Intermolecular / Interionic Interactions in L-Isoleucine-, L-Proline-, and L-Glutamine- Aqueous Electrolyte Systems

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Ultrasonic velocity and density values for ternary systems (amino acid salt water): L-isoleucine / L-proline / L-glutamine in aqueous solutions of 1.5M KCl, 1M KNO_3 and 0.5M K_2SO^{-4} have been measured for several concentrations of amino acids at different temperatures (303.15, 308.15, 313.15, 318.15 and 323.15) K. Using ultrasonic velocity and density data, the thermodynamic parameters such as isentropic compressibility (κ_s), change in isentropic compressibility ($\Delta\kappa_s$) and relative change ($\Delta\kappa_s/\kappa_0$) in isentropic compressibility have been computed. The isentropic compressibility values decrease with increase in the amino acid concentration as well as with temperature. The decrease in κ_s values with increase in concentration of L-isoleucine / L-proline / L-glutamine in 1.5M KCl, 1M KNO_3 and 0.5M K_2SO^{-4} has been ascribed to an increase in the number of incompressible zwitterions in solutions and the formation of 'zwitterions-ions' and 'zwitterions–water dipole' entities in solutions. The decrease in κ_s values with increase in temperature has been attributed to the corresponding decrease of κ_{relax}, (a relaxational part of compressibility), which is dominant over the corresponding increase of $\kappa_{¥}$ (an instantaneous part of compressibility). The trends of variation of ($\Delta\kappa_s$) and $\Delta\kappa_s/\kappa_0$ with variation of solute concentration and temperature have also been discussed in terms of solute-solute and solute-solvent interionic / intermolecular interactions operative in the systems.