Proteins and Calorimetry: from diluted solutions to food systems

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Thermal analysis and calorimetry are widely used for the characterization of bio-systems. The rather well defined general picture of the field implies the use of techniques and theoretical approaches that depend not only on the chemical peculiarities of the system (proteins, membranes, etc.) but mainly on its status with respect to the aqueous medium and the co-solutes.

In the case of proteins studied in diluted solutions, data obtained through HS-DSC (High Sensitive Differential Scanning Calorimetry) provide quantitative information about the mechanisms of the conformational transitions (protein denaturation) and the thermal stability of the macromolecules' energetic domains, according to the formal expressions of thermodynamics and statistical mechanics[1].

The above picture is substantially modified in case proteins are included in a complex matrix where different bio-polymers (polysaccharides, etc.) are present in the same aqueous environment such as food. Indeed, these biopolymers are often thermodynamically incompatible, leading to the formation of several distinct aqueous phases in the system which may modify the protein's properties both in terms of thermal stability and interactions. In these circumstances, the classical DSC technique is rather suitable for studying food products and processes mainly because it permits an easy evaluation of the relevant energetics of the systems on the basis of data collected from samples that do not demand any previous separation of the system's components and that can therefore be reliably related to real products[2].

[1] Fessas D, Iametti S, Schiraldi A, Bonomi F. Thermal unfolding of monomeric and dimeric b-lactoglobulins. *Eur J Biochem* (2001) **268**: 5439-5448.

[2] Fessas D, Signorelli M, Pagani A, Mariotti M, Iametti S, Schiraldi A. Guidelines for buckwheat enriched bread: thermal analysis approach. *J Therm Anal Calorim* (2008) **91**: 9-16.