MINERALOGICAL AND PETROLOGICAL ASPECTS OF GRANITOID AND METAMORPHIC ROCKS IN THE KADUDA-PYINGYITAUNG AREA, SINGU TOWNSHIP, MANDALAY REGION

PhD DISSERTATION

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ABSTRACT

The Kaduda-Pyingyitaung area in Singu Township, covering 58 square km, is the southern continuation of the highly deformed Mogok Metamorphic Belt. The area is made up of schists, gneisses, marbles, calc-silicate rocks and quartzite which were later intruded by biotite microgranite and tourmaline granite. Structurally, it is rather complex, consisting of Pyingyitaung anticline, Kaduda syncline with intricate numerous minor fold and similar folds mostly in calc-silicate rocks. In addition, four minor fault systems are recognized from the satellite image. This systems are NNW-SSE, NNE-SSW, NE-SW and E-W trending systems. Joint patterns show that there were NNE-SSW compressional and NNW-SSE extensional forces in the area. There are NNW-SSE trending prominent zoned pegmatite dykes; in addition, ENE-WSW to NNE-SSW trending pegmatite dykes are also present. All these pegmatite dykes intruded into the calc-silicate rocks and marbles of the Pyingyitaung range. Quartzofeldspathic veins occur in the biotite microgranite.

Regional metamorphism of calcareous and pelitic rocks resulted in the formation of garnet-mica schist, sillimanite-biotite schist, hornblende-biotite gneiss, banded biotite gneiss, various types of marble (white marble, diopside marble, phlogopite marble, forsterite marble, diopside-chondrodite marble, and graphite marble), calc-silicate rocks (mainly diopside calc-silicate rocks) and micaceous quartzite. The metamorphic mineral assemblages- muscovite, sillimanite (var: fibrolite), almandite, diopside and forsterite belong to the almandine-amphibolite facies with 5-7 Kb and 620°C-680°C estimated pressures and temperatures, respectively. The subfacies recognized are the sillimanite-almandine-muscovite subfacies in the northern part and the sillimanite-almandine-orthoclase subfacies in the southern part. The protolith age of the metamorphic rocks is probably Permian to Middle Jurassic, and the major phases of metamorphism may have taken place during Late Eocene and Early Miocene. The intrusion of biotite microgranite into the marbles and calc-silicate rocks of the Kaduda Hill resulted in the formation of skarns. They belong to the Pyroxene-hornfels facies and the estimated pressure and temperature are 2 Kb and 680°C, respectively.

The granitic rocks fall in the granite to alkali granite fields. Moreover, tourmaline granite, pegmatite and biotite microgranite belong to the high-K calcalkaline series, peraluminous in nature, and S-type in origin, partially derived from quartz-feldspar-rich sedimentary rocks. The tectonic environments for these granitic rocks fall within CAG and CCG fields, genetically connected to the earlier and later phases of the subduction-related magmatism. Biotite microgranite probably crystallized at about 23 km, pegmatite segregated at about 22 km and tourmaline granite fractionated at about 20 km, and so the depth of emplacement is estimated at mainly mesozone, and partly epizone. Liquidus temperature for biotite microgranite, pegmatite and tourmaline granite are 660˚C, 630˚C and 620˚C respectively, using the diagram of Piwinskii and Wyllie (1970).

Radiometric dating by zircon U-Pb method indicates that the age of biotite microgranite is 18.43 ± 0.59 Ma (Early Miocene), that of pegmatite is 24.56 ± 0.98 Ma (Late Oligocene), the protolith age of banded biotite gneiss is 38.16 ± 0.93 Ma (Middle Eocene), and that of quartzite is < 166 ± 3 Ma (Middle Jurassic) ie, if the zircon was recycled in this case.

The Pyingyitaung pegmatite occurring as ten bodies can be classified as zoned pegmatite, rare-element type and Complex-lepidolite subtype. Its characteristic features are the abundance of rubellite (both gem-quality and opaque), lepidolite, zinnwaldite and purple apatite generated by pneumatolytic action, and eventually metasomatic alteration.

Key words: Kaduda-Pyingyitaung area; Mogok Metamorphic Belt; gneiss, marbles and calc-silicate units, almandine-amphibolite facies; skarn rocks, pyroxene-hornfels facies; biotite microgranite (Early Miocene); zoned pegmatite (Late Oligocene); S-type granite, mesozone; rubellite