

## Aspects of geochemistry of Proterozoic Prince's Town granitoid from the southern Ashanti volcanic belt, Ghana

# Samuel B. Dampare[1]; Tsugio Shibata[2]

[1] Earth Sci., Okayama Univ; [2] Dept. of Earth Sci., Okayama Univ.

The Proterozoic Birimian Supergroup of Ghana is characterized by sub-parallel north-easterly-trending volcanic belts, separated by sedimentary basins. The volcanic belts and the basins are respectively intruded by 'belt-type' and 'basin-type' Eburnean granitoids. The granitoids display different geochemical characteristics, with the belt-type and the basin-type granitoids showing I-type and S-type characteristics, respectively.

The Ashanti greenstone belt is one of the five Paleoproterozoic Birimian. Recent studies conducted on granitoids from the northeastern part of the Ashanti belt have revealed that some of the belt-type granitoids show I-type characteristics, which might have a tectonic setting or origin different from the others. Whether this is a local occurrence or widespread in the Ashanti volcanic belt is worth investigating.

The Paleoproterozoic metavolcanic rocks of the southern Ashanti greenstone belt of Ghana are intruded by three major suites of granitoids, locally called Prince's Town, Dixcove and Ketan plutons. The volcanic belt is dissected into three branches referred to as Axim branch, Cape Three Points branch and Butre branch, and the plutons occupy positions between the greenstone branches. The Prince's Town pluton is the largest intrusive body in the Axim area, where the study was conducted, and tends to separate the Axim volcanic branch from the Cape Three Points branch. The pluton consists of granitic to dioritic rocks, which are generally massive but occasionally display alignment of ferromagnesian minerals. The rocks contain mainly plagioclase, K-feldspar, quartz, amphibole, biotite and opaques. The feldspars are mostly sericitized and saussuritized, and alteration of amphibole and biotite to epidote and chlorite is common.

The geochemical data indicate that the rocks are tonalitic to granodioritic in composition. The granitoids have SiO<sub>2</sub> content of 62.96-70.49%; TiO<sub>2</sub> of 0.27-0.38%; Al<sub>2</sub>O<sub>3</sub>, 14.50-16.33%; total Fe, as Fe<sub>2</sub>O<sub>3</sub> of 3.10-5.80%; MnO, 0.06-0.11%; MgO, 1.53-2.89%; CaO, 3.30-5.74%; total alkalis (Na<sub>2</sub>O+K<sub>2</sub>O) of 5.01-6.96% and Na<sub>2</sub>O/K<sub>2</sub>O ratios from 1.34 to 2.70; and P<sub>2</sub>O<sub>5</sub> of 0.10-0.13%. In the Harker diagrams for major elements, the rocks fall on a linear fractional crystallization line, with SiO<sub>2</sub> correlating negatively with Al<sub>2</sub>O<sub>3</sub>, MgO, CaO, Fe<sub>2</sub>O<sub>3</sub>, MnO and TiO<sub>2</sub>, and positively with Na<sub>2</sub>O and K<sub>2</sub>O.

Selected diagrams have been used to classify the Prince's Town rocks. On the A-B diagram, which use a measure of dark minerals ( $B = \text{Fe} + \text{Mg} + \text{Ti}$ ) and aluminous character ( $A = \text{Al} - (\text{K} + \text{Na} + 2\text{Ca})$ ), the rocks demonstrate a metaluminous character and also plot in field IV, reflecting the presence of biotite +/- amphibole +/- Cpx. This metaluminous affinity of the rocks is corroborated by their ASI ( $\text{Al}/\text{Ca} - 1.67\text{P} + \text{Na} + \text{K}$ ) being less than 1. The rocks also show I-type characteristics. In the AFM diagram, the rocks define a calc-alkaline differentiation trend. The  $\text{Fe}^*$  ( $= \text{FeO}^t / (\text{FeO}^t + \text{MgO})$ ) and modified alkali-lime index (MALI) of the rocks indicate that the Prince's Town pluton is dominantly magnesian and calcic to calc-alkalic.

In the R1-R2 tectonic discrimination diagram, the rocks plot in the field of pre-plate collisional granitoids. Thus, the Prince's Town pluton was emplaced in a volcanic arc tectonic setting environment. This observation is largely consistent with previous studies conducted on granitoids from other parts of the southern Ashanti greenstone belt and the belt-type granitoids of Ghana in general.