Influence of structure and nature of pseudopolyamino acids on size and morphology of their particle in self-stabilized aqueous dispersions

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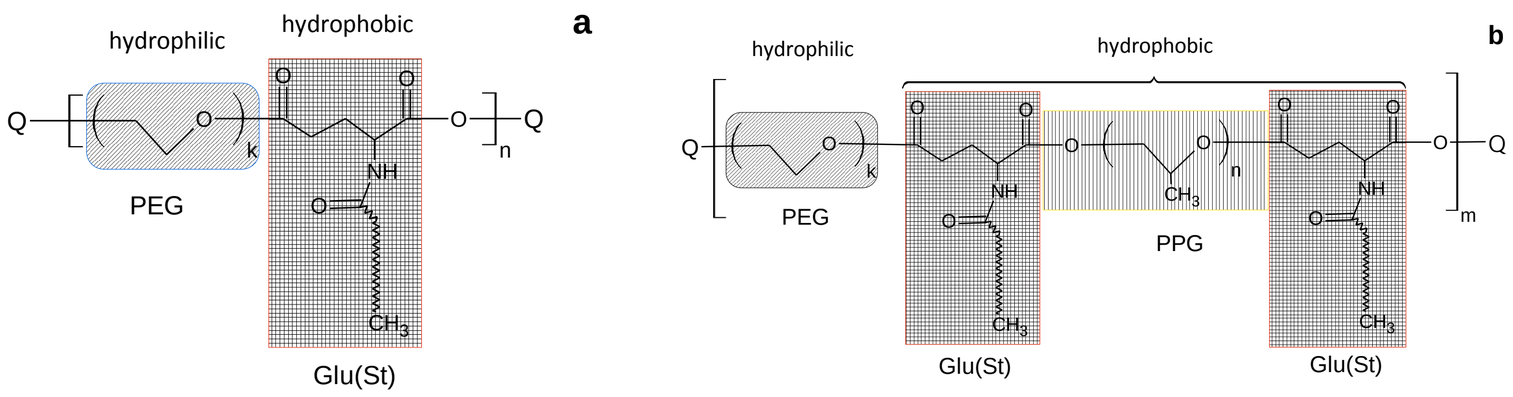
INTRODUCTION

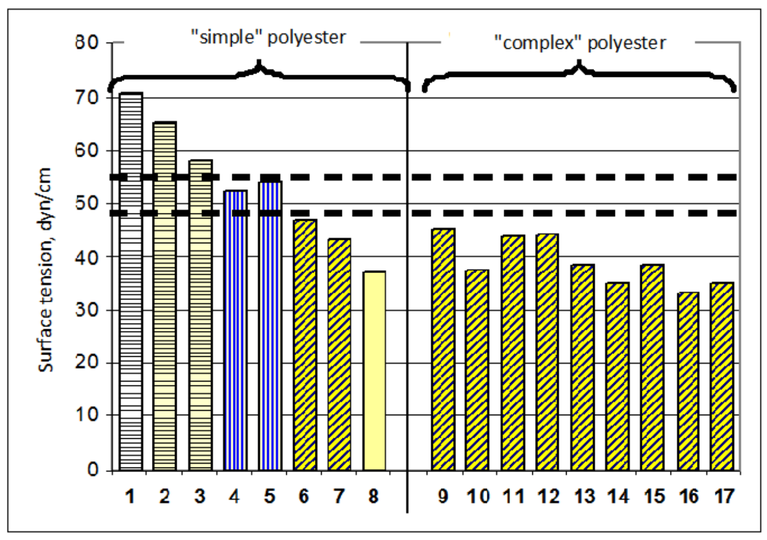
The creation of the latest nanocarriers for drug delivery and biologically active substances is an urgent task of the modern pharmaceutical industry. Amphiphilic polymers are now attracting the greatest attention of scientists to create drug delivery systems. Surfactant properties of amphiphilic polymers describe their ability to stabilize the dispersed phases of colloidal solutions or to form particles of colloidal size due to self-stabilization. These studies have led to the development of micellar carriers with solubilized drugs that can be safely administered to the human body.

The aim of the work is the synthesis of new polyesters based on glutamic acid and diols of polyoxyethylene and polyoxypropylene nature - pseudopolyamino acids and the investigation of the influence of their structure and nature on the size and morphology of their particles in self-stabilized aqueous dispersions.



The structure of "simple" (a) and "complex" polyester (b).

