

Principles for Researches of Stability of Three-Component Polymer-Colloid Systems Including Polymers Complexes and Polydispersed Colloid Particles

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The problems of studying of stability in solution of three-component polymer-colloid systems containing polycomplexes intermolecular (InterPC) or intramolecular of type (IntraPC) and also polydispersed colloid particles, are discussed in connection with analysis of the effect principally more high flocculating ability of polycomplexes compared with individual polymers.

It is shown, that the polydispersity of colloid particles complicate essentially the processes of aggregation and phase separation in polymer-colloid systems. That is why, it is necessary to study experimentally at least two limit cases two limit systems, in one of which the size of colloid particles R_p surpasses essentially the size of polycomplex particles R_{PC} , i.e. $R_p \gg R_{PC}$, but in other system the opposite relation $R_p \ll R_{PC}$ is executed, i.e. it contain, the smallest colloid particles. On the other hand, using of polycomplexes instead of individual polymers for regulation of the colloid disperses stability stipulates necessity of additional studying of competitive interactions in multicomponent polymer-colloid systems in conditions of the thermodynamic affinity between all components of system.

It is shown, what the best basis for characterizing of stability of systems with $R_p \gg R_{PC}$ is traditional colloid-chemical notions about the adsorption of polycomplexes on the surface of phase separation and its influence on parameters of double electric layer and process of aggregation of colloid particles. At the same time, it is necessary to lean on the notions about polymer-colloid reaction and about factors defining the stability of formed polymer-colloid complexes in systems with $R_p \ll R_{PC}$.

It is considered the results of using of such conception to two three-component polymer-colloid systems in water medium. The first of them contains InterPC (PSMA+PEO) based on poly(styrene-co-maleic acid) and poly(ethylene oxide), but the other – IntraPC based on poly(acrylamide) and poly(vinyl alcohol) (graft copolymers PVA-PAA_N with different number N of grafted chains). The condition of both systems in two limit cases of relation between the size of colloid particles (of silica) and polycomplex particles is investigated. So, the adsorption of InterPC and IntraPC on SiO₂ surface, is measured and its influence on ζ -potential of quartz particles ($R = 3-7$ or $70-110$ mkm) is established by the methods of viscometry, interferometry, potential of flow, microelectrophoresis and others. It is shown, that adsorption of polycomplexes lowers the stability of quartz particles in water solution.

The polymer-colloid reaction between InterPC or IntraPC and silica sol ($R = 8$ nm) as well as the construction of polymer-colloid complexes, by the methods of static light scattering, interferometry, viscometry, IR-spectriscopy and potentiometric titration, is studied further. The formation of dense and compact particles of polymer-colloid complexes with lowered solubility in water is revealed. The competitive interaction in both systems is considered also. As a conclusion, the reasons of more high flocculating ability of polycomplexes compared with individual polymers in systems with polydispersed colloid particles are discussed.