

C H A P T E R - V

SUMMARY :

This research work is aimed to understand the concept of structural interactions in aqueous and nonaqueous solutions of electrolytes. The brief survey about the knowledge of structure of water, the properties of water and their implications in governing life processes is presented.

The utility of the thermodynamic properties to understand ion-solvent, ion-ion and ion-molecule interactions is discussed. The concept of hydrophobic interactions is also elaborated. The use of transfer properties i.e. the corresponding changes in properties like volumes and compressibility of ions from non-aqueous solvent system to aqueous solvent system is discussed. A short account of binary aqueous-nonelectrolyte systems is also given to highlight the peculiar properties of these binary systems. All these have formed the introductory chapter (Chapter-I) of this dissertation. The aim of the work consists of measurement of sound velocity and density properties of aqueous solutions of Dimethylformamide (DMF) at 25^oC and the corresponding alterations in these properties by addition of salts like NaCl, KCl and Bu₄NBr. The properties also

studied in pure DMF for the salt Bu_4NBr at 25°C .

In Chapter-II a brief review on the techniques of measurement of sound velocity and density has been given. The recent advances in the density measurement i.e. measurement by the digital densimeter (Model Anton PAAR DMA 602) is discussed. A systematic measurements of sound velocity and density measurements were made for electrolytes in water, DMF in water and electrolytes in mixed DMF-water solvent systems at 25°C . The results and calculations of the derived parameters i.e. adiabatic compressibility of solutions (β_{ad}), apparent molal volume of DMF as well as of ions as a function of mole fraction of DMF in aqueous mixed solvent systems are presented. Similarly the apparent molal compressibility behaviour of DMF in aqueous binaries as well as of electrolytes in mixed solvent systems was studied.

Our prime aim was to carry out this work to study transfer properties of electrolytes from water to mixed aqueous DMF solutions which has been accomplished by obtaining appropriately the limiting apparent molal volume ϕ_{v}° and limiting apparent molal compressibility ϕ_{k}° values for aqueous electrolyte solutions, and for electrolytes in mixed aqueous solutions. The transfer functions of the salts from water to aqueous DMF solution show a non-linear behaviour for all the salts studied.

The transfer functions at various DMF fractions have been interpreted in terms of pair and higher order interactions between the electrolytes and the co-solvent (DMF). The decrease of $\Delta\phi_v^0$ has been attributed to solute-cosolvent interactions. The increase of $\Delta\phi_k^0$ values have been interpreted in terms of strong hydrophobic interactions i.e. solute-solute interactions and the effect of pressure on them.

The peculiarities which occur for $\Delta\phi_v^0$ and $\Delta\phi_k^0$ properties as a function of DMF concentration have also been attributed to water-structure making and breaking effect exerted by the ions as well as to the ion-ion or cation-cation (in case of Bu_4NBr) interactions. Such a discussion have been advanced and forms the contents of Chapter-IV of this dissertation.