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Excess Parameter Study of Aqueous Benzene at Various Temperatures

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ABSTRACT

The present paper reports the study of excess parameters of aqueous benzene namely excess adiabatic compressibility (βa^E), excess relaxation time (τ^E) and excess molar volume (V_m^E) at various temperatures and at frequency 5 MHz, In order to study the nature of interactions between the components of binary liquid mixtures. Excess parameters play a vital role in assessing the compactness due to molecular arrangement and the extent of molecular interaction in the liquid mixtures through charge transfer, dipole-dipole and dipole-induced dipole interaction. Non–ideal liquid mixtures show considerable deviation from linearity in their physical behavior with respect to concentrations which interpreted the presence of strong or weak interactions. The thermo acoustic parameters were calculated from the velocity, density and the viscosity measurements. By taking measurements over entire range of concentrations and temperatures, we obtained information about the aggregation of constituents in aqueous benzene.

Keywords : α-Al_2O_3, Ethanol, Free Length, Nanosuspension

I. INTRODUCTION

From the observed spectra, weak molecular interactions cannot be resolved. These weak molecular interactions can be resolved by ultrasonic nondestructive technique. The thermoacoustic measurement provides useful information regarding physical and chemical behavior of pure liquids and liquid mixtures. It is therefore important to obtain the fundamental information such as molecular association, dissociation, internal structure making or breaking, miscibility or compatibility, semi-miscibility or semi compatibility etc. Excess parameters study of binary liquid mixtures plays very important role in understanding molecular interaction in pure, binary and ternary liquid mixtures for possible applications in biomedical industries, chemical, pharmaceutical industries and technology. Liquid mixtures consisting of ions, polar and non-polar components are of immense importance in industries, such as in pharmaceutical, petrochemical and dye.

II. RESULT AND DISCUSSION

Figure 1 shows the variation of excess values of relaxation time (τ^E), adiabatic compressibility βa^E and molar volume V_m^E of aqueous benzene. It is seen that; excess values are positive over the entire range of concentration and at temperature 293 K. The positive excess values of relaxation time indicate the strong molecular interaction between the unlike component molecules of liquid mixture. The nonlinear variation may be due to solvent-solute or ion-dipole interactions. When temperature is increased positive excess values of relaxation time τ^E slightly decreases with same trend of variation.

Excess values of adiabatic compressibility βa^E and excess molar volume V_m^E are negative. The negative deviation of excess values is an indication of existence of strong interaction between the component molecules and molecular association between the unlike molecules.

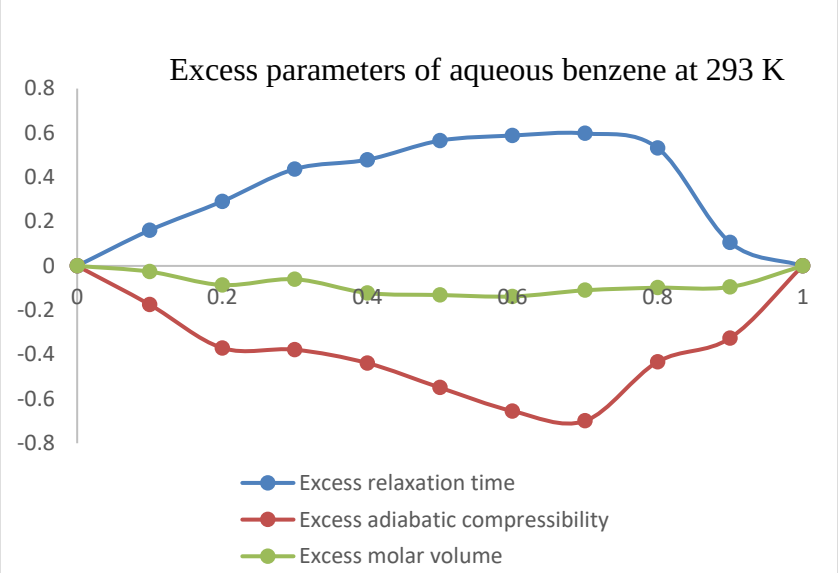

Figure 1 Variation of excess values of relaxation time (τ^E), adiabatic compressibility βa^E and molar volume V_m^E of aqueous benzene at 293 K

Figure 2 shows the variation of excess values of relaxation time τ^E of aqueous benzene. It is seen that; excess values are positive over the entire range of concentration and at temperature 298 K. The positive excess values of relaxation time indicate the strong molecular interaction between the unlike component molecules of liquid mixture. The nonlinear variation may be due to solvent-solute or ion-dipole interactions. When temperature is increased positive excess values of relaxation time τ^E slightly decreases with same trend of variation. Excess values of adiabatic compressibility βa^E and excess molar volume V_m^E are negative. The negative deviation of excess values is an indication of existence of strong interaction between the component molecules and molecular dissociation between the unlike molecules, it also shows that maximum structural changes take place in peak region of the mixture. It further suggests that the negative excess values of βa^E are due to the closely packed molecules which account for the existence of strong molecular interaction with increase in temperature, for entire range of

concentration, there are decreasing negative excess values of βa^E and L_f^E, indicates molecular association, which leads to less closer packing in binary liquid mixture.

