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THE IGNEOUS ROCKS OF THE MOGOK STONE TRACT : THEIR DESTRIBUTIONS, PETROGRAPHY, PETROCHEMISTRY, SEQUENCE, GEOCHRONOLOGY AND ECONOMIC GEOLOGY

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MAY, 2007

ABSTRACT

The Mogok Stone Tract is very famous not only for the finest rubies and spinels but also for gem quality sapphire, peridot, etc. The study area lies in the northeastern part of Mogok Stone Tract covering the Mogok-Kyat-pyin, Bernard-Pyaung-gaung and On-dan areas. It is a mountainous region with two distinct valleys–Mogok Valley and Kyat-pyin Valley. Both valleys were formed by structural and lithologic controls; they are south-plunging synclinal valleys separated by an anticlinal ridge (Baw-padan Anticline). These two valleys contain a large proportion of placer gemstones.

The geology and the rock sequence of the area modified from some previous works, and three new geological maps are presented. The rock sequence of the major rock units established is (from older to younger): Mogok metamorphics (metamorphosed Lower Paleozoic rock units–metamorphic age Late Oligocene), ultramafic and mafic rocks (Jurassic?), leucogranite (Early Oligocene), syenitic rocks (Late Oligocene), Kabaing Granite (Middle Miocene), and pegmatites and aplites (Middle Miocene).

On the basis of detailed microscopic observations, modal analyses, and normative calculations, the various igneous rocks types according to IUGS and Williams et al. classifications are dunite, harzburgite, pyroxene peridotite, and hornblende peridotite for ultramafic rocks; quartz syenite, alkali-feldspar syenite, nepheline syenite, alkali-felspar syenite pegmatite, and quartz monzonite for syenitic rocks; urtite, ijolite, and jacupirangite for urtite series; augite-biotite granite, leucogranite and biotite microgranite (Kabaing Granite) for granitic rocks; pegmatites and aplites. The pegmatites are complex, belonging to rare-element class, beryl type.

On the basis of petrogenetic interpretations the igneous rocks of the area are mainly calc-alkaline and only partly alkaline. This is also evident from the bimodal distributions of the petrochemical data plots. The value of alkali-lime index (Peacock index) is 55 for the igneous rocks of the area, indicating the calcic to alkalic-calcic character in this area. ACF diagram and some distinctive chemical properties of the granitic rocks of the area indicate that these granitic rocks are mostly S-type granites.

In K_2O mol. vs Na_2O mol. variation diagram, the plots of leucogranite, biotite microgranite and pegmatite fall in the field of late-kinematic granite. According to the petrochemical data, the granitic rocks of the area may be regarded as continental collision granites.

In the alkaline rocks of the area, the $(Na_2O+K_2O)/Al_2O_3$ ratio is less than 1, thus according to Hyndman classification (1985), these alkaline rocks fall in the miaskitic type, i.e., not peralkaline. The origin of nepheline syenite as small irregular bodies in the marginal zones of Mogok marbles near the contact with leucogranite (as in the Thurein Taung area) or with syenite (as in the area northwest of On-dan) can be explained by the well-known limestone syntexis model. In a similar way the rocks of the urtite series may have been formed by the assimilation and desilication of the leucogranite or syenite in contact with mafic-rich marbles.

The ultramafic rocks occur as layered intrusions in garnet-biotite gneiss in Bernard-Pyaung-gaung area. The ultramafic rocks of the area are considered to be not related to an ophiolite suite, because of the absence of bedded chert, pillow lavas, basalt-diabase sheeted dyke swarms, and large-scale serpentinization.

Field and petrochemical data suggest that the leucogranite and syenitic bodies intruded forcefully along a highly deformed zone roughly extending NE-SW. The depth of emplacement is estimated to range from katazone to mesozone. Kabaing Granite which is a large microgranite body intruded later at a shallower depth.

Radiometric dates of zircon in four rock samples by U-Th-Pb method give 129± 8.2 Ma (Early Cretaceous) for augite-biotite granite, 32± 1 Ma (Early Oligocene) for leucogranite, 25 Ma (Late Oligocene) for foliated syenite, and 16± 0.5 Ma (Middle Miocene) for painite from the contact zone between leucogranite and marble.

It has been observed that the syenitic rocks and pegmatites are especially important for the formation of precious gemstones of the area. The important gemstones with regard to the various igneous rock types are aquamarine, topaz, danburite, amethyst, moonstone, zircon in pegmatites, sapphire in syenite pegmatites, peridot in peridotite, and painite in leucogranite (contact zone).