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Petrographical Study of Pegmatite from Some Locations in IJERO Ekiti, Ekiti State South western Nigeria

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Abstract: Ten samples of pegmatite were collected from different locations in Ijero Ekiti. These were reduced to 30microns thickness using diamond-coated cutting wheel .The sections were set in epoxy resin with different grades of abrasives having been polished to a 1 micron diamond paste finish.The mineral content and the textural features of the slides were studied under the microscope at x80 magnification under both crossed and plane polars. It was observed that the Ijero pegmatite is porphyritic in texture.An intrusive porphyritic of common squared feldspar phenocrysts larger than crystals of surrounding matrix indicating that column of rising magma must have cooled in two stages.All the pegmatite shows high percentage occurrence of Plagioclase Feldspar and Quartz. However, the occurences of cordierites, biotite, plagioclase feldspar and tourmaline in the pegmatites could suggest that their crystallisation must have taken place under conditions similar to the recrystallisation temperature and pressure of the surrounding metamorphic minerals.Cordierites as fine grained groundmass could also suggest a high pressure transformation during the emplacement of the pegmatites in IjeroEkiti.

Keywords: Pegmatite, abrasive, cross polars, plane polarisation, porphyritic, metamorphic

Introduction

A Pegmatite is a holocrystalline, intrusive igneous rock that is composed of large interlocking phaneritic crystals usually larger than 2.5cm in size ,occurring as strongly zoned Intrusive dykes that are associated with rare element.They are formed during the final stage of magma's crystallisation and occur as discordant to semi-concordant dykes which intrude into mica schist and could develop at a high pressure environment. Pegmatites occur in shapes; dyke-like or lensoid, extensive and continous tabular bodies like deep seated veins. Most pegmatites are composed of quartz, feldspar and mica but rare intermediate composition and mafic pegmatitesdo occur and containamphibole, calcium plagioclase feldspar, pyroxene and other mineralsin recrystalline zones and apophises associated with large layered intrusions. However there is no single feature that can be diagnostic to all pegmatites and therefore a list of criteria could be used to distinguish pegmatites from other rocks. Pegmatites could be classified as simple and complex with reference to mineralogy and genesis.S imple Pegmatite consists mostly of coarse-grained quartz and feldspar with subordinate mica and they are ordinarily uniform from wall to wall both in composition and texture. Complex pegmatites results from igneous rather than recrystalisation associated with metarmorphism. Ijero Ekiti is highly mineralised. Precious and cemi-precious stones are hosted by the parent pegmatitic rocks. Adetail analysis of this pegmatite under microscope would reveal information about their microstructure and micro texture is a vis their industrial applications.The demand for gemstones and minerals commonly found in pegmatites is an indication that they are of great economic importance.The minerals found in pegmatites includes plagioclase feldspar, tourmaline, beryl, fluorite, topaz and muscovite, some of which are used in space age technology and electronics.This study is aimed at assessing the mineral content,structure and texture of the Ijero pegmatite under petrological microscope. Percentage occurence of the constituent minerals could be estimated.Wright(1976) and Woakes*et al(*1987) noted that rare-metal-enriched pegmatites of South western Nigeria is rather a product of partial melting and leaching process of the basement units and rare-metal rich pegmatites in Nigeria is known to be accomplished by alkali (Na_2O) metasomatism. Pegmatites serves as host rock for most of the precious andcemi-precious gem minerals of tourmaline, garnets, topaz, rose quartz and Zircon(Wright ,1970;Okunlola,1990).According to Anthony(1996); pegmatites can either occur as final liquid fractions from the crystallisation of a large body of magma or as initial liquid fraction produced under conditions of progressive partial melting and at both of these granite magma can be expected to be comparatively rich in water. Ige*et al*(2006) carried out the PIXE analysis of muscovites samples from Tourmaline bearing granite pegmatites of South western Nigeria. The analysis revealed that the crystal interlayer sites of the constituent muscovite are occupied by K, Fe, Rb, Na and traces of Mg and Ca in the octahedral positions whilst Si. Al, Ti, Mn occur in the tetrahedral layer. The low Na/Na+Kratios, low Ti content and enrichment in Rb in the Muscovites suggest post magmatic genesis of the host rocks.T he variability in trace element composition may reflect differences in geological environment of emplacement of pegmatite bodies.

