Petrology of the Metasedimentary rocks in Mehaw Chaung Area, Lewe Township, Mandalay Region

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Abstract

Mehaw Chaung area is situated in Lewe Township, Mandalay Region. Most of metasedimentary rocks are mainly distributed in the study area. Schist unit is exposed in the western part and gneiss unit in the eastern part of Mehaw Chaung area. The schists can be subdivided into quartz-sericite schists, sericite schists, muscovite-sericite schists, quartzitic schists, sillimanite schists, quartzite (partly silicified and chlorite) and low grade metamorphosed limestone and metagraywacke. In the eastern part, the exposed metamorphic rock is biotite gneiss. There can be observed two types of metamorphism in the study area. They are regional and contact metamorphism. Regional metamorphism can be studied and widespread occurrences in the study area. Contact metamorphism can also be studied and locally distributed in the study area. According to the mineral assemblages, they are used to define the metamorphic grade and facies. The type of metamorphism in the study area reached in low to medium grade, lower greenschist to lower amphibolite facies.

Keywords: Mehaw Chaung, Lewe Township, Metasedimentary rocks, Metamorphism

INTRODUCTION

Location

Mehaw Chaung area is located in south - east of Lewe in Lewe Township, Mandalay Region. Tectonically it is situated at the western margin of the eastern High land. It lies within latitudes 19º 32' 30" N to 19º 34' 30" N and longitudes 96º 22" 40" E to 96º 25' 25" E. The area is bounded by vertical grids 700 to 740 and horizontal grids 850 to 900, in one inch scale topographic map reference of 94 A/6 (Fig.1). It covers about 2.5 miles (4.35 km) long in length of east-west direction and 2.2 miles (3.54 km) width of north-south direction. So, the total area coverage is about 5.94 square miles (15.399 sq km).

Physiography

The study area lies within the western margin of the eastern highland and the eastern part of the Sittaung Valley. In the study area, the highest peak is Saingtamau 1840' in the northern part and Taungphila is about 1052' in the southern part. In the study area, the dendritic drainage pattern and trellis pattern are commonly developed. Mehaw Chaung is main stream of the study area and it flows from north to south. Mehaw Chaung is finally flowing into Paung Laung River (Upper portion of Sittaung River) which is situated in the west of the study area. Nanpon Chaung, Salu Chaung and Tashwe Chaung are small streams in the study area and these are tributaries of Mehaw Chaung.

REGIONAL GEOLOGIC SETTING

Morphotectonically, Myanmar has been divided from west to east into four major units named the Arakan Coastal Belt, Western Fold Belt, Central Cenozoic Belt and the Shan-Tanintharyi Massif (Ba Than Haq, 1981). Regionally the study area is situated within the western margin of Shan-Tanintharyi Massif, a part of the Sino-Burma Ranges which has become a stable block at the end of Mesozoic. On the other hand, the study area lies between two major fault zones, the Sagaing Fault zone in the west and the Shan Scarp Fault zone in

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the east. So, the area lies between two shear zones and it can be strongly deformed and associated with large scale emplacement of granite and related rock types.

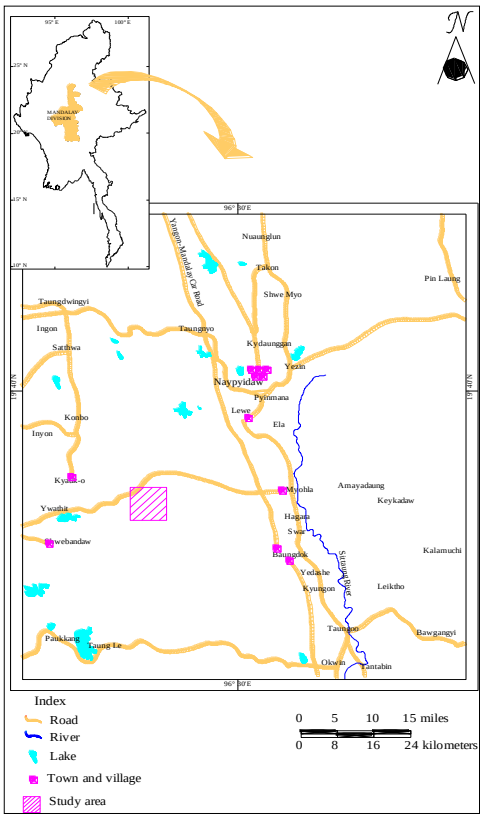


Figure (1). Location map of the study area.

