

Geochemical interpretation of distribution of aromatic hydrocarbons in components of geologic environment of Pechora, Barents and Kara seas.

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Information about the hydrocarbons content (including aromatic ones) in components of geologic environment allows to define common factors in distribution and correlation both nature and technogenic component, and also to reveal the sources of contamination. At that, it should be noted, that hydrocarbons are widely spread in lithosphere and create steady geochemical background, variations are caused here by specifics of initial organic matter, conditions of its accumulation and transformation.

The basis of the study are the samples of sea water and deep sea sediments (more than 600 stations), collected in western sector of Arctic region (Pechora, Barents and Kara seas) during the scientific-research expeditions of FSBI "VNIOkeangeologia" for the period 2000-2010.

Total content of aromatic hydrocarbons was defined by spectrofluorometric method using analyzer «FLUORAT-Panorama-02». Certification of data was performed on representative samples based on contents and molecule structure of polycyclic aromatic hydrocarbons using GC-MS (Agilent 5973/6850 GC-MS System).

Results of spectrofluorometric analysis of lipid fraction of organic matter of bottom sediments allowed to define specific parameters, which characterize various lithofacies groups of sediments.

Thus, sandy residues are characterized by low level of aromatic hydrocarbons (ca. 4.3 $\mu\text{g/g}$) with prevalence of bi- and tri-aromatic compounds (λ_{max} 270-310 nm). This correlates with low sorption capacity of coarse-grained sediments and absence of organic-mineral component, containing the breakdown products of initial organic matter. Tetra- and penta- aromatic structures prevail in clay sediments (ca. 13.0 $\mu\text{g/g}$), which are typical components of lipid fraction of organic matter of post sedimentation and early diagenetic stages of transformation. At that, changes of spectral characteristic of sediments in stratigraphic sequence completely reflect processes of diagenetic transformation of organic matter, including aromatization and new formation of number of compounds, for example perylene (λ_{max} 405,435 nm).

The presence in sediments of highly transformed (post-diagenetic) organic material forms special (for naphthides) type of spectrum (λ_{max} 370-380 nm), which interface is fundamentally different from recent marine sediments. Similar type of spectrum in combination with anomalously high content of aromatic hydrocarbons (ca. 349.1 $\mu\text{g/g}$) is typical, in particular, for shelf of Spitsbergen archipelago, whose erosion and redeposition of carboniferous rocks play important role in deposits formation. Similar content of aromatic hydrocarbons was noted in sediments of shelf of the Island Kolguev, where exogenous anomaly is caused mainly by anthropogenic factors. This assumption correlates with the results of aromatic hydrocarbons examination where pyrogenic components dominate.

The influence of endogenous processes (seepage of hydrocarbons) also may lead to substantial deformation of background spectrum due to formation of intensive peak in short-wave region (λ_{max} max 240-260 nm).

Credibility of collected results is proven by significant correlation of quantitative estimation of aromatic hydrocarbons contents conducted using both dispersed organic matter extraction and fractionation and spectrofluorimetry methods. Results, received during GC-MS analysis also prove spectrofluorometric information.