Materials and Methods

Ijero Ekiti is situated in the north western part of Ekiti State (fig 1) at the coordinates 07^{O} 42’61’’North and 5^{0} 17.9’49’’South at an average elevation of 1332m.The study area is readily accessible through tarred and untarred road.

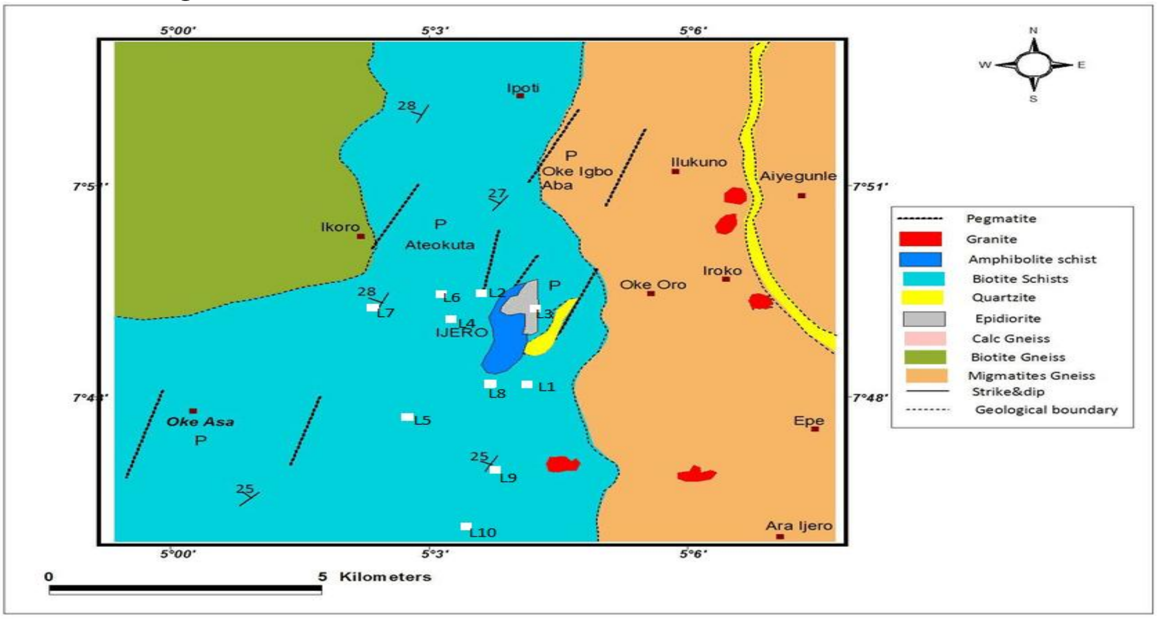


Fig 1; MAP OF EKITI STATE SHOWING THE STUDY AREA

TABLE 1: Record of location of Pegmatite Samples AtIjeroEkiti

SAMPLE LOCATION	LOCATION COORDINATE	ELEVATION (M)	NAME OF THE SAMPLE
L1	N 07º 48′ 45" E 005º 04′ 37"	1588	PEGMATITE
L2	N 07º 49′ 50.4" E 005º 04′ 35.4"	1672	PEGMATITE
L3	N 07º 49′ 29" E 005º 04′ 51.1"	1621	PEGMATITE
L4	N 07º 49′ 20.1" E 005º 04′ 29.5"	1660	PEGMATITE
L5	N 07º 47′ 30.6" E 005º 04′ 37.6"	1568	PEGMATITE
L6	N 07º 49′ 16.3" E 005º 04′ 24.7"	1701	PEGMATITE
L7	N 07º 49′ 17.5" E 005º 04′ 24.6"	1635	PEGMATITE
L8	N 07º 48′ 27.3" E 005º 04′ 29.1"	1665	PEGMATITE
L9	N 07º 46′ 29" E 005º 04′ 38.5"	1721	PEGMATITE
L10	N 07º 41′ 52.4" E 005º 04′ 44.6"	1700	PEGMATITE