This area also falls within the Central Granitoid Belt of Burma (Khin Zaw 1990) usually associated with tin and tungsten mineralization probably the age of late Cretaceous to Early Eocene. This graitoid belt is the northern continuation of W-Sn bearing granite of the Tanintharyi area which is known as the western Tin Belt of South East Asia Tin Province (Haq 1970, Mitchell 1977, Maung Thein 1983, Nyan Thin 1984). The generalized regional geology of the study area and its environs is excerpted from the one million scale geological map of the Burma (Fig.2).

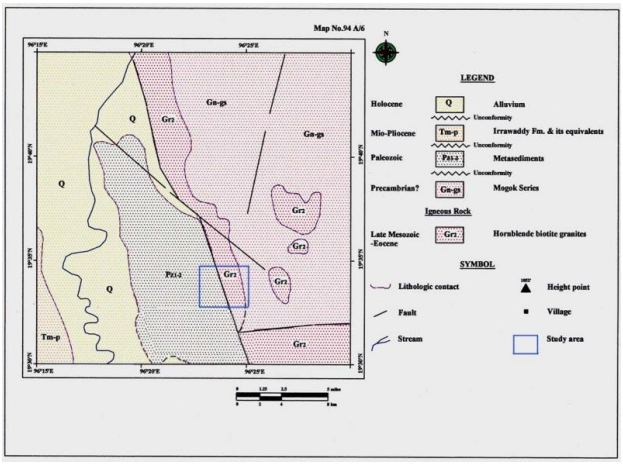


Figure (2). Regional geological map (From Geological Map of Myanmar, 1977).

PETROLOGY

In the study area, there are two units of undifferentiated metamorphic rocks and metasedimentary rocks.

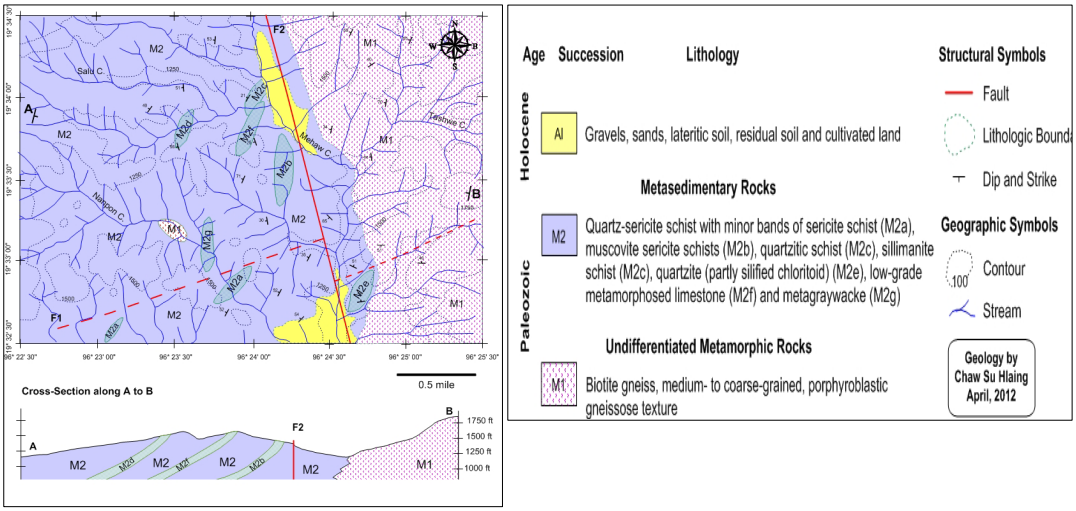


Figure (3). Geological map of the study area.

