

CHAPTER-IX

Concluding Remarks

Symmetrical tetraalkylammonium and alkali metal salts show numerous interesting properties that are now being investigated in many laboratories. Most of the present day knowledge on non-aqueous solutions has come from studies on various thermodynamic properties e.g. solubilities, free energies of solution, transfer free energies, heat capacities etc. as well as on transport properties e.g. conductance, viscosity and transference numbers. We therefore determined the thermodynamic and transport properties of some tetraalkylammonium, alkali metal and tetraphenyl salts in propylene carbonate and in its non-aqueous binary mixtures from their viscosity, conductance and solubility measurements. Solvent-solvent interactions in four binary non-aqueous mixtures of propylene carbonate have also been attempted from volumetric and viscometric studies. Infrared and Raman spectral investigations of some alkaline-earth metal and alkali metal perchlorates have also been attempted since these are potentially capable of yielding more precise information on the nature of interactions taking place in solution.

The viscosity B co-efficients give us quantitative values of the ion-solvent interactions, but still we have no unambiguous method of division of B-coefficients into ionic B values in all solvents. The use of Bu_4NBBu_4 and Bu_4NPh_4 appears to be sound, but we lack sufficient data measured in different solvents to arrive at a definite conclusion. It is desirable to use different methods of division of B values to have reasonably consistent ionic B values.

Accurate B_{ion} values would give the solvation number of ions.

It is known that

$$B_{ion} = B_{ion}^{Einst.} + B_{ion}^{Str} + B_{ion}^{Disord}$$

but it is not possible to calculate the individual constituents like B_{ion}^{Einst} etc. so that the effect of charges on the nature of solvation can be properly explored. Efforts should be made to know at least B_{ion}^{Einst} values experimentally.

Similarly, different methods are to be used to find out limiting conductances of the ions from the limiting equivalent conductances of electrolytes. Proper evaluation of the limiting equivalent conductance, Λ° , the single-ion conductance, λ_{\pm}° , the ionic association constant, K_A and the ion size parameter a° and their dependence on the dielectric constant would be of great help in determining ion-ion and ion-solvent interactions. However, the variation of λ_{\pm}° values for ions depends not only on their solvodynamic entity but also on their movement through different solvents. This aspect needs consideration and further study.

However, it is necessary to remember that ion-solvent interactions are very complex in nature. There are strong electrical forces between ions and between the ions and solvents and it is not really possible to separate them all. Nevertheless, if careful

judgement is used, valid conclusions can be drawn in many cases from solubility, viscosity, conductivity and spectroscopic measurements relating to degree of structure and order of the system.

More extensive studies of the different thermodynamic and transport properties of electrolytes will be of immense help in understanding the nature of ion-solvent interactions and the role of solvents in different chemical processes.