

Studies on Solvation Behavior of Some Amino Acids and Lysozyme in Mixed Aqueous Solutions of Organic Salts

T.S. Banipal^C and K. Singh

Department of Applied Chemistry, Guru Nanak Dev University, Amritsar, India
tsbanipal@yahoo.com

G. Singh^S

C.T. Institute of Pharmaceutical Sciences, Janadhar, Punjab, India

P. Banipal

Department of Chemistry, Guru Nanak Dev University, Amritsar, India

The native state of protein is a resultant of delicate balance of various interactions of protein within itself and with surrounding environment. Disruption of this balance by heat, cold, pressure, pH, denaturant etc., leads to protein denaturation. In the present paper we have investigated the effect of sodium acetate, magnesium acetate calcium acetate, sodium propionate and sodium butyrate on thermal stability and preferential solvation changes accompanying the thermal unfolding of lysozyme at pH = 1.5 by UV-Visible Spectrophotometer. The two state (N $\leftrightarrow$ D) reversible transition was observed for these systems. Thermal denaturation in these systems is explained on the basis of competing patterns of interactions of the cosolutes with native vs. denatured states of protein. It has been observed that sodium acetate, magnesium acetate and calcium acetate stabilize while sodium propionate and sodium butyrate destabilize the lysozyme. The order of stabilization by cations i.e. Na⁺ > Mg²⁺ > Ca²⁺ and by anions i.e. acetate > propionate > butyrate observed presently also follows the Hofmeister series. The preferential interaction parameters from these thermodynamic data and by correlating the surface tension of these cosolutes with surface area of lysozyme have also been calculated.

We have also studied the volumetric and viscometric properties of some amino acids with non polar and hydrophilic side chains in aqueous sodium and magnesium acetates, which indicate that some parallelism exists in various interactions occurring in case of lysozyme and small model compounds. Similar trends have also been reported earlier for lysozyme and amino acids with non-polar side chains in the presence of 1-propanol 1,2-propandiol and glycerol in aqueous solutions.