



Migration of humus substances from soil to water and the main chemical reaction (in different natural zone of Russian Federation)

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Migration of humus substances (HS) from soil to natural water has zonal specificity. Soil HS of different natural areas characterized by specific functional features, different molecular weight (MW) distribution and other physicochemical parameters. Due to the specifics of formation, waters in Russia widely distributed colored water with high concentrations of humus substances. HS involved in many chemical reactions in natural waters/soil. The most important:

1. Dissociation, association and some destruction - reactions are particularly important for assessing the acidification of natural waters

2. Complexation with metals - reactions reduce the toxicity of most metals

We researched the differences in the qualitative and quantitative composition of soil HS catchment and HS in natural waters of some climatic zones. Samples were taken: the mixing zone forests (sod-podzolic soils) and the steppe zone (black earth) European Territory of Russia (ETR).

In order to examine process of migration humus substances from soil to water have been performed HPLC, IR spectrometry and mass spectrometry analyses. We studied change of HS structure and MW in soil/water. The water HS of the mixed forest characterized as same ratio of functional groups as soil catchments. The molecular weight distribution in water - predominate medium (500-1000 kDa), and low molecular weight fractions (<100 kDa).

HS water in steppe zone differs from catchment soils. In HS catchment soils predominate nitrogen- and sulfur-functional group and in HS water - nitrogen-, oxygen- functional group. The molecular weight of HS in natural waters is macromolecular fractions (> 1000 kDa).

For evaluating of the acidification effect on structures of humic substances in natural waters/soil we used data of survey more than 300 lakes on the European Russia (ETP) and Western Siberia (WS) for assessing chemical parameters. Chemical analyzes of water samples were performed by a single method in accordance with the recommendations ICP-Water report 105/2010, 2010. We researched HS from more than 10 soil sites in different natural zone.

The some lakes are characterized more than 100 water color °Pt-Co-scale and low pH waters (<4.5). These data are particularly important in evaluating the composition changing of HS in the water. Our experimental research has shown the changes in the qualitative composition of the HS and a ratio of their fractions by lowering the pH, especially, increasing the share of fulvic acids (Kola Peninsula territory).

Change in the qualitative composition of HS is accompanied by a decrease in the molecular weight, the formation of additional free functional groups. This fact is crucial to the domination of the individual metals in natural waters of various natural zones.

To study the complexation of HS in natural waters/soils we used «in situ» measurements and research process by chemical experiment. Most metals form in waters are more resistant as complexes with low molecular weight HS and in soil - vice versa. We discuss depending on the zonal specifics of HS mechanisms of complexation of each metal vary greatly. We show that the acidification processes in natural waters and soils contribute to the destruction of HS and consequently change the metals form.