CHAPTER - VI

PETROGRAPHY

INTRODUCTION

A critical evaluation of the petrographic characters of the various rock types has led to a complete reinterpretation of the metamorphic and igneous history of the area. Structure, texture and mineral associations of the metasedimentaries, basic rocks and granites, have enabled the author to throw new light on the geological evolution of this area. With a view to provide an appropriate background, in this chapter, the author has given the salient megascopic and microscopic characters of the rock types encountered. As stated earlier, the principal rock types observed in the area occur in the following chronological order :

Basalts

Granites

Meta-dolerites

Calcareous rocks

Pelitic rocks

Ortho-amphibolites

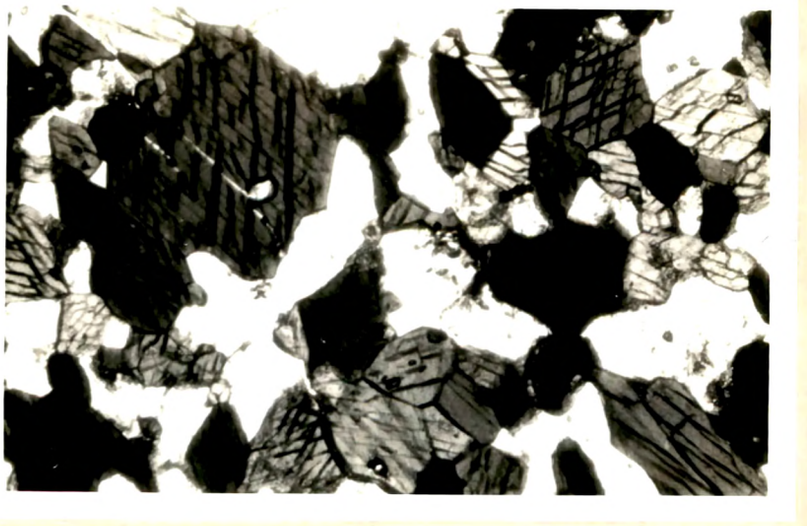
ORTHO-AMPHIBOLITES

Ortho-amphibolites are the oldest rocks of the terrain and represent the remnants of the basement of the oceanic crust. In the field, the ortho-amphibolites are seen as greyish black compact rocks. When examined under microscope, two types are distinguished. One is unfoliated and massive, (Plate VI.1) while the other foliated type (Plate VI.2) showing a preferred orientation of hornblende prisms. Segregational layering is also occasionally observed. The unfoliated type is more common. The foliated type is mainly restricted to the contact of the overlying hornblende rich gneissic rocks.

Mineralogically, the amphibolites show following assemblages :

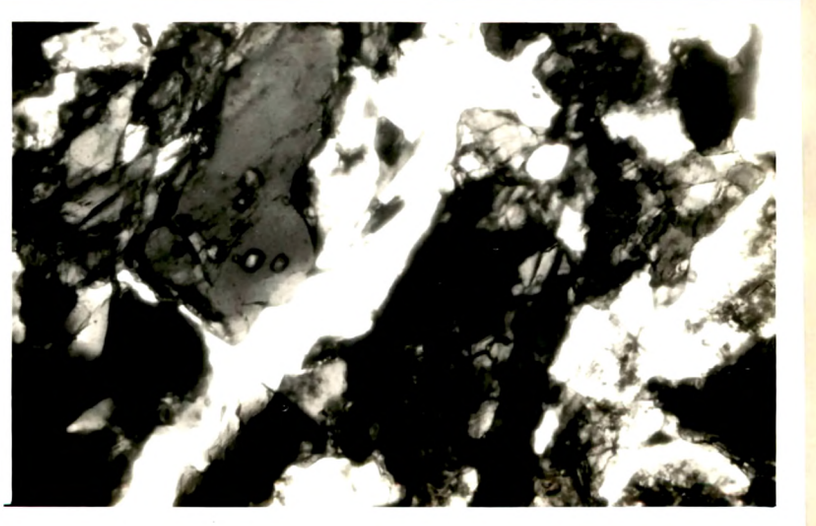
1. Hornblende + plagiocase + quartz + sphene
2. Hornblende + plagioclase + quartz + epidote
3. Hornblende + plagioclase + quartz + epidote + biotite
4. Hornblende + plagiocase + quartz + garnet
5. Hornblende + plagioclase + quartz + garnet + epidote

PLATE VI.1



Textural characters of unfoliated Ortho-amphibolite. (Photo micrograph. Polarised Light. X 80)

PLAVE VI.2



Textural characters of foliated Ortho-amphibolite (Photomicrograph Polarised light. X 80)

Hornblende

Hornblende is fresh and pleochroic in shades of green (x = pale green, Y = green, Z = dark green), always untwinned, and usually containing inclusions of quartz and opaque minerals. In unfoliated variety, both prismatic sections with conspicuous (110) cleavage and basal sections with two sets of cleavages (at angle of 56° and 124°), observed; birefringence is moderate, the interference colours being of middle second order; the mineral is biaxial negative.

Plagioclase

Plagioclase, next in abundance, is of andesine-labradorite composition showing the variation of An content from 40% to 64%, usually fresh, it occurs in equant xenoblastic grains and shows lamellar twinning.

Quartz

Quartz is always present but in small proportion; occurs as sporadic irregular grains of small sizes interestitially or as inclusions in hornblende and plagioclase.

