Geochemistry and geochronology of the bimodal volcanic rocks of the Suguti area in the southern part of the Musoma-Mara Greenstone Belt, Northern Tanzania

Mwache Mtoro, Makenya A.H. Maboko, Shukrani Manya

Abstract

The Suguti volcanic rocks of the southern Musoma-Mara greenstone belt in northern Tanzania comprise mainly of a bimodal suite of tholeiitic basalts-basaltic andesites and calc-alkaline rhyolites with a subordinate amount of intermediate rocks. Zircon U–Pb and whole rock Sm–Nd geochronology suggests that the two suites are cogenetic and were emplaced at 2755 ± 1 Ma with a common initial ε_{Nd} value of 2.1.

The tholeiitic basalts are characterised by relatively flat chondrite-normalised REE patterns with La/Yb_{CN} ratios of 0.8–1.6 (mean = 1.0). The basalts also exhibit negative Ti and Nb anomalies in primitive mantle-normalised multi-element diagrams. The flat REE patterns, the presence of prominent negative Nb anomalies and the positive initial ε_{Nd} value of 2.1 suggest that the basalts were formed by low pressure melting of a mantle wedge in an active continental margin setting.

Compared to the tholeiitic basalts, the calc-alkaline rhyolites are characterised by low abundances of the transition elements (Cr < 20 ppm, Ni < 20 ppm) and moderately high HFSE (e.g. Zr = 111–250 ppm) abundances. The rhyolites display strongly fractionated, slightly concave upward chondrite normalised REE patterns that are characterised by a slight depletion of the MREE relative to the HREE and minor to large negative Eu anomalies (Eu/Eu* = 0.3–0.9) and their epsilon Nd values range from +2.05 to +2.33. The depletion of the MREE relative to the HREE is an indication of fractionation of clinopyroxene and hornblende during petrogenesis whereas the negative Eu anomalies indicate plagioclase fractionation. The rhyolites are interpreted to have formed from the parental magma of the basalts by fractional crystallization and/or partial melting of a relatively young basaltic crust.

Keywords

Musoma-Mara greenstone belt; Geochemistry; Sm–Nd isotope; U–Pb zircon geochronology