

## CHAPTER – 12

### **Concluding Remarks**

The aim of the works embodied in this thesis was rheological and thermodynamic investigation of some properties prevailing in aqueous and non-aqueous systems.

After a thorough study in chapter 4, it is revealed from the behavior of alkan-1-ols and 2-methoxy ethanol mixtures that the lower alkan-1-ols were found to associate more strongly with the 2-methoxy ethanol molecules as compared with the higher ones and self association in an alkan-1-ol was found to increase with the increasing chain length of the alkan-1-ols. The measured data and calculated values of all systems are in good accordance, and are theoretically and statistically satisfying.

In chapter 5, an extensive study was done on the behavior of the tetraalkylammonium halides in 1,4 D.O + Methanol mixtures through conductometric measurements. It becomes clear that major portion of the electrolyte exists as ion-pairs with a minor portion as triple-ions. The tendency of the ion-pair and triple-ion formation of  $R_4NX$  depends on the size of the ions. Further, it was found that  $Oct_4NCl$  had the tendency to form maximum amount of triple-ions and minimum number of ion-pairs in different binary solvent mixtures of 1,4 D.O + Methanol as compared to the other electrolytes.

The study of  $V_\phi^\circ$  and viscosity  $B$ -coefficient values for different thiocyanate, in chapter 6 indicate the presence of strong ion-solvent interactions and these interactions are further strengthened with rise in temperature and with decrease in the amount of 1,3-dioxolane in the mixtures. It also seen that all studied thiocyanate salts in different composition of 1,3-Dioxolane + water mixture acts as a structure breaker.

After a thorough study in chapter 7, it is revealed that the solvent environment affects the strength of intermolecular hydrogen-bond formation between the  $-O-H$  group of primary alcohols, (methanol to 1-decanol) and the  $-O-$  linkage of ethers. The strongest solvent-solvent interaction was observed between the  $-O-H$  group of 1-decanol and the  $-O-C-O-$  linkage of cyclic diether, 1,3-dioxolane whereas the weakest interaction seem to exist between  $-O-H$  group of methanol and  $-C-O-C-$  linkage of the cyclic ether, tetrahydrofuran.

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In chapter 8 an attempt has been made to reveal the nature of various type of interactions prevailing in solutions of some acetate salts in tetrahydrofuran + water mixtures at various temperatures. It is found that the  $(\delta^2 V_\phi^0 / \delta T^2)_P$  values are positive for all acetate salts and for all mass % of THF + H<sub>2</sub>O mixtures investigated here suggesting thereby that these acetate salts act as structure promoters in these mixed solvent systems.

After a thorough study in chapter 9, of the behavior of some ether on DMF + C<sub>6</sub>H<sub>6</sub> mixtures we get a clear idea about the type and amount of molecular interactions between them and also given us an idea about antagonism. The explanation of this behavior is based on the known phenomenon of molecular dissociation, as a consequence of weakening the non-covalent bonding formed between the molecules producing a decrease in size of the molecular package.

After a thorough study in chapter 10, it is revealed that alkali halides remain slightly associated in Dimethyl sulfoxide (DMSO) + Acetonitrile mixtures and are very much solvated by DMSO than acetonitrile and that solvation of the ions is weakened as soon as the ion pair is formed. The cations are found to be substantially solvated in solvent mixtures whereas the anions appear to have weak interactions with the solvent molecules. The results further indicate that the Coulombic forces play a major role in the ion association processes. These electrolyte solutions, in general, show an increase in the association constant values with an increase in concentration of DMSO in the solvent mixtures. Further, the effect of concentration of DMSO on limiting equivalent conductances of alkali metal ions is more pronounced as compared to that of tetraalkylammonium ion in the present mixed solvent media.

After a thorough study in chapter 11,  $\phi_v^0$  and viscosity *B*-coefficient values for nicotinamide indicate the presence of strong solute-solvent interactions and these interactions are further strengthened at higher temperatures and higher concentration of resorcinol in the ternary solutions. This study also reveals that nicotinamide acts as a water-structure promoter due to hydrophobic hydration in the presence of resorcinol and resorcinol has a dehydration effect on the hydrated nicotinamide.

In recent years, to understand the intermolecular interactions and the mechanism of such interactions among mixed components at microscopic and macroscopic levels rheological and thermodynamic studies on mono, binary and ternary solvent systems are highly

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useful. Numerous forces may operate between the molecules in solvent mixtures and it is really hard to separate and assign them all. Nevertheless, if careful experimental technique and methodology is used, valid conclusions may be drawn related to nature of structure and order of the systems in solution phase.

To conclude it may be stated that extensive rheological and thermodynamic studies of the different physico-chemical, biological or pharmaceutical activity between different components of a given mixture will be immense help in understanding the nature of different interactions prevailing in mixed systems. The proper understanding of the ion-ion and ion-solvent interactions may form the basis of explaining quantitatively the influence of the solvents and ions in solution and thus pave the way for real understanding of different phenomena associated with solution chemistry.