ABSTRACT

An inventory of chemical wastes at the University of the West Indies, St. Augustine has revealed that a large number of chemicals, including heavy metals and their compounds, are generated and stored in several departments around this campus. This investigation reports on the technology of solidification and stabilisation, using ordinary Portland cement (OPC) as a viable option for laboratories to treat their hazardous inorganic metal wastes. The results indicate that, in general, most of these wastes can be directly treated with OPC to produce stabilised waste blocks that meet the USEPA Toxicity Characteristic Leaching Procedure (TCLP). However, metal halides and sulphates require pretreatment for stabilisation, prior to cement-based solidification and stabilisation. The pretreatment process effectively uses alkaline precipitation with NaOH, to convert the metal wastes to less soluble hydroxide precipitates. The filtrate collected in the process can then be treated with OPC as a flocculant to remove residual metals in solution prior its discharge into surface drains. The hydroxide precipitates and flocculated materials can then be treated with OPC to produce cemented blocks that satisfy the USEPA criteria for leachability by the TCLP.

Coating of the whole cemented waste block can further reduce metal leachability to below TCLP criteria, even for mixtures that did not initially meet them. X-ray diffraction was found to be useful in identifying major components in cemented waste mixtures including new compounds formed.

The OPC-asphalt treatment can be used by laboratories, local and regional for handling stored inorganic metal wastes. It is recommended that strategies be developed for the safe management of chemical wastes generated in laboratories of the Department of Chemistry and other departments, including the management of surplus chemicals in stock. Such management strategies should control all chemical waste types at the University, including their treatment and safe disposal.

Keywords: Chemical waste treatment, ordinary Portland cement (OPC), asphalt, metal wastes, cemented waste blocks, Toxicity Characteristic Leaching Procedure (TCLP).