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CHARACTERIZATION AND PROSPECTS FOR HARVESTING OF HEAVY MINERAL BEACH SANDS IN THE COASTAL BELT OF SRI LANKA

R.M.I.U. Rathnayake* and A. Senaratne

Department of Geology, Faculty of Science, University of Peradeniya, Sri Lanka
**indu.upamali@gmail.com*

Heavy mineral placer deposits of different scales, containing economical concentrations of ilmenite, rutile, garnet, zircon and monazite are abundant along the coastal belt of Sri Lanka. Other than Pulmoddai, many other small beach placers occur around the island but are not given much attention. Seasonal and intermittent exploitation of heavies or mineral sand harvesting can be applied to extract those enrichments. This work was conducted to study the sedimentological characters of some of small placer deposits in Sri Lanka and to estimate the grade which enables harvesting.

For this study, beach sand samples from Negombo, Matara, Kokkilai and Pulmoddai areas having seasonal heavy mineral enrichments were collected from different profiles of the beach as from swash, beach face, berm and fore dune including undisturbed vertical sampling. Heavy mineral contents and granulometric characteristics of samples were analyzed and assessed with comparison among locations. The granulometric parameters were obtained by sieve analysis and heavy mineral analysis was carried out by heavy liquid separation followed by magnetic separation. Mineralogical constituents were confirmed by X-ray diffraction method.

Grain size distribution analysis revealed that alternative layers of mineral sand and quartz sand acquire distinct differences in their textural characteristics. Beach quartz sand deviates from moderate to coarse in mean size of 2 mm-0.25 mm with moderate to poor sorting declared by standard deviation between 1.4 and 0.5. Sand in the beach face showed a similar granulometric relationship to mineral sands as 0.063 mm-0.25 mm in mean size with standard deviation less than 0.5 while swash, berm and fore-dune materials showed lesser similarities. Along the coastal profile, highest ilmenite of 70-75 wt% and zircon of 4-5 wt% contents were found in the beach face while the highest garnet quantities of 5-29 w t % were found in the swash region. The highest ilmenite, rutile, zircon and monazite contents were recovered in the upper 15 cm layer while more garnet was found in the layers below. The lighter mineral portion clearly increased with depth. It was found that beach face angle between 10° to 12.5° is preferred for ilmenite entrainment (70-79 wt%) but garnet deposition has occurred mostly (20-29 wt%) at the optimum angles between 12° to 14.5°. The studied placer deposits in Sri Lanka contain up to 90% of total heavy mineral content but the types of minerals and quantity are influenced by wave energy and coastal morphology, therefore seasonal heavy mineral harvesting of beach sands should be encouraged.