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Effect of chain length on interactions of aliphatic alcohols with suspended human serum albumin

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Abstract

Enthalpy changes on the immersion of human serum albumin (HSA) into *n*-butanol, *n*-propanol, ethanol and methanol containing different amounts of water have been measured calorimetrically at 25°C. Water sorption isotherms on HSA were also determined in water–*n*-butanol and water–ethanol mixtures. From comparison of the calorimetric and sorption data, it was concluded that there is a significant enthalpy change on the HSA immersion into methanol and ethanol even under conditions where there is no change in the quantity of adsorbed water. No similar contribution was found in the *n*-butanol based suspensions. Water monolayer capacity evaluated from the Langmuir model decreases also significantly when going from ethanol to *n*-butanol. Considering this non water sorption contribution, values of the monolayer capacity and the shape of the experimental dependences, it was inferred that a relatively small change of the solvent molecule structure (from *n*-propanol to ethanol) affects strongly the interactions of the protein with the solvent. © 1997 Elsevier Science B.V.

Keywords: Human serum albumin; Aliphatic alcohols; Interactions; Enthalpy of immersion; Water sorption; Langmuir model

1. Introduction

An examination of the solid protein–organic component interactions would be appropriate and enlightening for understanding both the solid state protein chemistry and biotechnological implications as the enzymatic catalysis in nonaqueous media. So, it was demonstrated that the direct organic solvent–enzyme interactions suppress the transesterification reaction catalyzed by subtilisin Carlsberg suspended in toluene [1]. On the other hand, denaturing cosol-

vents are able to activate enzymes suspended in nonaqueous media which was explained with easing the flexibility constraints imposed by protein–protein contacts [2]. Enantioselectivity of suspended enzymes was found to be greatly effected by the anhydrous solvents [3].

As such, solvent–protein interactions require further fundamental study [4], and there is a need in the thermodynamic data describing the effect of such kind of interactions on the protein suspension properties. To our knowledge, the typical approach for examination of the direct solvent–solid protein interactions contributing to the thermodynamic properties of suspensions involves the comparison of the water sorption isotherms in suspensions and in the gas phase [5–7]. It was concluded that when the water

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