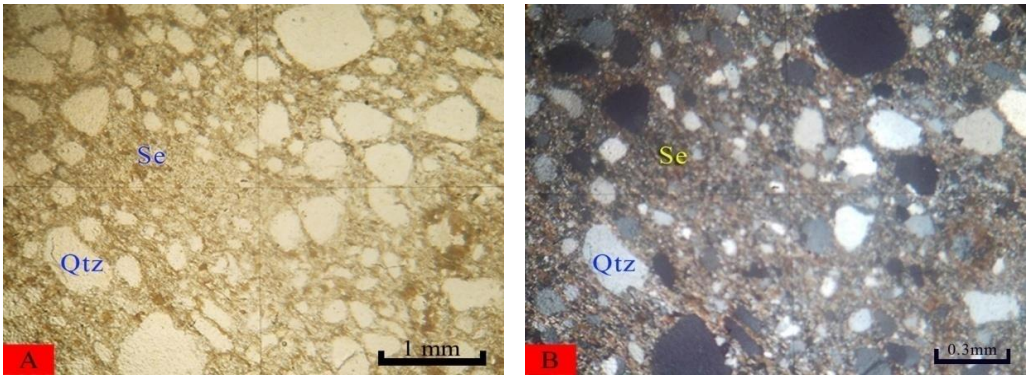
Quartz-sericite schist

It is widely distributed in the western part of the study area (Fig. 4 & 5). The weathered color is grey and fresh color is reddish brown. The rocks show fine to medium–grained, schistose texture. The mineral compositions are quartz, sericite and a few amount of biotite.

Microscopic Study

Microscopically, quartz sericite schists mostly contain quartz about (42%), sericite about (38%), biotite about (15%) and opaque mineral (5%). The texture is fine to medium-grained, porphyroblastic lepidoblastic schistose texture (Fig. 6). Quartz shows subhedral to anhederal grains which are elongated along the foliation. The bending of minerals is caused by stress. Quartz crystals occur as porphyrblasts. Sericite is made up of about 42%. The flaky mineral of sericite shows the foliation of the rock in this unit. Biotite shows pleochroism from light yellow to dark brown. Biotite gives in parallel extinction and some biotite minerals alter to sericite.

Figures (4 & 5). Well exposed nature of Quartz-sericite schist, near Nanpon Chaung, Looking W, Location 19º33′12.2″N,96º 23′28.4″ E.



Figures (6). Photomicrograph of porphyroblast quartz (Qtz) in quartz-sericite schist.

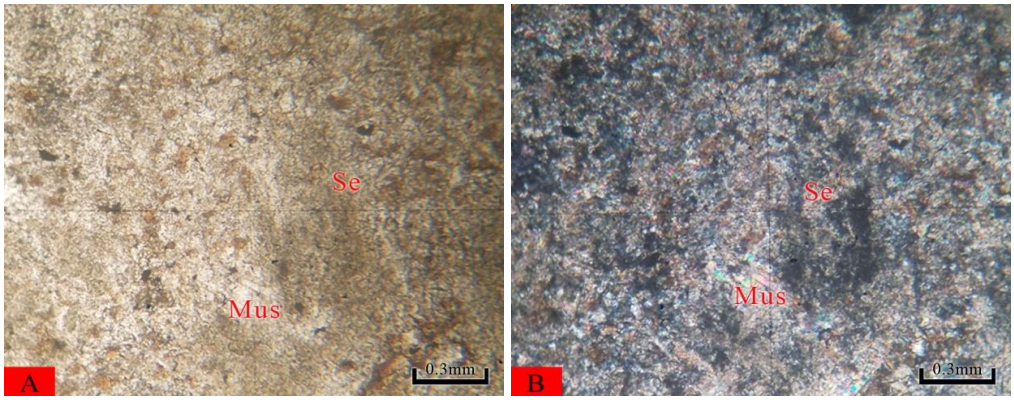
Sericite schists

Sericite schists are widely distributed in the western part of the Mehaw Chaung area. It is mainly composed of sericite, quartz and minor amount of biotite and muscovite. The rock show fine-grained, schistose texture (Fig.7). It shows grey color on weathered surface and yellowish brown color on fresh surface. The rocks show highly jointed and foliated nature.

Microscopic Study

Sericite schists mainly consist of sreicite (50%), quartz (30%), biotite (15%) and muscovite (5%). The texture is fine-grained, schistose texture (Fig.8). Sericite is made up of about 50%. It is minute muscovite mica and show sub-parallel to parallel alignments causing schistose foliation. The biotite shows strong pleochroism from light yellow to dark brown.

Figure (7). Exposure nature of sericite schist body near Mehaw Chaung.



Figures (8). Photomicrograph of muscovite (Mus) and sericite (Se) in sericite schists.

Muscovite sericite schists

Muscovite sericite schists are poorly exposed in the north-western part of Mehaw Chaung area (Fig.9). The weather color is grey and fresh color is whitish brown. It shows fine-grained, schistose texture. The main constituent minerals are quartz and mica.

Microscopic Study

The texture is fine to medium-grained, schistose texture. It is mainly composed of muscovite, sericite and minor amount of quartz and biotite. Muscovite made up of about 38%. It gives long prismatic form (Fig.10) and one set perfect cleavage and parallel extinction. Sericite is made up of about 32% and colorless. The flaky mineral of sericite shows the foliation of the rock in this unit. Biotite is strong pleochroism from light yellow to dark brown.