Garnet

Garnet is present in some sections; is of almandine variety; occurs as small rounded grains, characterised by bold relief, pitted appearance and isotropism.

Epidote

Epidote is colourless to yellowish green; shows feeble pleochroism and occurs either as short prismatic crystals or as small equant grains; the interference colours are usually of the second order.

Biotite

Biotite occurs only sporadically, having developed at the expense of hornblende.

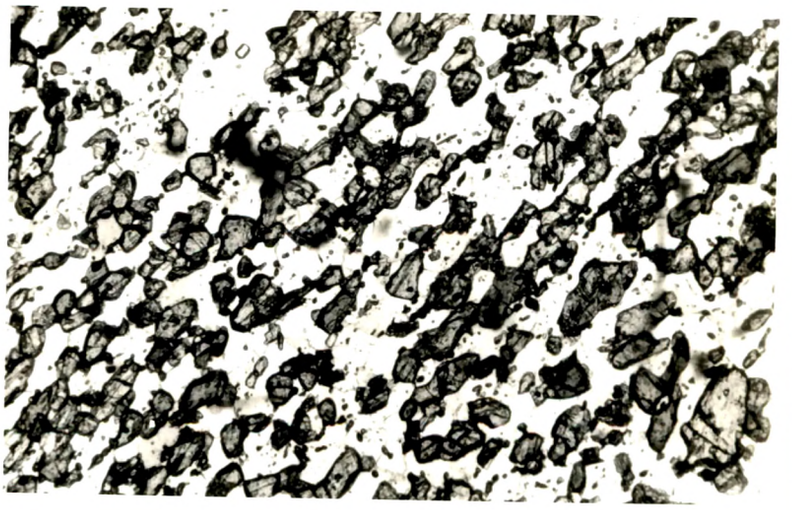
Sphene

Sphene is almost always present, occurs as wedge-shaped crystals and also as small anhedral grains.

Opaque minerals include magnetide and ilmenite that occur as clusters of small grains.

The author would like to mention the reported occurrence of diopside rich rock from the Rasanio ridge (Δ 737), referred to as pyroxene granulite by Sharma (1931) and Merh (1950). This rock is of considerable metamorphic significance. It has been found to consist of a granular aggregate (Plate VI.3) of diopside and plagioclase with hornblende and sphene. The thin sections of this pyroxene granulite clearly indicate that the hornblende is not an altered mineral from diopside as reported by Sharma et al. (1936).

PLATE VI.3



Granular aggregate of diopside and plagioclase in pyroxene granulites. (Photomicrograph. Polarised light. X 80).

PELITIC ROCKS

Pelitic rocks are supposed to be directly resting over the ortho-amphibolites, and in these existing conditions can be classified into the following three main divisions on the basis of their mineral composition :

(iii) Pelitic schists and associated rocks

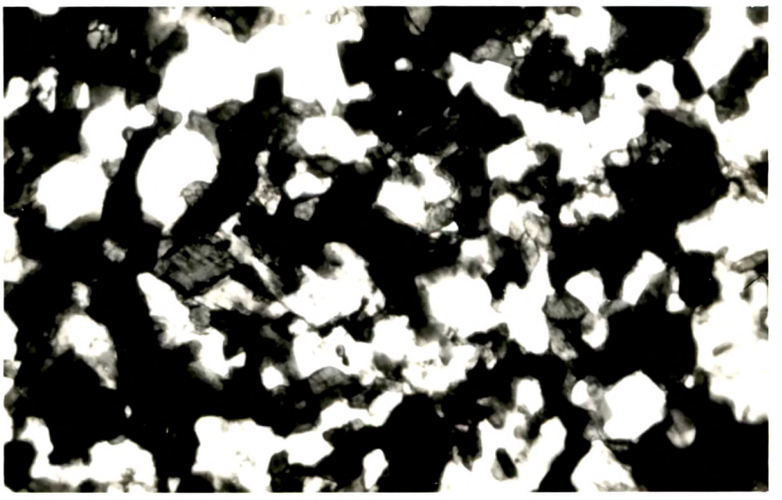
(ii) Biotite gneisses

(i) Hornblende gneisses

Hornblende gneisses

These are transitional rocks, having a restricted occurrence along the contact of the ortho-amphibolites and the biotite gneisses. Its exposures are sporadic. In the field it is recognised by a conspicuous banding consisting of dark coloured hornblendic and light coloured quartzofelspathic layers. Under the microscope, the hornblende rich layers typically show an equigranular aggregate of hornblende & plagioclase with some quartz and potash felspar (Plate VI.4), while the light coloured portion show a granitic texture and consist of quartz, plagioclase and potash felspar with subordinate hornblende (Plate VI.5). Occasionally intermediate varieties showing textural characters of both, are encountered. Biotite is only occasionally observed, and it is found to have developed at the expense of hornblende.

PLATE VI.4



Textural characters of hornblende rich layers in hornblende gneisses (Photomicrograph. Polarised light. X 80).

