

TRACE ELEMENT GEOCHEMISTRY OF EPPAWALA PHOSPHATE DEPOSIT: IMPLICATIONS FOR GENETIC, ECONOMIC AND ENVIRONMENTAL ASPECTS

*Prame W.K.B.N., Siriwardana C.H.E.R., Siriwardana Y.P.S., Sanjewa H.A.D.N.
Geological Survey and Mines Bureau,
569, Epatamulla Road, Pitakotte, Sri Lanka*

Twenty five (25) drill core samples from primary apatite ore lying below the leached zone of the Eppawala apatite deposit representing varying apatite/carbonate (P_2O_5/CaO) ratios were analysed for P_2O_5 , MgO and forty (40) trace elements including fifteen (15) Rare Earth Elements (La-Lu). Trace element geochemistry indicates that the deposit is of magmatic origin and may be ranked as a calico-carbonatite. However, our data is inadequate for a detailed petrogenetic appraisal. All samples show a highly fractionated REE pattern with La_N/Lu_N ratios ranging from 20 to 160. Both high P_2O_5 (17-42 % wt.; apatite) and low P_2O_5 (<16% wt.; calcitic) samples display a similarly fractionated pattern but high P_2O_5 samples have distinctly higher Σ REE (~3000 mg/kg). Total REE, Arsenic (As) and Fluorine (F) are positively correlated with P_2O_5 content. Thus apatite is a major host for REE, F and As. Total REE, As and F range from 350-3680 mg/kg, 0.5-32 mg/kg and 0.1-2.9 % wt. respectively. The deposit is depleted in U, Au and Ag having values not exceeding crustal averages. It is also depleted in most incompatible elements such as Rb, Ta, Cs, Hf, and Nb and toxic elements such as Cd, Hg and Pb. Strontium (Sr) is present up to 0.6% wt. with an average of 0.4 % wt. In addition to a valuable source of P, future sub-economic potential as a source of Sr and light REE may have to be evaluated. Presence of As and F in slightly elevated levels is of special concern in the context of prevalence of chronic kidney disease of unknown aetiology (CKDu) in the north-western province. Water samples and soil samples were analysed from environ of Eppawala apatite occurrence for F and As. Arsenic levels in soil and ground water are well within the recommended maximum contaminant levels (RMCL). It seems that leaching out of As in significant amounts is restricted. In order to understand the relatively low As levels in soil, powdered apatite samples were tested for leaching efficiency in laboratory under different conditions. It was noted that release of As to the solution was only possible with reacting the sample with hot acids. Therefore, it can be concluded that Eppawala apatite wouldn't release environmentally significant quantity of As under superficial weathering conditions.

Keywords: *Eppawala apatite, rare earth elements, trace elements, strontium, P_2O_5 , arsenic, fluorine*