

Fast rearrangement dynamics of water in biomolecules hydration shell: results from extended depolarized light scattering experiments

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The Extended frequency range Depolarized Light Scattering (EDLS), has been demonstrated to be a powerful tool to access the fast dynamics of water in a variety of binary systems, including sugars and proteins' aqueous solutions. EDLS enables one to disentangle solute from solvent dynamics and, into the latter, bulk from hydration water contributions [1-6]. The use of EDLS has been then extended to ternary systems by studying a lysozyme-trehalose aqueous solution over a broad time scale, from hundreds to fractions of ps. Experimental evidence has been given that the sugar, present in the ternary solution in sufficient quantity for biopreservation, strongly modifies the solvation properties of the protein. By comparing aqueous solutions of lysozyme with and without trehalose, it has also been shown that the combined action of sugar and protein produces a significant slowdown in the restructuring of a fraction of water molecules around the protein, namely more than twice the corresponding value in the absence of trehalose [7-8]. This hyperslow water close to lysozyme is believed to be preserved from crystallization by the presence of trehalose in the mixture, thus playing a key role in bioprotection.

Finally, it will be shown how significant improvements in instrumentation toward the use of microscopies can make it possible to study submicrometric regions in systems relevant to many fields [9].

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FIGURES

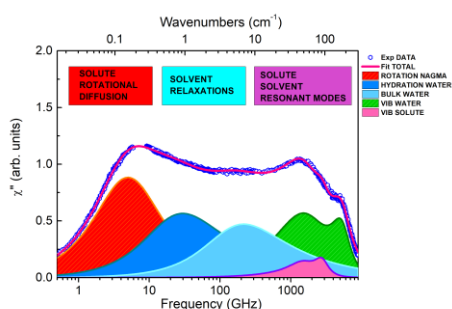


Figure 1: EDLS spectra of a peptide-water solution.