PLATE VI.5 a

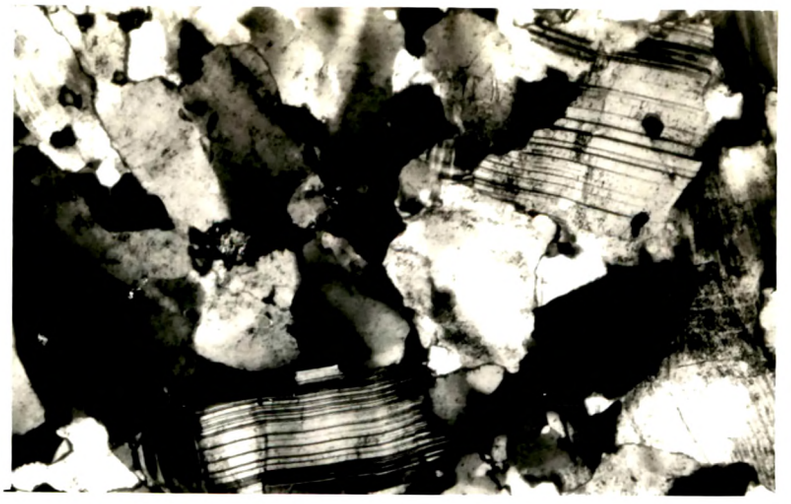
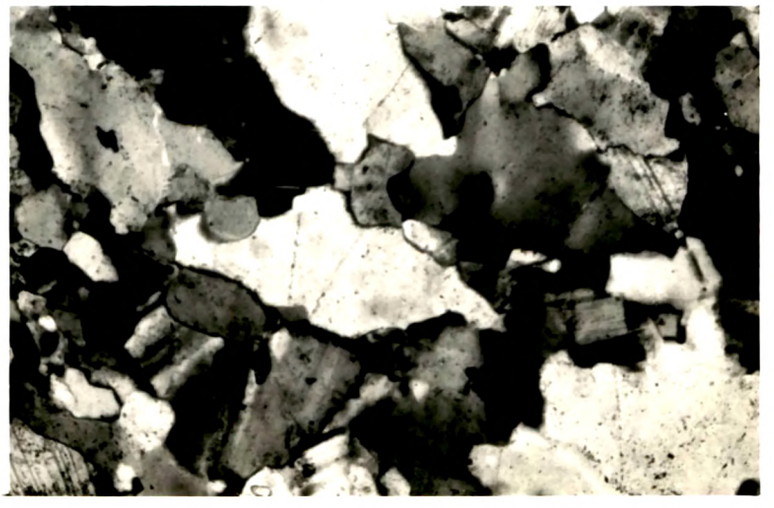


PLATE VI.5 b



Textural characters of leucocratic layers in hornblende gneisses. (Crossed nicols. X 80).

Mineralogically, the hornblende gneisses show following assemblages :

1. Hornblende + plagioclase + quartz + potash felspar
2. Hornblende + plagioclase + quartz + potash felspar + sphene
3. Hornblende + plagioclase + quartz + potash felspar + sphene + epidote
4. Hornblende + plagioclase + quartz + potash felspar + sphene + epidote + biotite

Hornblende

Hornblende occurs as subhedral to anhedral prisms, mostly randomly arranged but occasionally showing a faint preferred orientation; pleochroic in shades of green (X = pale green, Y = green, Z = dark green). Prismatic cleavages quite distinct.

Plagioclase

The nature of plagioclase is slightly variable. In the hornblende rich portions, it forms small stubby laths, shows fine twinning on Albite Law and is andesine (An_{32-40}), while in the hornblende poor portions, it is rather larger in size and is an oligoclase (An_{16-24}).

Potash felspar

Potash felspar always a microcline, is very subordinate in the hornblendic layers, where it occurs interstitially. In the felspar rich portions, it shows granitic intergrowth with quartz and is typically cross-hatched.

Quartz

Quartz is never predominant, but its percentage is more in the hornblende free layers. In hornblendic layers, it occurs as sporadic interstitial grains, while in the other variety, its grain size shows much variation. In hornblende layers, it occurs as sporadic interstitial grains, while in the other variety, its grain size showing much variation, forms the larger grains with embayed margins. It also occurs as tiny inclusions in hornblende and plagioclase.

Sphene

Sphene is present in fairly conspicus proportion in some rocks only. It occurs as stray grains or as irregular patches.

Epidote

Epidote is restricted to a few sections only, occurs as patches and veins; colourless variety is a zoisite while the green coloured grains are of pistacite.

Biotite

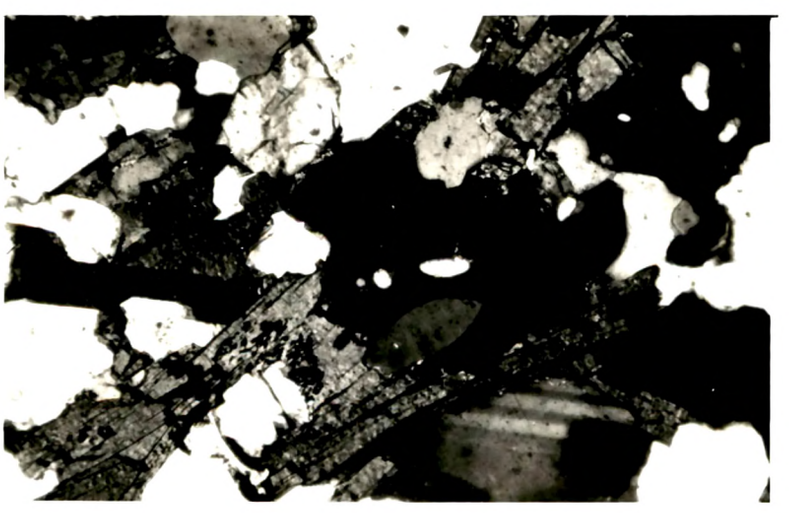
Biotite forms stray flakes and is an alteration product of hornblende.

