1/2}$ in accordance with the Masson's (4) empirical relation ,

$$\phi_v = \phi 0\ v0\ v + S^*\ v^*\ v\ c^{1/2} \qquad [3]$$

Where, $S^*\ v^*\ v$ is experimental slope. The slope is calculated by the extrapolation of the plots to zero concentration (using Microsoft excel). The positive and less negative values of experimental

slope are generally associated with the solutes showing an overall hydrophilic character as in the present investigation. The values of apparent molar volume are reported in Table 2.

Table 2: Apparent Molar Volume, Apparent Molar Volume at Infinite Dilution and Experimental Slop of Ammonium Oxalate Monohydrate in Ethanol - Water system at 308.15K

Concentration ($mol.L^{-1}$)C	Apparent Molar Volume (ϕ_V)	Apparent Molar Volume Infinite Dilution, ($\phi^* v$)	Experimental Slope ($S^* v^*$)
0.0100	24.3182	57.7447	816.8876
0.0200	79.8219		
0.0300	98.3217		
0.0400	107.7776		
0.0500	113.0351		
0.0600	116.5012		
0.0700	119.2161		
0.0800	121.3316		
0.0900	122.5251		
0.1000	123.8862		

The molar volumes of solutions are derived from the following expression (5),

$$V = (X_1M_1+X_2M_2) /\rho \qquad [4]$$

Where, X_1 and X_2 are Mole fraction of mixed solvent and Mole fraction of solute.M_1 and M_2 Molecular weight of solvent and Molecular weight of solute ρ is density of solution respectively. The data of molar volume of solution is reported in Table 3. The molar volume of ammonium oxalate monohydrate is 20.00.

Table 3: Molar Volumes Ammonium Oxalate Monohydrate in Ethanol - Water System at 308.15K

Concentration($mol.L^{-1}$)C	Molar Volume at 308.15K
0.0100	20.0005
0.0200	20.0154
0.0300	20.0300
0.0400	20.0449
0.0500	20.0582
0.0600	20.0709
0.0700	20.0845
0.0800	20.0986
0.0900	20.1081
0.1000	20.1215

Knowledge of the excess molar volume is of important property in design and storage and handling facilities of mixtures .The excess molar volume (V^E) for these solutions are obtained by the given expression (6),

$$V^E = V – (X_1 V_1 + X_2 V_2) \qquad [5]$$

Where, V, V_1 and V_2 are the molar volume of solution, mixed solvent and solute respectively. All the values are negative. The data of compound is reported in Table 4.

Table 4: Excess Molar Volumes of Ammonium Oxalate Monohydrate in Ethanol - Water System at 308.15K.

Concentration(mol.L^{-1})C	Excess Molar Volume at 308.15K
0.0100	-0.0011
0.0200	-0.0023
0.0300	-0.0037
0.0400	-0.0049
0.0500	-0.0070
0.0600	-0.0094
0.0700	-0.0114
0.0800	-0.0131
0.0900	-0.0171
0.1000	-0.0192

CONCLUSION

The data of densities increases as function of concentration .The positive value of ϕ_v for indicate greater solute-solvent interactions. The values of ϕ^0_v are large and positive for ammonium oxalate monohydrate in ethanol- water system at 308K .suggesting the presence of strong solute – solvent interaction.

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