Petrochemical Characteristics of Granitoid Rocks in the Southern part of Maungmagan Area, Launglon Township, Tanintharyi Region

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Abstract

The research area is situated in Launglon Township, Dawei District, Tanintharyi Region, covering about 64 square kilometers. It lies in the Shan Tanintharyi Block, representing the southern part of tin-bearing granitoid belt of Southeast Asia. The area is made up of NNW-SSE trending granitoid rocks; including porphyritic biotite granite, biotite granite, porphyritic biotite microgranite, hornblende biotite granodiorite and aplite. Structurally, two minor fault systems are recognized from the satellite image and field evidences. These are NW-SE and Nearly N-S trending longitudinal fault and NE-SW trending cross fault. Joint pattern shows that there were NE-SW compressional and NW- SE extensional force in the area. Nearly N-S trending aplite dyke is intruded into biotite granite and then aplite dyke contains molybdenite which is an important source of economic interest. Geochemically, the granitod rocks fall in the granite and monzonite field. They are subalkaline affinity and belong to the calc-alkaline series. Moreover, porphyritic biotite granite, biotite granite and porphyritic biotite microgranite fall in the high potassium calc-alkaline series and hornblende biotite granodiorite falls in the calc-alkaline series, metaluminous to slightly peraluminous in nature, and I type in origin. The decreasing of Al_2O_3, CaO, P_2O_5, MgO, Fe_2O_3, MnO and TiO_2 with increasing SiO_2 suggests that the granitoid rocks were formed due to fractional crystallization during magmatic evolution. According to field evidences and petrographic characteristics, the granitoid rocks in the study area are considered to be magmatic origin. Liquidus temperature can be estimated for porphyritic biotite granite and porphyritic biotite microgranite as 705°C, biotite granite as 710°C and that of hornblende biotite granodiorite is 695°C. Generally, it may be suggested that the granitoid rocks in the study area may crystallize at depth between 20 km and 22km and the depth of emplacement is estimated at mesozone. Radiometic dating by U-Pb Zircon age method indicates that the age of porphyritic biotite granite is 61±2 Ma, biotite granite is 60.58±0.75 Ma and that of porphyritic biotite microgranite is 59.04±0.53 Ma. Therefore, the granitoid rocks in the study area were successively emplaced during Paleocene. Granites from the study area can be used as decorative stones and dimensional stones. Granites can also be extracted for construction and road materials. The economic interest of the study area is the occurrence of ore mineral especially molybdenite and the economic minerals of rare earth elements.

Keywords: granitoid rocks, calc alkaline, metaluminous to slightly peraluminous, I type, molybdenite mineralization, Paleocene

I. Introduction

Location of the research area

The research area, lying on the southern part of Maungmagan area, is located in Launglon Township, Dawei District, Tanintharyi Region. It is bounded by Latitude 14°03'00" N- 14°08'15" N and Longitude 98°04'00" E to 98°09' 00" E in one inch topographic map number 95J/4. It extends about 8 km from north to south and about 8km from east to west, covering about 64 km^2. The location map of the research area is shown in Figure (1).

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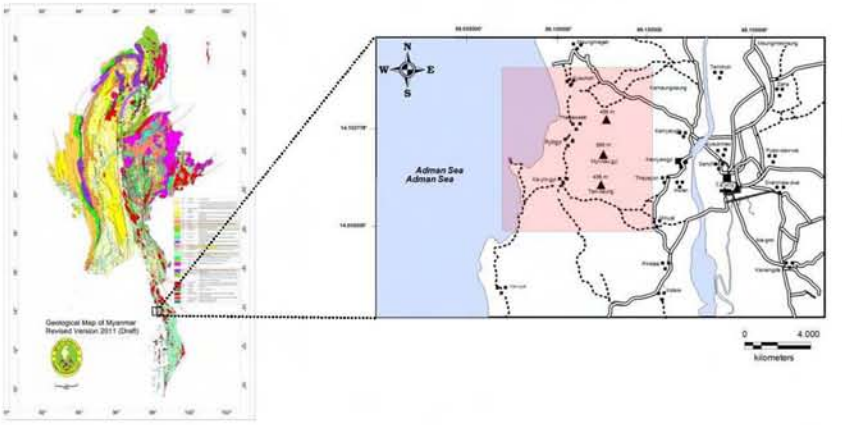

Figure (1) Location map of the research area

Objectives of the research area

The main objectives of the project area are as following:

1. To make a fairly detailed geological map of the area in an appropriate scale
2. To study petrography of igneous rocks of the project area
3. To study the petrochemical characteristic of granitoid rocks exposed in the project area.
4. To mention the economic aspects of the project area

