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Petrogenesis of granitoids in northern Palawan (Philippines) and its implications on rare-earth element mineralization

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Global attention brought about by the increasing demand of rare earth elements (REE) has paved the way for various exploration efforts worldwide. Areas with promising REE deposits were revisited. In the Philippines, explorations are now on-going with studies focused on several granitic intrusions. Some of these granitic bodies are distributed in northern Palawan, which is a rifted fragment of the southeastern Eurasian margin during the opening of the South China Sea basin in the Oligocene.

The granitic bodies were investigated for possible concentration of REE during magmatic differentiation. The Kapoas granitoids include granites and granodiorites that are metaluminous, high-K calc-alkaline, and belong to the I-type and ilmenite-series. The granitoids are mostly biotite-rich and contain xenoliths of schists and diorite, quartz xenocrysts, and mafic enclaves. Two separate intrusive bodies are observed: the Mt. Kapoas which is 13.2 Ma in age; and the Bay Peak granite which is dated 14.1 Ma. However, both intrusives have similar geochemical signature, which show LREE enrichment. These granitic rocks were more evolved or highly differentiated I-type, probably generated in the middle to lower continental crust . The REE-bearing minerals are allanite and monazite. The weathered crust also show LREE enrichment. Weathered crust profile shows Ce-anomaly in the B-horizon portion where kaolinite, muscovite and illite act as absorptive materials.

This study also confirmed the presence of the Cretaceous Daroctan granitoids aside from the well-studied Middle Miocene Kapoas granitoids. The Daroctan granitoids include granodiorites and granites which belong to ilmenite-series. The granodiorites contain xenoliths of metasedimentary rocks, quartz xenocrysts and mafic enclaves. It is also sporadically distributed in the northern part of the island but these different intrusive bodies have almost similar ages. The REE-bearing minerals are monazite. Enrichment of LREE in the weathered crust is relatively higher than that of the Kapoas.

Allanite and monazites in the study areas are enriched in Ce, La, Nd, and Sm with associated radioactive element Th. Heavy minerals concentrated in the beach in Erawan and Ombo, which is part of the Kapoas granitoids, contain up to >10,000 ppm of La, Ce, and Sm.

キーワード: Palawan Continental Block, Kapoas granitoids, rare earth element mineralization, monazite, allanite
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