Technological development in some electrical and electronic Appliances and its impact on the environment

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Abstract: The research aims to compare some electronic appliances and small electrical size of widespread use, particularly in Iraq as a result of instability of electrical power interruptions continuous and sudden hand and keep pace with the other hand and thus resorted citizen to protection devices home and the like (breakers session electrical and breakers session electrical, electronic switch and switch with protection device, a division of power and the division with the protection device, an electricity transformer Manual and an electricity transformer automatic, engine index computer screen plain and other Wireless, bell Plain and bell battery) and look how maintenance and installation, reuse and its impact on environment and throw it in the waste indiscriminately and appreciation of some of the elements by atomic absoribtion spectrophoto meter (AAS) (Cd, Cr, Cu, Pb).
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1. Introduction

Electrical and Electronic Equipment (EEE) is developing fast and spreading over every part of modern life. This equipment includes diverse substances that may cause serious damage to the environment and have adverse effects on human health so it is essential to manage the waste (WEEE) resulting from EEE in a proper way. Waste Electrical and Electronic Equipment has been identified as a priority area to take specific measures on a European scale (1). This situation had strayed great technological progress that has imposed itself reason to increase the intensity of industrial hazards and its impacts on other circles, making thinking in the face of these dangers of the biggest challenges faced by the State in general and institutions Industrial particular(2). Waste electrical and electronic equipment has become an important target in managing material cycles from the viewpoint of not only waste management and control of environmental pollution but also resource conservation(3). Several types of small digital equipment were also identified as important sources of precious metals; however, mid-size information and communication technology equipment (e.g., printers and fax machines) and audio/video equipment were shown to be more important as a source of a variety of less common metals. The physical collectability of each type of EEE was roughly characterized by unit size and number of end-of-life products generated annually (4). Waste electric and electronic equipment, or electronic waste, has been taken into consideration not only by the government but also by the public due to their hazardous material contents (5). The aim of this research study was firstly to determine the average concentration of four metals (Cd, Cr, Cu, Pb) in this sampled and it's effected on environmental.

Pathway and impact model for heavy metals in electronic waste. Electronic waste, current status of the management of electronic waste (e-waste), and recycling technologies for the recovery of metals from end-of-life electronic equipment. Because of the ever increasing generation of e-waste and the hazardous nature of this waste stream, e-waste is an emerging issue. Many countries have drafted legislation to improve the reuse, recycling, and other forms of recovery of such waste. Electronic waste is significantly heterogeneous and complex in terms of the type of components and materials. However, copper and precious metals make up more than 80% of the value for most of the e-waste samples. This indicates that the recovery of precious metals and copper may remain as the major economic driver for a long time. The hierarchy of treatment of e-waste encourages the reuse of the whole equipment first, remanufacturing, then recovery of materials by recycling techniques, and as a last resort, disposal by incineration and land filling (5)(see figure1(6)). Electronic devices may contain up to 60 different.

