Volumetric Study in Some Binary Liquid Mixtures Triethyl Amine with Primary Alcohols At 303.15k

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***Abstract*— Triethyl amine well as methanol, Ethanol, Propanol and Butanol are important aliphatic organic amino compound, which draw their importance as excellent solvents. The density and molar volume of binary mixtures of Triethyl amine with methanol, Ethanol, Propanol and Butanol have been determined experimentally at 303.15K. Molar volume computed utilizing these experimental data. The excess values are indicative of interaction between the components molecules in all four systems.**

***Index Terms*— Binary mixtures of Triethyl amine with methanol, Ethanol, Propanol and Butanol, density and molar volume**

I. INTRODUCTION

The volume change on mixing at constant temperature is one of the most interesting thermodynamic functions for the mixing process. Battino has presented a very extensive review on volume change on mixing are made relatively easily with high precision and information so obtained is much of importance regarding the molecular interaction and theories of solution. The values of excess volume are generally determined by employing pyknometer or dilatometers in the present investigation excess volumes have been measured, employing pyknometric technique.

II. MEASUREMENT OF THE EXCESS VOLUME

Excess molar volume has been determined by two general methods. The first of one is a direct method of which involves the mixing of liquid in dilatometer and observing the change of mercury level in the capillaries. This method used to estimate the molar volume. The second is an indirect method which is based on measurement of densities of liquids mixtures pyknometrically. Many types of pyknometer are discussed by Boer and Luewirr given the characteristics and handling procedures are also suggested. In the present investigation double armed pyknometer is used a double armed has been employed for densities measurements. The filling of pyknometer is done by syringe to avoid major source of error which is arise due to evaporation losses during the filling process. It reduces the errors accompanied in dilatometric technique due to inadequate mixing and due to the vapor space. Volume changes on mixing are estimated by densities measurements of the component liquid and their mixtures by using the relation.

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$$V^E = V_{12} - (X_1 V_1 + X_2 V_2)$$

Where V_1, V2 and X_1, X_2 are the molar volumes and mole fraction of component 1 and 2 respectively V_{12} is molar volume of the mixture.

III. EXCESS VOLUME STUDY OF MOLECULAR INTERACTION

In the excess volume measurement for binary liquid system in the present investigation is defined for the study of molecular interaction. Excess volume degeneration for the liquid mixture such as esters and Alcohols, ketones and Ester, chloroalkanes alkandiol, carbonate and aromatic hydrocarbons have been made and the result are interpreted on the basis of molecular interaction between the components. Excess volume of the solution of that self association and the hydrogen bond affect the V^E values Mato *et al.* have studied excess molar volumes of binary system of 1,2 dichloro and 1,3 dichloro benzene hexane, 1-chlorohexane and nature magnitude of the interaction has been investigation on the basis of positive and negative values of V^E. It was therefore, felt necessary to perform excess volume determination on the systems chosen for this investigation.

IV. EXPERIMENTAL

The binary systems studied were Triethylamine + Methanol, Triethylamine + Ethanol, Triethylamine + Propanol, Triethylamine + Butanol. The make and glades of the chemical used for excess volume measurements were save as those in the viscosity studies Binary mixture were prepared to cover whole mole fraction range, by weight component of the mixture were injected in to rubber sealed *glass* vials by means of syringe to avoid evaporation losses .Density of pure liquids and their binary mixtures were determined by Pyknometer after equilibrating in a water thermostat maintained at 303.15k ±0.03 the weights were measured by electric single pan analytical balance
accurate to ± 1.0×10^{-8} kg the density were evaluated by measuring the weights of liquid and that of triple distilled water filled in pyknometer up to make by following equation.

$$\rho_{liquid} = W' / W \, \rho_{water} \; t + 1.2 \, [\, 1 - W' / W \,] \; K\, gm^{-3}$$

Where ρ_{liquid} and ρ_{water} t are the densities of liquid and water at experimental temperature W ' and W are the weight of liquid and weight of water respectively the constant 1.2 in a buoyancy correction factor. The densities were accurate to $\pm 0.00001 = 10^3$ Kgm^{-3}. The excess *molar* volume, V^E for the mixtures studies were composition of the binary mixtures of below equation.

$$V^E = V_{mix} - V_{idl}$$

$$V_{mix} = X_1 M_1 + X_2 M_2 \; / \rho$$

Or $$V_{ideal} = X_1 M_1 / \rho_1 + X_2 M_2 / \rho_2$$

Where V_{mix} is the molar volume of the binary liquid mixture X_1, X_2 M_1 M_2 and ρ_1 ρ_2 all the mole fractions, molecular weights, and densities of the components of the binary mixtures respectively.

