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PETROGRAPHIC DESCRIPTION OF IGNEOUS ROCKS OF THE ASIN AREA, YE TOWNSHIP, MON STATE

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Abstract

The research area is situated 9.6 km to the Southwest of Ye. The structural trend of research area is generally N-S to NNW-SSE. It is mainly composed of igneous rocks such as diorite, porphyritic biotite granite, biotite granite, biotitemicrogranite, microdiorite dyke and pegmatite dykes. Hypidiomorphic granular texture is found in all units of the research area. In granitic rocks, quartz, orthoclase, biotite and plagioclase are major constituents. Zircon, sphene, apatite and opaque are minor constituents. Feldspar occurs as phenocrysts. Biotite was altered to chlorite along the cleavage planes and some are bent due to deformationin porphyritic biotite granite. Hornblende is the chief mafic mineral in diorite. In microdiorite dyke, biotite is main mafic mineral and altered to chlorite. In IUGS classification, biotite granite and porphyritic biotite granite fall in syeno granite and diorite falls in quartz monzodiorite fields. Igneous rocks can be used as construction and road materials and decorative stones.

Key word: Porphyritic biotite granite, biotite granite, diorite, biotitemicrogranite, microdiorite dyke.

Introduction

The research area is Asin Area in Ye Township. It lies between Longitude 97° 43' 40" E to 97° 48' 15" E and Lattitude15° 11' 45" N to 15° 15' 00" N in one inch topographic map No. 95E/11 and 95E/12. The area coverage is about 40.32 Km^2. The location map of the research area is shown in Figure (1).

Regional Geologic Setting

The granitic body of the research area is trending nearly N-S. Igneous rocks in study area presents in Tenasserim granitoids of the Sino-Burman Ranges, Bender (1983). It also liesin the Central Granitoid Belt. The granitoid rocks in the Central Granitoid Belt were possibly emplaced during continent-arc collision at the early stage of westward migrating, east-dipping subduction

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zone during the Late Mesozoic and Early Eocene (KhinZaw, 1990).Three Pagoda Fault lies in the northeasternpart of the research area. It is a major sinistral shear zone and composed of high-grade metamorphic rocks, (Morley 2002). The study area is underlain by Paleozoic metasedimentary rocks of Mergui Group and Mesozoic to Tertiary igneous intrusions, Figure (2).

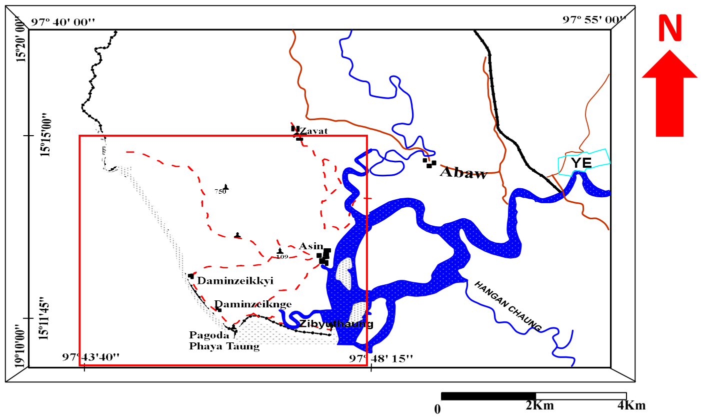


Figure 1. Location map of the research area

Geology of Research Area

The geological map of the research area is shown in Figure (3). The research area is mainly composed of igneous rocks. Biotite granites are the most abundant rock type of the research area. It is well exposed at the rock mine and central part of the study area, Figure (4-a). Porphyritic biotite granite is second widely exposed rock type. It occurs in the central part of the researcharea, Figure (4-b). Biotitemicrogranite is common at the Myintmotaung and Phalaingtaung, Figure (4-d). Diorite is exposed near Chaungwa, Figure (4-e). Microdiorite is exposed as dyke intruding the porphyritic biotite granite. It can be seen at Kyanbid Monastery, Figure (4-f). Quartz veins are common in all rock units of the research area. Especially, it can be found at Phayar Taung, Figure (4-c).Biotite Microgranite is intruding porphyritic biotite granite at the Phayartaung. It indicates that the porphyritic biotite granite is older than biotitemicrogranite, Figure (5-a). Biotite granite is intruding into porphyritic biotite granite located 15° 11' 52.6" N and 97° 46' 04.1" E. It again indicates that the biotite granite is younger than the porphyritic biotite granite, Figure(5-b).Porphyritic biotite granite intruded by microdiorite dyke at Kyainbid Monestry. It indicates that the microdiorite dyke formed later than porphyritic biotite granite, Figure (5-c). Porphyritic biotite granite intruded into diorite and shows that diorite is older than porphyritic biotite granite. Quartz veins cut all the igneous rocks. These dykes and veins can be considered to have occurred in the last phase of the igneous activity, Figure (5-d).

