

## Hornblende thermobarometry of Palaeoproterozoic basement rocks in Bangladesh

# Ismail Hossain[1]; Toshiaki Tsunogae[2]

[1] Earth and Env. Sci., Univ. Tsukuba; [2] Univ. Tsukuba

Geothermobarometers are useful for calculation or estimation of pressure and temperature (P-T) conditions of the crystallization of igneous rocks. In calc-alkaline plutonic rocks, amphiboles are the prominent mineral for the application of geothermobarometry, because they occur in nearly all calc-alkaline intrusives, regardless of mafic, intermediate or felsic compositions. They are stable over a wide P-T range from 1-23 kbar and 400-1150°C. Application of hornblende thermobarometry to the Palaeoproterozoic basement rocks (1.73 Ga) from the Maddhapara, NW Bangladesh, therefore provides useful information on the emplacement depth of the pluton and geotectonic evolution with average erosion and/or uplifting rate for acquiring the present stage.

The basement rocks in Bangladesh are predominantly dioritic rocks. Eight dioritic rock samples were selected for hornblende thermobarometry from Maddhapara basement rocks. All selected samples have a mineral assemblage of quartz, plagioclase, hornblende, K-feldspar, biotite, titanite and magnetite, which is an important prerequisite for aluminum-in-hornblende barometry. The anorthite range from An<sub>21.4</sub> to An<sub>46.7</sub>, and most have a range between An<sub>25</sub> to An<sub>35</sub>. Hornblendes of the basement rocks are classified as magnesiohornblende, edenite, tschermakite, magnesiohastingsite and pargasite.

The calculated temperatures (edenite - richterite thermometers) of the Maddhapara basement rocks are 700 to 760°C. Subsequent experimental studies provided general confirmation of increasing Al content of hornblende with increasing pressure. The temperature-corrected pressures calculated using Anderson and Smith (1995) of the Maddhapara basement rocks are 4.6 to 6.1 kbar.

Emplacement depth from the converting pressures on the assumption that the average crustal density of the Maddhapara basement rocks was about 3.0 g/cm<sup>3</sup> during the Palaeoproterozoic time. Dioritic body of Maddhapara basement rocks yielded an average palaeodepth of crystallization of 14-18 km, and the average emplacement depth of all analyzed samples is 16 km. This palaeodepth is consistent with Hossain and Tsunogae (2008), which were estimated from magmatic fluid inclusions in pegmatite and aplite veins in the same field. At this instant, Maddhapara basement rocks are unconformably overlain by thin cover Permian Gondwana fluvial sediments, which are assumed to be 0.299 Ga. We could consider the erosional period of the Maddhapara basement rocks were up to Gondwana deposit of Permian age. The period of erosion was about 1.43 Ga (1.73-0.3=1.43). Subsequently, 16 km of basement rocks were eroded from Maddhapara area during this period. Accordingly we can be divided the palaeodepth by the period of erosion and obtaining the average rate of erosion or uplifting rate of this pluton is 0.011 mm/yr. Therefore, hornblende geothermobarometry of the Palaeoproterozoic basement rocks in Bangladesh indicates slow erosion and/or uplift during Palaeoproterozoic to Permian.