Research Article

Pollution of River Drenica with Heavy Metals from Wastewater Industrial Discharge and Dump Slag-sterility by New Ferronickel Factory

Bardha Korça[1], Islam Krasniqi[2], Skender Demaku*[3], Ilir Shehu[4], Aziz Behrami[5]
[1,3,4]Dept of Chemistry, Faculty of Natural Sciences and Mathematics, University of Pristina "Hasan Prishtina", Pristina, Kosovo.
[2]Faculty of Education, University of Pristina "Hasan Prishtina", str. "Nëna Tereze" no. 5, Pristina, Kosovo.
[5]Faculty of Food Technology, University of Mitrovica "Isa Boletini", Mitrovic, Kosovo.
***Corresponding author's E-mail:** skender.demaku@hotmail.com

Accepted on: 10-08-2016; **Finalized on:** 31-08-2016.

ABSTRACT

The purpose of this study was assessment, of the impact of heavy metals in the environment; Earth, water, sterile and sludge, and assessment of their impact on environmental pollution, in general and attacks on the food chain of the living world in general. Sintered composition and sterile, besides other ingredients, attended by heavy metals such as; Ni, Co, Cr, Zn, Cu, Pb, Cd in the inorganic form of compounds. The level of concentration of heavy metals is a concern expressed at the general public, because the probability of their penetration, through the groundwater and surface water, through them to the food chain, is evident. This is clear when we consider that with increasing layer thickness (depth) of sterile and tails comes, up to increase the concentration of heavy metals.

Keywords: Factory "New Ferronickel", heavy metals, water, river, soil, sterile, sludge.

INTRODUCTION

Earlier it was thought that the earth has virtually unlimited capacity puffery, despite human activities, and today, geo-sphere is known to be more delicate and subject to human activities detrimental to[1,2]. Example, billions of tons of various minerals or coal, mined or extracted from the earth[2-4]. The water, as contamination may occur, the presence of substances in the environment, which because of the chemical composition or quantity[5,6] undermines the functioning of natural processes and produce undesirable effects[8,9] on the environment and live health systems[3,9,10]. Any material or chemical substance that causes environmental pollution, can describe how pollutants[4,12,13]. Regarding water pollution as specific environment, we mean any change in the physical, biological or chemical water quality that adversely affect living things, or make the water unusable for human needs[5,14]. Water pollutants, originating from a variety of human activities and different routes, totaling surface and underground waters[6,15].

MATERIALS AND METHODS

Methods used to determine the parameters have been ICP-OES and SAA methods. Equipment used has been those anticipated for determining the parameter specified by ISO standards as the standard method. Making and sterile preparation of samples for chemical analysis is done by methods standards which we found in the literature of his own analysis. The amount of solid components that we received was 3-5 kg on each site-sampling. A). Sterile samples for analysis were taken at five (5) site-sampling. Samples taken in the first, has been leading the dump sterile visa-line with the factory "New Ferronickel" samples taken in the second, finally dump visas come to the village Dobroshevc, samples taken in third amongst the dump sterile in terms Poklek Old village, samples taken in the fourth, towards the village of New Poklek, and samples taken in the fifth visa Gllogovc come to town. Samples were taken from the site of sterile fresh, sterile and sterile testified earlier, to which started ear thing, ie natural vegetation.

Samples were taken at different depths of the landfill. B). Besides sterile samples were analyzed soil samples, where these are taken in different layers of the earth from 3.10 and 25 cm deep in the earth, (which are taken, visa-line with New Poklek, neighbourhood ferronickel, to the drain pipe visa-line with factory New ferronickel, visa-line village Poklek Old visa-line village Dobroshevc and visa-line with Old Qikatova (all these points of site-sampling about riverbed Drenica). C). Silt samples were taken in the river Drenica, layers 2 and 5 cm at the same site-sampling points, where samples are taken of water and soil.

Also, the water samples taken in the river Drenica, a meter below the surface, a meter on the bottom and the intermediate layer in a riverbed, to these site-sampling, as, land and sludge.

All site-sampling points are measured with GPS coordinates type Magellan.

Coordinates:

Sampling points -I- (Samples; earth, water, sludge); WPT=453; Y=34492284; X=4719403.

Sampling points -II- (Samples; earth, water, sludge); WPT=454; Y=34492320; X=4719982.

Sampling points -III- (Samples; earth, water, sludge); WPT=453; Y=34492275; X=4719605.

Sampling points -IV- (Samples; earth, water, sludge); WPT=452; Y=34493280; X=4721193.

Sampling points -V- (Samples; earth, water, sludge); WPT=451; Y=34493278; X=472189.

Sterile site-sampling points are not measured with GPS, perhaps the existing landfill, it can move over folding sterile and tails, in any other country and these points cannot be taken as static points.

