Geochemistry and petrogenesis of intrusions at the Golden Pride gold deposit in the Nzega greenstone belt, Tanzania.

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Abstract

The greenstone sequence at Golden Pride gold deposit in Nzega greenstone belt of northern Tanzania is cross-cut by several intrusions whose geochemistry and petrogenesis is unknown. We present major and trace elements geochemistry of the Golden Pride igneous intrusions with the aim of constraining their petrogenesis and their ancient tectonic setting. The Golden Pride intrusions are geochemically categorized into two main rock suites: the granodiorites (which include the porphyries) and the lamprophyres (formerly intermediate intrusions). The granodiorites are characterized by SiO_2 contents of 54.5–69.9 wt%, elevated MgO (1.22–3.59 wt%) Cr (up to 54 ppm), Mg# (35–55) pointing to a mantle component in the source. Compared to the TTG and adakites, the granodiorites are characterized by higher K_2O (1.52–4.30 wt%), medium HREE (Gd/Er_{CN} = 2.13–3.77) and marked enrichment in Ba and Sr (Ba + Sr = 819–2922 ppm) and are in these respects similar to Archean high Ba–Sr sanukitoids. The rocks in this suite are interpreted to have formed by partial melting of an enriched mantle wedge through two metasomatic events: subduction-related fluids/melts and by metasomatism related to asthenospheric mantle upwelling caused by slab break-off.

Compared to the granodiorites, the lamprophyres have higher MgO contents (2.37–3.81 wt%), Cr (60–298 ppm), Co (31–57 ppm) and Mg# (32–40). They also show slight enrichment of the LREE relative to HREE (La/Yb_{CN} = 3.3–7.1), moderate Nb–Ti depletion and sub-chondritic Zr/Hf ratios (34–41). These geochemical features are attributed to derivation of the Golden Pride lamprophyres by partial melting of the amphibole-rich metasomatized mantle by slab derived hydrous fluids. Both of the Golden Pride intrusion suites show strong affinity to subduction related magmas and we interpret that the entire greenstone sequence and the associated intrusions at Golden Pride gold deposit formed in a late Archaean convergent margin.

Keywords

Golden Pride; Nzega greenstone belt; Granodiorites; Lamprophyres; Sanukitoids