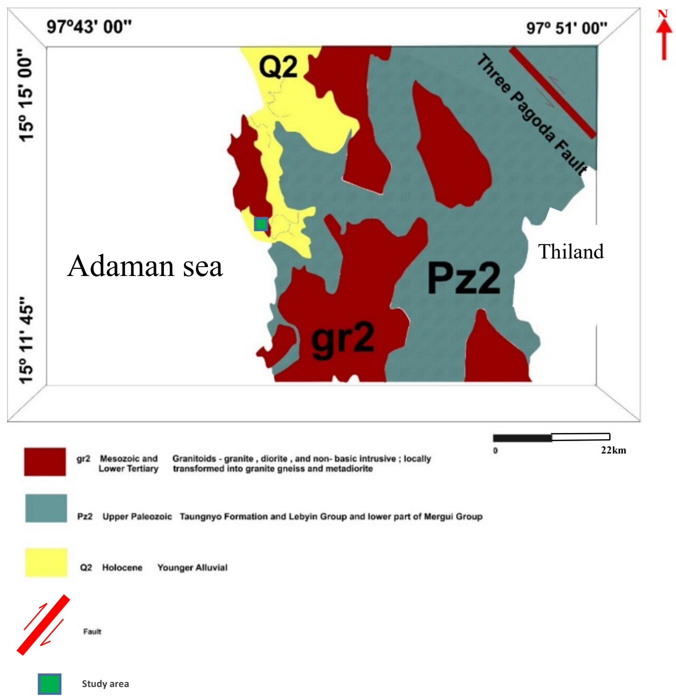


Figure 2. Regional geological setting of the research area and its environs.(Myanmar Geoscience Society, 2014(1:2000000)

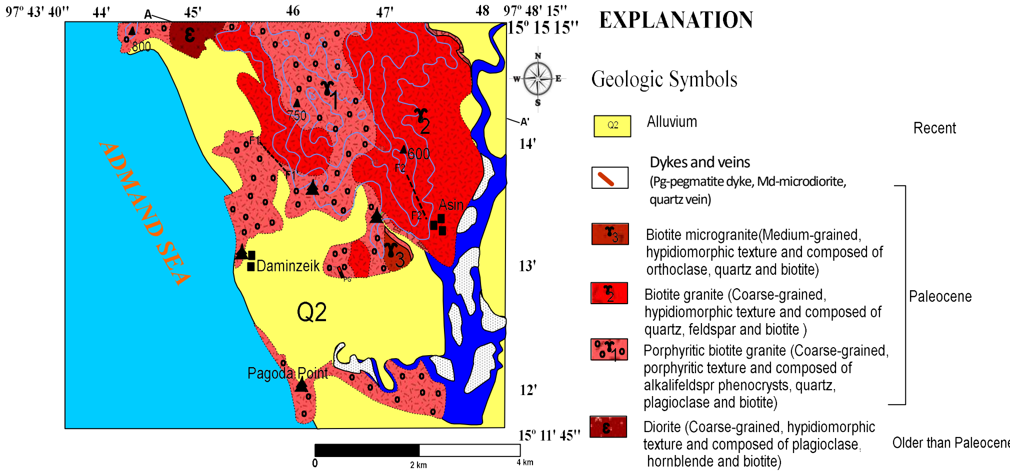


Figure 3. Geological map ofAsin Area, Ye Township (After Aye Nyein Thu, 2017).

Rock Sequence of the research area

Rock Type	**Possible Age (After PhyoThinzarTun, 2016)**
Alluvium	Quaternary
Dyke and Vein	
Quartz Vein and Pegmatite dyke	
Microdiorite Dyke	
Igneous Rocks	
Biotitemicrogranite	Paleocene
Biotite Granite	
Porphyritic Biotite Granite	
Diorite	Older than Paleocene

Figure (4-a) Segregation of mafic minerals in biotite granite at rock quarry, (Looking -165˚).

