Materials of Conferences

THE HEAVY METALS IN ECOSYSTEMS OF CITIES ALTAY

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The strong contribution in ecosystems large cities of Altay introduce different industrial enterprises and as well as automobiles and cars, that are assuming in last years threatening scales on ejections in environment enough extensive spectrum toxicants.

The dominant in spectrum heavy metals in ecosystems of cities Altay define by prevailing pollutants, that these arrive in environment from different sources pollution industrial infrastructural and acquiring cumulative effect acting on biota. Tree principal types ecosystems cities on Altay split: 1- ecosystems of cities with predominance industrial ejections enterprises military-industrial complex and chemical plants (Biisk); 2- ecosystems of cities with predominance industrial enterprises of heavy machine building (Barnaul); 3- ecosystems cities with predominance ejections rock-withdrawal and rock-benefication enterprises (Zmeinogorsk, Rubscovsk).

The high information of evaluation ecologic condition of nature system supplay by high detectivity bio-geochemical mapping with using X-ray emission spectroscopy radiometric apparatus (RRA) type NOKKIA (c. Saint Petersburg, LSU) that it is allow study roentgen spectrum assay probes on wide spectrum of chemical elements. The probes of dry leafs analyzed with assistance RRA on first stage. The first microns of surface leaf analyzed, where are concentrate more part of heavy metals, accumulation of plants for period from appearance to their gathering for analysis. The ash probe leafs analyzed on the second stage and bark of plants by method ICP-MS and ICP-AES on large spectrum elements in Analytical centre IMGRE (c. Moskow).

We adjusted before that the heavy metals more intensity absorb from gas faze, poorly – from solution and more poorly – from solid faze – soil (Gusev, Rusanova, 2005). The all chemical elements divided trough level biologic accumulation in correspondence of classification A. Perelman (Perelman, 1975): the phosphorus follow to classify to elements biologic accumulation (Kx = 3.4-24.0); Mo, Zn, Cu, Mn, Ag, Sr, Ba, B, Pb, Sn, Ni – to elements of middle entrainment (Kx = 0.5-8); Ti, Al, Co, Cr, Be, F – to elements of faint entrainment (Kx = 0.1-1). The elements zinc and silver (group of middle entrainment of elements) in industrial zone of Biisk exceed standard levels that these are showing in literature data.

The comparative analysis of ecosystem cities of region completed on detecting paragenetic association elements in plants with high count (200-250 probes) of poplar and wormwood for supply representation receiving results by method main components of factor analysis. It is know, that the factor analysis in more degrees correspond sense paragenetic analysis (Smirnov, 1975). The structure unity of model evidence about it, that it is describing of behavior chemical elements of system on change outward conditions and model main components:

$X_i = \sum W_{ij} Z_j$, where Z_j – values of $_j$ factor; Wij – factor load of j factor on i variable; (i=1,2,3,…, m; j= 1,2,3, …, r; r ≤m).

The heavy metals in the first type of ecosystems enter in all environments and these has specific set paragenic associations of elements. The calculation of factor loads for data on sampling analysis for bark and herb of wormwood receive in such form:

Φ I of poplar, D=42%, $Zn_{0,95}$ $Mo_{0,86}$ $Sn_{0,61}$ $Sr_{0,52}$ $P_{0,48}$ $Pb_{0,42}$

Φ I of wormwood, D=39,2, $Ag_{0,81}$ $Zn_{0,77}$ $P_{0,72}$ $Mo_{0,62}$ $Pb_{0,57}$ $Cu_{0,43}$

Where Φ I – factor loads of first exponent, D – contribution of factor loads in percents (for 95% level significance).

These results show that there are discovering associations in plants of industrial zone of c. Biisk reflect complexes of chemical elements, having technogenic nature, but the particularly values of factors arrange order on level increasing coefficient biologic accumulation (or anomaly in the plants). The paragenic associations of chemical elements in bark poplar and herb of wormwood has features similarity and distinction. There are has common associations chemical elements (Zn, Mo, P, Pb), but so specific, these are characteristic for poplar (Sr, Sn) and characteristic for wormwood (Ag, Cu).

The factor loads and paragenetic associations of heavy metals for those plants for second type of ecosystems (c. Barnaul) determine in follow appearance:

Φ I of poplar, D=49%, $P_{0,98}$ $Zn_{0,95}$ $Sr_{0,88}$ $Cu_{0,73}$ $B_{0,62}$ $Mo_{0,46}$ $Pb_{0,42}$ $Hg_{0,33}$

Φ I of wormwood, D=47,6, $P_{0,94}$ $Mo_{0,82}$ $Cu_{0,63}$ $B_{0,60}$ $Zn_{0,57}$ $Mn_{0,51}$ $Sr_{0,40}$

The bark of poplar of ecosystem Barnaul contain boron and mercury an against of Biisk and it is lacking tin, but phosphorus acquire significant role in bringing formula. The phosphorus predominate and in the wormwood. The paragenetic association appearance manganese, strontium and it is falling out silver from list.