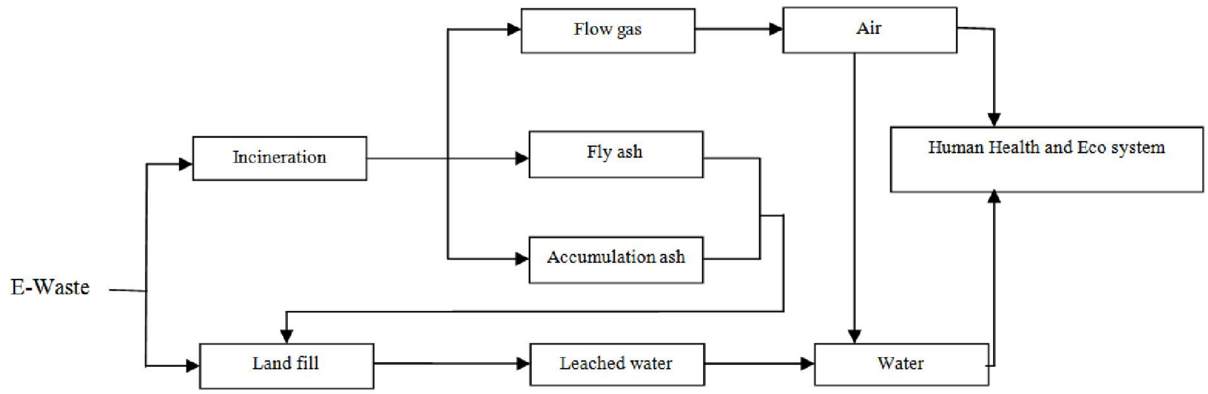


Figure (1) Pathway and impact model for heavy metals in electronic waste

2. Material and Methods

In this research we take 6 different part of small electrical, electronic equipments and(see photo1-6)and the sample digestion methods were found in many literatures that specializing in analysis of heavy metals differed when work with it using one of the following concentrated acids: HCL, HNO3, HCLO4, HF or a mixture of some of them and sometimes using H2O2 (12, 13), each time all compound of sample crashed and subjected to acid digestion using different temperature condition (14, 15,16).

Some of the methods a 95C digestion temperature was used for 2 hr (15) others digestion at 80C for chemical elements. However, deficiencies in the methods of combining and technologies for recycling and disposal of waste in illegal ways mean the loss of most of these precious resources when the arrival of the equipment to the end of life stage (7). These wastes could have a negative impact on the environment and human health if they contaminate soil, water and air (6).

Therefore Landfills established prior to the recognition of potential impacts from the leaching of heavy metals and toxic organic compounds often lack appropriate barriers and pose significant risks of contamination of groundwater (7).

3hr(17)and some with reflux (18,19). In the past century the concentrated acid solution which is consisted from three volumes of HCL mixed with one volume of HNO3 that it so called aqua regia was commonly used for digestion, this concentrated acid solution was recently used for digestion sample using temperature above boiling with digestion equipment (1,16,20). But recently(21)a digestion with lower temperature at 95C and for a period approximately 1 hr using a modified acid mixture which consisted of 2HCL+2HNO3+2H2O.

Photo (1) Cricket breaker manual and the other automatic

Photo (2) Normal division and the division with the protection device

Photo (3) Electric bell and ball with battery

Photo (4) computer engine with wire and the other without wire

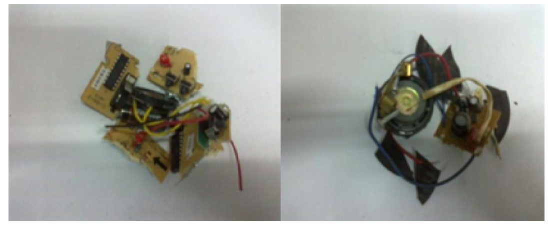
Photo (5) AC adapter manual and the other automatic

Photo (6) Plain black and the other protection device

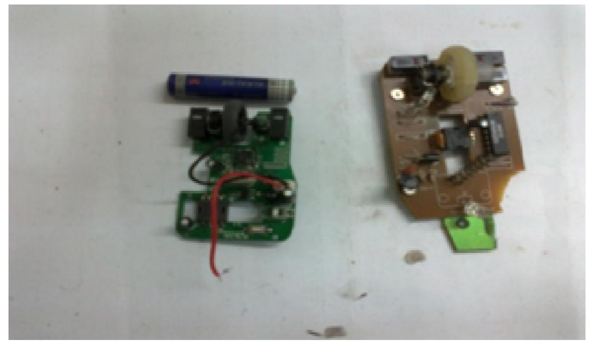
And after that we broken all the sample (see photo a-f)

(a)

(b)



(c)



(d)

(e)

(f)

Apparatus, materials and reagents:

In this work 40 ml of aqua regia has been used for digestion of sample, this acid solution was prepared from concentrated (37%) HCL and (69%) HNO3 both obtained from Applichem-company-GmbH Germany, the mixture was shacked for 24hr then filtered and the filtrate was further centrifuged then the supernatant was diluted using volumetric flask by distilled deionized water to a 250 ml.

A set of suitable standard solutions were prepared from 1000mg/L stock solutions of Cd, Cr, Cu, Pb all these stock were obtained from MERK company-Germany SHIMADZU AA-7000 flame atomic absorption spectrophotometer was used for the determination of analytes. The apparatus optimum condition for ASS is given in Table 1.

Table (1) apparatus operating parameters for ASS.