Biotite Gneisses

The typical biotite gneiss is a mediumgrained rock showing a coarse foliation and banding, characterised by biotite rich and biotite poor streaks and layers, while the biotitic portions are typically gneissic (Plate VI.6). Under the microscope, the biotite flakes occur as streaks and stringers with parallel orientation, alternating with an equigranular aggregate of quartz and felspar. The biotite poor layers show almost granitic texture. The minerals in order of abundance are plagioclase, potash felspar, quartz and biotite. Occasional presence of garnet is significant. Muscovite is seen only very rarely. Sphene, epidote and iron oxides are the usual accessory minerals. The overall proportions of the above minerals varies between the two constituent portions. Those rich in biotite contain more plagioclase as compared to potash felspar and quartz, while in the other variety, the potash felspar and quartz dominate over plagioclase. Following mineral assemblages have been observed :

1. Plagioclase + K. felspar + quartz + biotite + epidote
2. Plagioclase + K. felspar + quartz + garnet.

PLATE VI.6



Biotite rich layers in biotite gneisses. (Photomicrograph. Polarised light. X 80).

Quartz

Quartz always occurs as interstitial grains with irregular outline being coarse in biotite poor portions. It also exclusively forms inclusions in the felspars.

Plagioclase

Plagioclase is an oligoclase (An_{10-18}), forms subhedral to anhedral grains. It always shows lamellar twinning, and in most cases partial alteration to sercite.

K. felspar

K. felspar is microcline, typically shows cross-hatching and forms anhedral grains. Occasionally porphyroblastic grains with subhedral outlines are also observed. Alteration is negligible.

Biotite

It always forms small greenish brown flakes, pleochroic from yellow to brown (X = yellow, Y = brown, Z = Reddish brown). Alteration to chlorite is significantly absent.

Garnet

Garnet is observed in a few sections only. It forms small rounded grains scattered sporadically within the quartzofelspathic mass.

Accessory Minerals

Accessory minerals are sphene, epidote, apatite, zircon and iron ores.

Pelitic Schist

These are the ungranitised portions of the pelitic sediments, and are represented by :

1. Quartz mica schist
2. Micaceous quartzite
3. Quartzo-felspathic schist

The important minerals present are quartz, felspar (plagioclase and microcline), biotite and muscovite. Depending on the relative abundance of one or the other mineral, the above varieties have been identified. In the quartz-mica schist, the dominant minerals are quartz and biotite with subordinate plagioclase, microcline and muscovite. Usually fine grained, the rock exhibits a marked foliation, characterised by preferred orientation of tiny flakes of biotite.

The micaceous quartzite is predominantly siliceous, with small proportions of other minerals.

The quartzo-felspathic schist, which is obviously a metamorphosed equivalent of subgraywacke to graywacke are the most interesting rocks. These are fine to very fine grained rocks consisting of a groundmass of quartz,

felspar and biotite in which are embedded bigger grains (? porphyroblasts, ? pebbles) of quartz, plagioclase and microcline. The groundmass shows faint schistosity.

It is noteworthy to mention that transitions exist between the three types and obviously indicate the original variation in the sediments.

Mineralogically, the pelitic schists and associated rocks show following mineral assemblages :

1. Quartz + biotite
2. Quartz + plagioclase + microcline + biotite
3. Quartz + plagioclase + microcline + biotite + muscovite
4. Quartz + plagioclase + microcline + biotite + muscovite + epidote

Quartz

Its mode of occurrence is very interesting. It forms a granular aggregate of the groundmass, and also occurs as distinct larger grains with fairly smooth rounded to sub-rounded borders. These are obviously the original quartz pebbles embedded in an heterogeneous sedimentary matrix (Plate VI.7).

Felspars

Felspars are oligoclase (An_{12-18}) and microcline. Both occur in two ways - either small grains, along with quartz and biotite, make up the groundmass or they form conspicuous

PLATE VI.7

Quartz pebble embedded in heterogeneous matrix in quartzo - feldspathic schist (Photomicrograph. Crossed nicols. X 80).

porphyroblasts (Plate VI.8). These bigger grains of felspars appear to have metasomatically grown, the emanations having come from the granitised rocks below.

Biotite

Biotite is always present, and occurs in the form of thin flakes, pleochroic in shades of greenish brown (X = yellow, Y = brown, Z = greenish brown). It shows a parallel orientation and usually occurs in streaks.

Muscovite

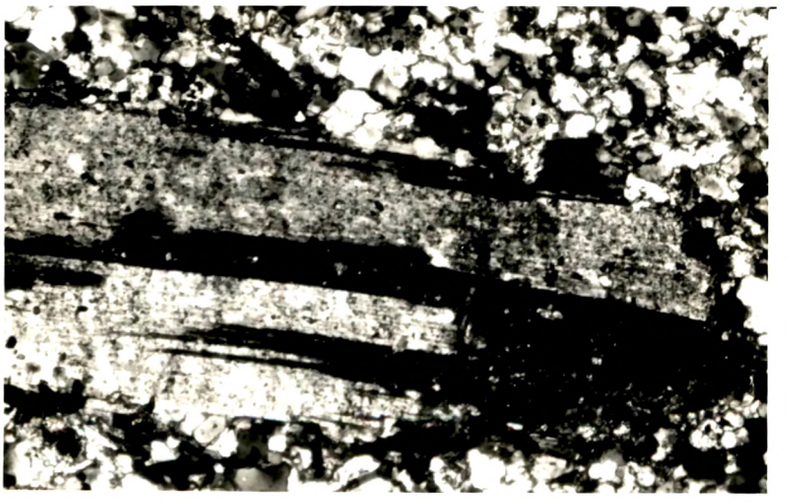
Muscovite is rather subordinate, and occurs as somewhat larger skeletal flakes, tending to be quite often porphyroblastic.

