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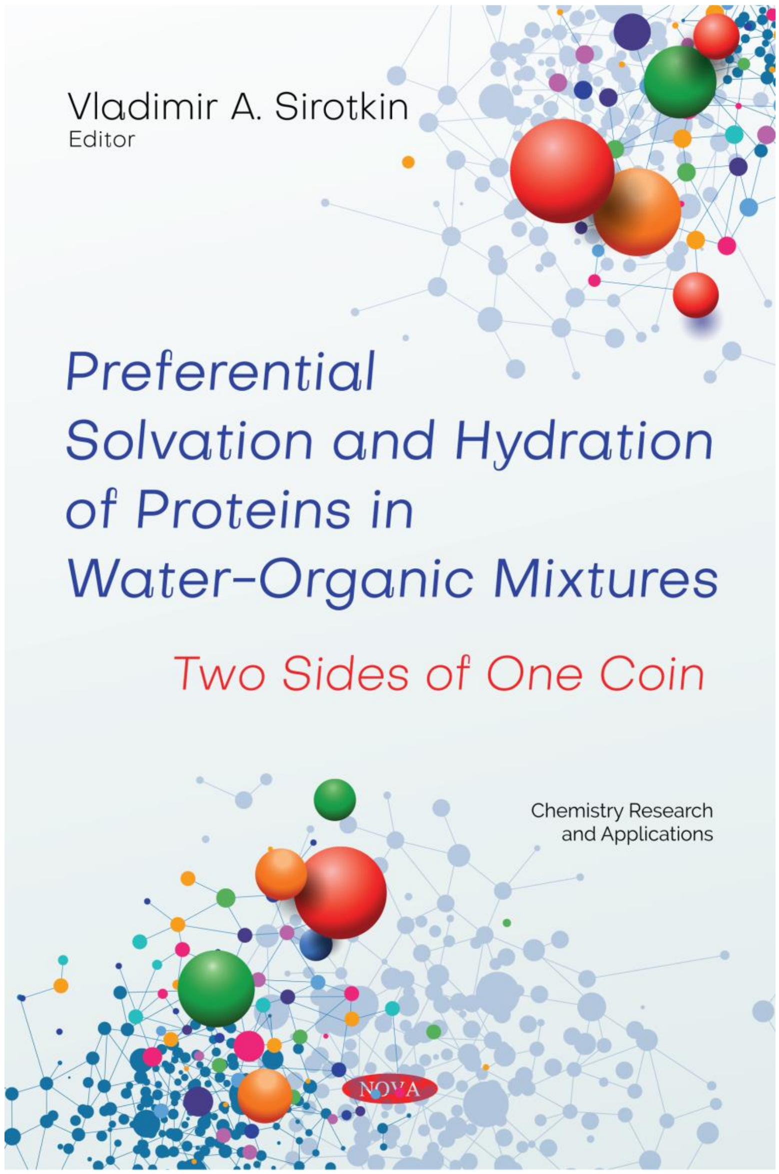

Chapter 4

PREFERENTIAL SOLVATION OF Lysozyme IN WATER-DIMETHYL SULFOXIDE MIXTURES: GIBBS ENERGIES OF WATER AND ORGANIC SOLVENT

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ABSTRACT

Water/organic solvent sorption and residual enzyme activity were investigated to monitor preferential solvation and preferential hydration of protein macromolecules in the entire range of water content in organic liquids at 25°C. This approach was applied to estimate protein destabilization/stabilization due to the preferential interactions of hen-egg-white lysozyme with water-dimethyl sulfoxide (DMSO) mixtures. This approach facilitates the individual evaluation of the Gibbs energies of water, protein, and organic solvent. There are two concentration regimes. Lysozyme is preferentially hydrated at high water content. The residual enzyme activity values are close to 100%. At low water content, lysozyme has a higher affinity for DMSO than for water. The DMSO-induced irreversible inactivation of α-chymotrypsin was found in this region. Residual enzyme activity is close to zero in this concentration range.

Keywords: protein hydration, preferential solvation, enzyme activity, hen-egg-white lysozyme, dimethyl sulfoxide (DMSO)

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