Method of study

The research programme includes the field and laboratory studies. Before the field investigation, various literature and previous works were studied. Geological field works were carried out about one month during the year 2015 to 2016. Firstly, the reconnaissance survey of the project area was made in April, 2016 and then field checking was carried out in July, 2016. Detailed geological studies were made on the basic of the geological map of the previous workers. Lithology, contact boundary and geological structure of the rock units are recorded in the field. The representative samples were collected from each rock unit. Each sample was named base on colour index, mineral composition, texture and natures of their occurrences in the field. The contacts of litholgy and structural characteristic were interpreted from the landsat satellite and aerial photographs. About (80) thin sections were prepared for microscopic studies. The detail mineralogical and petrological characteristics of minerals and rocks were studied by using Polarizing microscope. The compositions of plagioclase were determined by using Michel-levy's method. The modal composition of the representative samples were determined by point counting. These data are plotted on the IUGS's classification of igneous rocks diagram of Le Maitre (2001). Major, minor and trace elements of granitoids rocks were determined with XRF analysis. Analysed data are plotted by using GCD kits software and SPSS16 software.

II. Regional Geologic Setting

The research area lies in the southern continuation of the Shan Tanintharyi Block of Maung Thein (1974, 2000) or Sino-Burma Range of Bender (1983). The study area forms a part of the Tanintharyi granite belts, which is actually a part of Western tin-bearing batholiths called Western Tin belt of South East Asia tin provinces of Mitchell (1977), Thein (1983), Nyan Thin (1984) and Cobbing et al (1992). The study area is mainly composed of graintoid rocks of Costal Range Granite of Bender (1983). The regional geologic setting of the study area is shown in Figure (2). There are at least six major granitoid plutons in the Tavoy area, but detailed mapping of the major pluton has yet to be undertaken. The granitoid plutons intruded into the metasedimentary rocks of the Mergui Group of Brown and Heron (1923), Chhibber (1934) and Pascoe (1959). The graintoid plutons and batholiths are markedly elongated shape with the longer axes parallel to the NNW-SSE trend of the country rocks (Mergui Group). Tin- tungsten (Sn-W) mineralization is closely related and spacially with granitoid rocks in this belt. Particularly in the study area, the host rock is sedimentary and meta-sedimentary rocks of Mergui Group were possibly regarded as the Carboniferous-Upper Permian age of Win Swe (2012) according to the stratigraphic correlation and relationship.

The research area is corresponding to a part of the Central granitoid belt of Khin Zaw (1990). He described that the Central granitoid belt formed a narrow linear belt of 1450 km long which are dominantly Calc-alkaline and fall in the Peraluminous field, according to petrographic and geochemical data. The granitoid rocks were possibly emplaced during the continental arc collision at the early stage of westward migrating, east dipping subduction zone during Late Mesozoic to Eocene time. The Central granitoid belt is developed in the tectonic setting of subduction related magmatic arc, Maung Thein (1986).

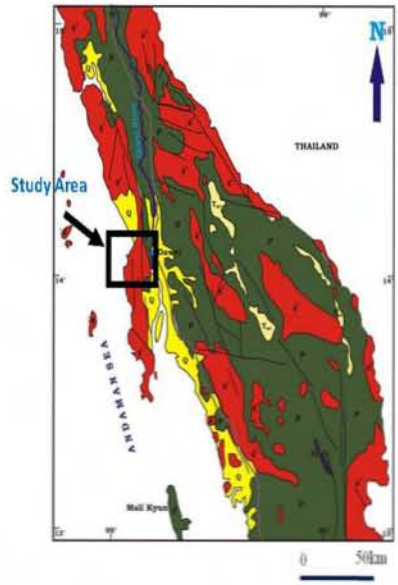

Figure (2) Regional geological map of the study area

(From Geological Map of Myanmar Survey Department, 1977)

III. Petrography

There are three major units exposed in the study area. These are (1) Porphyritic biotite granite unit (2) Porphyritic biotite microgranite unit and (3) Biotite granite unit. Two minor rock types are hornblende biotite granodiorite and aplite. Quartzo-feldsphatic veins and

quartz veins are intruding into the older granitoid rocks. The geological map of the study area is shown in Figure (3). The composition of the granitoid rocks plotted on the IUGS classification diagram is shown in Figure (4).