V. RESULT AND DISCUSSION

Density in access molar volume for whole mole fraction range of mixture, which for binary system triethylamine + methanole, triethylamine +ethanol, triethylamine + propanol and triethylamine + butanol are reported in table 1 to 4 perusal of table 1 to 4 shows that the excess molar volume are negative for all binary mixtures. triethylamine + methanol, , triethylamine + ethanol, triethylamine + propanol and triethylamine + butanol access molar volume of mixtures are be taken as qualitative guide to export of interaction binary liquid mixtures. Powell and Switerm proposed a large excess molecular volume indicate like interaction between component. The negative range of excess molar volume for binary mixture 1 to 4 explain by near of distraction of dipolar indication in pure liquid component the different of perusal interaction between the pure liquid are solution of four formation interaction, dipolar interaction like hydrogen bonding.

The all binary system are show negative excess molar volume. The negative value binary liquid mixtures show that molecular interactions are strong in system.

The mole fraction continued to rolling determinant excess molar volume of mixture of triethylamine + ethanol, triethylamine + propanol and triethylamine +butanol. Sharma *et al.,.*, has suggested hydrogen bonding in Toice system gives arise for strong complex which many testy by the large negative excess molar volume. Its clear that strong molecular interaction are pressure in these system.

Table- 1: Value of density (ρ), molar volume (v) and excess molar volume (V^E) for binary liquid mixture Triethylamine and Methanol at 303.15K.

Mole fraction (X_1)	Density (ρ) (gml^{-1})	Molar volume (V) x 10^6 (ml mol^{-1})	Excess Molar volume (V) (ml mol^{-1})
0.0000	0.7820	40.96	-
0.0311	0.7815	44.72	-0.31
0.676	0.7780	46.09	-0.64
0.1242	0.7772	53.24	-1.14
0.1618	0.7753	54.64	-1.49
0.2247	0.7703	62.42	-1.99
0.3029	0.7652	69.82	-2.37
0.4033	0.7608	77.61	-2.63
0.5368	0.7506	92.70	-2.87
0.7227	0.7408	112.82	-2.27
1.0000	0.7190	140.81	--

Table-2: Value of density (ρ), molar volume (v) and excess molar volume (V^E) for binary liquid mixture Triethylamine and Ethanol at 303.15K.

Mole fraction (X_1)	Density (ρ) (gml^{-1})	Molar volume (V) x 10^6 (ml mol^{-1})	Excess Molar volume (V) (ml mol^{-1})
0.0000	0.7810	59.00	-
0.0218	0.7808	60.55	-0.24
0.0446	0.7792	62.17	-0.48
0.0953	0.7784	65.77	-1.03
0.1529	0.7775	69.97	-1.54
0.2192	0.7680	81.00	-2.24
0.2963	0.7625	88.32	-2.34
0.3870	0.7565	97.20	-2.35
0.4956	0.7430	103.49	-2.24
0.6275	0.7315	108.21	-2.13
1.0000	0.7190	140.81	--

Table-3 : Value of density (ρ), molar volume (v) and excess molar volume (V^E) for binary liquid mixture Triethylamine and Propanol at 303.15K.

Mole fraction (X_1)	Density (ρ) (gml^{-1})	Molar volume (V) x 10^6 (ml mol^{-1})	Excess Molar volume (V) (ml mol^{-1})
0.0000	0.7957	70.26	-
0.1098	0.7921	70.88	-7.12
0.2173	0.7896	71.26	-14.33
0.3225	0.7842	80.67	-12.75
0.4255	0.7782	90.26	-10.01
0.5264	0.7725	101.23	-6.16
0.6250	0.7652	110.56	-3.79
0.7216	0.7531	118.26	-2.90
0.8164	0.7431	125.23	-2.62
0.9091	0.7326	135.24	-0.84
1.0000	0.7190	140.81	--

Table-4: Value of density (ρ), molar volume (v) and excess molar volume (V^E) for binary liquid mixture Triethylamine and Butanol at 303.15K.

Mole fraction (X_1)	Density (ρ) (gml^{-1})	Molar volume (V) x 10^6 (ml mol^{-1})	Excess Molar volume (V) (ml mol^{-1})
0.0000	0.8025	92.64	-
0.1240	0.7964	93.23	-5.05
0.2184	0.7856	94.23	-8.93
0.3239	0.7224	95.67	-12.95
0.4269	0.7656	98.25	-14.95
0.5279	0.7542	105.26	-12.80
0.6265	0.7426	110.52	-11.89
0.7231	0.7354	118.27	-9.20
0.8174	0.7223	125.43	-6.58
0.9102	0.7205	135.26	-1.22
1.0000	0.7190	140.81	--

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