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TOWARDS THE MILLENNIUM DEVELOPMENT GOALS

SWM by combustion: Implication on the metals in the environment

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INTRODUCTION

Wastes are conventionally subjected to thermal treatment, or landfill system. In the more technologically advanced countries an incineration (thermal) facility is monitored from contaminant receipt and storage to stack discharge dispersion. Operation and evaluation for hazardous and non hazardous gaseous, liquid sludge and solid wastes are explored. Breakthroughs in air pollution control have been attained (Flyhammer et al. 1998). In the developping nations, wastes are transferred to dumpsites which generate foul odour or leachates which are toxic to the enviroment from the perspective of liquid contamination as well as hazardous emissions and microoganisms. An alternative is to subject the wastes toopen air incineration. The incineration ash is often abondened or disposed off in a nearby water body.

Incineration ash has been reported to contain hazardous metals (Flyhammer et al. 1998). This investigation is therfore to evaluatue the metal levels of the incineration ash generated in urban areas in Nigeria, a case study of Abeokuta metropolitan city, south west of Nigeria.

Materials and methods

Sample collection and description of study sites

The solid wastes were collected in eight locations constituting basically of officies, institutional laboratories, residental quarters and agricultural areas in Abeokuta Nigeria (Table 1). At each station, wastes were gathered and collected once at week. The period of collection lasted for four weeks.

Table 1. Description of study area

Location	Description
ABW-01	Offices, Agricultural activities
ABW-02	Offices, Agricultural activities
ABW-03	Offices
ABW-04	Commericial activities
ABW-05	Offices, laboratories
ABW-06	Residences
ABW-07	Offices, laboratories
ABW-08	Offices

Toxic metal determination

Solid wastes were air dried and sorted for combustible and non-combustable components. The comustible fraction was subjected to open air incineration. The resultant ash was then treated to acid digestion (HNO_3) in a fume cupboard. Metal analyses were conducted on aliquots obtained from each digest using flameless atomic absorption spectrophotometer (Uni-cam. 969- series). The result was subjected to analysis of variance (ANOVA).

Results and discussion

Generally, the metal levels decreased as Pb (23.95 ± 12) > Zn (16.02 ± 6.47) > Cu (10.48 ± 6.26) > Fe (7.53 ± 4.55) >Al (7.09 ± 3.19) > Mn (6.65 ± 3.69) > Cd (6.30 ± 5.81) > Sn (4.68 ± .82) > As (4.04±4.73) > Ni (1.45 ± 1.37) > Co (1. 27 ± 1.29) > Cr (0.98 ± 1.29) units in $\mu g g^{-1}$ [Fig 1] The study population, n, was 32 for each metal.. These suggest that incineration ashes contain toxic metals. Highest contributors to the metal levels varied [Table 2a and b]. For instance, that for Pb came from offices and laboratories (43.25 ± 6.07μ gg^{-1}, ABW-07) while that forAl was from commercial centers (11.70 ±1.50 $\mu g g^{-1}$,ABW-04).

Conclusion

Ashes generated from solidwaste incineratipon ash contain toxic metals. It is recommended that preliminary tests carried conducted before hazardous wastes the final disposal.. Results indicate that local combustion of municipal solid wastes is not an enviromentally friendly technique in waste management strategies.