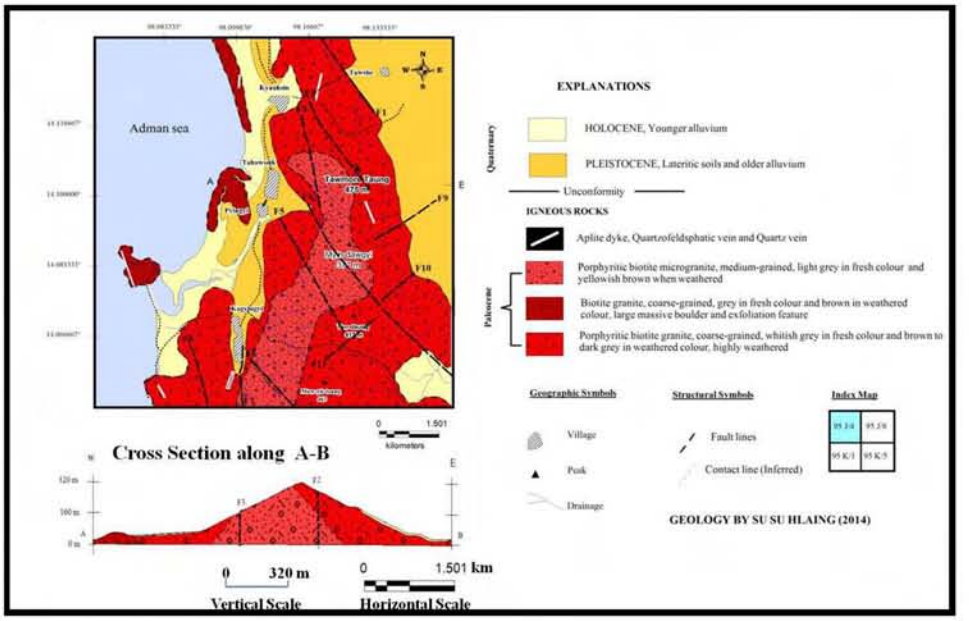

Figure (3) Geological map of the study area

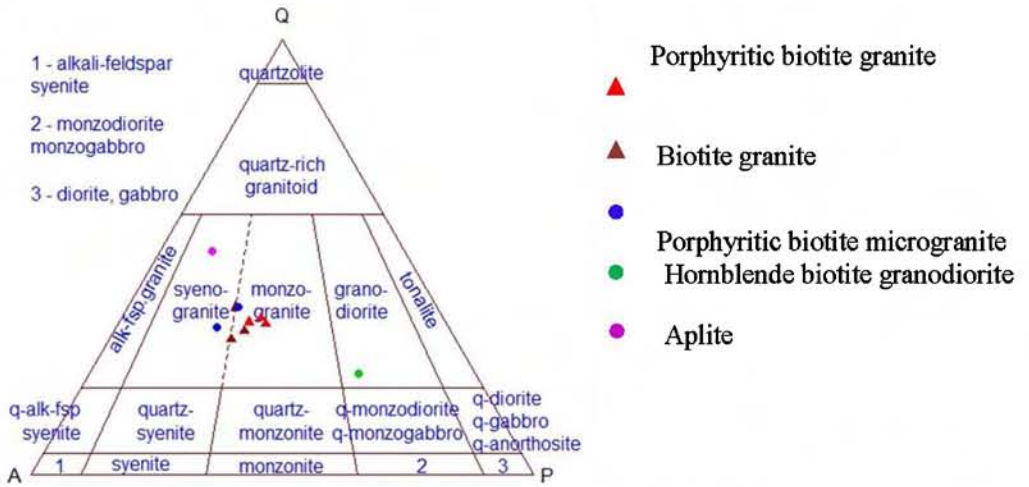

Figure (4) Modal composition of the granitoid rocks plotted on the IUGS classification diagram (Le Maitre, 2001)

Field description of granitoid rocks

Porphyritic biotite granite is the most abundant and well exposed at Tawmore taung, Tan-daung taung, Myindawgyi taung and also at the western flank of the range, Maungmagan village, Kyauksin village, Thabawseik village and Pyingyi village, Figure (5) (A). The phenocrysts (about 2cm to 6cm in length) are exclusively alkali feldspars which are randomly oriented, Figure (5) (B). Brown to dark grey colour on weathered surface

and whitish grey colour on fresh surface. It occur not only large massive boulder but also highly weathered nature. Hornblende biotite granodiorite occur as small outcrop within the porphyritic biotite granite unit.

Biotite granite is well exposed at the western costal part of the study area, especially Myawyit, Figure (5) (C, D) and Maungmagan Beach. It is brown on weathered surface and gray colour on fresh surface. Small rounded (or) oval shape xenoliths are abundant in biotite granite.

Porphyritic biotite microgranite is the second major unit in the study area and occurs at the central part and the western flank of the range, Figure (5) (E). Feldspar phenocrysts show parallel alignment at the contact margin and it flow direction is 145°- 325°, Figure (5) (F).

Aplite dykes and veins are intruded into porphyritic biotite granite unit and biotite granite unit. Aplite dyke is 5 m width and 122m long that cuts across biotite granite Figure (5) (G). Molybdenite specks are observed in aplite at Myawyit area. It is trending nearly N-S, (175° – 355°). It shows sugary texture in hand specimen and is characterized by even grain-size that rarely exceeds 2 mm in diameter.

In the study area, small enclaves are most common in biotite granite at beach side. The enclaves in this area are igneous origin of diorite and microdiorite. The contact between enclave and the host rock are sharp. Diorite enclaves are irregular in shape and about 20 cm to 30cm in size, (5) (H). Microdiorite enclaves are smaller in size (about 15 cm to 20 cm in diameter) and exhibit various shapes such as rounded, ellipse and elongated.