Geochemistry of the Palaeoproterozoic gabbros and granodiorites of the Saza area in the Lupa Goldfield, southwestern Tanzania.

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Abstract

Major and trace element data are presented for the Palaeoproterozoic gabbros and granodiorites of the Lupa Goldfield of southwestern Tanzania with the aim of inferring their petrogenesis. Both the gabbros and granodiorites are calc-alkaline in nature and in the field; they are spatially associated with one another and are separated by a gradational contact. Major element compositions show that MgO, Fe_2O_3, CaO, and Co decrease with increasing SiO_2 from gabbros to granodiorites whereas K_2O and Zr increase with increasing SiO_2. Gabbros have less fractionated REE patterns (La/Yb_{CN} = 4.65–13.7) compared to granodiorites (La/Yb_{CN} = 18.5–122) and the total REE concentrations of the granodiorites are slightly higher than those of the gabbros. On primitive mantle normalized spidergrams, both the gabbros and granodiorites exhibit negative anomalies of Nb, Ta and Ti relative to adjacent elements. The granodiorites show εNd (1924 Ma) values of −0.66 to −11.7 and T_{DM} ages of 2392–2913 Ma which are ~500–1000 Ma older than their emplacement age of ~1924 Ma. The gabbros exhibit εNd (1880 Ma) values of −0.90 to +2.46 and T_{DM} ages of 2199–2473 Ma which are ~300–600 Ma older than their emplacement ages. The εNd values for both rocks are lower than their corresponding mantle value of +6.11 at 1880 Ma.

The geochemical features of the gabbros are interpreted in terms of their derivation from the partial melting of an enriched mantle wedge in a continental arc setting whereas granodiorites are interpreted to have formed by magma–crust mixing processes. The resultant magmas of both rocks assimilated the pre-existing Archaean crust before their emplacement. The formation of the Lupa terrane in a continental arc coupled with the inferred subduction model in the Ubende terrane during the formation of MORB-like eclogites suggest that the subduction– thrust model cannot be ruled out in explaining the evolution of the Ubendian Belt.

Keywords

Lupa Goldfield; Saza; Gabbro; Granodiorite; Enriched mantle; Magma–crust mixing