NATURAL REMEDIATION IN POLLUTED AREAS BY MINING-METALLURGICAL ACTIVITIES. PART II. REVEGETATION OF MINING AREAS

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ABSTRACT

No more cinder was deposited on the dumb starting with 2004. The environmental balance indicates an overflow of heavy metals admitted in soil that shown a major possible pollution. The wastes mining-metallurgical deposits are a continuous pollution source for environment and human habitat. The physical pollution is manifested through the increase of air-floated and sedimentary powders atmosphere content while the chemical pollution is due to the content of the dumper ash in chemical compounds. The surface water, groundwater, soil, vegetation and the leaving area are the pollution receiver. Also, there is the danger of the West and North flank to debris-slide, the last one with the blocking-up of the river bottom.

INTRODUCTION

The cinder yard is a continuous pollution source for the environment and human habitat. The physical pollution is manifested through the increase of air-floated and sedimentary powders atmosphere content while the chemical pollution is due to the content of the dumper ash in chemical compounds. The surface water, groundwater, soil, vegetation and the leaving area are the pollution receiver. Also, there is the danger of the west and north flank to debris-slide, the last one with the blocking-up of the river bottom.

The pollutant migration gets along through air, surface water, phreatic water and opened transport outside the emplacement. There are no natural barriers for the identified pollutant migration.

The soils around the cinder yards are affected by the high concentration of calcium carbonate. This also increased the soils basicity. Their impact over environment (soil, vegetation) is demonstrated by soil pH changing and decreasing the capacity of synthesis of autotrophies plants.

Also cinder yard don't present proper conditions for plant development, was determined that after three years without materials deposition is developing vegetation of spontaneous flora species. The growing degree is as follow: about 10% at the base of the dumb, about 2% on the half high of waste-dump and on the top level of the dumb (50 m high) is formed a amplifying grass belt around the hill.

MATERIALS AND METHODS

The water and soil analyses were done regarding to the Romanian laws in force.

RESULTS AND DISCUSSIONS

In Table 1 is presented metal content in pseudo soils from two areas: the base and half high of waste-dump.

Table 1. THE CHARACTERISTICS OF THE WASTE-DUMP PSEUDO SOIL FROM TWO AREAS: THE BASE AREA AND HALF HIGH OF WASTE-DUMP

Metal	Zn mg/kg soil	Cd mg/kg soil	Pb mg/kg soil	Cu mg/kg soil	Ni mg/kg soil	Fe mg/kg soil	Cr mg/kg soil	Ca mg/kg soil	Mg mg/kg soil
Base level	1825.0	udl	633.0	144.9	56.8	100.0	75.0	43.0	5.0
Level I (half high of waste-dump)	1830.0	udl	77.0	3125.0	23.3	12.5	16.0	42.0	4.5

udl - under detection limit

The species that accumulate zinc in the aerial parts, sampled from the base and the half high of waste-dump are presented in Table 2.

Table 2. ZINC ACCUMULATION IN PLANTS, mg/kg plant D.S.

Studdied plant	Base level		Half high of waste-dump level		
	Site 1	Site 2	Site 1	Site 2	Site 3
Urtica dioica	2687.9	-	-	1858.6	-
Leafs of *Rubus fructicosus*	2724.7	1203.6	44.4	2331.6	-
Trifolium pratense	46.6	80.6	-	44.4	25.5
Achillea mellifolium	87.4	108.3	39.0	47.1	47.1
Lolium sp.	73.1	35.6	198.9	25.0	10.0
Bryophita	-	-	735.3	-	-

D.S. – dry substance

It is obvious that *Urtica dioica* and leafs *of Rubus fructicosus* accumulate large quantities of zinc, about 2 x 10^3 mg/kg D.S. *Bryophita* also have the capacity to hyper-accumulate the zinc.

The plant species that accumulate cadmium in the aerial parts are presented in Table 3. *Urtica dioica* and *Trifolium pratense* accumulate 3.5 to 9 mg/kg D.S., *Achillea mellifolium* accumulate 1 to 4.3 mg/kg D.S.

Table 3. CADMIUM ACCUMULATION IN PLANTS, mg/kg plant D.S.

Studied plant	Base level		Half high of waste-dump level		
	Site 1	Site 2	Site 1	Site 2	Site 3
Urtica dioica	6.90	3.46	-	4.40	-
Leafs of *Rubus fructicosus*	0.94	0.97	2.86	2.64	-
Trifolium pratense	4.59	5.99	-	5.46	9.03
Achillea mellifolium	4.34	2.29	1.46	1.01	1.01
Lolium sp.	0.30	1.67	1.20	0.32	0.11
Bryophita	-	-	0.22	-	-

In Table 4 is presented the lead accumulation level. A higher quantity of lead is accumulated at the base level. In this case, the hyper-accumulator is *Achillea mellifolium.*

Table 4. LEAD ACCUMULATION IN PLANTS, mg/kg plant D.S.

Studied plant	Base level		Half high of waste-dump level		
	Site 1	Site 2	Site 1	Site 2	Site 3
Urtica dioica	25.0	633.0	-	15.6	-
Leafs of *Rubus fructicosus*	71.0	18.0	9.8	35.4	-
Trifolium pratense	14.4	43.1	-	20.4	75.0
Achillea mellifolium	102.0	416.7	12.0	23.3	23.3
Lolium sp.	11.7	5.7	8.5	9.8	19.4
Bryophita	-	-	3.9	-	-

CONCLUSIONS

- The vegetation capacity of the area is decreased by waste-dump chemical components (blast-furnace slag, compact, spongious, granularly, metallurgical lime residue and many calcium and magnesium compounds);
- A 0-2 mm vegetation layer had grown in the three years since the slugging was stopped;
- The plants still present high zinc, lead and cadmium accumulation that make them an danger for the untended animals in the area.

LIST OF REFERENCES

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