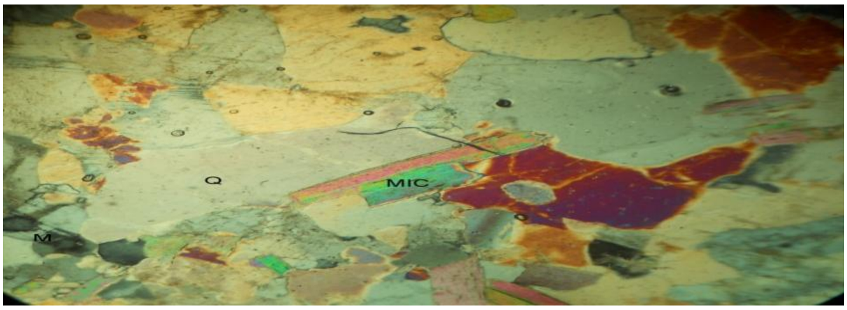
Samples Preparation for Petrographic Analysis

The sampled rocks were sectioned with diamond-coated cutting wheel and the sections were set in epoxy resin and polished to a 1um diamond paste finish. A fragment of the rock not more than 8-10mm in thickness is obtained from hard specimens by making use of a geologic hammer.

One surface of the chip was grounded smooth by making use of 120, 220, and 3F grade carborundum abrasive. This surface was glued to a microscope slide that measure 30cm by 30cm and up to 1cm thickness by lakeside 70c cement which was supplied in short rods and must be melted on a hot plate at temperature between 85^0C and 100^0C.

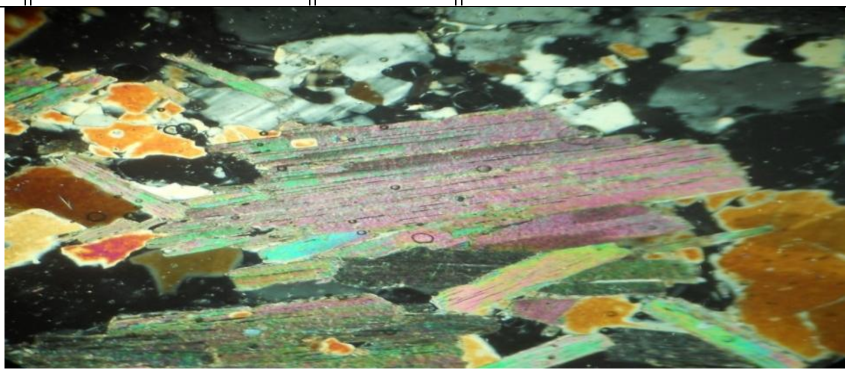
The other side of the rock fragment is now cut from its original thickness of 5-10cm to about 1mm with a diamond saw. This latest size was later reduced to 200um by using 100 micron size carborundum, a 60 micron size from 0.2mm to 0.1mm, a stage where quartz and feldspar shows bright second order interference colours under cross polars. The final grade of grinding was from 0.1mm to 0.03mm.This was accomplished by using 12 micron size carborundum. It was carefully reduced to the 30micron while maintaining a uniform thickness over its whole area. At such standard thickness, a Canada Balsam diluted in xylene was used in mounting slide.Ensure that no air or gas bubbles are trapped between the cover glass and the rock.This thin section for each rock is studied under the stage of a petrological microscope under both crossed and plain polarized light at X80 magnification (Plate 1-10).