Parameters	Cd	Cr	Cu	Pb
Wavelength,nm	228.8	220.3	324.8	232.4
HCLcurrent,mA	8	8	8	8
Acetylene flow rate,L/min	1.8	1.8	1.8	1.8
Air flow rate,L/min	15	15	15	15
Slit,nm	0.7	0.7	0.7	0.7

3. Results

Calibration curves for Pb, Cd, Cu and Cr were obtained by using suitable standard solutions prepared from stock solutions, the graphs obtained were rectilinear in the concentration ranges and equations of the curves were found as follow:

Y= 0.01371 X + 16.57×10^{-7}, R^2 = 0.9999 for Pb

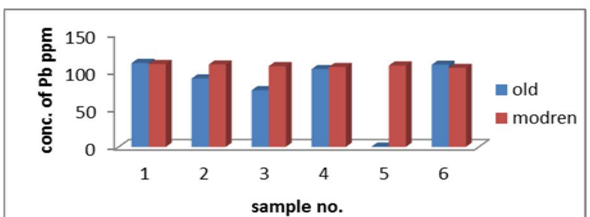
Y= 0.43930 X + 0.0290, R^2 = 0.9995 for Cd

Y= 0.16090 X + 15.3×10^{-4} , R^2 = 0.9971 for Cu

Y= 0.16090 X + 15.3×10^{-4} , R^2 = 0.9971 for Cr

Table (2) concentration of Pb, Cd, Cu, and Cr in ppm

sample	Pb ppm	Cd ppm	Cu ppm	Cr ppm
1	110.7728	3.7128	11.8207	0.0479
2	109.5086	3.9719	11.7206	0.9716
3	90.2733	0.5873	11.5630	0.0000
4	108.7730	4.0636	10.7187	0.3485
5	74.8538	0.2821	9.7325	0.0000
6	106.5847	4.6456	10.8097	0.3706
7	102.7827	0.5216	3.7585	0.7688
8	105.5916	0.0733	1.0632	1.5487
9	0.4459	1.5603	7.9925	0.0000
10	107.4719	4.2395	10.4943	0.3798
11	108.4466	1.4622	0.1914	0.5586
12	104.3779	0.1517	2.5516	2.8246

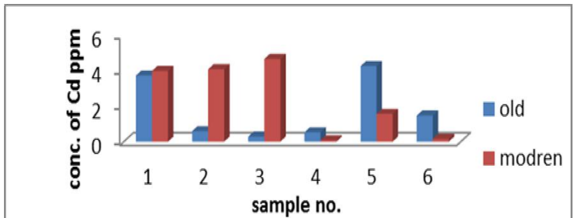


Fiqure 1 conc.of Pb in the sample

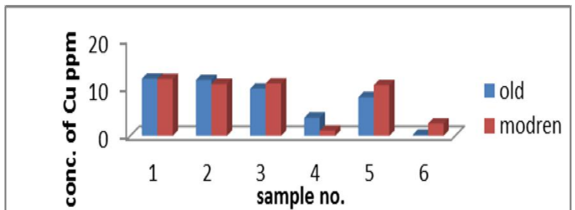
Where Y is absorption reading Abs is concentration in ppm, mg/L this unit by definition is also equal to the following unit's mg/Kg and µg/g. The higher concentration of Pb was found in sample 1, equal to 110.7728 ppm as in Table 1 Figure 1,2,3,4 and the minimum concentration of Pb was found in sample 9 equal to 0.4459 ppm, for Cd was 4.6456 ppm the higher, and the minimum 0.0733 ppm, for Cu sample 1equal to 11.8207, 0.1941ppm and for Cr in sample 12 was 2.8246, 3, 5, 9 was 0.0000ppm.

4. Discussions

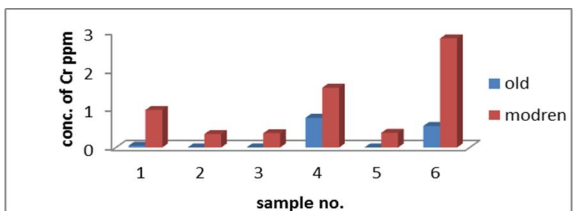
Heavy metal contamination in the Waste Electric and Electronic Equipment in the study was relatively high, and the highest concentration were detected in both samples, so to reduce human health risks or environmental we must classification waste and put this waste in special container to another reuse.



