Nitration of humic acids in water-dioxane or water-ethanol

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The functionalization of natural polymers is a significant trend of targeted changing the properties and expanding the possibilities of their practical application. Among the methods of chemical functionalization, nitration is distinguished. A distinct advantage of nitration is that NO₂ groups increase the polarity of macromolecules, surface activity, and complexing properties. In addition, NO₂ groups can be converted or replaced by other functional groups (halogens, amino, alkoxy, nitrile, etc.) using simple chains of transformations [1].

The research aimed to study the nitration of humic acids (HA) with nitric acid in dioxane, ethanol, and water.

The HA of the high-moor peat were used for the study. Nitration was carried out in a boiling water bath for a specified time (5 ... 60 min). The consumption of nitric acid was 28 mmol / g HA; the solvent was 8 ml / g HA. After the completion of the reaction, the liquid was separated from the insoluble part. The filtrate was evaporated in a vacuum, and the filter residue was washed with water until neutral and dried in a vacuum desiccator. The elemental composition of the nitration products was determined, and electronic ionization spectra were recorded.

It was found that reaction products with a nitrogen content of up to 5.3% are formed during the nitration of humic acids. An absorption band with a maximum at 430 nm, characteristic of nitro compounds, appears in the ionization spectra. A feature of the nitration of HA in an aqueous-dioxane medium is that the reaction proceeds quickly, and HA react to a soluble form (see Fig.).

Figure. Dependence of the yield of the insoluble part of HA (W, % of the mass of HA) on the duration of nitration (τ, min) in dioxane.

For example, after 10 min of nitration, the yield of the insoluble part was 10, 45, and 75% using dioxane, alcohol, and water, respectively. Thus, the possibility of obtaining soluble nitrated HA has been shown.

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References

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