

GEOCHEMISTRY OF GEM BEARING STREAM SEDIMENTS OF KALU RIVER BASIN, SRI LANKA: POTENTIAL FOR RARE EARTH ELEMENTS (REEs)

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Over the last two decades, the prospecting of Rare Earth Elements (REEs) has been extensively increased owing to their wider industrial applications. Stream sediments which are rich in precious gem minerals are considered as one of the emerging alternative sources of REEs with minable concentrations. Hence the present study aimed to investigate the REE potential of gem bearing sediments of the upper reaches of the Kalu Ganga river basin of Sri Lanka. The mineralogy and elemental composition of eighty-one sediment samples were analyzed on X-Ray Diffractometer (XRD) and X-Ray Fluorescence (XRF) techniques respectively. The resulted XRD spectrums revealed the presence of major quartz and ilmenite with minor gems and REE-bearing minerals such as andalusite, chrysoberyl, enstatite, garnet, lucasite, magnetite, monazite, pyrite, spinel, thorneite, titanite, xenotime and zircon. The mineralogy suggests the association of gem minerals in the studied samples. The stream sediments indicate significant amounts of Light REEs such as Ce [average 540 (286 - 4310) ppm], La [average 178 (457 – 1670) ppm], Nd [average 120 (1140 – 1260) ppm], Y [25 (10 - 111) ppm] and Gd (average 0.05 (0 – 0.98) ppm] which are even above the present day mining sites of the world. The chemical correlations demonstrated a positive correlation between REEs with concentrations of Ti and Zr. This suggests that the REE content is enriched within the recognized minerals such as xenotime (YPO₄), monazite [(Ce,La,Nd,Th)PO₄] and lucasite (CeTi₂(O,OH)₆) which might be associated with Ti and Zr rich minerals such as zircon (ZrSiO₄), ilmenite (FeTiO₃) and rutile (TiO₂). The REE concentration shows increased values along the river flow direction specially, after Ratnapura town. Thus, the study concluded that the Kalu Ganga river basin is a prospective place for REEs. Since the REEs are associated with gem minerals, it can be suggested that the gem mining sediments may be the best source for the REEs.

Keywords: *Gem mines, Kalu Ganga basin, REE potential, Stream sediments, X-Ray Diffraction analysis, X-Ray Fluorescence analysis*