Photo of an aqueous dispersion of polyester

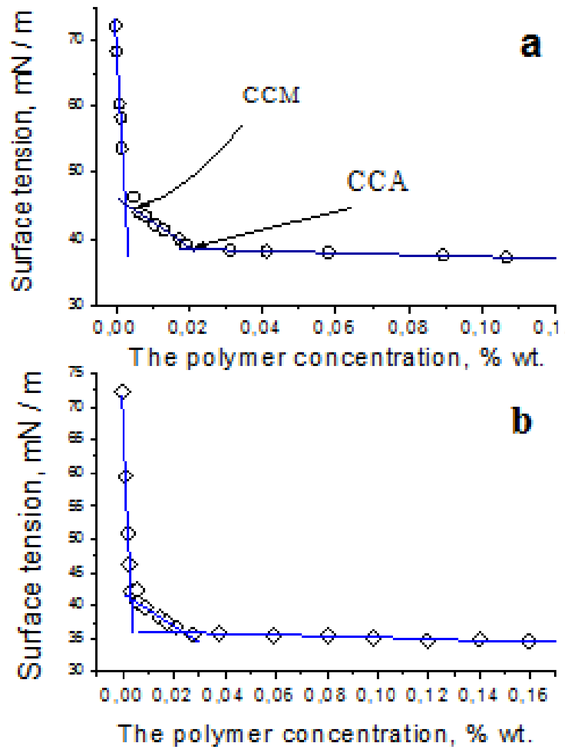


The value of the surface tension of aqueous dispersions (0.2%) of "simple" and "complex" polyesters

RESULTS

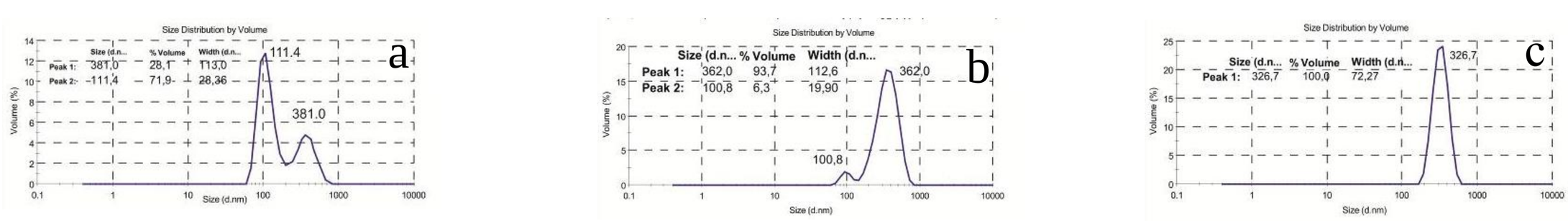
The studies show a clear relationship between the composition and structure of these areas and the surface activity and ability to form self-stabilizing particles of the dispersed phase in aqueous media.

The surface tension isotherms of aqueous polymer dispersions are characterized by two inflection (CCM and CCA).

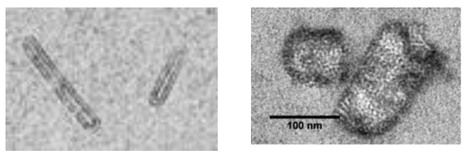


Surface tension isotherms for polyesters

a) At concentrations lower than the CCM, a monomodal particle size distribution with an average diameter of 25–30 nm is observed, corresponding to the sizes of the associates of individual macromolecules.
b) The size of the primary micelles polymer particles, which are formed in the range of concentrations close to CCM, is 70-140 nm.
c) At polymer concentrations in a solution close to CCA, rearrangement of primary polymer particles into aggregates with an average size of 320 ÷ 450 nm is observed, and further aggregation of aggregates is observed to micellar formations of even larger size.



At concentrations up to CCM - it is dominated by rod-shaped particles.
Increasing the concentration above the CCM leads to the rearrangement of these rod-shaped particles into parallelepiped-shaped particles.
A further increase in the concentration - the particles with the shape of a parallelepiped are rearranged into particles with a larger geometric size, the form of which we have not established.



Photomicrographs of TEM of polymer dispersion

CONCLUSION

The obtained experimental data using physicochemical methods of analysis confirm the orderly organization of the dispersed phase of pseudopolyamino acids in their aqueous solutions and allow to describe the features of their morphological transformations with the method of production and composition.