Figure (9). Exposure nature of muscovite-sericite schist, near Mehaw Chaung, looking NW, location- 19º 33′ 38.7″N, N 96º 24′ 11.4″E.

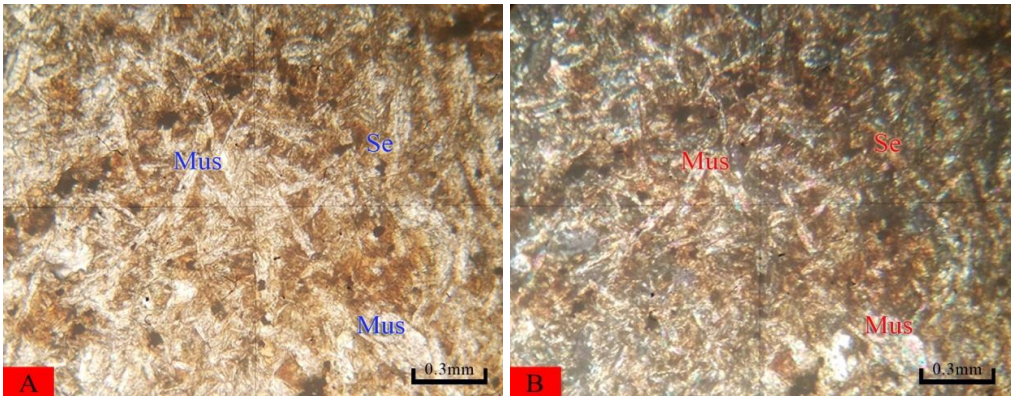


Figure (10). Photomicrograph of muscovite (Mus) and sericite (Se) in muscovite sericite schists Location N 19° 33' 38.7″ E 96° 24′ 11.4″.

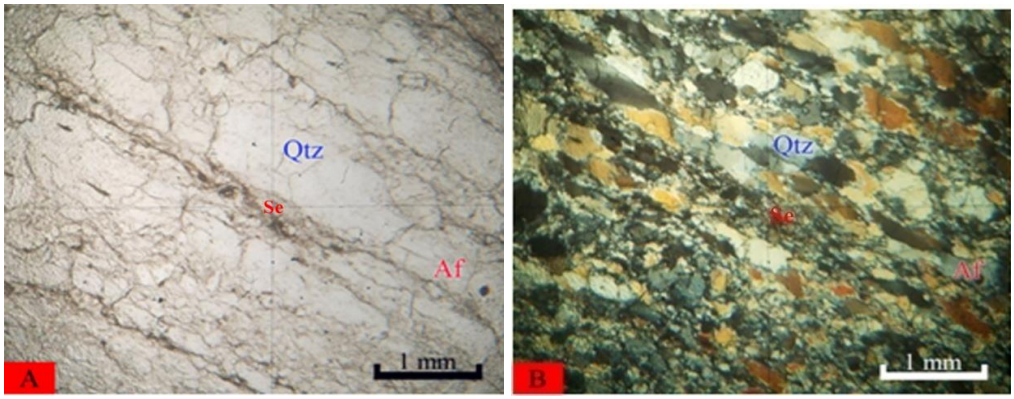
Quartzitic schists

It is poorly distributed in the north-western part of the study area (Fig.11). The weathered color is reddish brown and fresh color is yellowish white. It is fine to medium-grained, schistose texture and mainly composed of quartz, feldspar and mica. Quartz and alkalifeldspar occurred as well as foliations, and nature of grain boundaries is interlocking.

Figure (11). Showing the exposure nature of quartzitic schist body, near Tashwe Chaung, Looking- E, Location- 19˚ 33′ 55.8″N, 96˚ 24′ 49.2″E.

Microscopic study

The texture is fine to medium-grained, nematoblastic schistose texture (Fig.12). It consists of quartz, alkalifeldspar and minor amount of sericite and plagioclase feldspar. Quartz made up of about 70%. Most of the quartz grains are wavy extinction. Alkalifeldspar is anhedral to subhedral grains and these are orthoclase and plane perthite. Orthoclase can be recognized by simple or contact twin. Sericite shows sub-parallel to parallel alignments causing schistose foliation and it gives second order interference color and parallel extinction. A few amount of plagioclase are subhedral form and polysynthetic twinning.



Figures (12). Photomicrograph showing the quartz (Qtz), sericite (Se) and alkalifeldspar (Af) in quartz schists : Location- 19˚ 32′ 57.6″ N, 96˚ 24′ 49.2″ E.