Fiqure 2 conc.of Cd in the sample



Fiqure 3 conc.of Cu in the sample



Fiqure 4 conc.of Cr in the sample

References

1. Josefina Lindblom and Luis Delgado" Implementation of Waste Electric and Electronic Equipment Directive in EU 25 "Regional Environmental Center for Central and Eastern Europe, Institute for Prospective Technological Studies, 2006.
2. European commission Environment, "Restriction of Hazardous Substances in Electrical and Electronic Equipment", 2012.
3. X, K. Nakajima, H. Sakanakura, K. Matsubae, H. Bai, T. Nagasaki," Thermodynamic

estimation of minor element distribution between immiscible liquids in Fe–Cu-based metal phase generated in melting treatment of municipal solid wastes" 2012, Waste management, volume 32, issue 6, p1148-1155,(ivsl).

4. M, Shinsuke Murakami, Hirofumi Sakanakura, Akiko Kida, Takashi Kameya" A preliminary categorization of end-of-life electrical and electronic equipment as secondary metal resources" , 2011, waste management, Volume 31, Issues 9–10, September–October 2011, Pages 2150–2160,(ivsl).
5. J, Lifeng Zhang" Metallurgical recovery of metals from electronic waste: A review", Journal of Hazardous Materials, Volume 158, Issues 2–3, 30 October 2008, Pages 228–256,(ivsl).
6. S, Julie M. Schoenung," Human health and ecological toxicity potentials due to heavy metal content in waste electronic devices with flat panel displays", 2010, Journal of hazardous materials, volume 177. Issues 1-3, p251-259, (ivsl).
7. J, Hans Jorgen Roven, "Electronic Waste", 2011, A Handbook of management waste, chapter 20, p281-296.(ivsl).
8. V, B. Robotin, P. Ilea," Nickel recovery/removal from industrial wastes: A review", 2013, Resources, Conservation and Recycling. Volume 73, p229-238, (ivsl).
9. P. Naidu, Ming," Metals and polybrominated diphenyl ethers leaching from electronic waste in simulated landfills" 2013, Journal of hazardous materials, volumes 252-253, p243-249, (ivsl).
10. Workshop ITU / UNEP on Capacity Building for Environmentally Responsible Management of Waste Electrical and Electronic Equipment, Geneva, 3 April. 2013.
11. Balcerzak, M. (2002) "Sample digestion methods for the determination of traces of precious metals by spectrometric techniques" Analytical Sciences 18:737-750.
12. Nasralla, M. M. (1984) "Lead in jaddah urban dust" Enviro. Poll. Series B., 1984,8:133-141.
13. Lee, C. K., Low, K.S. and Lim, C.G. (1988) "Communication V lead in Kuala Lumpur urban dust" Pertanika 11(1):157-160.
14. Yeimoglu, E.K. and Ercan, O. (2008) "Multivariate Analysis of metal contamination in street dusts of Istanbul D-100 highway" J. Braz. Chem. Soc. 19(7)1399-1404.
15. Suuzuki, K., Yabuki, T. and One, Y. (2009) "Roadside Rhododendron pulchrum leaves as bioindicators of heavy metal pollution in traffic areas of Okayama Japan" Environ Monti Assess 149:133-141.
16. Paudyn, A. M. and Smith, R. G."Application of inductively coupled plasma atomic emission spectrometry in occupational health" J. of Analytical Atomic Spectrometry 5:523-529,1990.
17. Bakirdere, S. and Yaman, M."Determination of lead, cadmium and copper in roadside soil and plants in Elazig, Turkey"Enviro Monit Assess 136:401-410,2008.
18. Paudyn, A.M. and Smith, R.G."Microwave decomposition of dust, ashes, and sediment for the determination of elements by ICP-AES" Canadian J. of Applied Spectroscopy 37(4):94-99, 1992.
19. Abechi, E.S., Okunola, O.J., Zubairu, A.A. and Apene, E."Evaluation of heavy metals in roadside soils of major streets in Jos metropolis, Nigeria" J. Environ. Chem. Ecotoxical. 2(6):98-102, 2010.
20. Muhamad-Darus, F., Nasir, R.A., Sumari, S.M., Ismail, Z.S. and Otmar, N.A."Nursery schools: Characterization of heavy metal content indoor dust "Asian J. of Environment-Behaviour Studies 2(6):53-60,2011.

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