



ISOTHERMAL COMPRESSIBILITY STUDIES OF DIPEPTIDE IN AQUEOUS SODIUM CHLORIDE SOLUTION

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ABSTRACT

Protein hydration plays a crucial role in stabilizing the native structure of globular proteins in aqueous solutions. The specific interactions of water with various functional groups on the proteins as well as other solvent-related effects contribute to the formation of the stable folded structure of proteins in solutions. Thus, it is of immense importance to study the low-molecular –weight model compounds such as amino acids, peptides, and their derivatives, which represent the building blocks of proteins in a variety of media. The conformational transitions of biopolymers are extremely sensitive to subtle changes in solvent medium. Therefore, in order to understand the behavior of proteins in aqueous salt solutions, we have studied the isothermal compressibility and their derived parameters of glycylglycine in aqueous electrolyte solutions.

KEY WORDS: Isothermal Compressibility, Internal Pressure, Dipeptide

INTRODUCTION

Isothermal compressibility is a sensitive measure of solute-solvent interactions and as such, can be used to monitor solute hydration in an aqueous solution^{1, 2}. The isothermal compressibility has been well utilized to study the equilibrium as well as transport properties of various systems^{3, 4}. Though, it is not an easy task to determine isothermal compressibility directly² but, through ultrasonic velocity, density and heat capacity at constant pressure measurements, it can be determined indirectly^{5, 6}. It has been widely evaluated by several workers⁶⁻¹⁰ to elucidate the intermolecular / interionic interactions in aqueous and mixed aqueous solutions of amino acids, peptides and proteins. These data have been interpreted in terms of intermolecular / interionic interactions operative in the systems.

Internal pressure is known to be a measure of overall cohesion (dispersion, repulsion, ionic and dipolar interactions) in liquid systems. It has been widely used¹¹⁻¹⁴ to investigate the intermolecular interactions in liquid systems. Suryanarayana¹¹ suggested an indirect method for evaluating internal pressure using the viscosity, density and ultrasonic velocity data. This method has been used¹² to study the internal pressure of pure liquids, binary liquid mixtures and solutions of electrolytes and non-electrolytes¹². Pandey et al.¹⁵ extended the proposed method for evaluating the internal pressure values of multi-component systems.

Hildebrand et al introduced the concept of cohesive energy density, which is the energy of isothermal vaporization from the liquid to the ideal-gas state. The square root of the cohesive energy density is known as solubility parameter (δ). The Solubility parameter has been found to be useful for assessing the compressibilities of various substances. It has served as an efficient guide in the selection of proper compounding ingredients and solvents for polymeric substances^{16, 17}. The pseudo-gruneisen parameter, which accounts for the molecular association in solutions, has been evaluated by a

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