Figure (4-b) Outcrop nature of porphyritic biotite granite at Phayartaung, (Looking-60˚).

Figure (4-c) Quartz vein in porphyritic biotite granite at Phayartaung (Looking 140˚).

Figure (4-d) Rectangular joint on biotitemicrogranite at Kannar Monastery, (Looking-, 65˚).

e

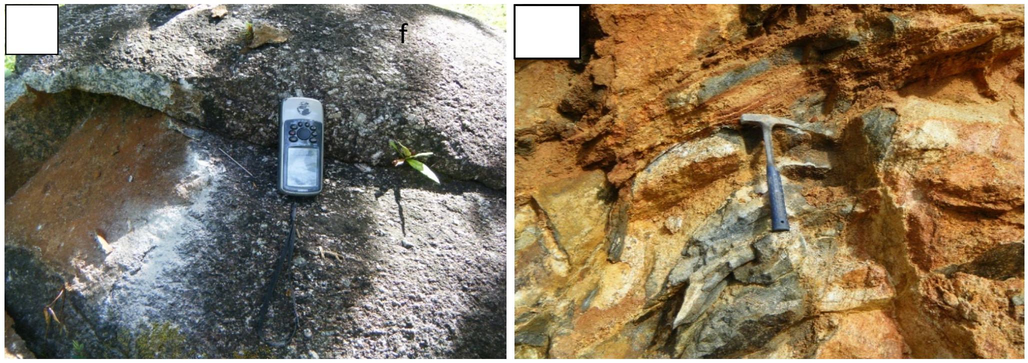


Figure (4-e) Well exposed diorite outcrop at Chaungwa, (Looking-103̊).
Figure (4-f) Outcrop nature of microdiorite dyke at Kyanbid Monastery (Looking- 110̊).

a

c

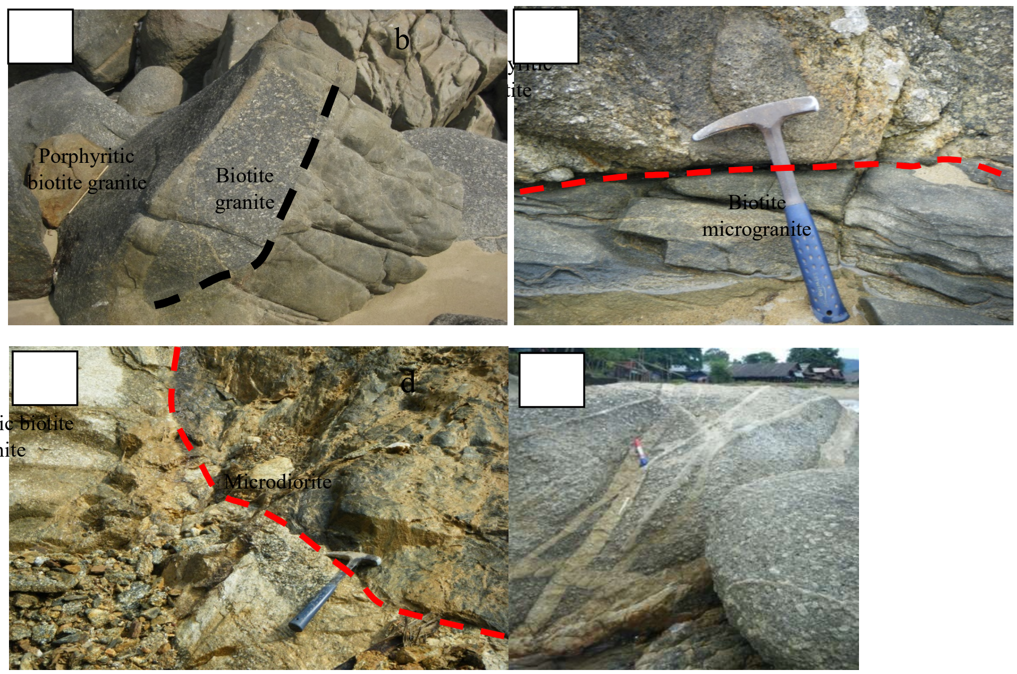


Figure (5-a) Biotite granite intruding porphyritic biotite granite at Phayartaung.
Figure(5-b) Biotitemicrogranite intruding porphyritic biotite granite at Phayartaung.
Figure (5-c) Microdiorite dyke intruding porphyritic biotite granite at Kyainbid Monastery.
Figure (5-d) Quartz veins cutting across porphyritic biotite granite.

