

Analysis of heavy metals in soil of mechanic workshop in Onitsha metropolis

E. N Ojiako and M. N Okonkwo

Department of Pure and Industrial Chemistry, Anambra State University, Uli

ABSTRACT

Soil samples were collected at different areas of mechanic workshops of Onitsha metropolis to assay the presence of heavy metals and their possible effects on eco system. Five areas were selected for analyses using AAS. Results show that sample B (Awada) has the highest Nickel concentration with the value as 0.9055ppm while sample A (Nkpor) has the least 0.4528ppm. For chromium sample E with value (0.8754ppm) > C (0.5081ppm) > B (0.4930ppm) > D (0.3597ppm) > A (0.3119ppm). Lead concentration in sample C was too high, is of the value of 33.2477ppm > 6.1097ppm > 5 2793ppm > 3.8260ppm > 3.6036ppm for sample D, E, B and A respectively. Cadmium concentration values in A, E, D, C and B have the value of (0.0868ppm) > (0.0496ppm) > 0.0475ppm > 0.0368ppm > (0.0303ppm) respectively. Then for copper, sample C has the highest concentration of (2.0259ppm) > D (1.7485ppm) > E (1.6467ppm) > B (1.0446ppm) > A (6.6851ppm). The high concentrations of these Heavy Metals when compared with the WHO standard for Cu, Cr and NI (0.02), Pb (0.02) and Cd (0.05ppm) indicate danger to human health and other animals in the area.

Keywords: Health, Heavy Metal, Human, Soil.

INTRODUCTION

Soil is a natural body consisting of layers of mineral constituents of variable thickness, which differ from the parent materials in their morphological, physical, chemical and mineralogical characteristics [1] soil is composed of particles of broken rocks that have been altered by chemical and environmental processes that militate weathering and erosion. Soil is a mixture of minerals or organic constituents that are in solid, gaseous and aqueous states [2]. Soil is formed from weathering of rocks and minerals, the surface rock breakdown into smaller pieces through a process of weathering of rock surface and organic matters [3]. Soil formation pathogenesis in the combined effect of physical, chemical, biological and anthropogenic processes on soil parent materials [4-5]. The main sources of soil contamination include agricultural and industrial pollution [1]. The high level of civilization related soil pollution has recently become a major issue and the chemical analysis of soil is important for environmental monitoring and legislation. Potentially contaminated soil may occur at old landfills sites particularly those that accepted industrial waste; old orchard that used insecticides containing arsenic as an active ingredient, and field that had past application of waste pipes and tacking, industrial areas where chemicals may have been dumped on the ground.

Some of the metals are essential to plants and animals lives in small account like copper, manganese and zinc. If excess are toxic to plants and animals [6]. Heavy metals are biodegradable and results in longtime contaminated of soil [7]. Heavy metals can be classified as all metals weighing more than 5000kg/m³ example lead, zinc, copper etc.

MATERIALS AND METHODS

Sample collection and pretreatment: Soil samples were collected from five different workshops in Onitsha metropolis at 6m depths using hand auger. The composites were stored in a polythene bags and labeled A,B,C,D,E to represent Nkpor, Awada, Awka Rd., Okpoko and Fegge respectively. Samples were air-dried and sieved using

2mm mesh. The dried-soil were further broken down, pulverized with a pestle and mortar and sieved samples were homogenized by conning and quartering and stored.

HEAVY METALS ANALYSES

2g of each of the sieved soil samples were weighed into a conical flask and digested with 10ml of 50% hydrochloric acid on a hot plate until 2-3ml of 2-3ml of acid was left [8-9]. 10ml de-ionized water was added to the content and demented into 50ml volumetric flask after additional water rinsing and decanted and made up to the mark with deionized water. A blank was similarly prepared without soil sample. The extract solution is poured into polythene bottles from where each sample was analyzed for Cd, Cu, Fe, Pd, and Zn using Atomic Absorption Spectrophotometer model 205.

RESULTS AND DISCUSSION

The result in Table 1 shows that the concentration of lead, copper, Nickel, chromium and cadmium was as follows; 3.6036ppm > 0.6551pm > 0.4528ppm > 0.3119ppm > 0.0868ppm. For sample B, it was in the order of 3.8260ppm Pb > 1.0446ppm Cu > 0.9055ppm Ni = 0.9055ppm Cr = 0.0303ppm Cd. For sample C: 33.2477ppm Pb > 2.0259ppm Cu > 0.6387ppm Ni = 0.6387ppm Cr > 0.0358ppm Cd. In sample D we had it as 6.1087ppm lead > 1.7485ppm copper > 0.7202ppm Cr > 0.2020ppm Ni > 0.0475ppm Cd. Sample E: 5.2793ppm Pb > 1.6407ppm Cu > 0.0637ppm Ni = 0.0637ppm Cr > 0.0196ppm Cu.

TABLE 1: The result of heavy metals concentration in PPM

Heavy Metals Conc. (PPM)	Ni	Cr	Pb	Cd	Cu
Samples A	0.4528	0.3119	3.6036	0.0858	0.6851
Sample B	0.9055	0.9058	3.8260	0.0303	1.0446
Sample C	0.6387	0.6387	33.2477	0.0358	2.0259
Sample D	0.2020	0.7070	6.1082	0.0475	1.7485
Sample E	0.6037	0.6037	5.2793	0.0196	1.6402
WHO Limit	0.02	0.02	0.01	0.05	2.0

DISCUSSION

Nickel in sample B has the highest concentration of 0.9055ppm of all the other samples while sample D had the least value of 0.2020ppm. sample D value was within WHO limits. Chromium concentration in sample A had the least value of 0.3119ppm as sample B had the highest value. The value of lead was too high in all the samples especially sample C whose value was 33.2477ppm followed by samples D,E,B, and A, seen as 6.1087ppm, 5.2793ppm, 3.8260ppm and 3.6036ppm respectively. There is evidence that the workshop located there were deposited with acid batteries and other automobiles. This would definitely pose health hazard to the inhabitants of the area. This would certainly lead even the corps and vegetables cultivated in the area to contain a lot of lead. It also shows area of high vehicle emission in the road as is always busy. For cadmium, its concentration in all the samples were below the standard with the exception of sample A, which was a little above the standard. Copper concentration is generally acceptable compared with the WHO standard.

CONCLUSION

The high concentrations of Pb, Cu, Ni and Cr in the soil of the mechanic workshops in Onitsha metropolis would pose a serious ill-health to the inhabitants of the area. Both plants and animals are affected. This could result in damage of nervous system, kidney, skin irritation and hypertension. Even the fishes in the river may be affected which indirectly affects man.

It is suffice to say that human health at Onitsha metropolis is put in danger with these high concentrations of heavy metals.

Recommendation

Since man is the only polluter of his own surrounding, soil pollution can be controlled by undertaking many pollution awareness programs, enacting laws and the necessary penalty victims of untreated chemicals and efficient disposals, checking reckless dumping of scraps will also be of immense help.

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