

ABSTRACT.

A Study of the Influence of the Physical Properties of Bauxite Waste on the Environment

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The aim of this study is to carry out physical characterisation of the red mud ponds in Jamaica. A specially built sampler was used to acquire red mud samples at various sites and depths in three different red mud ponds. Most of the physical parameters studied exhibited a random distribution rather than any systematic changes from site to site and with respect to the depth. The inherent radioactivity in red mud was also studied with respect to the depth and from site to site. The presence of uranium and thorium were confirmed and the levels measured using gamma-ray spectrometry and reported as equivalent uranium and thorium oxides respectively. Concentrations as high as 105 ppm and 120 ppm were measured for uranium oxide and thorium oxide respectively. The study revealed that seepage and the radiological hazards arising from the use of red mud are the main environmental effects. An assessment of the amount of seepage occurring in one of the largest red mud ponds in Jamaica as well as the assessment of the radiological hazards arising from the use of red

mud were carried out. It is estimated that the annual seepage from the pond is about $0.837 \times 10^6 \text{ m}^3$. This is small when compared to the size of the pond and a fraction of this amount is due to the siphoning of liquor from this main pond. The estimated gamma-ray absorbed dose rate for a house made from Revere red mud and based on 100% occupancy was estimated to be as high as 14.54 mSv per year. This is large compared to the ICRP recommended level for residents set at 1mSv per year.