Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9017

Evolution of the rare metal-bearing Jurassic Dutsen Wai and Roponmo plutons of the alkaline anorogenic granites, north-central Nigeria: Constraints from Whole-rock geochemical data and zircon trace element composition

ABDULGAFAR KAYODE AMUDA[1], SIDIKAT LAMI SALAU[2], MOHAMED FAISAL[3], MUSA BALA GIREI[1], DIGNE EDMOND RWATANGABO RWABUHUNGU[4] AND VANDI DLAMA KAMAUNJI[5]

[1]Bayero University Kano
[2]Initiative for Advancement of Mining and Environmental Sciences
[3]Suez Canal University
[4]University of Rwanda
[5]China University of Geoscience

Presenting Author: akamuda.geo@buk.edu.ng

We report whole-rock geochemical data and LA-ICP-MS zircons chemistry from Dutsen Wai and Roponmo anorogenic granites, north-central Nigeria. Whole-rock data indicate that the granites range in composition from peralkaline to aluminous and show geochemical characteristics typical of within-plate A-type granite. Zircon grains from Roponmo peralkaline granite (Rp) have low silica (average = 13.4 wt%), high ZrO_2 (average = 83.7 wt%) and Na (average = 1366 ppm) content suggesting that soda-rich fluids may have lowered silica activity and recrystallized monoclinic 'baddeleyite' (ZrO_2) grains from stoichiometric tetragonal zirconium orthosilicate ($ZrSiO_4$ with average 67.2 wt % ZrO_2, 32.8 wt % SiO_2 and Na = 19.5 ppm). The grains separated from the aluminous granite (Dt and St4) contain higher abundances of Hf, Pb and U than those of peralkaline granite but the reverse is largely true for Th contents. The relatively high Y, Th, U and Zr contents in Rp suggest the bulk of the grains have been altered to other mineral phases like yttrocrasite, polycrase and kobeite. Although most zircon grains exhibit chondrite-normalized REE patterns characterized by enrichment in HREE relative to LREE with positive Ce and negative Eu anomalies typical of magmatic zircons, few grains have fairly high LREE with somewhat flat chondrite-normalized patterns that are typical of hydrothermally-altered zircons. The 'altered' zircons largely had LREE-1 (Dy/Nd + Dy/Sm) values less than 30 and U/Yb ratio vs Hf contents suggests zircons crystallized in the crust. Links between whole-rock Rb/Sr and zircon Eu/Eu* highlight that the latter can monitor magma fractionation in these systems. Zircon Ce/Ce* and Eu/Eu* might also define the conditions favourable for crystallization of rare metal-enriched accessory mineral phases. The Ti-in-zircon thermometer gives a relatively high mean temperature for the peralkaline granite (Rp = 840°C; probably due to higher saturation temperature of accessories) while the peraluminous granites are within wet solidus for granite (Dt = 671°C and St4 = 696°C). The redox condition of Rp, δFMQ = 0.4 to 1.5 and Dt, St4, δFMQ = -3.8 to -1.5 reflects higher oxygen fugacity in the peralkaline granite probably due to the nature of femic minerals; aegerine, arfvedsonite that contains ferric iron.