Epidote and Iron ores are the only accessory minerals and occur as small patches or discrete grains.

Rocks of mineralised zone

The narrow band of mineralised zone, occurring within the pelitic rocks, consists of metamorphosed equivalents of Mg — Ca rich sediments. In their present form, they are seen as strongly foliated schistose rocks made up of tremolite, talc, anthophyllite, biotite, chlorite, quartz and spinel. Depending on the different combinations of minerals following assemblages are observed :

PLATE VI.8



Plagioclase porphyroblast in Quartzofeldspathic schist (Photomicrograph. Crossed nicols X 80).

1. Quartz + biotite + chlorite
2. Quartz + tremolite + talc
3. Quartz + tremolite + talc + spinel
4. Quartz + biotite + anthophyllite
5. Anthophyllite + talc + spinel

Biotite forms small flakes, shows identical nature as that seen in biotite schists. Quartz occurs as granular aggregate. Tremolite forms tufts and linear patches of acicular crystals. Anthophyllite forms sheaf-like bladed (Plate VI.9) and acicular aggregates (Plate VI.10) and is recognised by pale colour, faint pleochroism, typical amphibolic cleavage and low second order polarisation colours, ($2V_Z = 90^o$). Some sections contain well developed grains of green spinel. The chlorite and talc are the alteration products of tremolite, anthophyllite and biotite; and occur in varying proportions.

GRANULITES

The pelitic granulites exposed in the northwestern part of the study area consist of quartz, felspars, garnet, sillimanite, cordierite and biotite and show high grade of metamorphism. In thin sections, they reveal a coarse granoblastic to gneissic texture.

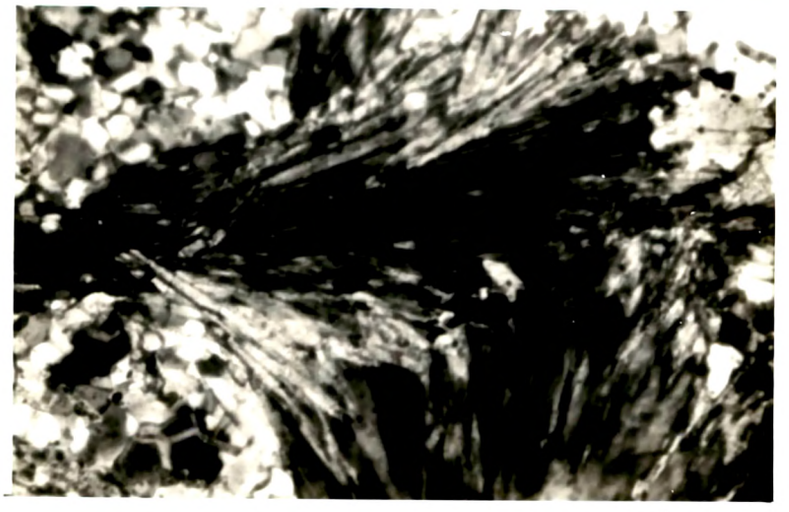
Quartz

Quartz occurs as interstitial as well as big grains with irregular outline.

PLATE VI.9

Bladed anthophyllite in calc magnesian rocks. (Photomicrograph. Crossed nicols. X 80).

PLATE VI.10



Acicular anthophyllite in calc-magnesian rocks. (Photomicrograph. Crossed nicols. X 80).

Felspars

Felspars are of two types - perthite and microcline, the former shows subhedral to anhedral grains and lamellar twinning. The latter forms anhedral grains and shows cross hatching.

Garnet

Garnet occurs as rounded to sub-rounded small grains scattered sporadically and is isotropic.

Cordierite

Cordierite is seen to occur in the form of rather big grains showing pinitization along irregular cracks (Plate VI.11).

Sillimanite

Sillimanite occurs as fibrolite and observed occasionally in association with cordierite and quartz. It always forms linear cluster of inclusions within the central part of the above two minerals (Plate VI.12).

Biotite

Biotite forms small brown flakes pleochroic from brown to yellow and obviously is the secondary mineral developed at the expense of garnet.

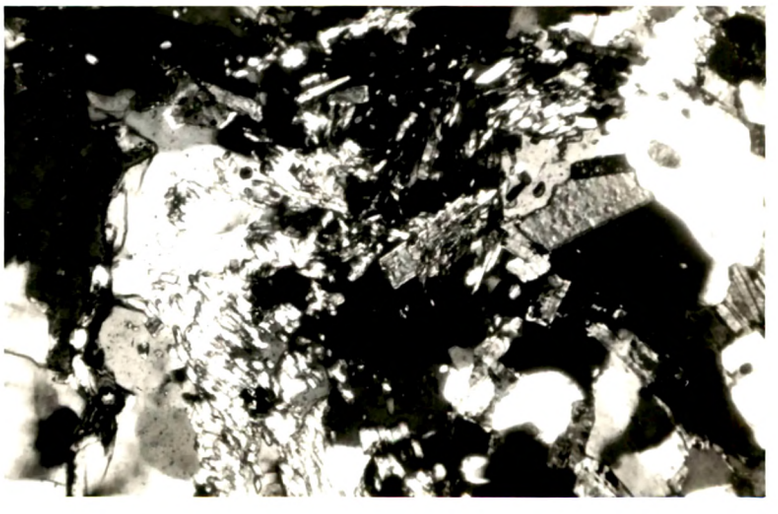
CALCAREOUS ROCKS

These comprise a group of metamorphosed equivalents of calcareous sediments with considerable variation in their original composition. The minerals present are calcite,

