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ANTIMONY STRIKE ON HUMAN HEALTH BY INAPT DISPOSAL OF E-WASTE

Rajeev Kumar Sharma[1] , Dileep Gupta[2]

Assistant Professor, Department of Chemistry, D.S. College, Aligarh, U.P. (India)[1] email: rajeev25chem@gmail.com

Associate Professor, Department of Chemistry, D.S. College, Aligarh, U.P. (India)[2]

***Abstract*:** Antimony strike on human health were reported in surface soil of Inapt disposal of e-waste sites. E-waste is a popular informal name for electronic devices nearing the end of their useful life. E-waste consisting discarded electrical and electronic appliances like Television, Computers, Telephones, Electrical switches, Mobiles, Semi-conductors, Flame retardants, circuit board. The Government policies are forced to the 'reuse' procedure to save the human health and environment and controls the money flow and management the e-waste. But certain product cannot be reused hence it is needful to adopt advanced technology and formal techniques for recycle and dispose of discarded electrical and electronic products with high precautions. The inapt disposal or recycle process of e-waste leach Antimony as one of the toxic elements among other heavy metal such as Chromium, Lithium, Mercury, Beryllium, Lead, Cadmium, Cobalt etc. The ultra trace level of Antimony have been elulid with a aqua regia and measured by Atomic Absorption Spectrometer. The obtained result of Antimony concentration in soil were compare with EPA and WHO.

The average concentration of Antimony in soil samples from the disposal sites of e-waste were found to be very near to threshold limits. This study stimulate the toxic effect of Antimony on human health by Non-strategic disposal of Informal Electronic and Electrical appliances.

***Key words* :** Antimony strike, E-waste, Atomic absorption spectrometer.

INTRODUCTION

Antimony naturally occurs as a sulphide ore, stibnite and valintinite pure Antimony is refined by traditional method of treating the ores. [1] Antimony is naturally present in the earth crust attains 0.2-0.3 mg/kg but these level differs with different locations.[2] Antimony is semi-metal and a toxic element used to make in various electronic and electrical products. [3-5] It used as semi-conductor components and flame retardants for circuit board within electronic equipments.

The local vendors and informal sectors dump e-waste in open fields inside and outside the residential areas. [6-10] The concentration of heavy metals increases into land and surface soil and impact adverse effect on human health. [11-15] Several researcher have used several techniques for determination of heavy metals and Antimony like electro-thermal atomic absorption spectrometry,[16-17] Spectrophotometry,[18-19] Fluarometry, [20] Inductive coupled plasma mass spectroscopy,[21] Chilate gas chromatography,[22] Inductive coupled plasma atomic absorption emission spectroscopy,[23] Atomic absorption spectroscopy. [24-28]

Atomic absorption spectroscopy techniques used for the determination of Antimony in surface soil sample of Improper disposal or informal recycling e-waste sites.

This study focused on adverse strike of Antimony on human health by uncontrolled disposal of e-waste in informal sectors.

MATERIAL AND METHODS

The criteria used in the current research work is based on the theoretical and practical observations. The Antimony and other heavy metals Beryllium, Lead, Chromium, Lithium, Arsenic, Cobal, Copper, Mercury are the constituent of electrical and electronic appliances, can cause adverse effect on human health by leaching from e-waste by non-strategic disposal and recycle of discarded electronic and electrical devices.

I. **Study area :** The area select for experiment covers the different improper disposal or recycle sites of e-waste in Aligarh region, inside and outside the residential area.
II. **Material :** Soil sample, Shovel 2mm – mesh sieve, sample bag, funnel, measuring cylinder, Double distilled water, Hot plate, Whatsman filter paper no. 42, Beaker, Pipette, Measuring flask 25ml, 100ml, Electric balance.
III. **Chemicals:** 35% HCl and 70% HNO_3

IV. **Sample Collection:** The sample of surface soil were collected randomly from the improper disposal and recycle e-waste sites of Aligarh region. The samples were keeping in a polythene (sample bag) and labeled to avoid a mix up of the different soil samples.

V. **Preparation of sample :** Unwanted material such as stones, glass, plastic, leaves and debris were removed from the soil samples by hand picking and other seperation method etc. The surface soil sample transferred into clean and labeled watch glass. The sample was set in thermostat at 50^0C for 45 days grinding the sample material by pestle and mortal and further set in thermostat for 10 days then sample was sieved through 2mm mesh sieve, after that sample were air dried then set further in thermostat at 40^0C for 40 minutes. The resulting fine powder will kept at room temperature for digestion.

VI. **Digestion of Soil Samples :** 0.25g fine powder of over dried soil samples was weighed using electrical balance and placed in a 100 ml beaker separately with fresh 20ml aquaregia (30% HCl and 70% HNO_3 in 3:1 ratio) and rest of two days overnight at room temperature. The mixture was then digsted on Hot plate at 70^0C till the solution becomes transparent and half of the initial quantity. The remaining 10ml of each sample solution placed in 25ml test tube with 10% HCl for sedimentation. Then the solution is decanted and filtered the solition through Whatmans filter paper no. 42 and 20ml sample solution was analyze for concentration of Antimony using an atomic absorption spectrometer.