Sillimanite schists

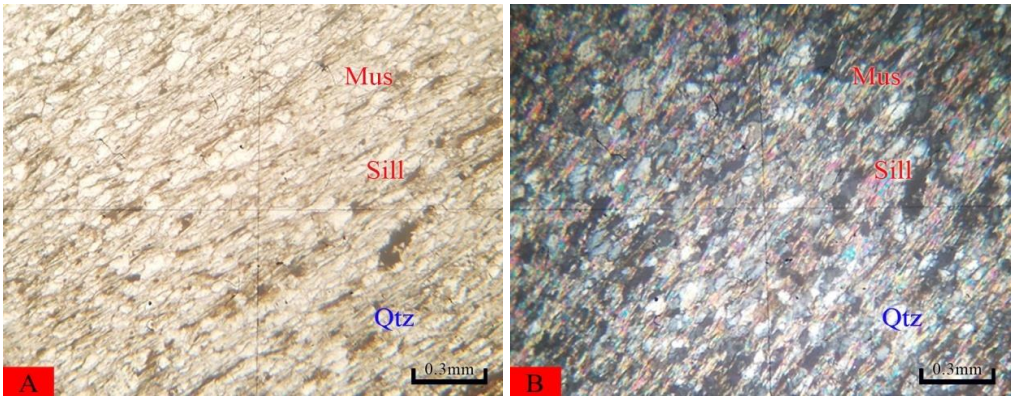
Sillimanite schists are poorly exposed in the western part of the study area, near Salu Chaung (Fig.13). Grey color on weathered surface and brownish grey color on fresh surface. It is fine-grained, schistose texture. It is highly exposed and well jointed nature. The mineral compositions are quartz, sillimanite, muscovite and a few amount of chlorite.

Microscopic study

It shows fine-grained, schistose texture and mainly composed of quartz, sericite, biotite, muscovite, sillimanite and chlorite. Muscovite made up of about 26%. It gives long prismatic form in this unit (Fig.14). Sillimanite is made up of about 20%. It can be recognized by moderate to high relief and second order interference color. It is also a fibrous form and gives parallel extinction. The flaky mineral of sericite shows the foliation. Biotite is strong distinct pleochroism from light yellow to dark brown colour.

The edges of some biotites are altered to chlorite. It occurred in a fibrous elongated form. Chlorite is green or greenish color in under PPL. Chlorite is low to moderate relief and first order grey color.

Figure (13). Sillimanite schist body exposed near Salu Chaung, Looking- S, Location- 19˚ 33′ 55.9″ N, 96˚ 23′ 26.5″ E.



Figures (14). Photomicrograph of sillimanite (Sill), biotite (Bi), muscovite (Mus), quartz (Qtz) in sillimanite schists.

Quartzite

Quartzite can be subdivided into three units: as; they are Quartzite, Silicified quartzite and Chlorite quartzite. They are poorly distributed in the south-eastern part of the study area and near Mehaw Chaung (Fig.15 & 16). Outcrops are highly weathered in this unit. The weather color is buff color and fresh color is yellowish white. It is mainly composed of medium to coarse-grained, foliated xenoblastic granular texture of quartz and minor amount of biotite, feldspar and chlorite. It is hard and compact, highly jointed and well exposed.

Microscopic study

The texture is fine to medium-grained, foliated xenoblastic granular texture. The main constituents minerals are quartz and minor amount of alkalifeldspar, chalcedony, biotite and chlorite (Fig.17). Quartz shows anhedral grains. Most of the quartz grains give wavy extinction, marginal granulation. Nature of grain boundaries is interlocked and slightly moderate brecciation. Most of the quartz grains are wavy extinction and some are normal extinction. Alkalifeldspar is colorless (cloudy) and shows low relief. Chalcedony is colorless to pale brown color (Fig.18). Biotite is major mafic mineral, occurring in this rock anhedral to subhedral grains. It is strong pleochroism from pale yellow to brown color. Chlorite is green or greenish color in under PPL.

Figure (15). Photograph showing the exposure of silicified quartzite body, near Mehaw Chaung. looking E, Loc: 19° 32′ 57.4″ N, 96° 24′ 33.4" E.

Figure (16). Photograph showing the exposure of chlorite quartzite body, near Mehaw Chaung, looking-N, location-19° 32′ 47.6″ N, 96′ 24′ 37.5″E .

