

Environmental Problems of Soils during the Liquidation Rozdil State Mining and Chemical Enterprise «Sirka»

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Abstract – At this work is determined heavy metals composition in soils of Rozdil State Mining and Chemical Enterprise Sirka, which is included in a list of the top 100 companies for causing environmental pollution in Ukraine. It has not been working since 2001, since 2006 it has been subordinating the State Property Fund, it has been passed readjustment.

This work has established qualitative and quantitative composition of chemical elements in the soils near tailing pond, phosphogypsum dump and place with tars, using spectral analysis method. Was determined amount of heavy metals, equal or exceed the maximum permissible concentration in soils, including: Mn, Ba, Sr, Cr.

Key words – mining and chemical industry, soil pollution, heavy metals, tars, phosphogypsum, sulphur, spectral method.

I. Introduction

The mining industry now holds a leading position in the infrastructure of the Ukraine economy. Along with this, mining activity is a determining factor of technogenesis, which greatly complicates the ecological situation in local areas by changing the forms of relief, hydrological and biogeochemical regimes of territories caused by the accumulation on the surface a significant amount of waste production. This creates a different dimension of environmental problems connected primarily with pollution of the environmental components - soil, water, vegetation, and therefore the deterioration of health conditions the local population. One of the industrial basins that suffered intensive use is Carpathian sulphur pool. Raw material base for mining of native sulfur in the Precarpathian Region are Rozdil, Podorozhne, Yaziv and Nemyriv and Lyuben, Zahaypil and Shevchenkovo deposits. The main objects within the sirkonosny pool, which was performed mining works were Rozdil and Yavoriv State Mining and Chemical Enterprise (SMCE) "Sirka".

The purpose of this work is environmental assessment of soil condition on the territory of Rozdil State Mining and Chemical Enterprise "Sirka".

II. Materials and methods of research

Carpathian sulphur pool until recently was considered one of the main source of chemical industry of Ukraine such valuable raw material as sulfur. Native sulfur deposits in the pool mainly are concentrated in the Lviv region. Unfortunately, due to irregular mining of sulfur by opencast methods in the former sulfur deposits now are remained distorted the natural landscape technological wastes and polluted soils and water bodies.

Only on Rozdil SMCE "Sirka" during the liquidation of his career, arose a number of environmental problems

associated with the change of landscape-geochemical, geodynamic and hydrogeological parameters. The main elements of the posttechnogenic landscape of territory are: about 60 million tonnes of sulfur ore tailings; 3,045,400 tonnes of phosphogypsum; 1.5 million m³ acid water; 17.195 thousand tonnes modifier such as "MG", made from neutralized tar residues and residues boiler anhydrite maleic acid which were brought from Hungary in 2002; thousands of tonnes of sulfur sub-standard residues and other chemicals; thousands of hectares of land disturbed by mining works which are not used; ruins of buildings that will never be used for new productions and others.

Spectral method for determination of chemical elements is based on evaporation sample in an electric arc on the spectrograph with a quartz optics, then are got a photographic image of the sample spectrum. Image allows you to determine qualitative composition of the samples for 40-50 chemical elements. As fast physical method of determining the chemical composition the substance, spectral analysis can replace the long and time-consuming chemical analysis. Using spectral analysis methods can quickly and precisely give the chemical characteristics of rock or soil with the definition of all metals and certain other elements. Spectral analysis allows you to visually of the spectrogram estimate the approximate content of these elements. Using quantitative spectral analysis can accurately determine the content of trace elements contained in the sample. Spectral analysis can detect concentrations of non-ferrous, rare, scattered and radioactive elements. In order to determine the quantitative composition of chemical elements need special additional methods of determination. In research we used the methods of spectra comparison. Like all instrumental methods of analysis, quantitative spectral analysis based on a comparative study of the sample and standard samples of known composition.

III. Research results and discussion

Soil samples were taken at 1 m and 20 m of tailings pond, phosphogypsum dump and place with tars.

Fig. 1 shows the contents of barium in soils on the territory of enterprise. Barium belongs to class 3 of hazard heavy metals (low-hazard). Maximum permissible concentration (MPC) of barium is 200 mg/kg. There is exceeding of MPC for barium in 3 times in the soil at a distance of 20 m from the dump of phosphogypsum in 4 times in soil at a distance of 1 m from the tailings pond, in 5 times at 20 m of tailings pond.