Petrography of Igneous Rocks

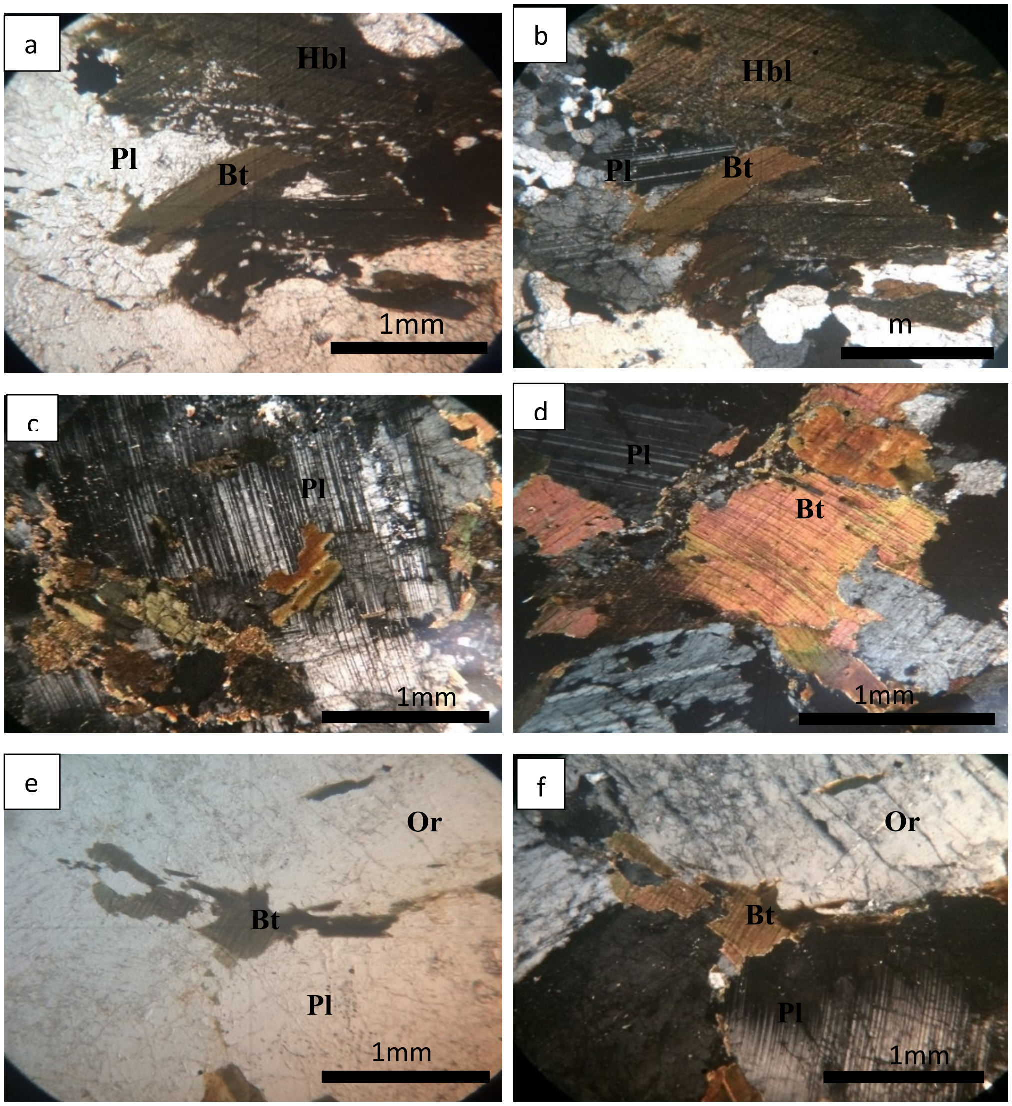
Igneous rocks in the research area are diorite, porphyritic biotite granite, biotite granite and biotite microgranite. Point counting data from the representative samples were plotted in IUGS classification diagram, Table (1) and Figure (9). According to this classification diagram, biotite granite and porphyritic biotite granite fall in syeno-granite and diorite falls in quartz monzodiorite fields.

