

TOXICAL ELEMENTS IN SURFACE-WATER LEAK OUT FROM MINING DUMP AROUND BANSKA STIAVNICA

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Abstract

This article is describing an excessive concentration of representative kations of heavy metals (Pb, Cd, Mn, Cu, Zn, Ni and Fe) in the surface-water leaking out from mining dump in the region Banska Stiavnica. The aim of

this article is to inform you about contamination in this region and if the mining dump share at the contamination of soil and water.

Keywords:

heavy metal; surface-water; atomic absorption spectrometry

1. Introduction

Mining activity in Stiavnica Hills began a few centuries ago. The first documents about this activity came from 12th century. During the mining evolvement there were broken a lot of tunnels under the ground and millions of cubic meters dump were transported on the ground. Mining dump are now source of pollution and initial of many ecological metamorphosis. Some toxic substances began giving off the dump because of the effect of oxygen and water and aerate activity. These substances devalue surrounded nature. Soil in this district contains a lot of pyretic stones and there is a sulphur-sauer disintegrate. Also heavy metals are accumulated because of mineral erosion.

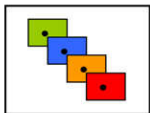
Elevated concentrations of Cu, Pb, Zn, in the soil and plants were found in 1985¹. South of a Sobov an influence of acidificated clay on plants² was observed. In this district is soil with pH 5.2 - 3.6. Elevated concentration of heavy metals was discovered in the soil and water south-eastern B. Stiavnica³, with emphasis on a it today determination of As, Ag, Cd, Cu, Co, Cr, Fe, Hg, Li, Pb and Zn. In the observed local region was concentration of As and Cu around reference value. There were raised contents of Ag in the soil and lower contents of Cr and Hg than the reference value. Concentration of Cd, Pb, Zn and Ag was over the limit of decontamination the soil.

Water in the brook Banska Stiavnica has concentrations of Cd, Pb, Fe and Mn over the limit. Heavy metals were observed also in two wells. In the well from Banska Bela heavy metals were not over the limit, but near the gallery Juraj Cd, Fe and Mn were over the limit.

In this work we aimed at an analysis of the surface-water leaking out of from mining dump Sobov. We found out some new knowledge about raising concentration of some heavy metals in this region. We decided for determination in the local district after reading literature with all known results about concentrations of kations of heavy metals in the water soaked from mining dump which are insufficient. Near the shaft Sobov there are two large mining dumps. The first "A" belong to Banska Bela and is located to the right of road to Zamovica. The second "B" is located to the left of this road and belongs to Banska Bystrica (One Mine). There is evident leaking of water from "A" heavy contaminated in the other years. Concentration of Fe, Mn, Pb, Cd, Zn, Cu. and Ni get over the limit. In a stream from "B" are elevated concentration of Pb, Mn, Cu, Zn, Fe and Cd.

2. Experimental

Samples of water from "A" and "B" were taken after rainy day. This water was putting into artificial vessel and stored at 15⁰C in dark place. Determination was made after 2 hours. Concentration of cations in the sample was determined by AAS-fy Pye Unicam Ltd./Phylips, model PU 9000 with deuterium background corrector. Pb, Zn, Cu, Mn, Cd, Ni and Fe were detected in HNO₃. pH - was determined by digital pH-meter.



3. Results and discussion

| | | | | | | | | |
|-----|----------------------------|------|------|-------|------|-------|------|--------|
| "A" | cation | Pb | Cd | Mn | Cu | Zn | Ni | Fe |
| | conc.[mg.l ⁻¹] | 0.1 | 0.02 | 80.00 | 6.80 | 11.00 | 0.20 | 3690.0 |
| "B" | cation | Pb | Cd | Mn | Cu | Zn | Ni | Fe |
| | conc.[mg.l ⁻¹] | 0.01 | 0.02 | 11.00 | 0.20 | 4.60 | 0.75 | 1.50 |

Allowable values of concentration by STN 757 221 (about quality of surface-water) are below:

| ion | concentration [mg.l ⁻¹] |
|-----|-------------------------------------|
| Pb | 0.010 |
| Zn | 0.020 |
| Cu | 0.020 |
| Mn | 0.050 |
| Fe | 0.500 |
| Cd | 0.003 |
| Ni | 0.020 |

Comparison of ions concentration in soak water from "A" with pH=2 and limit:

| | |
|----|---|
| Fe | 7.10 ³ - multiple over the limit |
| Mn | 1.5.10 ³ - multiple |
| Cu | 3.10 ² - multiple |
| Cd | 7 - multiple |
| Zn | 5.10 ² - multiple |
| Ni | 10 - multiple |
| Pb | 10 - multiple |

Comparison of ions concentration in soak water from "B" with pH=4.4 and limit:

| | |
|----|-----------------------------|
| Pb | 1 - multiple over the limit |
| Mn | 220- multiple |
| Cu | 10- multiple |
| Zn | 230- multiple |
| Fe | 3- multiple |
| Cd | 7- multiple |
| Ni | 10- multiple |

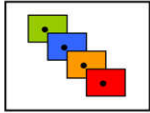
Conclusion

Both dumps are open and one way to solve the problem is to grow grass there.

Disparagement of concentration of many ions in soil will then turn up. Grass can prevent oxygen and water from atmosphere to cause mineral erosion. During our study we have found out that the activity of microorganism in water cause lower concentration of some metal as Fe and Mn. After 30 days samples were analyzed and there was a drop about 25% in comparison with fresh samples.

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