

End-of-life mobile phones parts contain toxic metals that make them hazardous, but can also serve as resource reserves for such metals

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Abstract. In this study, the concentration of some toxic metals in different parts of end-of-life mobile phones was assessed. Twenty end-of-life mobile phones of different brands and countries of origin, which were widely in use up to the year 2011, were collected from phone repair workshops in Lagos, Nigeria. The collected mobile phones were disassembled into the phone screens, printed wiring boards, plastic casings and batteries. Disassembled parts were individually milled and pulverized, and digested using HCl, HNO₃ and H₂O₂. Flame atomic absorption spectrometry was used to quantify some toxic metals (Pb, Cd and Ni) in the digested samples, and the determined concentrations were compared with permissible limits. The average metals concentration in the disassembled parts followed the order: printed wiring boards > batteries > plastic casings > phone screens. The concentrations of Pb and Ni exceeded their toxicity threshold limit concentration in printed wiring boards, while Ni exceeded the limit concentration in batteries. Based on the maximum permissible concentration required by the Restriction of Hazardous Substances (RoHS) Directives, all Cd concentrations were below the limit concentration; Pb and Ni in printed wiring boards exceeded their limit concentrations, while Ni exceeded its permissible concentration in batteries. The results of this study indicate that printed wiring boards and batteries of end-of-life mobile phones are hazardous, and their improper disposal of could cause environmental and health problems. However, considering the very high concentrations of Pb and Ni, these mobile phone parts could serve as resource reserves for these metals.

Keywords: toxic metals; end-of-life mobile phones; printed wiring boards; batteries; toxicity threshold limit concentration; Restriction on Hazardous Substances Directive.

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