Diorite is mainly composed of plagioclase, hornblende, biotite and minor amounts of quartz, orthoclase and perthite. Plagioclase occurs in subhederal to euhedral forms with average grain size of 1mm x 2mm. The compositional range of plagioclase is from An_{37} to An_{40}(andesine).Sometime, plagioclase shows the combination of simple contact twin and polysynthetic twin. Hornblende, zircon and opaque minerals occur as inclusion in plagioclase. Hornblende is the chief ferromagnesium mineral and occurs as subhedral to euhedral form with 0.5mm x 3mm. Zircon and opaque minerals also occur as inclusion in hornblende crystals. Biotite shows subhedral to euhedral form and average grain size of 0.5mm x 1mm.Some biotite alters to chlorite. Quartz occurs as anhedral grain and as interstitial fillings between plagioclase, hornblende and biotite, Figue (6-a, b, c, d).

Porphyritic biotite graniteis mainly composed of alkali feldspar (orthoclase, microcline and perthite) pheocrysts, quartz, plagioclase and biotite. In porphyritic biotite granite, perthitic orthoclase shows euhedral form and the average grain size is 4mm x 8mm.Orthoclase occurs as irregular interlocking mosaic. Perthite; flame perthite are present. Microcline shows cross-hatched twinning. Alkali feldspars are very abundant and found as phenocrysts. Some alkali feldspar altered to sericite. Quartz shows anhedral form and wavy extinction. Biotite is pleochroic from light yellow to brown. It is altered to chlorite along the cleavage planes and some are bent due to deformation. Plagioclase occurs in subhedral form and composition of plagioclase is albite An_{9-10}.Some plagioclase are altered to saussurite and muscovite. Myrmekitic texture is observed in it, Figure (6-e, f) (7-a, b, c, d, e, f).

Biotite Granite is mainly composed of quartz, orthoclase, microcline, biotite, and plagioclase and accessory mineral is muscovite. Quartz occurs as anhedral grains with undulose extinction. Myrmekite texture is also found along the margins of quartz and plagioclase. Orthoclase exhibits simple twinning. Some orthoclase altered to sericite. It shows anhedral to subhedral forms and size varies from 0.5mm x 1mm to 1mm x 2mm. Microcline is subhedral and shows cross-hatched twining. Size varies from 1mm x 2mm to 1.5mm x 3mm. Perthitic microcline is also found in some biotite granite. Biotite displays subhedral to anhedral forms and size varies from 0.5mm x 1mm to 1mm x 2mm. It shows light yellow, pale brown to dark brown in pleochroism. It altered to chlorite. And also occurs as inclusion in plagioclase. Plagioclase shows subhedral forms and polysynthetic twinning. Some plagioclase are altered to saussurite. Zoning are present. Some plagioclases twin band are bent due to deformation. The composition of plagioclase is albite An_{8-10}. Muscovite flakes are present in minor amounts and curved cleavages are found due to deformation, Figure (8-a, b, c, d).

Biotite Microgranite is mainly composed of orthoclase, quartz and biotite. Plagioclase and microcline occur in minor amounts. Small quartz grains show undulose extinction and anhedral form. It is also found between interstices of larger grains. Orthoclase is abundant and found as subhedral to euhedral grain. Size of orthoclase varies from 0.2mm x 0.5mm to 0.3mm x 1mm. In biotite microgranite, orthoclase is more abundant than plagioclase. Biotite shows subhedral to anhedral form. It is pleochroic from light brown to dark brown. Some biotite are altered to chlorite. Biotiteis found disseminated. Plagioclase occurs as subhedral form and average grain size varies from 0.2mm x 0.5mm to 0.3mm x 1mm. It is present in small amount and shows polysynthetic twinning. Twin bands are closely spaced and composition of plagioclase is albite An_{8-10}. Normal zoned plagioclase are also found. Microcline occurs in very little amounts as subhedral grains. It shows cross-hatched twinning, Figure (8-e, f).



Figure(6-a and b) Hornblende (Hbl), Plagioclase (Pl) and Biotite (Bt) in diorite, under PPL and between XN.

Figure (6-c) Plagioclase corroded by altered biotite in diorite between XN.

Figure (6-d) Plagioclase (Pl) and bent biotite (Bt) in diorite between XN.

Figure (6-e and f) Orthoclase (Or), Biotite (Bt) and Plagioclase (Pl) in porphyritic biotite granite, under PPL and between XN.

