

**MINERALOGY AND PETROLOGY OF THE  
IGNEOUS AND METAMORPHIC ROCKS OF THE  
MOUNT LOI-SAU AND ITS ENVIRONS,  
MOMEIK TOWNSHIP, SHAN STATE (NORTH)**

**PhD DISSERTATION**

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## ABSTRACT

The study area is situated in the remote area between Mogok Township, Mandalay Region and Momeik Township, Shan State (North), on either side of Mogok-Momeik motor road. The study area, which is a segment of the Mogok Metamorphic Belt, is mainly composed of metamorphic rocks, granitic and syenitic rocks.

The main purpose of this study is to constrain metamorphic  $P$ - $T$  paths of the study area based on detailed petrographic observations, bulk-rock chemistry of XRF and mineral geochemistry of EPMA using phase equilibria modelling.

Igneous rocks are minor intrusions which occur as small outcrops within the study area, but they should be makeweights because  $P$ - $T$  condition of the study area is determined only on a metamorphic basis. The metamorphic rocks covered about 90% of the whole area and they are sillimanite-garnet-biotite $\pm$ ilmenite gneiss, garnet-biotite gneiss, spinel-diopside-forsterite-phlogopite $\pm$ graphite marble, white marble and calc-silicate rocks.

A new contribution of felsic and mafic granulitic rocks are observed in the study area. It is characterized by a mineral assemblage that was developed under high-grade metamorphic conditions. Taking the metamorphic rock units of the study area into consideration, granulitic rock is fairly exposed and it is associated with sillimanite-garnet-biotite gneiss and intruded by syenitic and granitic rocks. Granulite can be subdivided into two distinct units based on pyroxene percentage (< and > 30%); felsic granulite (<30%) (sapphirine-hypersthene-garnet-biotite granulite) and mafic granulite (>30%) (pyroxene granulite), respectively.

$P$ - $T$  calculation indicates sillimanite-garnet-biotite gneisses in the study area have reached up to granulite facies (740-810 °C & 6.2-9.3 kbar), characterized by the mineral assemblages and petrochemical results from EPMA and XRF. The  $P$ - $T$  condition of granulitic rocks in the study area should probably be the same as and/ or greater than the  $P$ - $T$  condition of the high-grade gneiss of the study area, according to the mineral assemblages of orthopyroxene + garnet + sillimanite + sapphirine + hercynite in felsic granulite and that of clinopyroxene + biotite + plagioclase in mafic granulite. In the study area, sapphirine + hercynite + silica of granulite also indicate that it probably perform as ultra-high temperature mineral assemblage leading finally

to an ultra-high temperature metamorphism (UHT) of Mogok Metamorphic Belt (MMB).

There are some gem worksites in the study area both active and non-active mines. Original source of *insitu* has not enough been found yet. Gem minerals are found in alluvial deposit and alluvial sediments at gem worksites and also in the creeks. In the study area, sapphire is usually found in association with garnet, spinel, aquamarine, zircon, tourmaline, moonstone, chalcedony, jermitejevite and other precious gems as economic possibilities.