Heavy Mineral Composition from Marine Sediment, Bangka, Indonesia

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Ten unconsolidated sediment samples from Menumbing shallow marine area, Bangka Island, Indonesia were addressed to density separation in order to reveal heavy mineral composition. Prior to density separation, bulk sediment samples were analyzed by XRD, XRF, and ICP-MS to describe mineralogy and elementary composition as well as rare earth element concentration. The objective of this research is to explicate heavy mineral composition as important factor for Rare Earth Element concentration. From XRD result, sediment are dominated by quartz with appearance peak of halite, plagioclase, and clay mineral (illite, smectite, and kaolinite), while elementary composition reveals Zr concentration range from 250-530 ppm (average 380 ppm), Th values from 7-32 ppm (average 18 ppm), and concentration of Y from 14-28 ppm (average 19 ppm). Density separation splits light and heavy mineral (ρ = 2.9 g/cm^3). Heavy minerals in Menumbing sediment are distributed in > 75 μm fraction with abundance of ilmenite and sulfide mineral (pyrite, hematite, and marcasite). The others heavy minerals are tourmaline, zircon, monazite, cassiterite, and scheelite but only zircon and monazite can be REE bearing heavy mineral.

ΣREE concentrations are within the range 169-334 ppm with an average 213 ppm. Chondrite normalized REE pattern shows enrichment of LREE over HREE with LREE/HREE ratio range from 2.3 - 4.8 (average 4.33) and exhibits low $(Gd/Yb)_N$ ratio (range between 1.3-2.2, average 1.91) that ilustrate flat HREE pattern. Eu/ Eu* and Ce/ Ce* anomalies give negative anomaly result. It ranges from 0.03 - 0.25 (average 0.12) for Eu anomaly, and 0.014 -0.026 (average 0,02) for Ce anomaly. Eu and Ce negative anomaly possibly correspond to the changing of redox condition during sedimentary process (weathering, transport, and diagenesis).

The correlation between REE and REE-bearing heavy mineral bound elements (P, Zr, Th, and Y) were made to see the contribution of heavy mineral to bulk REE concentration. La has positive correlation with Th (r = 0.81) and Y (r = 0.97) but no correlation with P (r = 0) and Zr displays negative correlation with Yb (r = - 0.67). The positive correlation between La vs Th and La vs Y implies that monazite found in the heavy mineral composition play some role in LREE concentration, however no correlation with P might be due to another influx of organic P-bearing material (shell fragment, carbonate, etc) to the sediment even though REE-bearing phospate are significant. Another REE bearing heavy mineral, zircon, is considerably HREE bearing , but HREE in the bulk sediment is probably less affected by the presence of zircon.

Keywords: Rare Earth Element, Heavy Mineral, Marine Sediment