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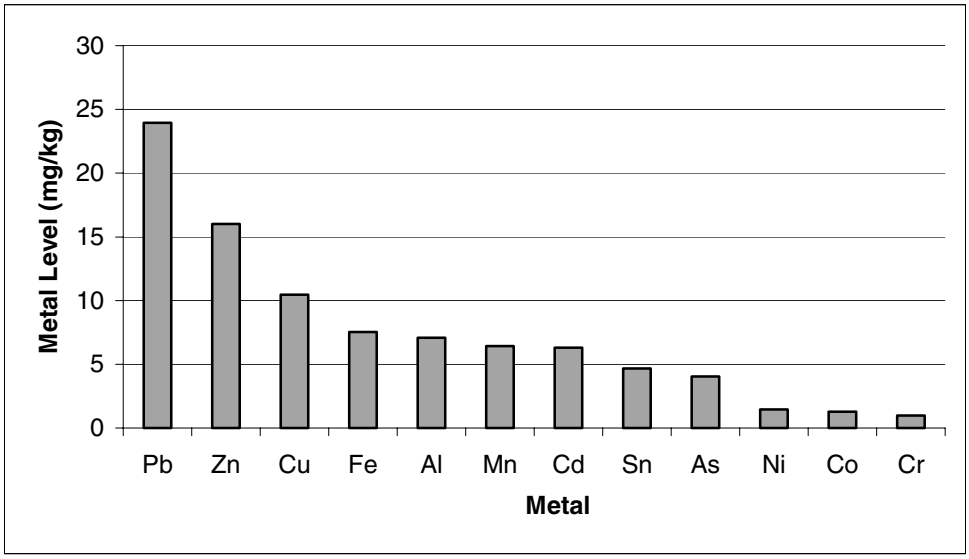

Figure 1. Metal levels in incineration ash generated in Abeokuta, Nigeria

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Table 2a. Metal levels in incineration ash generated in Abeokuta, Nigeria as a function of waste source

*Code	n	Pb	Zn	Co	Mn	Sn	Cd
ABW-01	4	7.08± 0.96	8.85± 3.06	1..50± 0.26	7.28± 0.79	7.25± 2.37	1.43± 1.27
ABW-02	4	15.10 ±1.88	7.40± 2.278	2.80± 0.28	13.60± 2.67	0..28± 0.21	2.78± 2.18
ABW-03	4	19.30 ±7.23	18.03± 1.42	2.80± 0.67	6.15± 2.19	ND	ND
ABW-04	4	23.33± 1.53	26.25 ±1.34	1.05±.0.05	8.60 ±1.80	2.95±± 0.06	6.68± 0.92
ABW-05	4	28.95± 2.62	20.25± 3.98	0.15± 0.30	0.80± 0.59	5.05 0.86	15.28± 4.29
ABW-06	4	34.03± 10.81	15.00± 1.94	3.18 ±1.11	5.13± 0.74	5.48± 0.05	8.25± 3.81
ABW-07	4	43.25±± 6.07	14.25± 0.87	1.08± 0.32	5.20± 1.07	11.73± 3.13	12.55± 4.04
ABW08	4	20.95 12.18	18.15± 6.62	1.27± 1.20	6.43 ±1.112	4.73± 0.30	3.48± 4.04

*** See Table1. , n = study population**

Table 2b. Metal levels in incineration ash generated in Abeokuta, Nigeria as a function of waste source

*Code	n	Ni	Fe	Cr	As	Cu	Al
ABW-01	4	0.93± 0.05	2.40± 1.07	ND	11.75± 1.47	8.75± 2.94	3.85± 0.30
ABW-02	4	0.95 ±0.64	5.78± 2.07	0.83 ±0.05	ND	5.73 ±3.86	7.15± 0.30
ABW-03	4	2.65 ±1.30	10.03± 0.33	1.30± 0.08	11.05± 1.84	14.80± 0.96	3.05 ±0.41
ABW-04	4	3.90± 1.36	6.68± 0.51	0.05± 0.05	0.78± 1.55	0.10± 0.20	11.70 ±1.50
ABW-05	4	0.95± 0.19	14.08 ±1.74	0.98 ±0.09	0.85 ±0.76	13.38± 0.09	310.45± 1.74
ABW-06	4	1.70± 0.59	3.50± 0.35	ND	5.63 ±0.45	5.95 ±0.41	5.25 ±0.82
ABW-07	4	0.55± 0.37	3.78± 0.56	4.07± 0.05	2.00 ±±0.16	17.95 ±0.24	9.60± 1.67
ABW-08	4	ND	14.05± 1.47	0.60 ±0.49	4.04 4.73	17.18 ±2.29	5.69± 1.07

***See Table 1. , n = study population**