Geochemical Study of Selected Heavy Metals Of Amman - Zerqa Area

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ABSTRACT

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Forty seven surface Sid samples were collected from Amman - Zerqa area including thirty samples from Amman city, eight samples from Sahab locality and nine samples from Zerqa- Russeifa road. In addition, nineteen subsurface soil samples were collected from three cores taken from the three localities one care for each.

The soils of the study area are homogeneous and display a moderately to fine texture. Clay minerals found in the clay fraction (<2μ) arranged to their decreasing abundance are kaolinite, smectite, illite and illite-smectite mixed-layered. Quartz and calcite were found as major non-clay minerals in the sand-
silt-size: olivine, sederite, plagioclase and pyroxine were encountered as common to traces.

By comparing the measured concentrations of the cadmium, mercury, lead and zinc with the geochemical clay standard given by Turekian and Wedepohl (1961); it is revealed that the enrichment factors of cadmium and mercury are relatively higher than their background values which may reflect and anthropogenic effect; lead and zinc concentrations reflect the natural background values.

The distribution of lead, cadmium and zinc in the soils of the study area were differently affected by various geochemical factors. Their concentrations are positively correlated with the pH-values, cation exchange capacity, the organic matter content and the phosphate content, and negatively correlated with the carbonate content. The increasing of the carbonate content decreased the pH-values which lead to the decreasing of lead, cadmium and zinc concentrations.

The lead, cadmium and zinc concentrations show a general decrease in the subsurface soil samples collected from Amman city and Zerqa-Russia road; this is associated with the decreasing of the pH-values and the organic matter content. Cadmium concentrations show insignificant variations with depth in these two localities. In Sahab locality, the concentrations of the three heavy
metals are increased with depth which is associated with the increasing of the pH- Values and the cation exchange capacity.

Mercury concentrations are positively correlated with the pH- values, clay content and the organic matter content they are positively correlated with mercury concentration; the concentrations of mercury in the subsurface soil samples are generally increased with depth in Zerqa- Russeifa road and Sahab locality which may be due to the evaporation loss.

A sequential extraction experiment was carried out in order to show the distribution of lead, cadmium and zinc in different phases (exchangeable bound to carbonate, Fe/Mn oxides, organic matter and the residual phases. The metals associated with the soils in these phases were determined in fifteen surface soil samples and nine subsurface soil samples selected from the three cores. The order of release of metals was Pb>Cd>Zn. These heavy metals are largely bound to the residual phase especially the zinc (retained about 85%), which indicates that these metals are hold within the mineral matrix.