



Hydrocarbon complex of soils in the area of impact of carbon-producing plants

Andrey Zhidkin, Alexander Gennadiyev, and Timur Koshovskii
Lomonosov Moscow State University, Russian Federation (gidkin@mail.ru)

The hydrocarbon complex of soils was studied at three key sites, located near the carbon-producing plants (CPP) in different parts of Russia. "Noginsk" CPP (in the Moscow Region) is the oldest source of technogenic hydrocarbons among the considered objects (worked from 1916 to 1998). It used the least environmentally acceptable "lamp" technology. "Omsk" CPP (in the Omsk region) is the largest enterprise in terms of the production of carbon black in Russia, worked from 1942 to the present. In the 1970s, the technology was changed from "lamp" (less environmentally acceptable) to "furnace". "Syzran" CPP (in the Samara region) worked short period (from 1963 until the 1980s), the technology of production - "furnace". The "Syzran" site was also under influence of an oil refinery and a thermal power station.

The revealed significant differences in the concentration and composition of hydrocarbons in soils were due to differences in the technology of production and the duration of work of CPP, as well as differences in the natural factors of hydrocarbons transformation.

Based on the statistical analysis it was established that the studied soils can be characterized and grouped by a complex of polycyclic hydrocarbons and bitumoids. Clear differences in the type of bitumoids were revealed, at the "Noginsk" site the bitumoids are mainly of a resinous type, at the "Omsk" site - the oily-resinous type, at the "Syzran" site - the oily type. Heavy PAHs associations are confined to a CPP with coal raw materials and "lamp" technology of production; in other cases the heavy PAHs associations mark positions with local mechanical injections of solid hydrocarbon-containing waste. The light PAHs associations usually found nearby CPP with "furnace" technologies, as well as in areas removed from the source of pollution, in the buried and scalped soils. In a consequence of sites "Noginsk-Omsk-Syzran" an increase of portion of light PAHs (diphenyl and homologues of naphthalene) and decrease of portion of heavy PAHs (chrysene, tetraphene, benz(ghi)perylene, benz(a)pyrene) were revealed.

The concentration of bitumoids in the investigated sites varied slightly. The concentration of PAHs in the soils near CPP "Noginsk" was two orders of magnitude higher than in the soils of "Omsk" and "Syzran" sites. A very strong variation of PAHs concentrations were also found at all sites. The abnormally high maximum concentrations of PAHs at the "Syzran" site are probably related not so much to their income from the atmosphere as to mechanical injections of solid hydrocarbon-containing waste products from oil refinery and a thermal power station. The work was supported by the Russian Science Foundation, project no. 14-17-00193.