

## Nanocomposites and nanomaterials

### Formation of nanoscale complexes based on chitosan

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Last time chitin and chitosan became a subject of intensive research. This is caused by the unique complex of environmental and physic-chemical properties: biodegradability, playback of the raw material base, reaction and complexing ability, compatibility with living tissues without toxicity. The basic natural sources of chitin are shells of crustacean and biomass of fungus' mycelium. Researches had shown that chitin and chitosan can be used for sorption from aqueous solutions of surfactants [1], heavy metals, dyes.

The aim of our researches was to study the process of formation nanoscale systems based on chitosan in solution with the addition of anionic surfactants (sodium alkylsulfates and alkylcarboxylates). Researches had shown that pre-association of the surfactants with chitosan leads to increase its sorptive capacity. This is confirmed by our study of surface activity and viscosity systems. For systems surfactant - chitosan, surface tension decreased to  $(30-40) \cdot 10^{-3}$  N/m. Emerging associates are more hydrophobic, have better adsorption activity. The effect becomes stronger with increasing length of the hydrocarbon surfactant radical from 8 to 14 carbon atoms, as well as in time. This is due not only to the process of association, but with the change in the conformation of macromolecules.

The conformational transformation of chitosan macromolecules in the formation of complexes confirms the rheological studies. Reducing the viscosity shows minimized polyelectrolyte macromolecules. The process is slow, and viscosity decreases to values close to the pure solvent is achieved globular conformation of macromolecules. There were researched some parameters of the macromolecular chains which characterized the process of associates' appearing. As a result of the formation of associates, the root mean square radius of gyration is reduced by 2 points of magnitude. The formation of polymer-colloid complexes chitosan-anionic surfactants in solution is making a positive contribution to improving the efficiency of their sorption.

1. *Tymchuk A.F.* Sorption of anionic surfactants by natural polymer sorbents/ Odessa National University Herald, «Chemistry», 2011. – Vol. 16, №. 14 . – P. 96- 101.