From the samples taken from sterile samples, collected are representative prepares for chemical analysis, so sterile collected, mixed and homogenized well and divide them into four parts, the initial amount was reduced to about 1 kg. This amount of sample is, still mixed snuff and the porcelain havens, with ejector and nozzle with sieve; 100 to 200 mesh.

As well as samples of soil were taken and prepared as sterile samples. It is the entire material obtained at 105°C to constant weight, is transferred to a special container (vegegllas) and then, samples prepared in this way is further used for chemical analysis.

Depending on the amount of parameters that are present in the sterile earth is measured their samples, dry about (1-5 g), with precision of up to 0.1 mg, for analysis of chemical parameters.

Similar was done with samples of sludge, but they were taken in smaller amounts, given the state of sludge aggregates, in the form of porridge and much more easily resolvable than soil samples and samples sterile.

Samples collected from polluted water, some ingredient can be volatile, easily decomposable, or ingredients interact.

For this purpose, during water sampling some parameters must be measured at the sampling sites or samples must be stored at low temperatures (about 4°C) and conservation of samples must be done, adding HNO_3 concentrated up at pH = 3.5, and thus, samples should be stored in closed containers and dark place, to use necessary. Polyethylene bottles are best shown for preserving the sample, before determining the majority of elements analyzed or organic compounds. Therefore, water samples were taken in polyethylene containers.

In order to define heavy metal, it is used method of atomic absorption spectrometry (AAS) and (ICP-OES) Interco plated plasma, therefore the measurement of heavy metals in the samples analyzed; we have used the methods above mentioned.

Analysis and results of samples were measured and evaluated in the laboratory "Agro vet" in IHMK and laboratory IKSHP, in August 2013. For digestion of the elements in the soil, sterile and silt, in order to determine heavy metal, we use mixtures of acids, nitric and perchloric acid (1: 4), were 0.25g sample measured before dried, in 105°C and have dissolved in 10 ml mixture of perchloric acid and nitric acid. Samples were set on the digester bathing sand and evaporated until dry.

And the restive dealt with 10ml 1M HCl and the sample is ready for ICP-OES measurements and SAA. Usually, some silicates remains undigested in the bottom of the container which removed by filtration, to avoid having obstacles in the analysis with appropriate methods.

Water samples for determination of heavy metals in site-sampling, conserved with concentrated nitric acid. From the total volume of samples measured 1L and slowly evaporates at a constant temperature, up to about 10 ml volumes.

Samples with a volume of 10 ml, poured in normal 100ml container, take 1 ml of HCl and mark the places of sampling the sample is ready for analysis.

RESULTS AND DISCUSSION

Our research results are presented in figure form. So for each sampling points that are defined and presented in separate figure and for certain time periods, research, values stated for sterile, soil, water and sludge.

Therefore, sterile for the first series, we analyzed heavy metals. The concentrations of these metals vary in different values, where:

