

# **Pressure Perturbation Calorimetric Studies of the Effect of Osmolytes and Crowding on the Stability and Solvation of Biomolecular Systems**

Roland Winter

TU Dortmund University, Physical Chemistry, Otto-Hahn-Straße 4a, D-44227 Dortmund

Pressure perturbation calorimetry (PPC) was used to study the solvation and volumetric properties of various biomolecules such as proteins in their native and unfolded states. In PPC, the coefficient of thermal expansion of the partial specific volume of the protein is deduced from the heat consumed or produced after small isothermal pressure jumps, which strongly depends on the interaction of the protein with the solvent or cosolvent at the protein-solvent interface. The effects of pH and various chaotropic and kosmotropic ions and cosolvents on the solvation and unfolding behavior of the proteins was also investigated, and the observed volume and expansivity changes are correlated with further thermodynamic and spectroscopic properties of the systems. Depending on the type of cosolute and its concentration, specific differences are found for the solvation properties of the proteins, and the volume change upon unfolding may even change sign. In addition, the effects of macromolecular crowding and confinement on the solvational properties of proteins were studied. Finally, the use of PPC for studying intermolecular interactions and aggregation phenomena (amyloidogenesis) of proteins will be discussed.