Petrological studies of high-grade paragneisses from Onzon and Thabeikkyin areas, central Myanmar

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The sigmoidal and elongated Mogok metamorphic belt extends for 1500 km from the Andaman Sea in the south to the eastern Himalayan syntaxis in the north and has variable metamorphic conditions throughout the belt. It lies at the western margin of Shan-Thai block and comprises high-grade metasedimentary rocks and metaigneous rocks with subduction-related granitoid intrusions. Previous radiometric studies, based on U-Th-Pb and Ar-Ar dating, concluded that an assembly of these high-grade metamorphic rocks was formed during Paleogene to early Neogene event that was caused by the collision of remnants of Gondwanaland with the Eurasian continent and subsequent underthrusting and collision of Indian plate with Eurasian plate. The metamorphic grade of the Mogok metamorphic rocks reaches upper amphibolite facies and granulite facies in some places.
Samples were collected from the middle segment of the Mogok belt, ~100 km north of the Mandalay region, where the geology is dominated by high-grade paragneisses overlain by various types of marbles and calc-silicate rocks trending toward the NE-SW and ENE-WSW directions. The marbles occur in massive or scattered blocks and are medium- to coarse-grained, showing polycrystalline texture. Their common mineral assemblage contains diopside, forsterite, chondrodite, garnet, phlogopite, and graphite, suggesting metamorphic grade up to upper amphibolite facies. In places, the marbles are intruded by biotite micro-granite, syenite, and pegmatite.
The paragneisses are medium- to coarse-grained and show well-banded gneissose texture defined by elongated layers of biotite, feldspar, and quartz. The matrix of the paragneisses is mainly composed of garnet, cordierite, biotite, plagioclase, K-feldspar, quartz, ilmenite, and rutile. Graphite and monazite are common accessory minerals. Sillimanite mainly occurs as inclusions within garnet. Most porphyroblastic garnet grains (> 3 mm) show retrograde zoning with increasing almandine {X_{alm} = Fe / (Ca + Mg + Fe + Mn) = 0.53 -0.58} and decreasing pyrope contents {X_{pyr} = Mg / (Ca + Mg + Fe + Mn) = 0.37 -0.43} towards the rim. Grossular (X_{gros} = 0.03) and spessartine (X_{sps} = 0.02) contents are low and fairly constant. Cordierite grains {X_{Mg} = Mg / (Mg + Fe) = 0.68-0.83} occur as the matrix phase, inclusions in garnet, and as pseudomorphs after garnet. Using garnet–biotite geothermometer and garnet–biotite–plagioclase–quartz (GBPQ) geobarometer, the matrix assemblage estimates pressures (P) and temperature (T) conditions of 0.5–0.8 GPa and 750–870°C. Biotite grains occur as an isolated phase in the matrix, inclusions in garnet, and a symplectic phase around garnet. Fluorine and chlorine contents are up to 0.6 wt. % and less than 0.1 wt. %, respectively. The Ti-in biotite geothermometer suggests 800° C or higher-temperature for the Ti-rich isolated biotite grains. Zr-in-rutile geothermometer gives temperature estimates of 750 –935°C (at P = 0.8 GPa), which are consistent with those estimated using a conventional geothermometer.
The samples analyzed in this study demonstrate that metamorphic conditions in the Mogok Belt reached 800°C or higher, implying wide distribution of granulite facies metamorphic rocks in the middle segment of the Mogok metamorphic belt.

Keywords: paragneiss, granulite, metamorphic conditions, Mogok metamorphic rocks, Myanmar