Crossed Polar

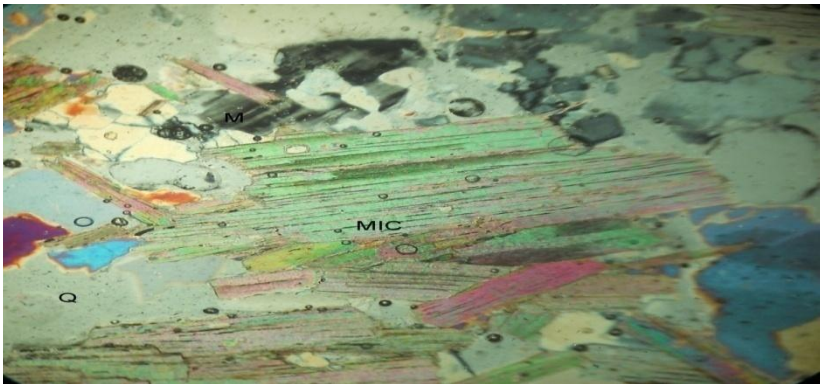


Plane Polar

Plate 1(L1); Petrographic View of Ijero Pegmatite Texture: Porphyritic
Magnification: X80
Mineralcontent: Quartz,Tourmaline,Biotite,Microcline.

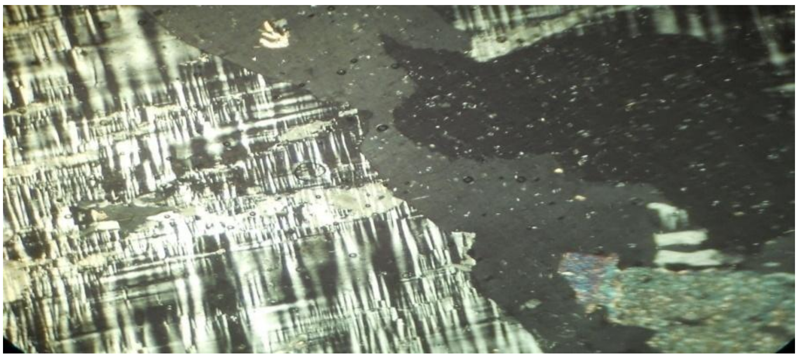


Cross Polar

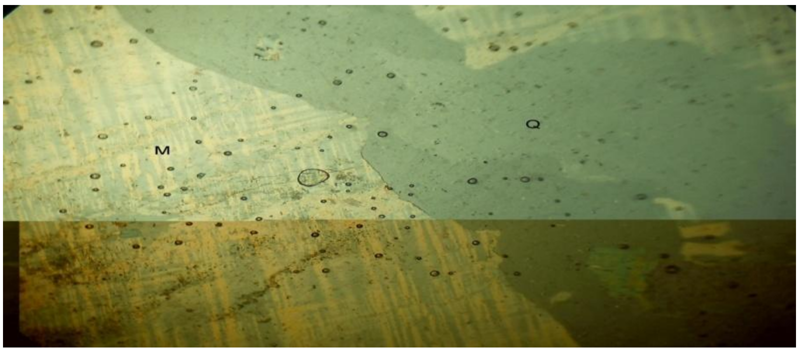


Plane Polar

Plate2 (L2); Petrographic View of Ijero Pegmatite
Texture: Porphyritic
Magnification: X80
Mineral Content: Biotite, Quartz, Tourmaline, Cordierite.

