DETOXIFICATION OF POLYCYCLIC AROMATIC COMPOUNDS BY MEANS OF NATURALLY OCURRING HUMIC SUBSTANCES

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Three model polycyclic aromatic compounds (PACs) - pyrene, fluoranthene and anthracene - have been chosen for the investigation of their binding and detoxification with 27 humic acids (HAs) of different origin, being isolated from waters, soil, peat and coal.

The quantitative estimation of reactivities of these humic acids directed to polycyclic aromatic compounds mentioned above has been performed by means of laser fluorescence. It has been shown, that the binding is growing with the increase of aromatic fragments content in HA molecules. The correlation analysis of data on structures and reactivities of humic acids gave the possibility to proclaim a descriptor – the ratio of the aromatic carbon content to the aliphatic one (Car/Calk) – having the highest prognostic ability for the HA-PAC binding constants. The aromaticity parameters have been obtained from the 13C NMR spectra. It has been shown also, that the HA – PAC bindings in waters depend substantially on the pH values and ionic strength of the medium. As to the mechanism of HA – PAC interactions, it has been proposed, that the hydrophobic properties of PACs contribute substantially into the donor–acceptor interaction of PACs with HAs.

Biotesting has been chosen for the study of detoxifying abilities of HAs in relation to PACs (grazing activity of Daphnia Magna, registered by the change of Chlorella Pyrenoidosa's photosynthetic activity). The detoxification decreases as following:

Pyrene > Fluoranthene > Anthracene

It has been proposed, that the detoxification observed is explained by the formation of nontoxic HA-PAC molecular complexes, which are quite stable both in waters and soil.