Geochemistry and petrogenesis of the late Archaean high-K granites in the southern Musoma-Mara Greenstone Belt: Their influence in evolution of Archaean Tanzania Craton

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Abstract

Musoma-Mara Greenstone Belt (MMGB) is abundantly occupied by the post-orogenic high-K granites which also they mark the end of magmatism in the area.

The granites are characterized by high SiO_2 and Al_2O_3 contents that average 74.42% and 13.08% by weight respectively. They have low Na_2O content (mean = 3.36 wt.%) and high K_2O contents (mean = 4.95 wt.%) which resulted to relatively high K_2O/Na_2O ratios (mean = 1.50). They also characterized by low Mg# (mean = 33) as well as low contents of transition elements such as Cr and Ni which are below detection limit (<20 ppm). Negative anomalies in Eu (Eu/Eu^*, mean = 0.56), Nd, Ta and Ti elements as shown in the chondrite and primitive mantle normalized diagrams indicate MMGB high-K granites originated from a subduction related environments. These high-K granites also characterized by relative enrichment of the LREE compared to HREE as revealed by their high $(La/Yb)_{CN}$ ratio ranging from 8.71 to 50.93 (mean = 26.32). They have relatively flat HREE pattern with $(Tb/Yb)_{CN}$ ratio varying between 0.81 and 2.12 (mean = 1.55). Their linear trend in the variation diagrams of both major and trace elements indicate magmatic differentiation was also an important process during their formation. Conclusively, the geochemical characteristics as well as experimental evidences suggests MMGB high-K granites were formed from partial melting of pre-existing TTG rocks, under low pressure at 15 km depth or less and temperature around 950 °C in which plagioclase minerals were the stable phases in the melt.

Keywords

Geochemistry;
Petrogenesis;
High-K granites;
Musoma-Mara Greenstone Belt;
Archaean Tanzania Craton