GEOCHEMISTRY OF THE SERPENTINITE DEPOSIT AT USSANGODA AND POSSIBLE ENVIRONMENTAL IMPACTS

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Abstract

Moderately weathered pale green coloured serpentinite body is exposed at Ussangoda, in southern Sri Lanka. Dark reddish brown, dark brown and dusky red colours were in serpentinite soils. Soil, water, paddy and hare faeces samples collected from the Ussangoda serpentinite body and near by villages in southern Sri Lanka were analysed for major heavy metals to evaluate their environmental impacts on the people living in the near by villages. The geology of the area studied includes ultramafic rocks that are overlaid by iron rich lateritic soil cap. Possible thrusting of Wanni/Highland blocks over Vijayan Complex may have resulted in the formation of such ultramafic rocks along the boundary zone. The Ussangoda serpentinite deposit is one of the mantle blocks exposed in the Sri Lankan crust. This idea is supported from chemical evidences such as exchangeable Ca/Mg values in serpentinite soils ranges at lower values of 0.70 ± 0.18 whereas in non-serpentinite soils, the Ca/Mg values are of 1.43 ± 0.70. Low Ca/Mg ratios are very commonly observed in the soils in the serpentinite locations worldwide.

Serpentinite soils collected from Ussangoda, Sri Lanka were analyzed for physico-chemical characteristics and compared with those from adjacent non-serpentinite localities. The serpentinite soils contained high levels of nickel (546–1952 μg/g dry soil), cobalt (100–272 μg/g dry soil) and chromium (1025–2135 μg/g dry soil), in addition to 3,019–7,012 μg of iron and 30–130 μg of manganese per gram dry soil. The water samples collected from the near by ponds of the Ussangoda have high Ni, Fe and Cd concentrations, higher than the permissible values given by WHO. Ni concentrations exceeding the desirable level of 0.02 mg/l. Average values of 0.32 ± 0.06 of Fe were

found are which is much higher than the WHO standard of 0.3 mg/l. Cd concentration rose up to minimum desirable level of the WHO standard of 0.005 mg/l.

The concentration of Fe, Ni, Cr and Co follow a similar pattern in the Ussangoda soil, water, hare faeces and paddy. This concentration pattern can be associated with the mineralization of the ultramafic rock. The heavy metal uptake by paddy and hare faeces shows the greatest accumulation of Al, Zn, Ni and Fe in the seeds of rice. A possible Survival of paddy crops irrigated by heavy metal rich water indicates tolerance to toxic heavy metals. Accumulation of heavy metals in paddy and hare faeces shows the serpentinite deposit may influence the food chain of the animals and humans living nearby. Since for many people in the Ussangoda area the common diet is rice, the accumulation of toxic heavy metals in rice may lead to health disorders. Further studies on socio-economic factors of these results are required to substantiate the conclusions and recommendations made in this study.