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Peat humic acids and their complex forming properties as influenced by peat humification

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To study paleoenvironmental changes of importance is understanding of processes of organic matter diagenesis, especially changes of refractory part of natural organic substances – humic substances. Studies of the living organic matter humification process are also essential for understanding of the carbon biogeochemical cycle. The aim of this study was to analyze peat organic matter diagenesis: changes of properties of humic acids, relations between the humification process, properties of peat, peat humic acids, their ability to interact with metal ions, as well ability to accumulate metals.

The analysis were carried out on samples of humic substances preparatively extracted from three ombrotrophic bog peat profiles to identify the links between peat age, decomposition and humification degree, botanical composition and properties of peat humic acids elemental (C, H, N, O), functional (-COOH, -OH) composition, structural characteristics - UV, fluorescence, FTIR. The found variability of peat properties is less significant than differences in the properties of peat-forming living matter, thus revealing the dominant impact of humification process on the properties of peat. Correspondingly, composition of peat humic acids is little affected by differences in the properties of precursor living organic material, and such indicators as decomposition degree, humification degree, humic acid elemental ratio and concentrations of acidic functional groups are the best descriptors of changes in organic matter during the process of organic matter diagenesis and humification.

Peat ability to accumulate major and trace elements depends on the character of element supply, potency of metal ions to bind functionalities in the peat, with an emphasis on the structure of peat humic acid, pH reaction, oxygen presence, presence of complexing compounds, inorganic ions and many other factors. Major and trace element presence in peat is of importance as an indicator of peat genesis and organic matter humification processes. We studied accumulation of trace element in peat profile to reconstruct the changes of human pollution and track down sources and characterize intensity of anthropogenic pollution. In view of this, the major and trace element distribution between peat and peat humic acids from three well characterized raised bog profiles was assigned and factors affecting element concentrations in peat humic acids were analysed.

Complex forming properties of isolated humic acids were studied as well and compared with structural features of peat humic acids, also were compared with reference and synthetic humic substances. The Cu(II) complexing capacity and stability constants of Cu(II) complexes of peat humic acids were determined in respect to the basic properties and humification characteristics of the studied peats and their humic acids. Stability constants significantly changed within studied bog profiles, also well correlated with age and decomposition degree of peat layer from which humic acids were isolated.

Keywords: humic substances, peat, complexing capacity, stability constant, humic acids, humification