

CHAPTER X

CONCLUDING REMARKS

In this research work, I have tried to investigate the interaction of some vitamins with some solution systems. Molecular interactions have been studied with the help of thermodynamic and transport properties of solutions. Various types of interactions exist in solution, of these, solute-solute and solute-solvent interactions are of much interest in all branches of chemistry. Such a study will find importance in chemical engineering areas and pharmaceutical industry.

In this **chapter IV**, we have analyzed molecular interaction prevailing in α -amino acids (glycine, L-alanine, L-valine) and aqueous solution of Folic acid (FA) physico-chemical properties as density (ρ), viscosity (η), refractive index (n_D) and ultrasonic speed (u) at 298.15 K. The role of the cosolute (FA), and the contribution of solute-solute and solute-solvent interactions to the solution complexes, has also been analyzed through the derived properties. We have tried to find out the trends in transfer volumes, $\Delta\phi_v^\circ$, which have been interpreted in terms of solute-cosolute interactions on the basis of a cosphere overlap model. Our analysis revealed that strong solute-solvent interaction predominates.

In **chapter V**, precise electrical conductance measurements are reported for some ethanoates, viz. ammonium, lithium, sodium and potassium in pure tetrahydrofuran (THF) and dimethyl sulphoxide (DMSO) and their binary mixtures at 298.15 K. The conductance data have been analyzed by the Fuoss conductance-concentration equation in terms of the limiting molar conductance (Λ_0), the thermodynamic association constant (K_A) and the association diameter (R). The limiting ionic conductances have been estimated from the appropriate division of the limiting molar conductivity value of the "reference electrolyte" Bu_4NBPh_4 . It was concluded that the ion-pair and triple-ion formation of salt depends on the size, the charge distribution of the ions and also the relative permittivity of the solvent mixtures. Here too the classical Fuoss-Kraus theory of triple-ion formation which occurs in low dielectric solvent was found to be valid in the study.

The apparent molar volume (ϕ_v), viscosity B -coefficient and molal refraction (R) of some carbohydrates (D-Glucose, D-Sucrose, and D-Maltose monohydrate) have been determined in 0.01, 0.03, 0.05 mol·dm⁻³ aqueous ascorbic acid solutions at 298.15 K from the experimental density (ρ), viscosity (η) and refractive index (n_D) values respectively in **chapter VI**. Solute-solvent and solute-solute interaction pattern, we have tried to interpret using Massion equation. From different measurements we have concluded that solute-solvent interaction dominates.

In **chapter VII** apparent molar volumes (V_ϕ), viscosity B -coefficients for Nicotinamide (NA) in (0.03, 0.05, 0.07 and 0.10) mol·dm⁻³ aqueous Citric Acid monohydrate (CA) solutions have been determined from solution density and viscosity measurements at (298.15, 308.15 and 318.15) K as function of concentration of NA. The structure making or breaking ability of NA has been discussed. V_ϕ^0 and viscosity B -coefficient values for NA indicate the presence of strong solute-solvent interactions and these interactions are further strengthened at higher temperatures and higher concentration of CA in the ternary solutions. This study also reveals that NA acts as a water-structure promoter due to hydrophobic hydration in the presence of CA and CA has a dehydration effect on the hydrated NA.

Here, In **chapter VIII** apparent molar volume (ϕ_v), viscosity B -coefficient, molal refraction (R) and adiabatic compressibility (ϕ_K) of Nicotinic Acid, Ascorbic Acid, and Folic Acid have been determined in 0.01, 0.03, 0.05 mol·dm⁻³ aqueous Cysteine solutions at 298.15 K from density (ρ), viscosity (η), refractive index (n_D) and speed of sound (u) respectively. We have investigated presence of strong solute-solvent interactions which increases with the increase in the interactive centres of vitamins and with increase of mass fraction of cysteine in the aqueous mixture. The refractive index and the molal refraction values imply that Folic Acid molecules are more tightly packed in the solution leading to higher solute-solvent interaction than the other vitamins.

In this **chapter IX** we have tried to find molecular interaction in terms of apparent molar volume (ϕ_v), viscosity B -coefficient, apparent molar adiabatic compressibility (ϕ_K) and molal refraction (R) of Glycine, L-Alanine, L-Valine in 0.01, 0.03, 0.05 mass fraction of aqueous nicotinic acid solutions at 298.15 K.

Analysing experimental results we have found that solute-solvent interaction is dominant over the solute-solute interaction for all the amino acids in all the aqueous solution of nicotinic acid. The molecular polarisability is higher for L-valine leading to more solute-solvent interaction compared to the other two amino acids. ϕ_k^0 and R also supports the same fact.

It is necessary to remember that molecular interactions are very complex in nature. There are strong forces existing in the molecule and it is not really possible to separate them all. Nevertheless, if careful judgement is used, valid conclusions can be drawn in many cases relating to degree of structure and order of the system. More extensive studies of the different thermodynamic properties will be of sufficient help in understanding the nature of the solute-solvent interactions and the role of solvents in different chemical processes.

In the near future we endeavour to extend our research work which I hope will certainly compliment our present findings.