PLATE VI.11

Cordierite in pelitic granulites showing pinitization along cracks. (Photomicrograph. Crossed nicals. X 80)

PLATE VI.12



Fibrolite needles in cordierite in pelitic granulites. (Photomicrograph. Crossed nicols. X 80).

plagioclase, quartz, actinolite, tremolite, wollastonite, phlogopite, muscovite, diopside, forsterite, garnet, epidote and sphene. Depending on the relative proportions of the various minerals, the calcareous metasediments have been classified as under :

1. Marble - predominantly calcite (more than 80%) with subordinate quartz, tremolite, diopside, muscovite, phologopite, wollastonite, etc. (Plate VI.13).

2. Calc-Schist - Calcite and the various Calc-silicates in almost equal proportions or the latter may even predominate. The rock shows a distinct schistose (Plate VI.14) structure marked by the various prismatic and flaky minerals. Well developed garnet and epidote are characteristic of the variety.

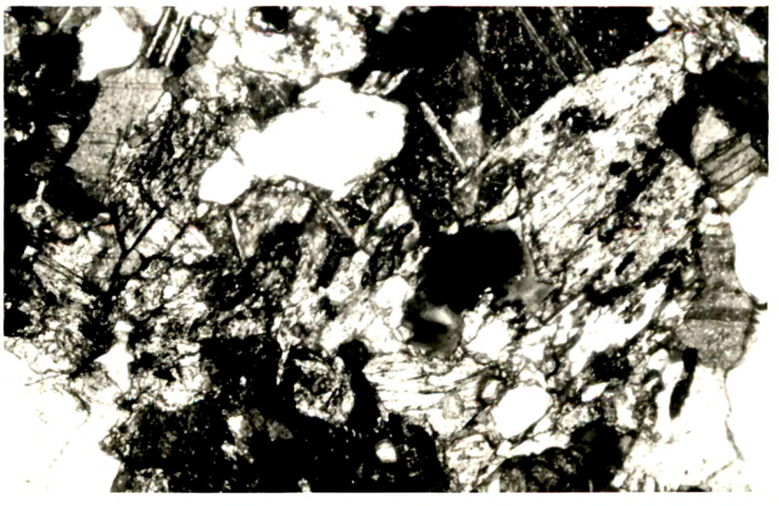
3. Calc-silicate gneiss - Coarse banded rock consisting of alternating calcite rich and silicate rich layers. In addition to the usual calc silicates, the silicate rich layers also contain plagioclase and quartz. The texture is typically banded and gneissic. The accompanying table (VI.1) gives the various mineral associations.

Mineralogically, the calcareous rocks show following mineral assemblages :

PLATE VI.13

Textural characters of marble
(Photomicrograph. Crossed nicols.
X 80).

PLATE VI.14



Textural characters of Calc-schists.
(Photomicrograph crossed nicols. X 80).

TABLE VI.1

VARIOUS MINERAL ASSOCIATIONS IN CALC-SILICATE GNEISSES

Sr. No.	Calcite	Tremolite	Diopside	Quartz	Epidote	Garnet	Clinozoisite	Plagioclase	Sphene	Actinolite	Remarks
1.		X	X	X	X						Silicate rich portion
2.	X		X	X			X	X	X		Silicate rich portion (calcite subordinate)
3.	X	X		X	X			X	X	X	Silicate rich portion (calcite subordinate)
4.	X			X	X		X				Calcite rich portion (rich in epidote)
5.			X	X	X						Silicate rich portion
6.	X		X			X					Calcite rich portion

X Mineral present

1. Calcite
2. Calcite + tremolite + quartz
3. Calcite + tremolite + quartz + diopside
4. Calcite + forsterite
5. Calcite + tremolite + wollastonite
6. Calcite + forsterite + phlogopite
7. Calcite + quartz + epidote
8. Calcite + quartz + epidote + garnet
9. Calcite + quartz + epidote + plagioclase + actinolite

Calcite

Calcite in marbles occurs as a mosaic of interlocking grains, slightly elongated in the direction of foliation. While in the silicate rich layers, its proportion varies and generally occurs as interstitial grains together with other calc-silicates.

Diopside

Diopside forms clusters as well as discrete equant grains showing a greenish tinge, it is non-pleochroic, with second order polarisation colours and extinction angle of -40° to -42° ($Z \wedge c$).

Tremolite

Tremolite is present in variable proportions, it occurs as tiny aggregates of shreds and flakes showing a faint parallelism.

Actinolite

Actinolite is rather uncommon confined to a few sections only. When present, it forms somewhat bigger prismatic crystals with inclusions of epidcte and quartz.

Wollastonite

This mineral is restricted to only a few specimens collected from the vicinity of granite. Obviously, product of contact metamorphism. It is seen as sporadic regged grains, with distinct cleavage and characteristic grey interference colours.

