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The book of abstracts contains materials of V International Symposium “Biogenic–abiogenic interactions in natural and anthropogenic systems” (October 20–22, 2014) devoted to the discussion of fundamental and applied aspects of interactions between biogenic and abiogenic components in lithosphere, biosphere and technosphere. The Symposium is traditionally interdisciplinary and is attended by experts in the fields of Earth sciences, biology, soil science, materials science, chemistry, environmental protection and the preservation of cultural heritage.

Organizers of the symposium are the oldest Russian scientific societies and the largest educational-scientific centers of St. Petersburg.

concentration of chemical elements in soils by an amount equal to $1 \cdot 10^{-3}$ %, within the upper 30 cm layer corresponds to an increase (decrease) of their weight by 6 tons on an area of 1 km^2.

In some cases, instead of the value of the background content in a certain part of the geochemical system can be used the average concentration in the Earth's crust or a certain normalizing indicator (i.e. threshold limit value, TLV) .

However, such a quantitative measure of how IAA required for many decisions related to environmental issues does not provide sufficient information about the most negative impact of certain chemical elements in each case. Let's consider the following example. An increase of hundreds of tons per 1 km^2 of iron content in the soils is less hazardous for organisms than an increase of 10 tons of mercury and arsenic. It happens due to the different average concentrations of these elements in the Earth's crust. High content of Fe (average 4.64 %) is habitual for organisms over a long period of development and evolution and the high concentrations of Hg ($8.3 \cdot 10^{-3\%}$) or As ($1.7 \cdot 10^{-3\%}$) are unaccustomed. The Indicator of Relative Accumulation (IRA) was proposed by V. A. Alekseenko to overcome this geochemical feature. IRA shows the ratio between the mass of the element accumulated (lost) as a result of the processes occurring in a certain part of the geochemical system (i.e. IAA) and the background content (or the average concentration in the Earth's crust). Thus, we can assume that IRA = IAA/C_1.

SEVERAL GEOCHEMICAL FEATURES OF URBAN SOILS

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Urban soils are being under the greatest technogenic pressure among the bioinorganic (organomineral) systems. Their geochemical features reflect an overall ecological-geochemical state of territories, within which most of the population spends most of their lives. Depending on the technogenic impact we have described seven different groups among the settlements: 1) millionaire cities (> 700 thousand people); 2) half-millionaire cities (300–700 thousand people); 3) cities with a local significance (100–300 thousand people); 4) small towns (< 100 thousand people); 5) small settlements, villages, hamlets; 6) tourist and recreational areas; 7) mining sites settlements. The cities differ by the human-made impact and by the number of inhabitants. This fact has facilitated the division of cities by groups. During studying cities in detail it is expedient to consider the cities of 2nd 3rd and 4th groups depending on their main industries and the cities of 7th group, depending on the extracted material.

The analysis of geochemical characteristics of soils of more than 300 settlements in Europe, Asia, Africa, Australia, America has allowed us to determine the average concentrations of 50 chemical elements in this organomineral system.

The research methodology allows to consider these concentrations as the abundances in urban soils for the period of late XX century — early XXI century.

Based on a comparison between the abundances in the Earth's crust, in the Earth's soils and in urban soils the following conclusions could be done:

1. The accumulation of such elements as Ag (5,3 times), As (9,4), Bi, Mo (2,2), Sn (2,7), W, Yb (in the gaps — the excess over the concentration in the Earth's crust, times) is caused by both natural soil formation processes and technogenic activity.

2. The abundances of B, Ba, Ca, Cl, Hg, Li, P, Pb, Sr, Zn in urban soils have occurred firstly because oà the technogenic impact. Their abundances in urban soils exceed the abundances in the Earth's crust and in the Earth's soils.

3. Soils of each determined groups differ by the association of elements in increased and decreased concentrations.

4. Several cities in these groups distinguish themselves by the critically increased concentrations of the number of elements. The developed industries in these cities could be a reason for this sufficiently rare appearance.

5. The increased concentrations of chemical elements are able to save for decades in urban soils even after the removal of the general sources of pollution input to the soils.

6. The established abundances of chemical elements in urban soils reflect the geochemical (ecological-geochemical) characteristics of the joint impact of natural and technogenic processes in our-days' time period. With the development of science and technology the abundances may gradually change. The rate of these changes is still poorly predictable. The authors hope that the abundances of chemical elements presented for the first time may and will be used during various ecological and geochemical studies.

MIGRATION MODELS OF CU, ZN, CD IN SOILS UNDER IRRIGATION WITH URBAN WASTEWATER

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The wastewater is that released from municipal and industrial production. The urban wastewater containing a great amount of heavy metals (HM) like Cd, Cu, Fe, Mn, Ni, Pb, Zn is utilized for irrigation and fertilization of agricultural fields and may lead to a continuous HM accumulation in soils. It is considered that the heavy metals are accumulated only in the topsoil, however, the irrigated wastewater used for a long period of time contributes to soil contamination at a depth.

The information on mathematical models to show the HM migration in soils is rather scanty in literature. Probably, predominant is the idea that HM being accumulated in topsoil don't migrate downwards the soil or the HM migration is not significant for evaluating the soil contamination. However, it is worth emphasizing that this migration constitutes a risk to contamination of the environment and groundwater and for this reason dynamic mathematical models are an important aspect in scientific research.

The present study is aimed at estimating adequate application of migration models for the HM transport downwards the soil profile in the case of irrigation with natural and urban waste- water for a long period of time. The heavy metals of interest in this study are Cu, Zn and Cd.

The field experiments have been carried out in Egypt (Goma Botkhina Saad near Alexandria). Two test areas were located on alluvial soils of