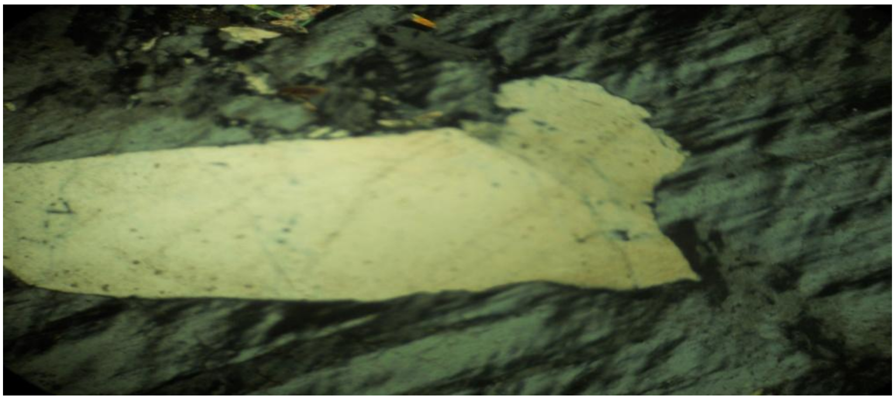


Crossed Polar

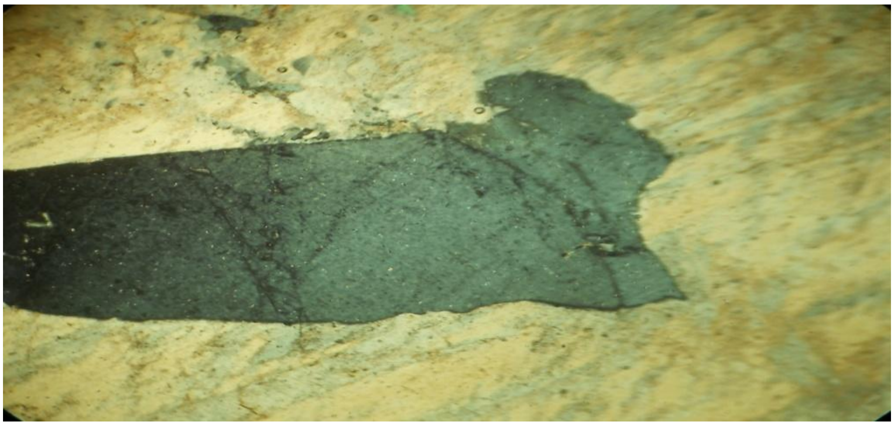


Plane Polar

Plate3 (L3); Petrographic View of Ijero Pegmatite
Texture: Porphyritic
Magnification: X80
Mineral Content: Cordierite.



Crossed Polar



Plane Polar

Plate4 (L4); Petrographic View of Ijero Pegmatite
Texture: Porphyritic
Magnification: X80
Mineral Content: Euhedral Quartz, Cordierite Intergrown With Biotite

Crossed Polar

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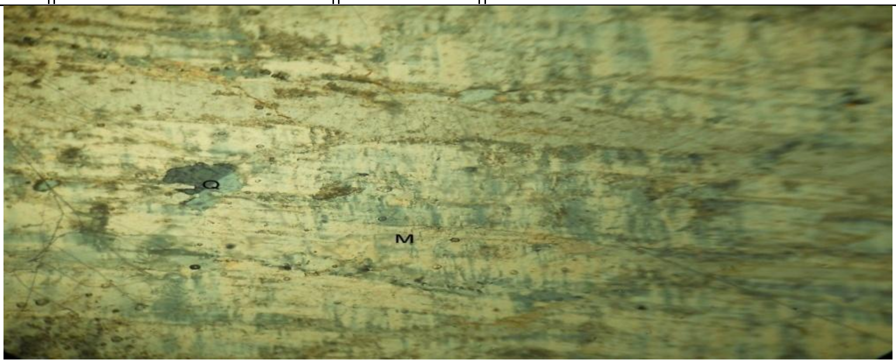
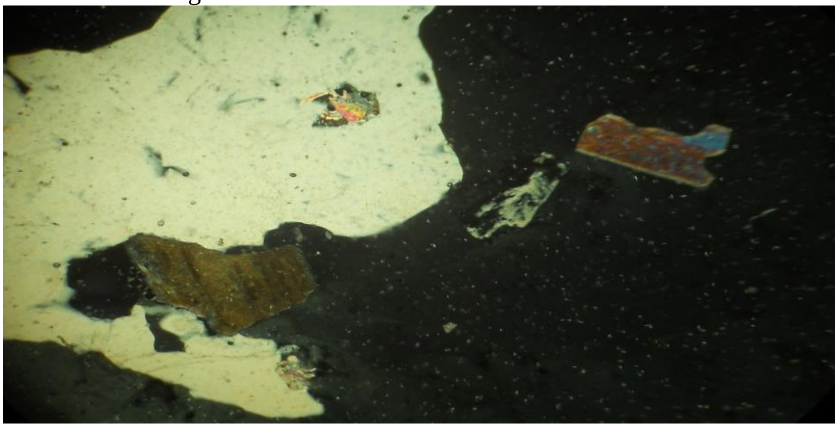
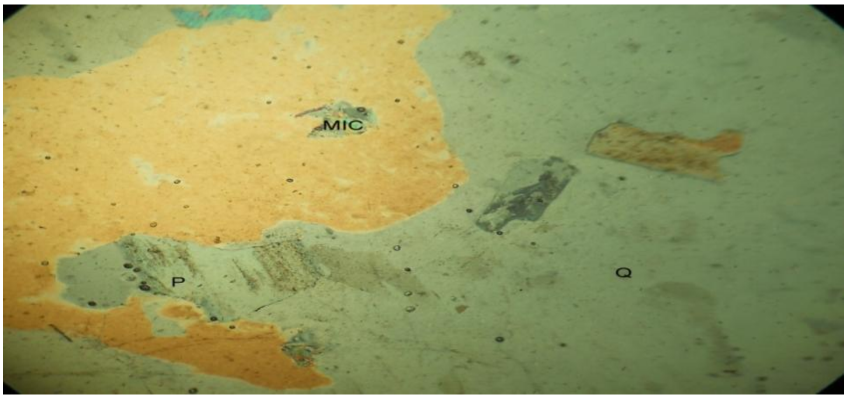


