

Toxic chemical elements in Moscow

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Our Institute, in co-operation with other organizations, has carried out (spend) an estimation of an environment of Russian cities since 1976. Among another Moscow is taken in. The basic objects of research are soil, snow, bottom deposits, water and atmospheric air. In basic, the most toxic elements (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, V, Zn) and contents of rare elements on territories, where there is an emission of these elements, have been studied.

Repeated daily instrumental measurements of a concentration level of some elements in atmospheric air in cities — important necessity of an estimation of quality of the air. This monitoring of atmospheric air allows to establish dynamics of change of quantitative and qualitative structure of the elements in the air.

Similar studies conducted in Moscow has revealed a

wide spectrum of pollutants in atmospheric air of populated area sited in the outskirts of the city. Using the enrichment factor, three groups of microelements differing in origin are differentiated: (i) elements of terrigenous origin (Si, Al...); (ii) elements related to heat power plants impact (V, Ni); (iii) elements supplied by industrial zone (Cr..., Sn). Soil sampling gave grounds, to indicate pollutants' paths from major sources over the area.

Effectiveness and representativity of litho- and geochemical environmental studies are defined by philosophy of the project and by quality of analytical results, and application of the same analytical „instrumental kil” should be preferred to the free artist's palette here. Samples may be analysed for a wide variety of the elements using quantitative OESA, INAA and XRF combined.

Data on a condition of soil and snow are used in cities for an estimation of the area and the level of pollution. In the last years a map of the territory of Russia (on the scale 1 : 5,000,000), and of separate cities (scales 1 : 25,000–

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1 : 100,000) also, have been prepared. These works allowed to allocate sites, subject technogenic to influence and to give the recommendations to municipal agencies for acceptance of effectual remedies.

The bottom deposits which accumulated toxic compounds of heavy metals, mineral oils, organochlorine compounds and many other dangerous for the people technogenic substances, required special attention. The level of bottom deposits pollution is the highest in sites with influence of the river Moscow and other rivers and brooks, receiving drains disposed beside of the industrial enterprises. The concentration of the elements and compounds in bottom deposits depends on their lithological structure and hydro-geological regime.

Representativity of ecogeochemical studies is defined not by methodology alone, but also by quality of soil and air

samples' analysis. The following methods are most widely used for instrumental analysis of atmospheric aerosols: INAA, ICP, XRF, AAS, quantitative OESA; organic components of atmospheric air are determined using chromatographic MSA and gas chromatography. A combination of INAA and quantitative OESA has shown very good accuracy and precision when used for the same sample. A combination of chromatographic MSA and gas chromatography provides an identification of more than 200 compounds in atmospheric air pre-concentration with Carbochrom-type sorbent. Similar techniques are used for elementary analysis of soils, with semi-qualitative OESA as a leader because of low costs. Inter-laboratory control has shown that a rarefaction in contents of certain elements of several decimal orders is a real possibility when analysing the some soil sample.