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Effect of chemical structure and linear density charge of sulfonate-containing aromatic polyamides on interaction with polycations in organic and water-organic media

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Abstract

The interaction of sulfonate-containing aromatic poly- and copolyamides with acrylonitrile copolymers with *N,N*-dimethyl-*N,N*-diallylammonium chloride (DMDAAC) and *N,N*-diethylaminoethylmethacrylate (DEAEM) in organic and water-organic solutions was studied. It was shown that as a result of macromolecular reactions interpolyelectrolyte complexes (IPEC) forms. They are stabilized mainly by electrostatic forces. To characterize the interpolyelectrolyte complexes composition the φ parameter was used, that defines as the ratio of corresponding functional groups molar concentrations of interacting polyelectrolytes. The transformation degree in interpolymer reactions θ was calculated as the ratio of the salt bonds number between polyions to their maximum possible number. It was shown that the main factors determining the composition and structure of forming interpolyelectrolyte complexes are linear charge density of polyelectrolytes, the nature and composition of the solvent in which interpolymer reactions occurs. It is possible to obtain IPEC, the composition of which for the same polycation will vary from $\varphi = 2.5$ to $\varphi = 1.0$, changing these factors. It was found that at the complexation process is not accompanied by a change in the phase state of the interpolymer system, when the concentration of units with sulfonate groups in the macromolecular polyamide chain 5 mol.%. It was found that the introduction of polycation leads to the formation of IPEC structures in the form of particles with an average size of ~217.7 nm for poly-4,4'-(2-sodium sulfonate) – diphenylaminisophthalamide and ~248.1 nm in the case of poly-4,4'-(2-sodium sulfonate) -diphenylaminterephthalamide. It was shown that the decrease in the polymer content of units with sulfonate groups is accompanied by a decrease in the transformation degree from 0.65-0.66 to 0.18. It was found that the studied complexes can be transferred to the solution by increasing its ionic strength. The result obtained during this work can serve as a base for the development of for the manufacturing technology of film and membrane materials based on sulfonate-containing aromatic poly- and copolyamides.

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