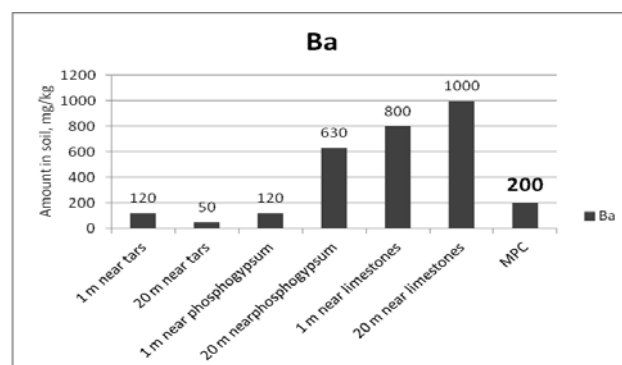


Fig. 1. The composition of barium in soils on the territory of enterprise

Fig. 2 shows the contents of manganese, which belongs to the class 3 hazard of heavy metals in soils. In soil samples, taken at a distance of 20 m from the phosphogypsum dump, the amount of manganese equal MPC (1500 mg / kg). All other samples content does not exceed the MPC.

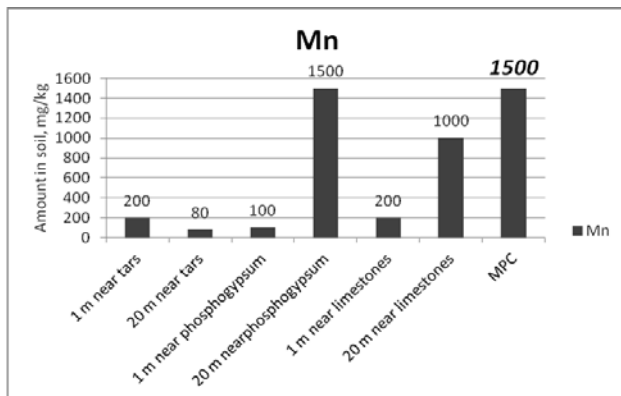


Fig. 2. The composition of manganese in soils on the territory of enterprise

Fig. 3 shows the number of strontium (hazard class 3 of heavy metals) in soils. MPC of strontium in the soil is 1000 mg/kg. There are significant excess of MPC in almost all samples.

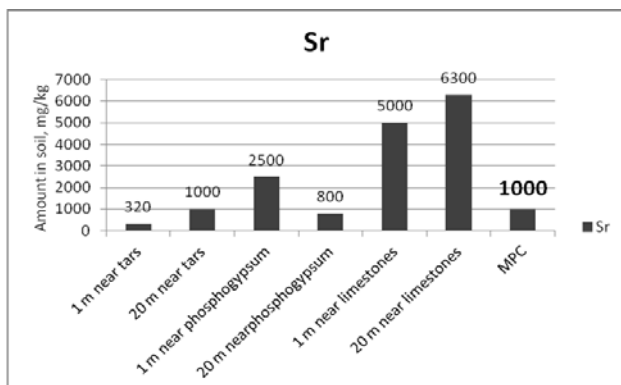


Fig. 3. The composition of strontium in soils on the territory of enterprise

Also in the soil at a distance of 20 m from the phosphogypsum dump was found chromium (Class 2 hazard of heavy metals) at MPC (100 mg/kg).

Mining industrial complexes usually have a negative impact on the environment. The reason is the opened mining, during that is disturbed landscapes lithogenic

basis and there is rapid restructuring of the surface and is formed technogenic relief in the form of quarries, dumps and other subjects. As a consequence of irrational use of natural resources of the Rozdil State Mining and Chemical Enterprise "Sirka" territory in addition to the problem of the presence of heavy metals in soils, the enterprise has a problem with water pollution, large-tonnage wastes, natural disasters (landslides) on the territory of and nearby settlements, a violation landscape and vegetation.

The main steps towards addressing the problem of environmental rehabilitation of the territory are recycling the large-tonnage waste and providing of monitoring system for predicting environmental changes.

Conclusion

Were done elemental qualitative and quantitative composition of heavy metals in soils of Rozdil State Mining and Chemical Enterprise "Sirka", which is the subject of environmental hazards. It is established exceeded of MPC for manganese, strontium, barium, chromium in soils.

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