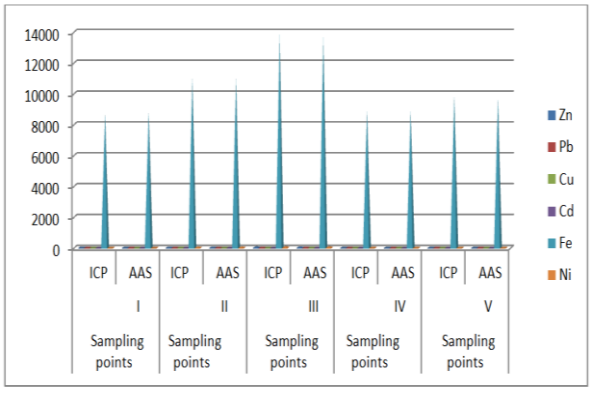

Figure 1: Concentrations of heavy metals in Sterile, August 2013

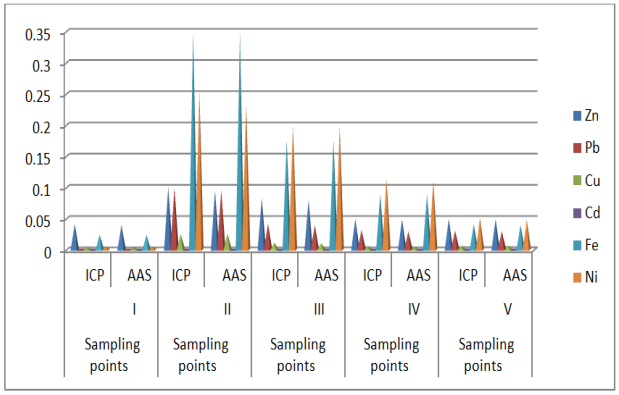

Figure 2: Heavy metals in water, August / 2013

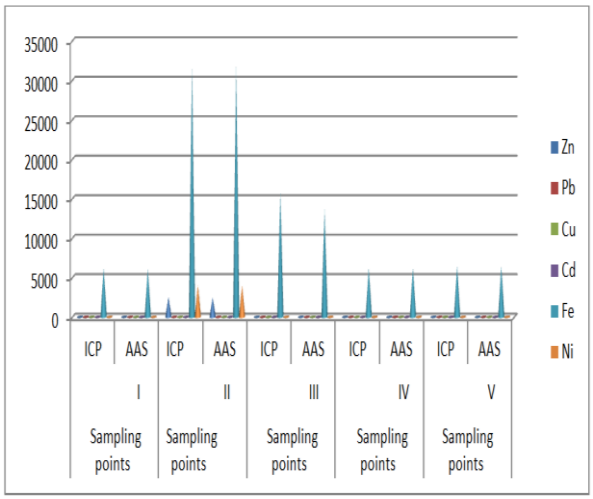

Figure 3: Heavy metals in sludge, August / 2013.

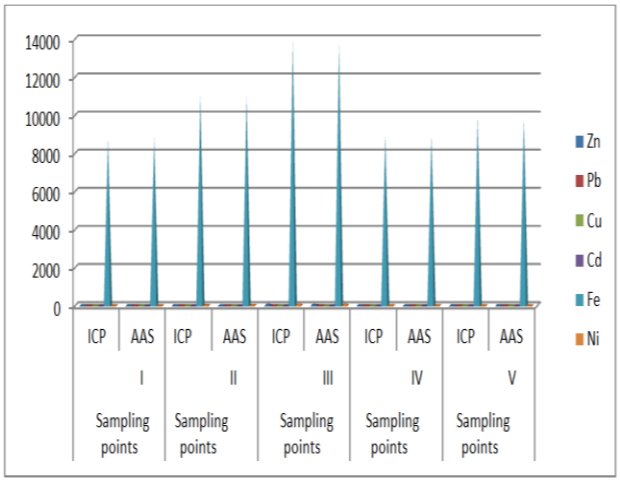

Figure 4: Heavy metals in soil, August / 2013.

The main environmental impacts from landfills sterile complex "New Ferronickel" are the impacts on air, land and water. One should note that landfills existing sterile and tails, are inadequate for protecting against contamination of surface and groundwater, so these landfills are folded on the shore of the river Drenica, in a vicinity of 20m and the impact of the landfill, almost directly on the river Drenica. Control and analysis of water, is one of the most sensitive issues which the environment act obliges it to do so. Elements in traces (heavy metals) and their salts, which are derived from sterile and dross, which is cast as the residue of plant Ferronickel, in contact with water, melt and pour polluted water, the river Drenica and groundwater. Law on protection of environmental which is based on EU Directive 1998/83, prohibits the discharge of water with toxic substances, which when released into the aquatic environment, causing contamination of the water, an action that is prohibited and strictly most specifically prohibited from factories that make, money laundering and after processing ore, as we do with the complex case "New Ferronickel" where then immediately this industrial water through the exhaust pipe to pour without any prior treatment, the river Drenica. It's pretty easy to see that the color that brings out the main pipe factory, from dust and other gases releases out, it is the same color that emerges from the water discharge pipe industrial Ferronickel.

Therefore, we as scientific researchers in this field, gives us to understand that neither the pipes that convey dust and gases no filter is adequate, or other device additional air purification and also as cleaning the water, before and after rinsing the ore not they have collectors, or any other apparatus for the treatment of water before, it flows into the river Drenica. Therefore, we have done the measurement of heavy metals such as: Fe, Ni, Pb, Cd, Cu and Zn, in five sampling points that, in the abovementioned areas.

In the water of the river, also have made the determination of heavy metals, which are derived from sterile and dross stored, or the water discharge through the duct leading from the factory, or by any pouring another side and in contact with water, melt and polluted water discharged into rivers and penetrate the groundwater. The results obtained for heavy metals in water, compared with standards and regulations permitted under EU's rivers and waters in general, show a large increase in their concentration. It must state that has high load with heavy metals, which would impact significantly on the quality of surface water, whether in the field of landfill sterile and sintered or industrial water, which discharged from ''New Ferronickel'' through exhaust in factory right, cross the train tracks in the neighborhood Ferronickel in water the Drenica river. There is a greater increase of heavy metals in the water of the river Drenica, compared with sampling points that landfill which stems of course from that, at this time the rain are slim and contact laundering dump sterile and sintered with water from the river Drenica, is in the form of direct rare.

Table 3 shows that the concentration of heavy metals in sludge, is very high, during solidification of sludge, they will remain in the composition of his own for a long time, some 200-1000 next few years, or even more, depending on how much is better protected from infiltration of water dump.

