Geophysical Research Abstracts
Vol. 14, EGU2012-6932, 2012
EGU General Assembly 2012

Composition of Humic Acids of the Lake Baikal Sediments

O. Vishnyakova, G. Chimitdorzhieva, and D. Andreeva
Institute of General and Experimental Biology SB RAS, Ulan-Ude, Russian Federation (ok_vish@mail.ru)

Humic substances are the final stage of the biogeochemical transformation of organic matter in the biosphere. Its natural compounds are found not only in soil, peat, coal, and sediments of basins. Chemical composition and properties of humic substances are determined by the functioning of the ecosystem as a whole. Therefore the study of the unique Lake Baikal sediments can provide information about their genesis, as well as the processes of organic matter transformation.
For this purpose, preparations of humic acids (HA) were isolated by alkaline extraction method. The composition of HA was investigated by the elemental analyzer CHNS/O PerkinElmer Series II. Various located sediments of the Lake Baikal were the objects of the study: 1 - Chivyrkuisky Bay, 2 - Kotovo Bay, 3 - Selenga river delta near Dubinino village, 4 - Selenga river delta near Murzino village.
Data on the elemental composition of HA in terms of ash-free portion show that the carbon content (CC) is of 50-53% with a maximum value in a sample 3, and minimum - in a sample 2. Such values are characteristic also for the soils with low biochemical activity. The hydrogen content is of 4,2-5,3%, a maximum value is in a sample 1. Data recalculation to the atomic percentages identified following regularities. The CC of HA is of 35-39 at. %. Hydrogen content is of 37-43 at. %. According to the content of these elements investigated substances are clearly divided into two groups: HA of the sediments of the Lake Baikal and river Selenga delta. The magnitude of the atomic ratio H/C can be seen varying degrees of condensation of the molecules of humic acids. The high atomic ratio H/C in HA of the former group indicates the predominance of aliphatic structures in the molecules. Humic acids of the later group are characterized by a low value H/C (<1), suggesting a large proportion of aromatic components in HA composition.
In sediments of the Selenga river delta there is an addition of organic matter of terrigenous origin, the remains of higher plants are the most source of it. In the bays of the Lake Baikal the remains of aquatic animal organisms, other than algae, are the source of organic matter, that explain the marked differences in the HA composition.
The nitrogen content in the studied HA is of 3,5-4,0 % (2 at. %), that corresponds to the lower boundary values for the soil HA. No significant differences in nitrogen content between preparations were found. HA of sediments vary widely in sulfur content: 0,5-4,6 %. Maximum sulfur content is observed in the HA of Chivyrkuy Bay, which is higher than this element content in the soil HA. Likely sources of organic matter in the sample 1 are enriched in sulfur-containing amino acids such as cystine, cysteine, methionine, which is reflected in the composition of HA. Oxygen content is about 33,8-39,1% (17-22 at. %).
Data analysis of the elemental composition of humic acids of studied sediments indicates that the HA formed in subaqueous conditions of bays are slightly condensed, contain less carbon and more hydrogen, compared with HA of delta part sediments, which are more carbonized and enriched in aromatic components. Thus the last group of sediments is of mixed subaqueous and terrigenous origin.