

Dottorato di Ricerca in Fisica dell'Università degli Studi di Messina

20 Settembre 2012, ore 15.30, Aula E. Majorana, Dip.to di Fisica,
V.le F. Stagno d'Alcontres 31, S. Agata, Messina

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Seminar title:

“WATER AND PROTEIN DYNAMICS IN HYDRATED GLOBULAR PROTEINS”

Abstract

The hydration properties of proteins and water and protein dynamics in protein–water mixtures have been studied in the past several decades by a variety of experimental techniques, aiming to contribute to understanding biological function in physical terms. A minimum amount of water is necessary for enzymatic activity of a protein and dielectric results indicated a correlation between the onset of enzymatic activity and of a percolation type displacement process of protons on single macromolecules [1]. Thermal and dynamic studies of hydrated proteins revealed the presence of a thermal glass transition in the temperature range from about 160 to 200 K.

In this talk we focus on water and protein dynamics in water mixtures of two globular proteins, lysozyme and bovine albumin serum (BSA), over wide ranges of temperature and composition, by a combination of differential scanning calorimetry (DSC), dielectric techniques and equilibrium water sorption measurements. BSA exhibits a larger swelling degree as compared to lysozyme at high hydration levels. The glass transition of the hydrated system was observed by DSC, more clearly in the case of hydrated BSA [2,3]. Dielectric measurements reveal the α relaxation process associated with the glass transition of the hydrated protein (dynamic glass transition) for both systems [3,4]. Regarding the dynamics of uncrystallized water, we follow by dielectric techniques the secondary relaxation of uncrystallized water superimposed on a local dielectric relaxation of small polar groups at the protein surface [4]. The results indicate the existence of interrelations between the formation of a conductive percolating water cluster and the saturation of the reorientation process of uncrystallized water molecules [4].

1. J. A. Rupley, G. Careri, *Adv. Protein Chem.* 41, 37–172 (1991).
2. A. Panagopoulou et al. *Food Biophysics* 6, 199-209 (2011).
3. A. Panagopoulou et al. *Biochim. Biophys. Acta* 1814, 1984-1996 (2011).
4. A. Panagopoulou et al. *J. Phys. Chem. B* 116, 4593-4602 (2012).