P-T-t Evolution of the Pongyang Gneiss, Inthanon Zone, NW-Thailand

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The Pongyang gneiss occupies a dominant portion within the Doi Suthep Complex, part of the Inthanon Zone, NW-Thailand, which is usually overlain by Paleozoic sedimentary rocks. Within the area, abundant granitoid rocks occur, which belong to the Central Granitoid Province in Thailand. Here, we present petrography, mineral chemistry, geothermobarometric and geochronologic results for the Pongyang gneiss. The Pongyang gneissic rocks comprise various light-colored to dark grey varieties depending on the amount of biotite. The typical mineral assemblage comprises garnet, quartz, plagioclase, K-feldspar (perthite), biotite, sillimanite (inclusions in garnet) and sometimes muscovite with accessory minerals ilmenite, pyrite, apatite, monazite, xenotime, and zircon. Plagioclase, quartz, biotite, and muscovite coronas developed around partly resorbed garnet porphyroblasts, which is indicative of a pressure decompression history. Garnet also contains numerous mineral inclusions such as sillimanite, quartz, biotite, muscovite, monazite, etc. Garnet composition is mostly almandine-rich and is slightly zoned with enrichment of spessartine content at the resorbed rim. Plagioclase in the matrix is sometimes zoned with an albite-rich rim and elevated anorthite contents within the core. On the other hand, the plagioclase corona composition is more anorthite-rich than plagioclase in the matrix. P-T conditions were calculated by the Garnet-Biotite-Plagioclase-Quartz (GBPQ), and Garnet-Biotite (GB) geothermobarometers to 6.0–7.0 kbar and 680–750 °C. The growth of plagioclase, quartz, biotite, and muscovite coronas around garnet occurred during exhumation at slightly lower conditions of 4.0–6.0 kbar and 640–660 °C. Monazite grains are observed as small (5–10 µm), anhedral to subhedral inclusions in garnet. The monazite grains discovered in the matrix (10–25 µm) are larger compared to the inclusions in the garnet and have usually fringed rims. The Th-U-total Pb dating of monazite (inclusions and matrix grains) yielded 192.08 ± 3.60 Ma in sample Sm-62-4 and 189.08 ± 5.41 Ma in sample Sm-62-5. The Pongyang gneiss of the Doi Suthep complex experienced upper amphibolite to lower granulite facies metamorphism at pressures of around 6 kbar in the Early Jurassic with a subsequent retrograde decompressional history. The metamorphic event is related to the late-stage collision between the Sibumasu block and the Sukhothai terrane.