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Studying of Sn Concentration in the Soil Around Aluminum Factory in Arak City

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ABSTRACT

In this study, in order to get more information about the condition of the pollution of soil all around Iralko, 11 samples were taken and from each region we have taken 2/3 samples and then complicated uith one another. To distinguish the amount of element (Sn) in the lab was tested.
According to the results taken from the mean of concentration this element is 5 Mg/Lit. to find out the amount of pollution in the region which had al ready been studies from I_{poll} as Geo chemical indicator. According to the amount of pollution, we put sn around the polluted area. Based on the results studied and comparison of concentration of this element with the mean of lager, it should be noted that soils around Iralk complex, are not too much polluted to this element, we can't present this region as polluted all around this hard element (with the element as pollution).
KEYWORDS: *Sn ,Iralko,I_{poll}*

1. INTRODUCTION

The Knowledge of the heavy metal accumulation in soil, the origin of these metals and their possible interactions with soil properties are priority objectives in many environmental monitorings. Statistical analysis procedures, as powerful tools, can provide such knowledge and assist the interpretation of environmental data(7-9) In recent times, the statistical methods (univariate or multivariate) have been applied widely to investigate heavy metal concentration, accumulation and distribution in soils. This is documented by a large number of reported studies which apply statistical methods to heavy metal accumulation in soils, e.g. Modak and others (1992), Arakel and Hangjun (1992), Ratha and others (1993), Chakrapani and Subramanian (1993), Ntekim and others (1993), Henburg and Bruemer (1993) and Cambier (1994) studied the behavior and distribution of heavy metals in soils using multivariate statistical methods(10)

These metals have peculiar characteristics including that (1) they do not decay with time (2) The accumulation of heavy metals in agricultural soils is of increasing concern due to the food safety issues and potential health risks as well as its detrimental effects on soil ecosystems(1) They can be necessary or beneficial to plants at certain levels but can be toxic when exceeding specific thresholds, (3) they are always present at a background level of non-anthropogenic origin, their input in soils being related to weathering of parent rocks and pedogenesis and (4) they often occur as cations which strongly interact with the soil matrix, consequently, heavy metals in soils can become mobile as a result of changing environmental conditions. This situation is refereed to as “Chemical timing bomb”(2) Sources of these elements in soils mainly include natural occurrence derived from parent materials and human activities. Anthropogenic inputs are associated with industrialization and agricultural activates deposition, such as atmospheric deposition, waste disposal, waste incineration, urban effluent, traffic emissions, fertilizer application and long-term application of wastewater in agricultural land(3-5) Apart from the source of heavy metals, the physicochemical properties of soil also affect the concentration of heavy metals in soils. Organic matter and pH are the most important parameters controlling the accumulation and the availability of heavy metals in soil environment(6) It is necessary then to evaluate the relationship among these parameters and heavy metal accumulation in soil..

In environmental monitoring and assessment strategies, these methods can be used to predict or estimate the variability of heavy metals and its controlling factor (s) and to highlight the influence of human activities on heavy metal

contents of soils(11-12) Therefore, statistical analysis of heavy metals in soil can offer an ideal means through which to monitor not only the heavy metal accumulation in soil but also the quality of the overall environment as reflects in soil.

MATERIALS AND METHODS

Company of Aluminum Production of Iran (Iralko) is placed in 5th kilometer of Arak. In this Alumina (aluminum Oxide) is carried to the factory and in reduction hall in several stages it is change to aluminum metal and in moulding is changed into ingot and exit from the factory. In this studying we use screen3 soft ware product of EPA America to choose the studying region according to the maximum concentration of the issued contaminants from point resource. According to the rate of the issued contaminants from the factory chimney, maximum concentration of Co, Nox, and

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Sox in 500-1500 m distance was observed. And the study region at this distance in direction of dominant wind by the angle of 75m from the chimney was chosen. In sampling from soil in lands of Arak around Iralko complex all the samples were excavated from 0-25 depth. For this reason one stainless steel tube with entrance diameter about 4m and length of 1m equipped with piston was used to extract soil. To achieve global information about the contamination the sampling was done on land soil of 11 region and each 2 -3 samples were mixed together. Then their humidity, electric conduction, and pH scaled in the laboratory. All the samples were dried in 70°C and after isolation about 5 gr from particles smaller than 63 micron powdered in agate mortar. HClO4, HF, HCl, HNO3 in sand bath were used to assimilate in 125°C .(31,32,33,34,39)

Acid ascetics, hydroxylamine, H2O2 were used to assign the loosely, sulfides, and organio-metalic bonded ions respectively. To study the bioavailability we use NaOH and Acid Ascetic. Then heavy element in soil samples analyzed with Atomic Absorption. (35)

Cluster analyses are one of the multi variate analysis that are used in this study to originate statistics of elements by Cluster software.(37) Coefficient of correlation which is one of the approaches of Explore software was used to achieve the similarity coefficient and dendogram. Cluster tree joins the treasure of the same weight with together to make bigger cluster(38). Then it assigns the similarity of the samples. Finally by using Ipoll index compared with the intensity of the contamination the element was analyzed.

RESULT

To assign the contamination intensity of the mentioned region we use Ipoll geochemical index which is based on formulation(36):

$$I_{Poll} = Log_2\left[\frac{Cn}{Bn}\right]$$

Ipoll: geochemical index or intensity of contamination in sediments
Cn: concentration of the heavy and poisonous elements in sediments with less than 63micron in diameter.
Bn: concentration of heavy metals in lithogenous portions.

In fact, the amount of pollution is between 0-5 and (0) shows the conditions without pollution and 5 indicated most pollution and other numbers between these two show average, least and most pollution.

Table1: concentration of Sn in soil(mg/kg)

avarage	11	10	9	8	7	6	5	4	3	2	1	station
4.7	5	5	3.6	4.8	4.9	5	5	5	4.8	4.7	4.8	**Sn**

The amount of pollution based on I poll and mean of concentration of elements in the layer and the amount of pollution in soils around Iralko had been valued and compared in Table 2.

Table(2) The result of research and based formula and the average I_{poll} concentration and severity of the shell element in soils around Iralko

Element	I_{poll}	Average element in 11 samples (mg/kg)	Severity element region	Lee&yao 1970	Taylor 1964	AlinaKabata 2007
Sn	2	5	Low pollution	-	2	**2.5**

According to the amount of pollution in the table, Sn is ranged as something with less pollution.

As seen from the table, the mean of this element is more than the mean of concentration in the layer, but it is not possible to believe that the region studied s presented as polluted one. Statistics from the tables show that the mean of concentration of all have metals in comparison with mean of the layer is different.

CONCLUSION

According to the results of studies and comparison of concentration this element with mean of the layer and the amount of pollution based on I_{poll}, it should be noted that soils around Iralko are placed and exposed to less pollution and Apart from this fact that all of hard metals in rocks and soil results from erosion existed and their concentration is various.

Based on the relation with the source of this element resulting from man's activities in the region, we can't directly comment on it.

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