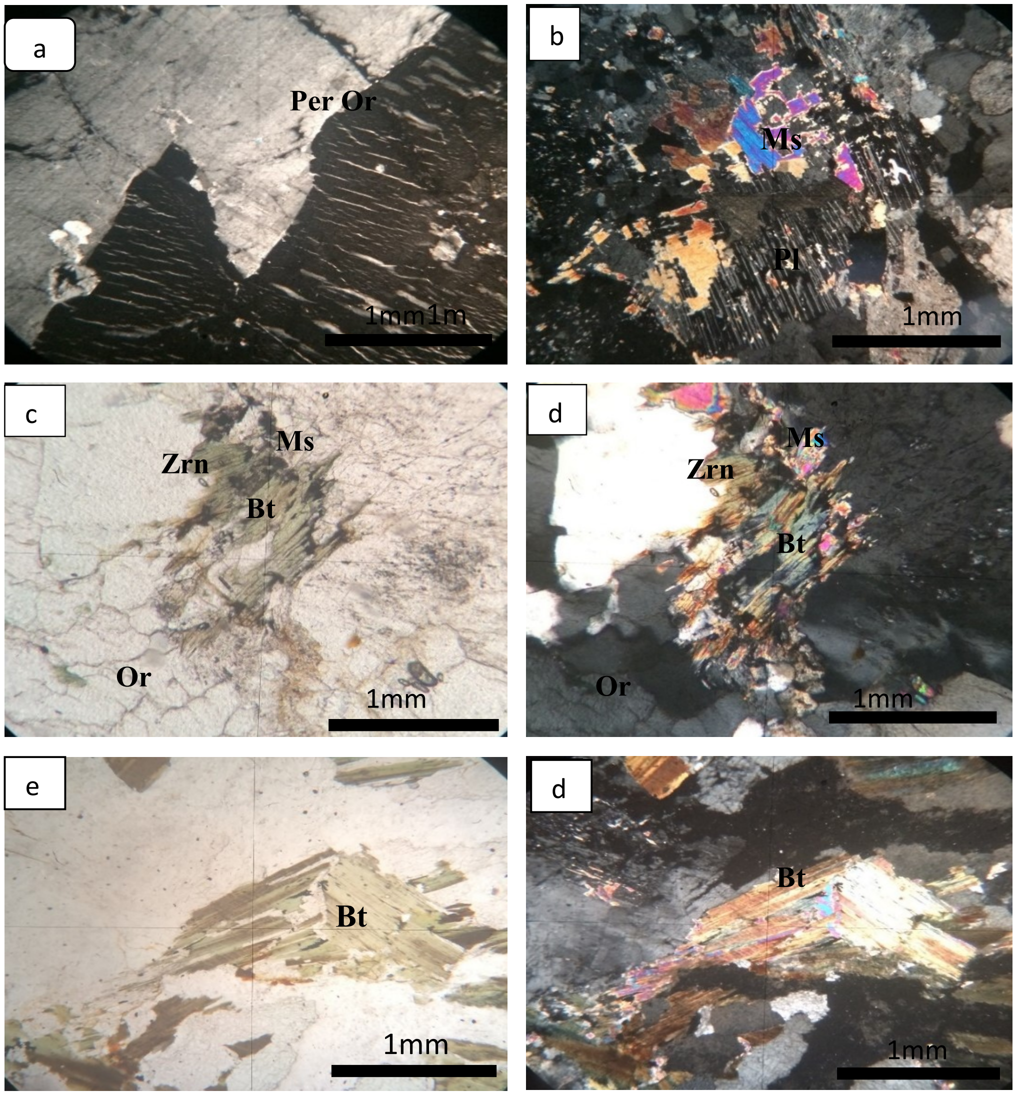


Figure (7-a) Large - grained size of perthitic orthoclase (Per Or) in porphyritic biotite granite, between XN.

Figure (7-b) Plagioclase altered to saussurite, between XN.

Figure (7-c and d) Zircon (Zrn), Orthoclase (Or), Muscovite (Mus) and Biotite (Bt) altered to chlorite in porphyritic biotite granite, under PPL and between XN.

Figure (7-e and F) Biotite (Bt) is bent due to strain effect in porphyritic bioitite granite, under PPL and between XN.

