

Interaction enthalpies of α -Chymotrypsin with water-1,2-propanediol mixtures as measured by isothermal calorimetry

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Abstract

© 2017 Nova Science Publishers, Inc. All rights reserved. Understanding the physico-chemical regularities of the enzymes in nonaqueous media (organic solvents, ionic liquids) is a topical problem for nonaqueous enzymology and biotechnology. The use of organic solvents as a reaction medium makes it possible to successfully conduct enzymatic reactions with hydrophobic compounds poorly soluble in water. Nonaqueous media provide the possibility of conducting industrially important synthetic reactions (peptide synthesis and esterification) that do not occur in aqueous media. The aim of this work is to give a thermochemical description of the stabilizing/destabilizing effect of organic solvent molecules on the stability of model enzyme (bovine pancreatic α -chymotrypsin) to elucidate what intermolecular processes produce the main effect on the stability and functioning of the enzymes at high and low water content in organic liquids. Isothermal calorimetry measurements were applied to study the stability of α -chymotrypsin in water-alcohol mixtures. Enthalpy changes on the interaction of α -chymotrypsin with water-organic solvent mixtures have been measured using a Setaram BT-2.15 calorimeter at 25°C. The obtained results show that isothermal calorimetry is an effective experimental tool for studying the simultaneous action of water and organic liquids on the stability of enzyme macromolecules. The degree of enzyme stabilization/destabilization depends strongly on the water content in organic solvent.

Keywords

1,2-propanediol, Calorimetry, Enthalpy, Enzyme hydration, Organic solvent, Water

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