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Petrography, Geochemistry, Tectonic Setting, and Rare Earth Elements Mineralisation Potentials of Selected Granitoids from Southwestern Nigeria

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The demand for rare earth elements (REEs) has necessitated the need to search for REEs from sources aside from carbonatites, leading to granitoids currently being assessed globally as possible sources of REEs. Granitoids from parts of southwestern Nigeria were studied based on field observations, textural features, and mineralogy; geochemical analysis of representative granitoid samples was done by LA-ICP-MS to determine major, trace, and REE concentrations, while mineral chemistry of rock units with abundant REE concentrations was analyzed with SEM-EDX to determine the REE-bearing minerals within them. The dominant rock units observed are granitic gneisses, granites, diorites, and monzonites with minor intrusions of pegmatites and quartz veins. Petrogenesis and tectonic setting classification done using geochemical data grouped the granitoids as calc-alkalic to alkalic, mostly metaluminous, and emplaced mainly as within plate tectonic rocks. The REE concentrations for the studied granitoids show higher concentrations of the light rare earth elements (LREEs) compared to the heavy rare earth elements (HREEs) with a negative europium anomaly indicating that these rocks have been formed from the crystallization of melted crustal materials with plagioclase fractionation. The Σ LREEs for the granites (Σ LREEs 13.10-1083.6 ppm, Σ HREEs 0.44-50.79 ppm) and monzonites (Σ LREEs 14.9-795 ppm, Σ HREEs 0.34-33.86 ppm), respectively, were found to compare favorably with the granites of China, (Σ LREEs 152-402ppm, Σ HREEs 16-53ppm), where REE exploitation is ongoing. REE-bearing minerals in granitic gneisses, granites, and monzonites include synchysites, allanites, monazites, apatites, and tritomites, from where economic concentrations of REEs can be extracted. These granitoids are therefore rock units of interest in understanding Nigeria's economic potential of REEs.