

# Nanocomposites and nanomaterials

## The nanochitosan as an effective adsorbent of the surfactants

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The adsorption technologies require of searching of the effective, ecologically friendly adsorbents as natural polymers – derivatives of cellulose. They are limited swelling adsorbents and used for the extraction of the organic and inorganic substances from the water solutions. The main advantage of these adsorbents is their biological degradation.

The analysis of the literature data shows that chitosan adsorbents have high adsorption ability in relation to mineral oils, dyes, alcohols, phenols and heavy metals. Chitin's prevalence in the nature takes the second place after cellulose. The basic natural sources of chitin are the shells of crustacean and the biomass of fungus' mycelium. Chitin provides the mechanical strength of the structure without rigid bonds between microfibrilles, that allows to keep the certain elasticity of a cellular wall.

The submitted researches are devoted to studying adsorption activity of the chitosan received from the shells of crustacean in relation to representatives of surfactants. They are used in many technological processes and therefore they are the widespread pollutants of the water environment. The adsorbent prepared in two methods. The first method is to mill the adsorbent. The crushing of the adsorbent are made using a planetary mono-mill " Pulverisette 6 ". The subsequent dispersion into fractions are made with the help of the vibrating sifting machine " Analysette 3 ". According to the second method previously prepared solution of chitosan in 0,3 M acetic acid. Then the pH is adjusted to 7 - 9 to precipitate the chitosan. The equations of Langmuir, Hill – De Boer, BET have been used for the description of surfactant adsorption process. The calculation of constants of the equations is made by the graphic method using the equations to the linear form. It was used the computer program for calculation of constants of Langmuir. The analysis of the received isotherms has shown, that isotherms of anionic surfactants adsorption (sodium alkylsulfate) concern to L - type, the isotherms of cationic surfactants adsorption (alkylpyridinium chlorides) - to S - type according to Gilles classification. Processing of experimental data with the help of the computer program gives satisfactory conformity of the parameters of the adsorption calculated by the various methods.

The researches have shown that the adsorption process proceeds more efficiently when used the nanosized chitosan. The adsorption has the physical mechanism in all cases. The plateau and excesses in the field of concentration before critical micelle concentration are on the isotherms of adsorption of the researched surfactants. In some cases the association of molecules of adsorbate at small degrees of filling of adsorbent surface long before critical micelle concentration is observed.

The results of IR-spectroscopic research of samples of chitosan and surfactants have confirmed, that during adsorption in researched systems there is no chemical interaction, and the formation of the hydrogen bonds between the functional groups of chitosan and surfactants is observed.

