# The stability of emulsions at the presence of polyelectrolyte complexes of noionic surfactants OP-10

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**Abstract:** Currently the composite systems such as polymer-polymer or polymer-surfactant have been successfully used for regulation of processes at different interfaces. The aim of our study was to investigate the stability of straight and reverse emulsions in the presence of polycomplexes of polyacrylic (PAA) and polymethacrylic (PMAA) acid and nonionic surfactant OP-10. Polycomplexes based on polyacids and OP-10 have relatively high surface activity at the water / oil (toluene, a mix of hydrocarbons). At the water / toluene the high surface activity is observed for the system PMAA-OP-10 as a result of conformational changes of macromolecule PMAA leading to lesser degree of binding with surfactant.

**Keywords:** surfactants, polyelectrolyte, complexes, emulsion, oil emulsions.

**1. Introduction.** The obtaining of domestic demulsifying agents from polyelectrolyte complexes is very important problem for republic of Kazakhstan. In this work surface activity of polycomplexes of nonionic SF OP-10 at the various interfaces and also stability of model straight and reverse emulsions on the basis of toluene and water, a mix of hydrocarbons (toluene, hexane, cyclohexane) and waters, and also the oil emulsions stabilised by polycomplexes OP-10 was studied. Besides the washing action of polycomplexes on the oil substrates on the surface of glass plates was studied.

**2.Theoretical:** Earlier it was established that replacement of nonpolar liquids (hexane, 50-70 % solutions of oil in kerosene) from separate capillaries of the correct geometrical form and porous systems at n> 2 (5-20, n-relative concentration of surfactants (SF) in a mix with polyelectrolyte (n = [SF] / [PE]) proceeds with relative high speed. One of mechanisms of replacement is surface diffusion of macromolecules of a polycomplex on a surface of a capillary under oil washing action, possibility dispergation, and also deemulsification of oil. Complexes on the basis of synthetic polyelectrolytes (SPE) – polyacrylic (PAA), polymethacrilic (PMAA) acids, polyethilenimine (PEI) and oxylethylated phenol (OP-10), formed as a result of of hydrogen binds and hydrophobic interactions in system SPE-SF representing a new high-molecular SF.

**3.Results:** It was established that polyelectrolyte complexes of OP-10 (OP-10/PAA, OP-10/PMAA, OP-10/PEI) show high surface activity on the water/toluene, water / (toluene+cyclohexane+hexane) interface. The surface tension decreases till 8-10 mJ/m$^2$. The strong wetting (hydrophylization) action on substrates from oil various (Kumkol, Karazhanbas) deposits ($\Theta$ = 5-10$^0$), the greatest wetting action the complexes on the basis of PEI showed. The concentration of a disperse phase was 30 % (vol.) for all types of the studied emulsions. Stability of model straight emulsions increases with increase of relative concentration (n) OP-10 – time of life increases from 45 to 100 minutes At n=5,10 the stability of straight emulsions becomes almost boundless (time of observation more than 3 weeks). In case of reverse emulsions full separation of emulsions is observed at all n.
Similar dependences are observed and for oil emulsions. Time of life of oil emulsions decreases from 800 to 56 mines with increase of relative concentration OP-10 (n=1-10). At small concentration OP-10 (0.1 – 0.8) oil emulsions are stabile.
Estimation of washing action of above-stated polycomplexes of OP-10 made on loss of weight of oil substrates at keeping in solutions of polycomplexes, and also on displacement of an oil layer at spontaneous flowing of drops of the solution put on border of section of an oil layer and a pure surface of glass. The increase in loss of weight (0.003 – 0.016 g) oil substrates on a firm surface with growth of time of keeping (0.5 – 5 hours) in solutions of polycomplexes was established. Also displacement growth (3 – 8 mm) of an oil layer at polyelectrolyte action was observed.

**4.Conclusion:** Introduction of OP-10 in the polyelectrolyte solutions can be considered as oxylethylating of macromolecules. Such polycomplexes stabilize the straight emulsions and apparently destroy the reverse ones.

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