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Prospects for surfactant peat derivatives

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Peat is a caustobiolith traditionally used as a renewable source of organic substances, in particular humic substances (HS). They are considered to have high biological activity and therefore are widely used in industry and agriculture.

Geoclimatic conditions have a significant impact on the peat accumulation process. Accordingly, peat from various regions differs in composition and physicochemical characteristics of the main components. This affects the properties of peat-based products.

The study of the group chemical composition of high-moor peat from different climatic regions (Western Siberia and the Belomor-Kuloy plateau) was performed according to the certified author's method. The study revealed that there are both similarities and a number of differences in peat group chemical composition. All samples showed the low ash-content (up to 3.5%) and the content of easily-hydrolyzable components is inversely proportional to the degree of peat decomposition. This is due to their greater bioavailability compared to other organic matter components. Despite the similar values of the bitumen content in the peat samples (3.5-4.2%), the composition and content of HS differ significantly: 26% and 13-15% for the peat samples from the Siberian region and the Belomor-Kuloy plateau respectively. The ratio of humic and fulvic acids in the peat samples are 3.8 and 1.8 that is consistent with differences in the degree of decomposition.

Humic substances macromolecules are diphilic, so they can show surface activity in solutions. By the Wilhelmy method it was found that for the adsorption of humic substances into the surface layer to an equilibrium state is required 16-20 hours. While the greatest changes (by 65-85%) occur during the first 30-60 minutes. The maximum depression of surface tension was 31.5-35.8 mN/m. This is characteristic of compounds with high molecular weight. The presence of bitumen components, which also have surface activity, in the HS solution, accelerates the achievement of adsorption equilibrium at the air-water interface.

Based on the measuring of the surface tension the surface activity was determined. The surface activity characterizes the process of the surface layer formation of a surfactant solution at the air-water interface with an infinite dilution. This parameter was calculated depending on HS solution concentration. The surface activity value of HS solutions extracted from Siberian peat is 2.1 N/m² that is 2 times higher than the HS solutions from the Belomor-Kuloy plateau. Removal of bitumens from the peat leads to an increase of the surface activity of HS solution from Siberian peat at twice it was before, but for Belomor-Kuloy plateau peat it decreases by 10%. The observed

differences can be associated with the peculiarities of the composition of the bitumen. This trend has been confirmed by calculation of the critical micelle concentration and the measurement of the hydrodynamic sizes of particles in solutions using the dynamic light-scattering method.

It was revealed high surface activity of HS solution. So the range of their possible use could be extended (synthetic detergents, emulsifiers, etc.).

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