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Molecular and Elastic investigation of proteins self-assembling phenomena

Many biocompatible hydrogels are formed by the self-assembly of macromolecules, between these natural polypeptide-based hydrogels are very promising systems. They are good candidates for tissue engineering and drug delivery since they meet the majority of the design criteria for tailored biomaterials [1]. The balance between intramolecular and protein-solvent attractions determines the development of the molecular networks and the folding and unfolding processes are deeply involved in the self-assembly phenomena.
Lysozyme based hydrogels show very high cyto-compatibility, suggesting that globular protein-based hydrogels may be useful as scaffolds for tissue engineering. In these hydrogels the aggregation processes are characterized by different steps in which the protein undergoes conformational rearrangements and intermolecular association to form stable structures of increasing complexity. The β-sheet motif appears to be deeply involved in the self-assembling processes and in the development of hydrogel networks [2]. The hydrogel proprieties, including the elastic-viscous response, can be tuned using the aggregation conditions; under certain environments, Lysozyme self-assembles and produces transparent thermo-reversible gels [3].
In this work, we have studied the unfolding, aggregation and gelation processes of highly concentrated solution of Lysozyme in denaturing conditions at different temperatures. We investigated the low frequency vibrations by Infrared and THz spectroscopy [4] and the elastic-viscous-thermal proprieties by Transient Grating spectroscopy [5] with the aim to compare and link molecular and viscoelastic properties of these biomaterials.

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Summary

Topic

1. Amorphous and soft matter

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