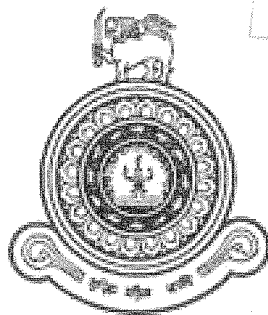


PERMANENT SERVICE



An investigation into leaching of heavy metals to Soil and water from a battery dump yard

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Abstract

Batteries have become essential items to human beings as portable energy sources in their daily activities. There are three battery manufacturing factories in Sri Lanka. In addition to their production here Sri Lanka imports batteries to meet the current demand of the consumers. The manufactures invariably discard their factory defects and the waste along with the used batteries into dump yards without much concern to the environmental damages. With the prevailing environmental conditions, particularly with the rain fall, water soluble waste from the batteries electrolyte drained into the environment contaminating the neighboring water bodies and the ground soil.

Zinc is one of the main ingredients used in battery production. Unfortunately, it contains cadmium as an impurity. Cadmium reacts with ammonium chloride and leaches out to the soil along with other materials from the battery. These hazardous pollutants elevate the health risks of the people living in the vicinity, who are not be aware of the health risks. This project was carried out to investigate in to the leaching of battery contents into soil and ground water. A battery dumping site was selected for the analysis of soil cadmium levels. Discharged batteries were applied on the uncontaminated soil for three months.

A systematic sample protocol was adopted to investigate the leaching at 10 different time periods and the average results are shown in the table. Leached metals were extracted from the soil samples and analyzed using atomic absorption spectrometry. Standard addition analytical technique was used to determine the trace levels of cadmium from the soil samples. It was found that cadmium concentration was increased when the depth increases to down to deep soil layers and maintained highest at 120 cm depth distance form the surface. Surface level cadmium examination was monitored at distances from the dumping site. In addition to cadmium analysis, soil pH was tested for monitoring of acidity. Soil acidity was found to be much high in the vicinity of the dumping site. Presumably, the increase in soil acidity is due to the presence of ammonium chloride in the batteries.

It is evident that the batteries need to be stored in completely enclosed environment without exposure to rain. The Central Environmental Authority (CEA) recommends to store leaking/damaged battery in a covered shelter with cemented base to prevent the contamination of soil. Use of cadmiumfree zinc would be ideal to prevent leaching of cadmium. This research can be extended to investigate the damage to the animals and plants in order to investigate the inclusion of cadmium in to the food chain from the improperly dumped batteries.