Plane Polar

Plate5 (L5); Petrographic View of Ijero Pegmatite
Texture: Mylonitic
Magnification: X80
Mineral Content: Cordierite Intergrown With Biotite

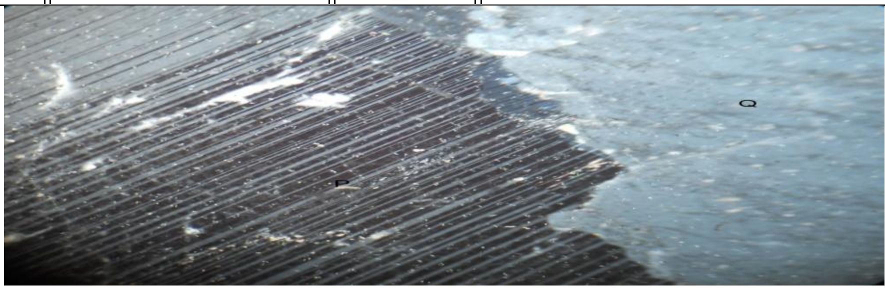


Crossed Polar



Plane Polar

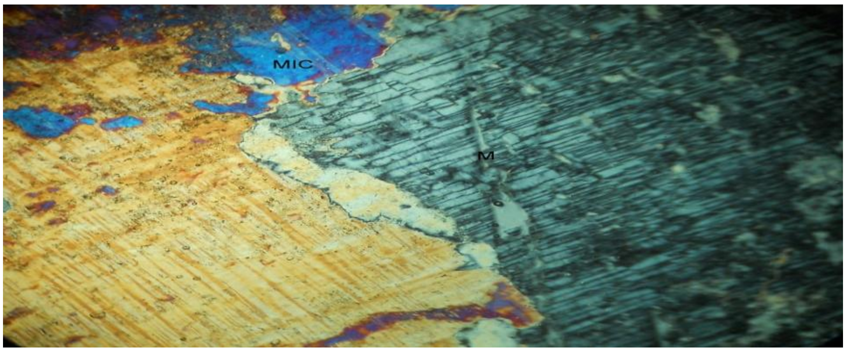
Plate6 (L6); Petrographic View of Ijero Pegmatite
Texture: Porphyritic
Magnification: X80
Mineral Content: Cordierite, Biotite, Microcline.



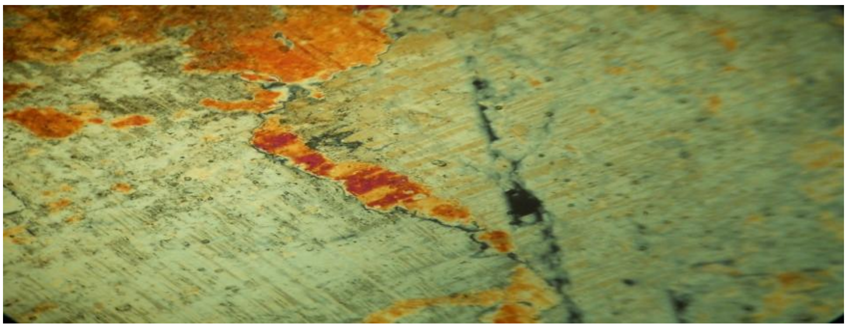
Crossed Polar

Plane Polar

Plate7 (L7); Petrographic View of Ijero Pegmatite
Texture: Porphyritic/Graphic
Magnification: X80s
Mineral Content: Plagioclase Feldspar, Quartz