Garnet (Grossularite)

Garnet is also a contact mineral, seen in the vicinity of granite, and occurs as coarse anhedral grains of yellow colour with bold relief, as well as ill defined patches, traversed by cracks. It is usually associated with calcite and/or epidote.

Epidote

Pistacite, the green epidote is extensively developed as a contact mineral. It forms either small granular aggregate interspersed with calcite, tremolite or garnet, or as veins and stringers cutting the rock mass in all directions.

Plagioclase

This plagioclase (An_{31-44}) is of restricted occurrence and is seen in the silicate rich layers as discrete grains, but its percentage is always very small.

Phlogopite

Phlogopite is mostly confined to marbles (i.e. calcite rich rocks) and occurs as short prismatic crystals. It is pale brown to colourless and shows feeble pleochroism.

Forsterite

Forsterite is also restricted to calcite rich rocks (i.e. marbles) and forms sporadic grains within calcite mass; is colourless, shows irregular cracks and interference colours of upper second order.

Quartz

Quartz is only sporadic, occurs as small interstitial grains in silicate rich portions.

Microcline

Microcline is only rarely observed from the rocks in the vicinity of granite.

Sphene

Sphene is almost invariably present in Calc-silicate rich portions and forms scattered anhedral grains.

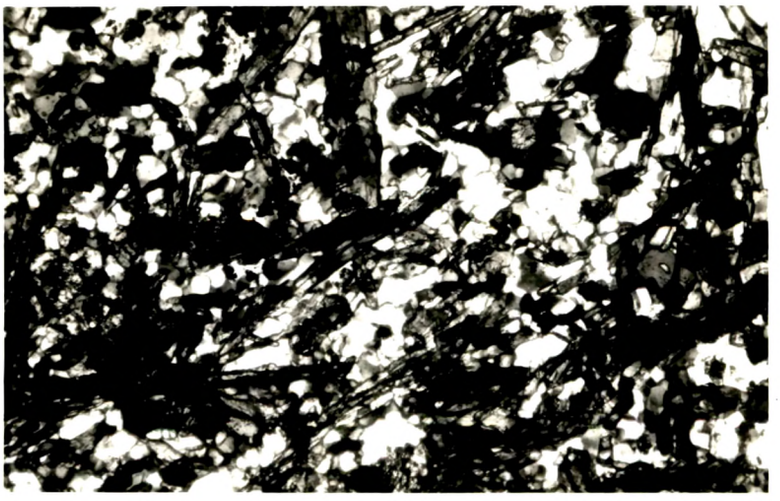
Para-amphibolites

These are amphibolitic rocks occurring within the calc-schists and calc-silicate gneisses, as narrow dark Coloured layers. They show a fairly diffused contact. Consisting essentially of actinolite, plagioclase, quartz and epidote, these typically comprise a group of para-amphibolites derived from the metamorphism of impure calcareous sediments. Some sections also contain diopside. Actinolite, plagioclase and quartz are present in almost equal proportions. In fact, with the increase in the proportions of these three minerals, the calc-schists pass into para-amphibolites.

Texturally, these amphibolites are very fine to mediumgrained with acicular actinolite interspersed in a granular aggregate of quartz and plagioclase (Plate VI.15). In some samples, the actinolite shows preferred orientation and a banded nature due to increase or decrease in its proportions. Mineralogically they comprise the following mineral assemblages :

1. Actinolite + plagioclase + quartz.
2. Antinolite + plagioclase + quartz + epidote
3. Actinolite + plagioclase + quartz + epidote + diopside.

PLATE VI.15



Textural characters of para-amphibolites.
(Photomicrograph. Polarised light. X 80).

Actinolite

Actinolite occurs as slender prisms of bluish green colour, pleochroic (colourless to pale green) and is devoid of any inclusions.

Plagioclase

Plagioclase is andesine (An_{35-42}) and occurs as tiny anhedral grains, in intimate association with quartz.

Quartz

Quartz also forms a fine to mediumgrained aggregate; in which the amphibole needles are embedded.

Epidote

Epidote is pale green pistacite and colourless clinozoisite and occurs as stray grains and as elongated streaks.

Diopside

Diopside is present only in a few sections, it occurs as patchy skeletal crystals with inclusions of quartz and plagioclase.

META-DOLERITES

These mafic bodies occur as sills within the metasedimentaries and extend for long distances, easily recognised by their freshness. Being younger than the main foldings, these show little deformation.

In hand specimen, these rocks are typically greyish black, compact and finegrained. Under the microscope the ophitic to sub-ophitic texture (Plate VI.16) is clearly seen, laths of fresh to altered felspars embedded in plates of partly altered pyroxene. The minerals are andesine and augite with their altered products.

1. Plagioclase + augite + uralite
2. Plagioclase + quartz + epidote + augite + uralite
3. Plagioclase + saussurite + augite + uralite + iron oxides.

Augite

Augite forms ophitic to sub-ophitic plates enclosing plagioclase laths. It is almost invariably altered to uralite and epidote. Wherever fresh, it is seen to be bi-axial negative with high extinction angle, and second order polarisation colours.

