# カレドニア造山帯トロムセ・ナップに産する正片麻岩の岩石学と年代学
# Petrological and geochronological study of orthogneiss from the Tromsø Nappe in Scandinavian Caledonides

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Orthogneiss is the predominant lithotype in ultra-high pressure (UHP) terranes in the world but it generally consists of low pressure metamorphic minerals of mainly amphibolite facies. However, extensive petrological studies succeeded to find several signs of UHP minerals from the county gneiss, and hence, most of the country gneiss shared the UHP metamorphism. The Scandinavian Caledonides were formed by collision between Baltica and Laurentia Cratons during Ordovician to Devonian, and are composed of several allochthons which have juxtaposed onto Precambrian cover. Evidences of UHP metamorphism are found from the Western Gneiss Region (WGR) in Lower Allochthon (Hacker et al., 2001), the Seve Nappe in Middle Allochthon (Majka et al., 2014), and the Tromsø Nappe in Uppermost Allochthon (Janák et al., 2013). In the WGR, UHP evidences occur widely in the NW part, however in the Seve and Tromsø Nappes UHP evidences are sporadic, so the areal extent of UHP metamorphism remains unclear. The Tromsø Nappe is mainly composed of eclogites, gneisses, schists and marbles. Krogh et al. (1990) estimated the peak *P-T* conditions of country gneisses and pelitic schists as 670-700 C and 1.5-1.7GPa during $D_1$ stage. After that, Janák et al. (2012) estimated the UHP metamorphic conditions of 720-800 C and 3.2-3.5 GPa using pseudosection analysis and conventional geothermobarometry for eclogite in Tromsdalstind. Janák et al. (2013) finally found microdiamond from garnet-rich carbonate-bearing gneiss in Tønsvika. However, UHP evidence has not been reported from the country gneiss and schists. In this study, we report mineral paragenesis and zircon U-Pb age of orthogneiss hosting UHP eclogites in the Tromsø Nappe. Studied sample was collected from large blocks of orthogneiss distributing on the ridge around N69°26′0″, E19°9′33″ (garnet-muscovite schist unit: Zwaan et al., 1998). Main constituent minerals are garnet, muscovite, plagioclase, alkali-feldspar, and quartz with minor amounts of kyanite, rutile, biotite, hornblende, epidote, chlorite, ilmenite, and zircon. The alignments of mica and plagioclase porphyroclast characterize the gneissose structure. The LA-ICP-MS U-Pb dating of zircon in orthogneiss gives the majority of the concordant ages between 470 and 420 Ma, and minor inherited ages of about 1500-1300 Ma and 800 Ma. The weighted mean $^{206}Pb/^{238}U$ age (± 2σ) of rim of zircon is 454.2 ±5.2 Ma (n=21). This age is consistent with metamorphic age of Tønsvika eclogites (452.1 ±1.7 Ma; Corfu et al., 2003) within error. Most of garnets with a few 10 to 100 μm diameter have Fe-rich compositions ($Alm_{0.68-0.74}Prp_{0.11-0.18}Grs_{0.10-0.18}Sps_{0.01}$). They include quartz, rutile, zircon, and rare kyanite as primary inclusions. Some of them have Ca-rich rim ($Alm_{0.63-0.68}Prp_{0.09-0.11}Grs_{0.20-0.26}Sps_{0.01}$) with a distinct chemical gap to the core. In some plagioclase, Ca-content decreases from the core (An=0.26-0.33) to the rim (An=0.17-0.28). Biotite commonly replaces rim of muscovite or occur as fine laths of a few 10 μm diameter, suggesting the secondary origin, while muscovite is relatively coarse grained {100-500μm diameter; Si=6.13-6.38 (O=22), $TiO_2$=0.17-1.34, $X_{Fe}$=0.28-0.50}. GASP geobarometer and Grt-Ms Fe/Mg exchange geothermometer give 450-500 °C and 1.1-1.2 GPa for the core-core pairs of garnet and plagioclase and 530-570 °C and 1.6-1.7 GPa for the rim-rim pairs of garnet and plagioclase, indicating the pressure increase is necessary for the rim formation. *P* condition estimated from the rim-rim pairs is consistent with $D_1$ stage (1.5-1.7 GPa) of the country gneiss in the same nappe (Krogh et al., 1990), but *T* condition obtained by the same pair is

 

significantly lower than that of $D_1$, which may be caused by the modification of muscovite composition.

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