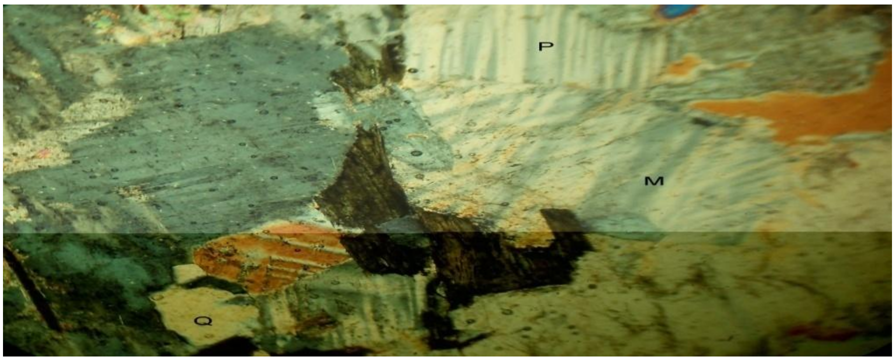
Crossed Polar



Plane Polar

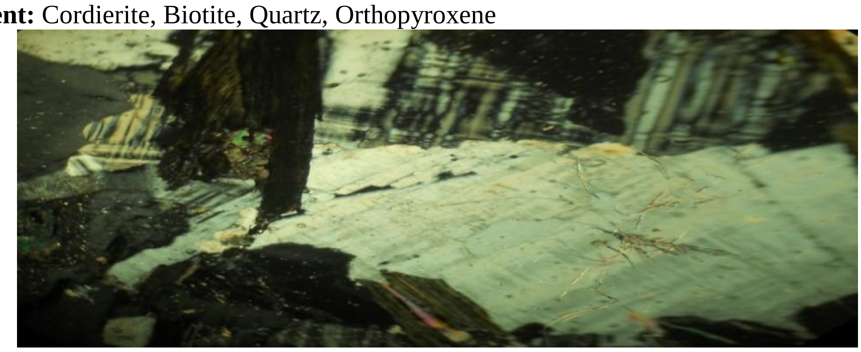
Plate8 (L8); Petrographic View of Ijero Pegmatite
Texture: Porphyritic/Graphic
Magnification: X80
Mineral Content: Cordierite,Microcline

Crossed Polar



Plane Polar

Plate9 (L9); Petrographic View of Ijero Pegmatite
Texture: Porphyritic
Magnification: X80
Mineral Content: Cordierite, Biotite, Quartz, Orthopyroxene



Crossed Polar

Plane Polar

Plate10 (L10); Petrographic View of Ijero Pegmatite
Texture: Porphyritic
Magnification: X80
Mineral Content: Cordierite, Biotite, Quartz

Discussion

Most of the studied slides of the Ijero pegmatites show the presence of strongly pleochroic Cordierite that could haveintergrown with alkali feldspar. Occurrence of Cordierite in the Ijero Pegmatite might have resulted to formation of minor amount of chlorites and talc as alteration products.The presence of garnet(Wright,1970;Okunlola,1990) and thecordierite could be likened to that of sillimanite-garnet-cordierite bearing pegmatite intrusive from Takato, which according to Carira (1978) were produced as a result of partial melting of high temperature parts of the Ryokemetamorphic rocks that rise to the crustal level of upper Amphibolites facies. The association of Cordierite with Tourmaline suggest high temperature during the emplacement of the Pegmatite.A condition that could be similar to recrystalisation temperature and pressure of the surrounding metamorphic minerals.According to Berry *et al* (2001), Bytownite and Labradorite are characteristics of igneous rock of granite and granitic pegmatite. This is an indication that the plagioclase in ijero pegmatite could have been bytownite or labradorite of thesolid solution series.

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