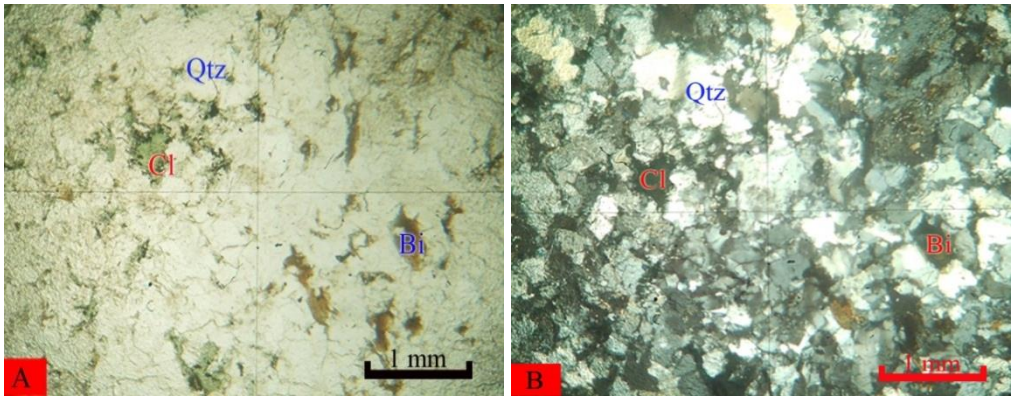


Figure (17). Photomicrograph of chlorite (Cl), biotite (Bi) and quartz (Qtz) in chlorite quartzite, Location: 19° 32' 50.8″N, 96° 24′ 41.0″ E.

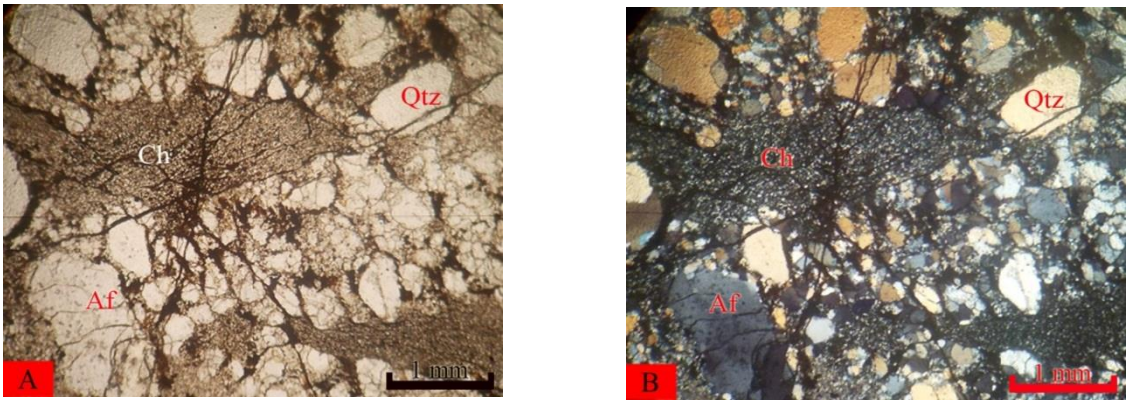


Figure (18). Photomicrograph of chalcedony (Ch) quartz (Qtz) in silicified quartzite. (Location: 19° 32' 57.6″N, 96° 24′ 49.2″ E).

Low grade metamorphosed Limestone

This rock unit is locally distributed in the western part of the study area (Fig.19). It shows fine to medium-grained, crystalline texture and mainly composed of calcite, quartz and minor amount of epidote, actinolite and biotite. The rocks are highly weather exposed in nature.

Microscopic study

The texture is fine to medium-grained, crystalline texture. Calcite is colorless and sometimes shows anhedral to subhedral grains and fine to coarse aggregates. Its distinct optical properties are twinkling effect, high relief, fourth order interference color and symmetrical extinction. It shows polysynthetic twinning and rhombohedral cleavage (Fig.20).

Actinolite is long prismatic crystal and columnar to fibrous aggregates. It shows fairly high relief, second order interference color and inclined extinction. An extinction angle is 20º. Epidote can be seen in granular to columnar aggregate.

Figure (19). Photograph showing the exposure nature of low grade metamorphosed limestone, Looking-W, Location: 19º33′49.8″N, 96º 24′05.9″E.

