DYNAMIC SURFACE ELASTICITY OF THE LAYERS OF PLANT PROTEIN AGGREGATES AT THE LIQUID SURFACE

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It is frequently discussed that the animal proteins can be replaced by cheaper and more ecologically friendly proteins of plant origin in many applications. This replacement is not always simple because the functional properties of plant proteins are usually worse than those of their animal counterparts; in particular, they are usually characterized by low solubility in water and lower surface activity. At the same time, although the surface properties of protein solutions are the most important for many applications, for example, for the stabilization of foams and emulsions, their intensive investigation have been started only recently. Special attention in these studies is paid to the dilational dynamic surface elasticity because just this quantity determines the stability of liquid disperse systems. In this work we analyzed the dynamic surface properties, especially the dynamic surface elasticity, of solutions of a number of plant proteins and compare them with the data for aqueous dispersions of their aggregates, mainly amyloid fibers. It proved that the kinetic dependencies of the dilational dynamic surface elasticity of the solutions of some proteins can have a local maximum, which is followed by a local minimum. The analysis of the protein primary structure allowed to discover in this case rather long intrinsically disordered fragments of the protein chains and thereby to find correlations between the protein structure and the properties of the protein aqueous solutions. The kinetic dependencies of the dynamic surface elasticity of the dispersions of plant protein fibrils proved to be always monotonic. At the same time, the modulus of the dynamic surface elasticity of the fibril dispersions proved to be significantly higher than that of the most native protein solutions. This result indicates that the plant protein nanofibrils can be successfully applied for the stabilization of foams and emulsions instead of native proteins with a lower surface activity.

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