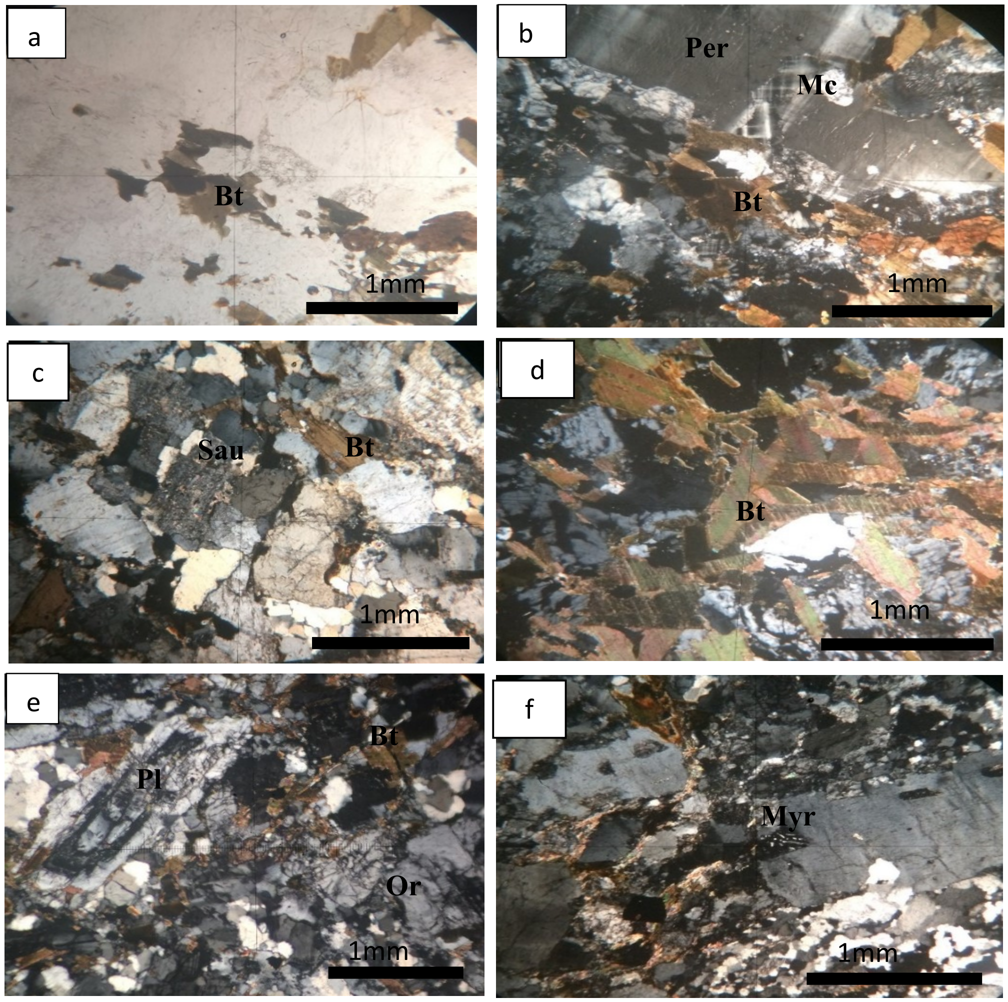


Figure (8-a and b) Biotite (Bt), Microcline (Mc) and Perthite (Per) in biotite granite under PPL and between XN.

Figure (8-c) Plagioclase (Pl) altered to saussurite in biotite granite between XN.

Figure (8-d) Biotite (Bt) altered to chlorite in biotite granite between XN.

Figure (8-e) Zoning and saussurite in the core of zoned plagioclase (Pl) in biotitemicrogranite, between XN.

Figure (8-f) Myrmekitic texture (Myr) in bioitiemicrogranite, between XN.

Table (1) Modal composition of igneous rocks (in volume per cent)

Name	**Porphyritic biotite granite**	**Biotite granite**			**Diorite**
Sample No	29/1	28/1(I)	28/1(II)	28/1(III)	1/3
Location N- E	15°13' 1.08" N	15°14' 13.32"N	15°14' 13.32"N	15° 14' 13.32"N	15°15' 11.4"N
	97°46' 35.34"E	97°45' 43.44"E	97°45' 43.44"E	97°45' 43.44"E	97°44' 57.78"E
Total count	1098	1031	1082	1054	1256
Quartz	23.4	25.08	23.23	25.05	5.1
Al-feldspar	42.25	48.88	49.68	60.15	15.96
Plagioclase	13.29	9.56	11.13	10.5	57.80
Biotite	9.28	8.45	5.5	4.84	7.83
Hornblende	-	-	-	-	10.51
Muscovite	3.18	3.7	4.25	-	0.32
Sphene and Zircon	2.5	-	2.25		1.51
Opaque and others	5.5	4.5	3.65	-	1.86
Total	**99.4**	**100.17**	**99.69**	**100.54**	**100.89**