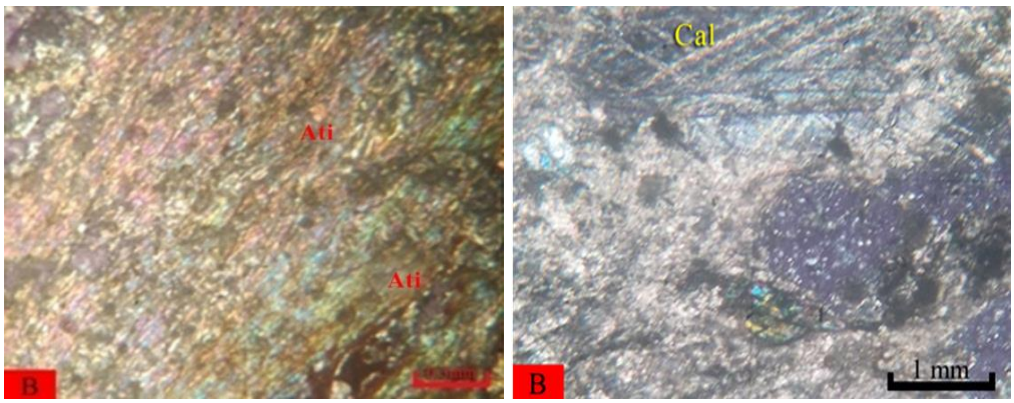


Figure (20). Photomicrograph of calcite (Cal), epidote (Ep), actinolite (Ati) and quartz (Qtz) in low grade metamorphosed limestone; Location: 19° 33' 49.8″ N, 96° 24′ 05.9″ E.

Metagraywacke

This rock unit is locally distributed in the western part of the study area (Fig.21). The weather color is grey and fresh color is whitish grey. It shows fine to medium-grained, clastic texture and mainly composed of quartz and biotite mica. The rocks are highly weather exposed in nature.

Microscopic study

It is moderately hard and compact in nature. It is mainly composed of quartz and mica. Quartz shows subhedral to anhederal grains which are elongated along the foliation. The wavy extinction is common. The bending of minerals is caused by stress (Fig.22). It can be characterized by low relief, colorless (clear), absence of cleavage and alteration. Quartz crystals occur as porphyroblast. Sericite is made up of about 42%. The flaky mineral of sericite shows the foliation of the rock in this unit. It shows second order interference color and parallel extinction between crossed-nicols. Biotite shows pleochroism from light yellow to dark brown. Biotite gives sin parallel extinction and second order interference color.

Figure (21). Photograph showing the close-up view exposure nature of Metagraywacke, near Nanpone Chaung, Looking-W, Location-19˚ 33′ 12.2″ N, 96˚ 23′ 38.4″ E.

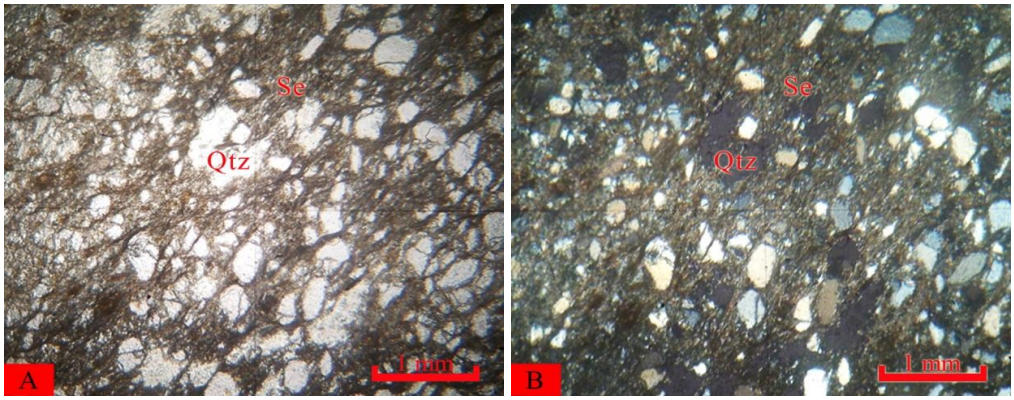


Figure (22). Photomicrograph of quartz (Qtz) and sericite (Se) in quartz sericite schists (Location: 19° 33' 55.1″ N, 96° 22′ 57.5″ E).

Biotite Gneiss

Gneiss is widely distributed in the eastern part of the study area. Weather color is grey and fresh color is whitish grey (Fig.23). They are medium to coarse-grained, gneissose texture and show foliated nature. The mineral compositions are quartz, alkalifeldspar, biotite and minor sphene. This rock unit is highly well exposed and it gives distorted quartz vein and gneissosity.