The paragenetic associations of third type ecosystem (c. Zmeinogorsk) determine entirely by composition extracted polymetallic ores from gold-sulfide massive deposits (Zmeinogorskoe, Korbalichinskoe, Srednee, Petrovskoe and other). The factor loads and paragenetic associations of heavy metals for those plants for third type of ecosystems (c. Zmeinogorsk) determine in follow appearance:

Ф I of poplar, D=52,4%, Ba $_{0,97}$ Cu $_{0,93}$ Zn $_{0,91}$ Pb $_{0,89}$ Sr $_{0,88}$ Ag $_{0,81}$ Cd $_{0,60}$ Mo $_{0,46}$ Tl $_{0,39}$

Ф I wormwood, D=44,5, Ba $_{0,92}$ Ag $_{0,91}$ Cd $_{0,85}$ Zn $_{0,81}$ Pb $_{0,69}$ Cu $_{0,53}$ Sr $_{0,48}$ Mo $_{0,42}$ Tl $_{0,29}$

The barium, copper, silver, cadmium, tallium receive considerable role in both plants in composition of paragenetic associations of ecosystem city Zmeinogorsk. The last elements from it list appear by admixture**,** but they turn out an important pollutants, absorption by plants.

The intense change (yellow of leafs) on poplars and birches happened in July 2004 year in ecosystem of Biisk in area of target burning rocket fuel (to N-W and N-E from target) after next burnings. Unusual early defoliation foliose trees and bushes took place at beginning august. The probes of leafs birch and poplar in it area turn out with anomaly concentrations of manganese, aluminium, mercury, cobalt, chromium, strontium. The near list anomaly elements fixed in wormwood also. High concentrations noted for lead, zinc and barium in wormwood besides above indicating.

Consequently necessity it note that in limits of every ecosystem arranged considerable variations in spectrums of anomaly elements. Anomaly indicators at lead, cadmium, zinc, cooper, cobalt in soils and in leafs of different herb reveal in the center of c. Biisk, that there are connect with high longstanding assignment on environment movement auto transport on the stretch auto station – Biisk city and these caused by high fume of it area and thrusting out in atmosphere tetra etil lead and other heavy metals with exhaust gases.

The near picture technogenic pollution observe for center of city Barnaul, area of railway station, auto station and so area “Potok”, where there are concentrate intensive movement auto transport. The anomaly significances in ecosystem of Barnaul as against Biisk obtain the elements of first class of danger – mercury and beryllium (Zhdanova, Gusev, 2006).

References:

1. Gusev A.I., Rusanova Z.V. The technogenic pollution of herb c. Biisk //Materials of science-practical conference, devote 60-year Novosibirsk geology-reconnaissance technical school.- Novosibirsk, 2005. – P. 46-50.

2. Zhdanova M. V., Gusev A.I. The biogeochemical indication of antropogenic pollution of herb cities Biisk and Barnaul // The nature resources of Gorny Altay: geology, geophysic, ecology, mineral, water and forest resources Altay. – Gorno-Altaisk, 2006. - № 1. – P. 90-93.

3. Perelman A.I. The geochemistry of landscape. – M., High School. -1975. – 276 p.

4. Smirnov B.I. The statistical methods of discharging association chemical elements and minerals // Review. M.: Science, 1975. – 62 c.

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CONFIGURATION OF CROSS CRACKS FORMED IN BRITTLE MATERIALS BY MEANS OF PLASTIC SUBSTANCES AND EXTERNAL LOADING ON FRACTURED SAMPLE

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To find out the possibilities of crack configuration management in the course of its development under the conditions of external loading on the destroyed sample a series of laboratory experiments in a press was carried out by my colleague Kyu N.G. and me. Four separate organic glass blocks dimensioned 100×100×100 mm each one were used in the experiment and were fractured using plasticine. The purpose of the experiments was to find out general principles of crack formation in such conditions.

The first experiment was carried out without any external loading on the tested sample and served as the basis for the following comparisons. The plasticine charging was performed through a bore drilled out in the block center into its bottom-hole part by means of a special cylinder device held in this bore by thread. The bottom-hole pressure was measured by a manometer provided with a special adaptor placed on the opposite side of the block. In the course of the experiment it was found out that with the increase of the putty amount introduced into the crack and simultaneous growth of its dimensions the putty charge pressure decreases at the end and at the beginning of every separate stage of the experiment. Besides, the horizontal and vertical dimensions of the formed crack and also the zones of its filling with a plastic substance grow much the same in the nature with the result that the crack assumes a definite round-shape form. At the beginning of plasticine charging the pressure changed from 370 atm до 150 atm, and at the end – from 200 atm to 50 atm. The split of the sample followed the pressure downtick. In the course of carrying out the first experiment all the earlier educed principles of development of the crack formed using plastic substances transverse the shot hole axis in brittle materials were confirmed, they corresponding to the lack of external loading on the tested sample.

The second experiment was carried out at the vertical loading on the sample on the part of press. Because of technical failures (faulty seals in the system of oil charging) the loading varied fluently within the interval from 10 to 15 tons. A characteristic feature of the second experiment was an accelerated growth of the crack and the zone of its filling with the putty in the direction of loading appliance to the tested