Land is one of the elements of the environment, in which the application of various technologies superficial injuries suffered drastic. Sintered dump sterile and complex "New Ferronickel", he has made land degradation in a large area, where they have changed the chemical properties, physical, and biological properties of soil water in the area of the landfill expansion factory. Location is characterized by physical extinction petrologic land profile, which represents the most severe form of damage to land. Contamination of soil/earth is visible even with heavy metals. Here we note that most of the agricultural lands, stretching around the riverbed Drenica, with a ridge of entire villages, starting from New Poklek until Vragoli, where river Drenica flows into the river and

back pollution continues from TC "KOSOVO". So as we said above, due to the concentration of rural and urban settlements around the river Drenica, this river has become the collector of household wastewater and industrial. It should also be said that river Drenica is loaded with organic pollutants due to the use, often uncontrolled different fertilizers and chemical preparations, used in agriculture, but it remains to be explored in the upcoming projects, in environmental directions. But obviously as a pollutant largest ecosystem of the river Drenica considered complex "New Ferronickel" which with its operation, starting from extraction of ore, to the production and transfer of thanks, significantly impact pollution of the river Drenica.

CONCLUSION

In this work, it is bringing an overview of the quality of the river Drenica, for his course, in a period, in ecological; 2013 also has been particular interest, measurement and evaluation of the concentration of heavy metals in the environment; water, soil, sterile and sludge. This complex, triggering contamination permanent water of the river Drenica, whereas other indicators that confirm the toxicity of "New Ferronickel" are the flora and fauna of the river, where before the river traversing this plant, keep in away some species of fish, and after expiry of this area, there are no creatures of this type. Considering all these concentrations of these elements, we believe that "New Ferronickel" but the relevant ministry should think seriously about the environment, which is degrading repeatedly and economic development, not to harm to a national scale, protection environmental.

REFERENCES

1. Degermont. Municipal Wastewater Treatment "Water Treatment Handbook", Vol 26th, ed. Lavoasier Inc, Paris, 1991.
2. ICWE. International Conference on Water and Environment, Develpoment Issues for the 21st Century, Dublin, 1992.
3. Çullaj A. Theory, exercises and laboratory work, Environmental Chemistry, University of Tirana, Faculty of Natural Sciences, Tirana-Albania, Unit-7 & 12, 2010, 128-280.
4. Pula Xh. Beqiri L. Chemical Technology, University of Prishtina, Faculty of Mathematics and Natural Sciences-Pristina-Kosovo, Unit-14.3.1, 1985, 244-252.
5. Elezaj Z & Kodra A. Geology of Kosovo, University of Prishtina, Faculty of Mathematics and Natural Sciences-December-Pristine-Kosovo, Unit-11, 2007, 189-214.
6. Çikatovo-Goles. Investing in Nickel Mines-Glogovc-Kosovo, 1973.
7. Btu Lowicz K., Kotlinow Ska T. Sto Biecki M. Dechnik K. Obtu Lowicz M. Manecki A. Manecki M. Schejbal-Chwastek M. Environmental air pollution and Pollen allergy. *Annals of Agricultural and Environmental Medicine*, 3(2), 1996, 131.
8. Chirenjet T., Ma Q. Heavy metals in the Environment. *Journal of Environmental,* 28, 1999, 760.
9. Fernandez L., Lopez A. Trace elements in coal and their behavior during combustion in large station. *Fuel*, 74(3),1995, 331.
10. Fulek Ar H., Dave M. Deposal of fly ash – an environmental problem. *International Journal of Environmental Studies,* 26, 1986, 191.
11. Fyti Ano K., Tsanikidi B., Voudri E. Leach ability of heavy metals in Greek fly ash from coal combustion. *Environment International*, 24(4), 1998, 477.
12. Karayi I., On Acak T., Gayer A., Gold -Smith S. Mineralogy and geochemistry of feed coals and their combustion residues from the Cayirhan power plant, Ankara, Turkey. *Applied Geochemistry*, 16, 2001, 911.
13. Min Ghou X., Ron Y., Chu Guang Z., Yu Q., Jun H. Chagdong S. Status of trace element emission in coal combustion process: a review. *Fuel Processing Technology*, 85, 2003, 215.
14. Okt Ay B. Characterization of Turkish fly ashes. *Fuel*, 77, 9/10, 1998, 1059.
15. Zh Ang J., Deyi R., Yanmin Z., Chen -Lin Ch. Rongshu Z. Baoshan Z. Mineral matter and potentially hazardous trace elements in coal from Qianxi Fault Depresion Area in southwestern Guizhou, China. *International Journal of Coal Geology,* 57, 2004, 49.

Source of Support: Nil, **Conflict of Interest:** None.