Geochemical Variations of Prospective Heavy Mineral Deposits Bordering the Coastline of Sri Lanka

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Heavy minerals with a specific gravity greater than 2.9 g/cm^3 such as ilmenite ($FeTiO_3$), rutile (TiO_2), leucoxene (altered ilmenite), zircon ($ZrSiO_4$), monazite ($(Ce,La,Nd,Th)PO_4$), garnet ($(Ca,Mg,Fe,Mn)_3(Al,Fe,Mn,V,Cr)_2(SiO_4)_3$), sillimanite ($Al_2SiO_5$), and magnetite ($Fe_3O_4$) have gained global attention as a result of modern technological advances. In this regard, the mining and processing of these heavy minerals are a timely requirement to uplift the mineral industry and the economy of Sri Lanka. Therefore, the objective of this study is to investigate the geochemical variations of prospective heavy mineral deposits along the coastline in order to identify locations with economically significant concentrations of heavy minerals. Field excursions were carried out to identify the potential of heavy mineral placers in Sri Lanka. Sediment samples were collected from ten locations covering both the shoreline and raised beaches. X-ray fluorescence (XRF) analysis was used to determine the major and trace element compositions of sediments. When compared to average Upper Continental Crust (UCC) values, major and trace element variations show the enrichments of TiO_2, Fe_2O_3, La, Ce, Zr, Cr, Nb, Th, and V. The abundance of TiO_2, Fe_2O_3, and Zr, and visual examination of samples suggest the presence of higher concentrations of heavy minerals such as ilmenite, rutile, and zircon in the prospective locations. Moreover, the abundance of trace elements such as La, Ce, and Th implies the presence of rare earth elements (REEs) bearing heavy minerals such as monazite and zircon. In contrast, major elements (Al_2O_3, Na_2O, and K_2O) and large-ion lithophile elements (Ba and Rb) were significantly depleted compared to UCC values. Based on the XRF data and visual examination, it can be concluded that all the studied locations such as Verugal, Dickwella, Kosgoda, Payagala, Beruwala, Kalutara, Dharga Town, and Aruwakkalu can be identified as potential sites for heavy mineral placers. Finally, proper quantification is required to estimate economic grade and to determine mining feasibility.

***Keywords*:** Heavy minerals; Geochemical variation; Economic concentrations; Coastline of Sri Lanka