ABSTRACT

The overall aim of this thesis was to investigate the molecular interactions of biologically important compounds in aqueous and aqueous sodium chloride and potassium chloride solutions. The departure of a real solution from ideal behaviour has been attributed to the difference in interaction between like and unlike pairs of the molecules. The biologically important compounds chosen for the present work are glucose, sucrose, urea, ascorbic acid, fructose, galactose, glycine, alanine, oxalic acid, citric acid, tartaric acid, succinic acid, malic acid, maleic acid, malonic acid and glutaric acid. Totally sixteen binary systems and twenty ternary systems were studied at two different temperatures 308 and 318 K.

Density (d), viscosity (η), ultrasonic velocity (u) and heat of mixing (q) were measured. Apparent molal volumes (φ_v), partial molal volumes (φ^0_v), viscosity constants A, B, isentropic compressibilities (k_s) and enthalpy change (ΔH) were calculated from the above measured parameters. Transfer properties of the chosen compounds were calculated from water to 0.5 mol kg^{-1} aqueous sodium chloride / potassium chloride solutions. The data were interpreted in terms of ion-ion, ion-hydrophilic, hydrophilic-hydrophilic and ion-hydrophobic interactions. Using B-value free energy of activation per mole of the solvent
\( (\Delta\mu_1^{0*}) \) and solute \( (\Delta\mu_2^{0*}) \) were calculated. Using \( \frac{d(\Delta\mu_2^{0*})}{dT} \) values, entropy of activation and enthalpy of activation for viscous flow were calculated. From \( \frac{dB}{dT} \) data, whether the solute acts as structure breaker or structure maker in the given solvent was found out. The effect of added electrolytes in the living systems was revealed.