

Change of physical and chemical parameters of fulvic acids at different pH of the system

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Organic substances of humic nature significantly change physicochemical properties at different pH of natural waters. As a consequence, a large number of consecutive and parallel reactions in the structure of organic polymers, and reacting with inorganic anions. The main indicators of changes in the properties of organic acids in natural systems are changes in their IR spectra, changes in the colloid stability (the zeta potential) as well as in the molecular weight and emission spectra (fluorescence emission spectra).

The aim of our study was to evaluate of changing in physical and chemical properties of the fulvic acid from soil/water samples in the natural areas of European Russia and Western Siberia (the steppe and the northern taiga zones) at different pH (from 8 to 1.5).

Changes in absorption bands of fulvic acid caused by both COOH groups and amino groups with varying degrees of protonation were found. Consequently, we can assume that in an electric field fulvic acid change the sign of their charge at depending on pH. During the lowering of the pH intensity of C-O bands generally decreases, while in the region 1590 cm⁻¹ disappears. In turn, the band at 1700 cm⁻¹ is the most intense; it could mean a complete protonation of the carboxyl groups.

According to our data, the values of zeta potential changes depending on pH of the system. The zeta potential becomes more negative with increasing pH and it may be due to ionization of oxygen groups of fulvic acid.

For the colloidal polymer systems the value of the zeta potential is strongly negative (less than -20 mV) and strongly positive (over 20 mV) characterize the system as the most stable.

Our experimental data for the study of the zeta potential of fulvic acids extracted from the soils and waters of different climatic zones show zonal influence of the qualitative characteristics of organic substances on the surface charge of the high-molecular micelle of fulvic acids. It was found that fulvic acids extracted from objects of the steppes zone have greater stability that soil fulvic the same territory. In turn, the fulvic acids isolated from the northern boreal forest sites have a large size and the saturated positive charge; that can be attributed to their high content of hard Pearson acids ions - sodium, potassium, aluminum, iron, etc.

In external influence on the mesomeric energy of the boundary functional groups (change in pH and the influence of transition metal ions) is not only the redistribution of the charge (zeta potential variation), but also changes in the size of the molecule. In the process of acidification of fulvic acid of samples extracted there was a decrease the size an average of 20-25%, due to the formation of a larger number of individual fragments increasingly capable to the elimination of a proton.

The work was performed as part of the Grant of the President of the Russian Federation for young scientists № -7485.2016.5