Microscopic study

It is medium to coarse-grained, gneissose texture. Alkalifeldspar is colorless (cloudy) and shows low relief. It shows first order interference color and parallel extinction. It is anhedral to subhedral grains and these are orthoclase, microcline and perthite. Orthoclase can be recognized by simple or contact twin and perthitic alkalifeldspar display various perthitic texture. Microcline shows cross-hatch twinning. Alkalifeldspar occurs as porphyroblasts.

Quartz made up of about 23%. It normally occurrs as anhedral grains. It gives first order grey or yellow color. Most of the quartz grains are wavy extinction. Cracks are common in quartz grains and brecciation in marginal granulation.

A little amount of biotites are anhedral to subhedral grains. It is strong pleochroism of light yellow to dark brown. The edges of some biotites are altered to chlorite. It gives long prismatic form. A little amount of plagioclase is subhedral to subhedral grain. It is

characterized by polysynthetic twin (Fig.24). Plagioclase ranges from An_{31} to An_{50}. Sphene may appear as brown color, subhedral form, high relief and shows fourth order interference color and strong birefringence. It is neutral to brownish color which is found as accessory minerals.

Figure (23). Photograph showing the exposure nature of biotite gneiss body, east of Mehaw Chaung, Looking-N, Location - 19˚ 32′ 16.8″N, 96˚ 24′ 46.6″ E.

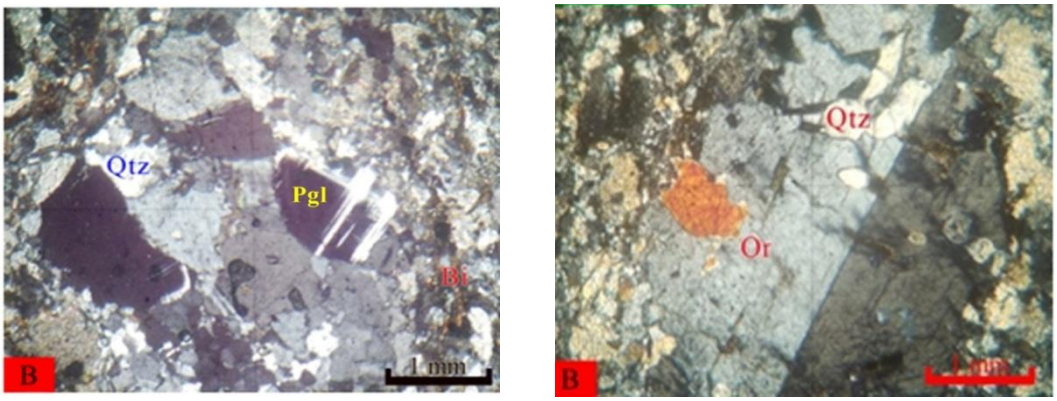


Figure (24). Photomicrograph showing the quartz (Qtz), biotite (Bi) and plagioclase (Pgl), Orthoclase (Or) in biotite gneiss. Location 19˚ 32′ 30.0″ N, 96˚ 24′ 46.6˚ E.

CONCLUSION

The study area is situated in Lewe Township, Mandalay Region. The study area is occupied by metasedimentary rocks and undifferentiated metamorphic rocks. Metasedimentary rocks consist of quartz-sericite schists, sericite schists, muscovite sericite schists, quartzitic schists, sillimanite schists, quartzite (partly silicified and chlorite) and low grade metamorphosed limestone and metagraywacke. Undifferentiated metamorphic rocks include gneiss and biotite gneiss. They are regional metamorphism and contact metamorphism. Regional metamorphism can be studied and widespread in the study area. Contact metamorphism can also be studied and locally distributed in the study area. Although the surface exposure of igneous rocks cannot be found in the study area, the contact metamorphic assemblage has been locally encountered at the Salu Chaung, N 19º 33′ 55.9″ to E 96º 23′ 26.5″ and near Mehaw Chaung, N 19º 33′ 49.8″ to E 96º 24′ 30.4″. According to the mineral assemblages of schists units and gneiss units, the study area falls in low to medium grade, lower greenschists facies to lower amphibolite faies.

Acknowledgements

We would like to express our profound thanks to Dr Tin Htwe, Reactor, and Dr Theingi Shwe, Pro-Rector, Hinthada University, for their kind permission and encourangement to carry out this work. We are indebted to Dr Theingi Kyaw, Professor and Head of the Department of Geology, Hinthada University, for her enthusiastic reading and comments on this work.

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