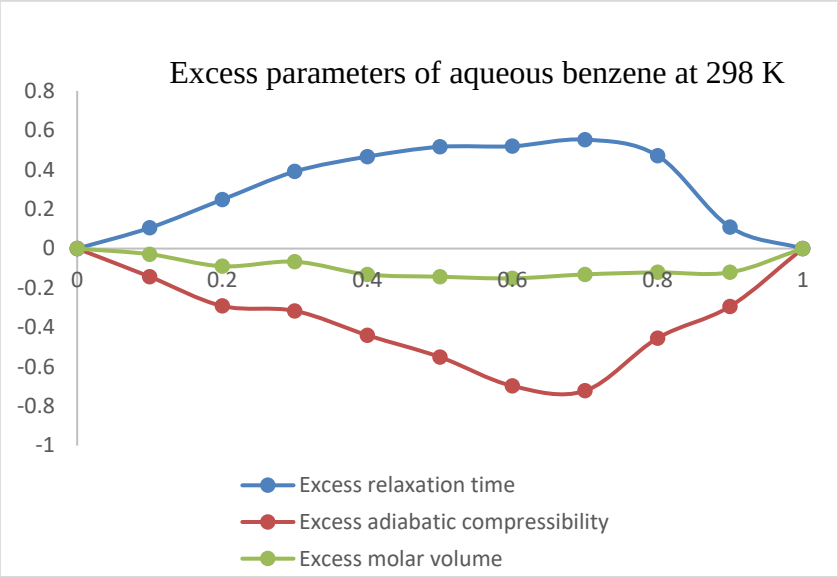

Figure 2 Variation of excess values of relaxation time (τ^E), adiabatic compressibility βa^E and molar volume V_m^E of aqueous benzene at 298 K

Figure 3 shows the variation of excess values of relaxation time (τ^E), adiabatic compressibility βa^E and molar volume V_m^E of aqueous benzene. It is seen that; excess values are positive over the entire range of concentration and at temperature 303 K. The positive excess values of relaxation time indicate the strong molecular interaction between the unlike component molecules of liquid mixture. The nonlinear variation may be due to solvent-solute or ion-dipole interactions. When temperature is increased positive excess values of relaxation time τ^E slightly decreases with same trend of variation. With increase in temperature, negative excess values of βa^E and V_m^E again decreases keeping same variation trend negative excess values and trend which are applicable in Broad classification.

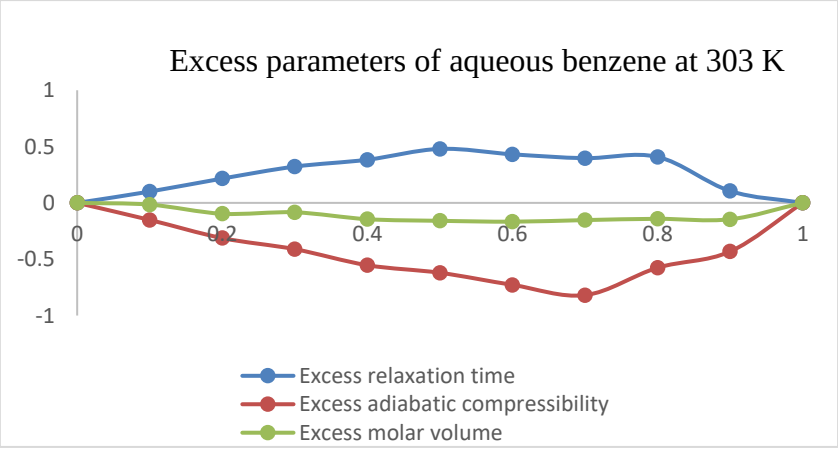

Figure 3 Variation of excess values of relaxation time (τ^E), adiabatic compressibility βa^E and molar volume V_m^E of aqueous benzene at 298 K

III. CONCLUSIONS

In broad classification $\%\beta a^E$ and $\%V_m^E$ indicating strong interactions between the component molecules.
Broad classification on the basis of negative $\%\ \beta a^E$ values the relative strength of heteromolecular AB interaction

IV. REFERENCES

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