Chapter 16
E-Waste Recovery and Utilization Processes for Mobile Phone Waste

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ABSTRACT

Mobile phones are among the most widely used devices worldwide, but they also present a serious environmental contamination issue. Mobile phones often contain dangerous materials that, if not properly handled and disposed of, will leak into the environment. To ascertain the level of contamination, risk assessment techniques must be developed. In this research, national and international scenarios and regulating measures have been discussed for the harmfulness and management of mobile waste materials. The various characteristics of mobile wastes and materials flow for the processing of mobile related wastes have been elaborated. The different types of frameworks for the indicating systems, selection criteria, and risk assessment indication systems were also illustrated. The various stages of mobile waste handling and processing to recover polymers have also been represented.

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INTRODUCTION

Since the 1990s, there has been a considerable increase in electronic garbage ("e-waste"), making it one of the most rapidly expanding pollution issues globally. Since mobile phones are compact and portable electronic devices, they greatly contribute to this stream of e-waste. People use their mobile phones as essential communication tools in their daily lives, and they switch phones regularly. Waste mobile phones can seriously affect the environment if they are not disposed of properly since they contain a number of dangerous and harmful materials, including heavy metals and brominated flame retardants. The frequency of replacement is currently less than two years in industrialised countries and less than three years in underdeveloped nations. Electronic goods that are no longer functional or have simply been thrown away are referred to as "e-waste." Wasted mobile phones contain a variety of valuable materials, including gold, silver, and copper. The recycling process, however, can also have a negative impact on the environment and people's health if there are insufficient effective controls on pollutants. Mobile phone waste is referred to as "e-waste," and due to the quantity created, many laws and programmes have been implemented to manage this type of waste(Cherukuri et al. 2018). The WEEE Directive (on waste electrical and electronic equipment) and the RoHS Directive are significant pieces of legislation in the European Union.

Certain hazardous compounds cannot be used in electrical and electronic equipment, according to the RoHS Directive. To find practical answers, a global initiative called Solving the E-waste Problem (StEP) has been created. It also offers advice on the best ways to control the usage and disposal of mobile devices. The process of evaluating the risks associated with used mobile devices is seen as challenging and ambiguous. According to the World Health Organization, risk assessments can evaluate the extent of environmental pollution and enable risk managers to develop strategies for risk reduction that are grounded in science. Establishing a risk assessment indicator system to measure the danger level in the context of mobile phones looks preferable because it can streamline the risk assessment process. A good indicator can successfully transform complex data or events into clear, understandable information. An indicator is a single measure of a characteristic. Hazardous Laboratory used TCLP, WET, and TTLC to conduct leaching experiments on a variety of electronic devices, including LCD monitors, cell phones, and plasma TV panels. Pb was the metal that surpassed the threshold limit the most frequently, the study showed. In one study, 34 mobile phones were used to compare TCLP, WET, and TTLC in order to assess the consistency of hazardous waste classification. It was discovered that one sample exceeded the Lead regulatory limit. The improved technique leached less Pb than the TC limit but more Pb than the acceptable limit (5 mg/L). Disc drives, expansion cards, motherboards, and power supply units in outdated PCs were examined by Li et al. using TCLP extraction fluid. The following 18 elements were examined: As, Au, Ag, Al, Ba, Cr, Cu, Fe, Be, Cd, Cr, Cu, Fe, Ga, Pb, Sb, Se, Ni, Pd, Sn, and Zn. According to the study, old computers continuously produce Pb when they are dumped or exposed to rain. Pb extraction from motherboards was found to be 30–100 times greater than the permitted limit set by the EU (5 mg/L). 50 to 80 percent of the Pb that leached out of PWBs was caused by the motherboards. Heavy metal toxicity in the TCLP leachates generated by electronic gadgets was examined(Elleuch et al. 2018). Pb content was less than 5 mg/L in solidified PWBs. The dangerous PWBs were changed into non-hazardous PWBs via high compaction and cement solidification. The study's findings indicated that using modified TCLP increased Pb extraction by 50.9 percent.

According to the study, even after extensive transit, Pb would continue to leak. The metal content of PWBs and spent batteries (Lithium and nickel-metal hydride) from ten different manufacturers are

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