

Fractionation and Availability of Heavy Metals in Ratnapura Gem Bearing Alluvium

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ABSTRACT

The sedimentary gem deposits in Ratnapura District are alluvial deposits. Gem minerals are concentrated as gem bearing gravel layers predominantly with different types of clay materials and other heavy minerals, locally referred to as "illama". This study is carried out to investigate the availability and mobility of heavy metals in gem bearing sediments in Ratnapura alluvial gem deposits. In order to determine the abundance and leachability of heavy metals in gem sediments, multi element (Pb, Zn, Cu, Co, As, Mn, Ni, Cd and Fe) analysis was carried out on 35 gem sediment samples from 15 gem pits located in Ratnapura District. The analysis was based on the total, exchangeable and bioavailable metals. The material characteristics of gem sediment observed by FT-IR analysis, the result confirm gem bearing sediments (63µm fraction) predominantly consists of kaolin type clay. Total metal concentrations were recorded as Fe>Mn>Zn>Pb>As>Ni>Cu>Co>Cd. Iron, Zn, Mn and Pb concentrations are reported high. The average values of Fe, Mn, Zn and Pb respectively as 49362, 218, 233, and 153 mg/kg. Nickel, Pb, Zn and Co exceeds the regulatory limits of various countries for contaminated soils. Exchangeable fractions results were observed as Fe>Ni>Mn>Co>Zn>Pb>Cu>Cd>As. Mobilization may increase due to changes in the pH and the presence of other ions in the environment. In some places Fe, Ni, Cu, Zn reported high in bioavailable fractions 70, 25, 20, 10 mg/kg respectively. High concentrations of toxic metals in exchangeable and bioavailable fractions indicate the risk on plant and animals as well as the open water bodies and groundwater sources.