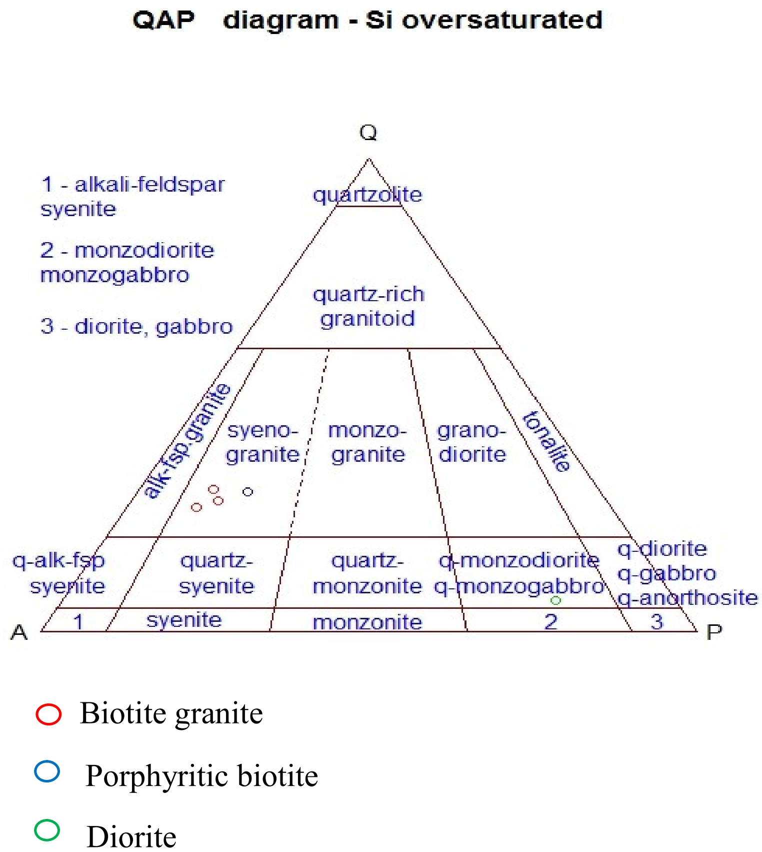


Figure 9. Modal composition of the igneous rocks in the research area (in volume percent).

Economic Aspects of Research Area

The important economic minerals are not found in the research area. The granite and diorite can be used as construction materials and road materials. The microgranite can also be used as road materials. The Daminzeik Quarry is situated in the northwestern part of the research area producing large quantities. These granitic rocks are crushed and chipped to be used for highways, railways, construction and road materials. Biotite granite, biotitemicrogranite, diorite and porphyritic biotite granite are used as decorative stones, Figure-28.

Figure 28. Biotite granite is excavated for construction and decorative stones at Daminzeik Quarry.

Summary and Conclusion

The research area is situated around Asin, Ye Township, Mon State. It is located about 9.6 km to the southwest of Ye. Asin area is fairly mountainous and rugged terrain with trending nearly N-S regional trend in general. Biotite granites are the most abundant rock type of the research area. It is well exposed in the rock quarry in the central part of the research area. Porphyritic biotite granite is second widely exposed rock type and occurs in the central part of the research area. Sometimes, it is also found associated with biotite granite. Biotitemicrogranite is common at the Myintmotaung and Phalaingtaung. Diorite is exposed near Chaungwa. Microdiorite is exposed as dyke intruding the porphyritic biotite granite. It is found at Kyanbid Monastery. Quartz veins are common in all rock units of the research area.

Especially, it is found at Phayar Taung. Petrographically, quartz, orthoclase, biotite and plagioclase are major constituents and zircon, sphene, apatite and opaque are minor constituents in porphyritic biotite granite, biotite granite and biotitemicrogranite. Hornblende is the chief mineral in diorite. In IUGS classification, biotite granite and porphyritic biotite granite fall in syeno-granite and diorite falls in quartz monzodiorite fields. Igneous rocks can be used as construction and road materials and decorative stones.

Acknowledgements

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