VII. **Instrument Required :** Atomic absorption Spectrometer

RESULTS AND DISCUSSION

The analysis of soil samples for Antimony content by atomic absorpotion spectrometer this analysis showed the presence of Antimony in all sample collected from non-strategic disposal and recycle centre of e-waste within the concentration range 3.676 mg/kg to 7.326 mg/kg tabulated in table no. 1, 2 and fig. 1.

Table 1
Antimony Standard Solution

No.	Name	Intensity	SD	RSD	Conc. mg/L
1.	Cal-Zero	800.4	0.00	0.00	0.00
2.	Cal-1	3695.5	0.013	6.69	0.2
3.	Cal-2	4281.3	0.037	4.18	1.00
4.	Cal-3	8760.0	0.014	0.30	5.00
5.	Cal-4	14877.1	0.018	0.19	10.00
6.	Cal-5	32992.7	0.109	0.45	25.00
7.	Cal-6	63627.5	1.485	3.00	50.00

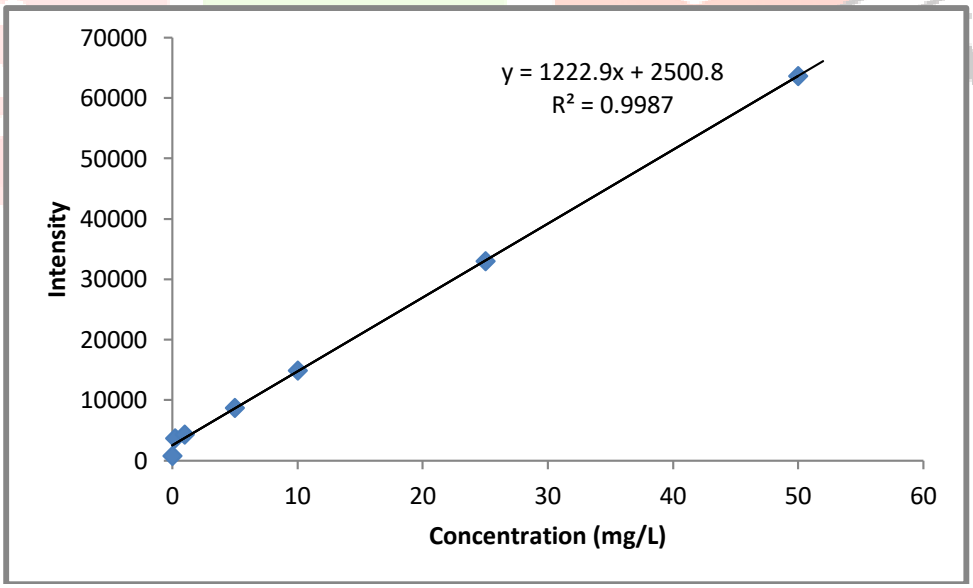

Fig. 1
Calibration curve for Antimony Standard Solution

Table 2
Concentration levels of Antimony in different e-waste sites of Aligarh region

Sample sites	Average Antimony levels (mg/kg)
S_1 Kasganj	3.676
S_2 Etah	4.766
S_3 Hathras	5.139
S_4 Aligarh	5.931
S_5 Aligarh	7.326

According to the above observations of table and graph, the average 3.676 to 7.326 mg/kg concentration of Antimony content have recorded the value very near to the threshold values with the tolerable limit according to the WHO standard.

In table no. 2 the surface soil sample taken from Aligarh recorded as the highest Antimony content with concentration 7.326 mg/kg and 5.931 mg/kg followed by Hathras with concentration level 5.139 mg/kg, Etah high concentration level 4.766 mg/kg and the level was taken from Kasganj 3.676 mg/kg from different non strategic disposal and recycle sectors of e-waste. The amount of Antimony elevated in Aligarh region. The Antimony concentration detected in all five sample of e-waste sites within the natural concentration range 3 to 8 mg/kg.

However, soil sample of Aligarh contain large concentration of Antimony in comparison with other regional disposal sites. This because of the disposal of e-waste in large quantity in comparison to other sites but average Antimony concentration in surface soil sample from all sites were found to the tolerable limit. According to WHO[29] and EPA[30], the analysis indicates if the disposal of e-waste moved on as usual informal sectors. The concentration of Antimony increases tolerable limits and are very high risk to developing chronic Antimony disease and lung cancer[31] and headache abdominal pain, constipation colic, small mouth ulcers with salvation dizziness, albuminuria, loss of weight and glycosuria.[32]

Antimony also effect the eye, skin, tongue irritation.[33] Antimony or metals may biologically alter several cellular defense mechanisms, thus potentiating carcinogenesis.[34] Reproductive disorders and chromosomes damage may be associated with chronic Antimony with consequent mutagenic and oncogenic potentiate lung heart and gastraintestial diseases. The effect on human health are inducement of vomiting and eye and mucus membrane irritation in some cases, cardiac arrhythmias and mild jaundice may occur intramuscular dimercapral[35] long term inhalation of antimony can potentiate pneumoconiosis, altered electrocardiograms stomach pain, diarrhea, vomiting, stomach ulcers. [31] Antimony adverse strike on human health who live in close proximity to hazardous informal disposal sites of e-waste. The heavy metal and Antimony unlikely to leach in to the soil and often changed into compounds and these compound may stay in soil for long time. The increasing concentration of Antimony impose the toxic effect in human health.

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