



Sedimentology and Geochemistry of Heavy Minerals Along Kerala and Tamil Nadu Coast With Special Reference to Raman Spectroscopy

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Abstract

The Chavara and the Manavalakurichi regions are recognized as the two important heavy mineral deposits in India. The surface samples were collected from five locations and each was analyzed for their textural parameters and mineralogy. Sediments from both the regions are characterized by fine and to medium grained sand. The Chavara sands are moderately well sorted whereas, the Manavalakurichi sands are moderate to moderately well sorted. The sediments at both sites are positively and negatively skewed with very leptokurtic to very platykurtic nature. The linear discriminate function (LDF) of the textural parameters shows aeolian and shallow marine depositional environment. The major heavy mineral present in both the region is ilmenite followed by zircon, sillimanite, rutile, monazite, leucocene and garnet. The heavy mineral content increases towards onshore in the upper and lower foreshore slope, but the grain size becomes finer and better sorted. The highest concentration of heavy minerals was found in the berms and the upper foreshore slope. The analysis shows that these heavy mineral placers are formed mainly from the palaeo-beach deposits being reworked and transported by the waves. The geochemical studies such as the XRF and the XRD analyses show that the major heavy mineral ilmenite has the alteration property by means of ilmenite- pseudo-rutile- leucocene. The XRD data reveals about the transformation of rutile from anatase in both the sectors, and garnet phases were identified as almandine. The Raman spectroscopy data reveals that ilmenite has high vibrational frequency compared to the other heavies, mainly in case of the Chavara ilmenite than the Manavalakurichi. The Raman data for rutile shows that the polymorph of rutile *i.e.* anatase transformed into rutile at lower temperatures. This is well identified in the samples collected from the Manavalakurichi region. The Raman spectroscopy of sillimanite shows the initial stage of crystallization in the samples obtained from the Manavalakurichi region. Basically, the XRD allows the identification of different phases of minerals and the Raman spectroscopy is more sensible to observe the bassanite compound. In the Raman spectra, the differences between phases are related essentially to the movement of the main Raman band.

Keywords: Heavy Minerals, Sedimentology, Geochemistry, Raman Spectroscopy, Kerala and Tamil Nadu Coasts