

## **ASSESSMENT OF HEAVY METALS DISTRIBUTION IN THE DIFFERENT FRACTIONS OF IRRADIATED SEWAGE SLUDGES**

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### **ABSTRACT**

An experiment was conducted using three kinds of sewage sludge: raw, secondary treated and digested which exposed to three gamma radiation (<sup>60</sup>Co) doses: 0, 3, 6 KGy. Samples analysis included total and DTPA heavy metals contents. The heavy metals different fractions (forms) were determined using the sequential extraction procedure: 1) CaCl<sub>2</sub> solution to remove soluble + exchangeable fraction 2) acetic acid solution to remove metals bound by inorganic sites 3) potassium pyrophosphate solution to remove metals bound by organic sites 4) acid oxalate solution to remove metals bound by free oxides. Heavy metals were analyzed using the Atomic Absorption Spectrometry-Flame and Graphite Furnace (Shimadzu 6800).

The tested metals were: Cd, Pb, Fe, Zn. The data indicate that Fe and Pb maintained the highest percent in the free oxide fraction and the lowest in the extractable fraction. The percent of iron occluded by free oxides is almost similar in the different sludges. Percent of Fe in the organically bound fraction was highest in the digested sludge comparing with the other two sludges. The percent of Pb occluded by free oxides was as follows: secondary treated sludge > raw sludge > digested sludge. In the organic fraction, secondary treated sludge (Helwan WWTP) exhibited the highest Pb percentage comparing with the other two sludges. The digested sludge showed the highest Fe & Pb percentage, out of the total content, in the extractable fraction. Radiation did not exhibit a specific trend on metal content in the different fractions and the different sludges. The distribution pattern of Cd, Pb, Fe, Zn depends on the physio-chemical properties of the element and the physical treatment the sludge received at the waste water treatment plants.

*Key words: Cd, Pb, Fe, Zn, gamma radiation, digested sludge, raw sludge, Secondary treated sludge, sequential extraction*