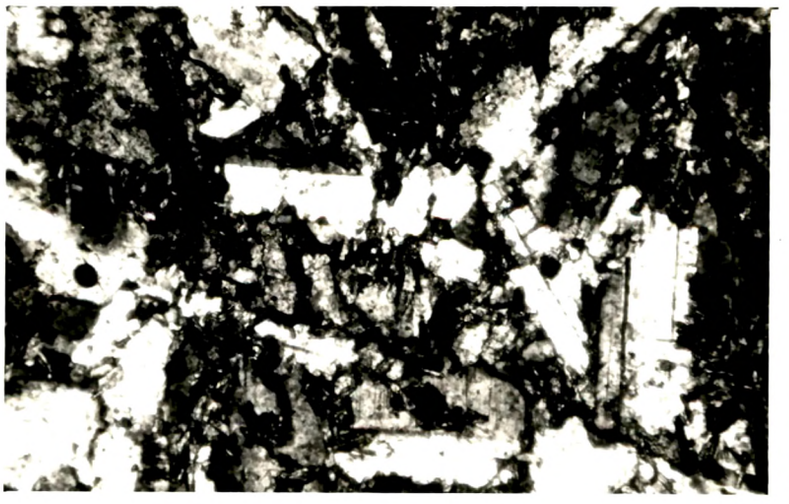
Plagioclase

Plagioclase is fresh to partly altered and is andesine (An_{30-40}), characterised by usual Albite type twinning. The degree of alteration is variable, and is always to saussurite and sericite.

Magnetite and ilmenite

Magnetite and ilmenite are the two conspicuous iron oxides that occur as important accessory minerals.

PLATE VI.16



Metadolerite showing sub-ophitic texture.
(Photomicrograph crossed nicols. X 80).

Alteration products

Alteration products comprise uralite, chlorite, saussurite, sericite and epidote. Uralite is the principal alteration product of augite and occurs as acicular to fibrous aggregates of green colour, pleochroic from pale green to bluish green. Quite often shows amphibole cleavage. The cleavages are often characterised by released iron-oxides. Chlorite is also derived from the pyroxene but it is generally very subordinate. When present it is recognished by its green colour and very feeble polarisation colours. Saussurite is derived from plagioclase and partly or fully clouds the felspars. Epidote occurs as discrete grains or patches in the uralite, chlorite and matrix; appears to have developed at the cost of pyroxene and plagioclase. Quartz occurs interstitially in a few sections only and appears to be a product of hydrothermal changes brought about by the granite.

GRANITES

These include the intrusive masses of nonfoliated granites, and based on the mode of occurrence and petrography, fall into two varieties :

I. Ferromagnesian free fine to mediumgrained flesh coloured granite (- Microgranite of Sharma)

II. Coarse to medium grained biotite granite (- Erinpura granite proper).

Variety I

It is a compact nonfoliated fine to medium grained rock of flesh or red colour, almost devoid of ferromagnesians. In this sections, it shows an equigranular (Plate VI.17) holocrystalline aggregate of quartz, microcline and plagioclase. Biotite, if present, is in negligible quantity. Quite often the rock is porphyritic with phenocrysts of quartz and felspars.

Mineralogically, this variety comprises the following mineral assemblages :

1. Microcline + quartz + plagioclase
2. Microcline + quartz + plagioclase + biotite + epidote.

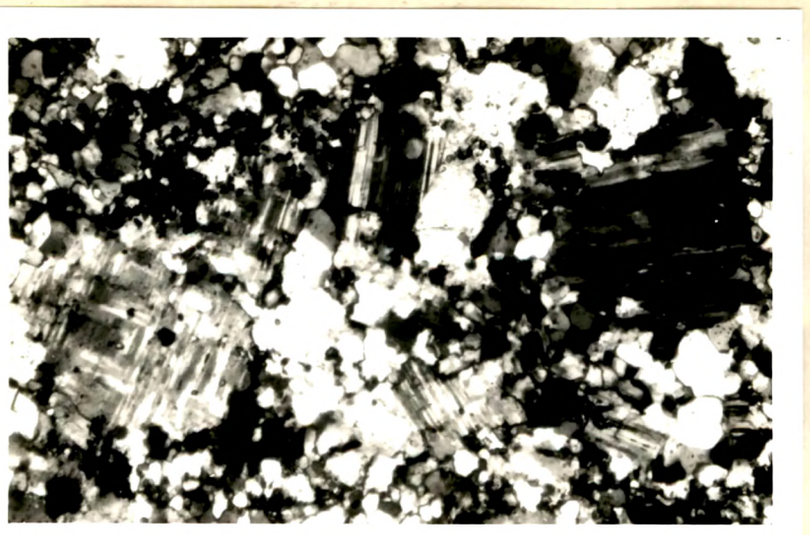
Quartz

Quartz is the most dominant mineral and occurs as anhedral grains of variable sizes, quite often intergrown with felspars, Frequent phenocrysts are not uncommon.

Felspars

Felspars comprise microcline and plagioclase. The former typically shows gridiron structure. Plagioclase is an oligoclase (An_{10-16}) shows Albite type twinning and low extinction angle on twin lamellae. Microperthitic intergrowth with plagioclase is quite common. Microperthite often forms phenocrysts. On the whole the felspars are fresh and unaltered.

PLATE VI.17



Textural characters of finegrained granite (Photomicrograph. Crossed nicols. X 80).

Epidote and biotite

Epidote is present always in some rocks quite abundant. It is pistacite, showing typical green colour. Sometimes it occurs as veins. Biotite is only occasionally recorded, and is seen in a few sections only as tiny brown flake.

Variety II

Coarse to medium grained, quite often porphyritic, this variety is the most dominant and represents the typical Erinpura granite. In hand specimen, it is seen as pink or grey rock with biotite as the main ferromagnesian mineral. Phenocrysts are the felspars.

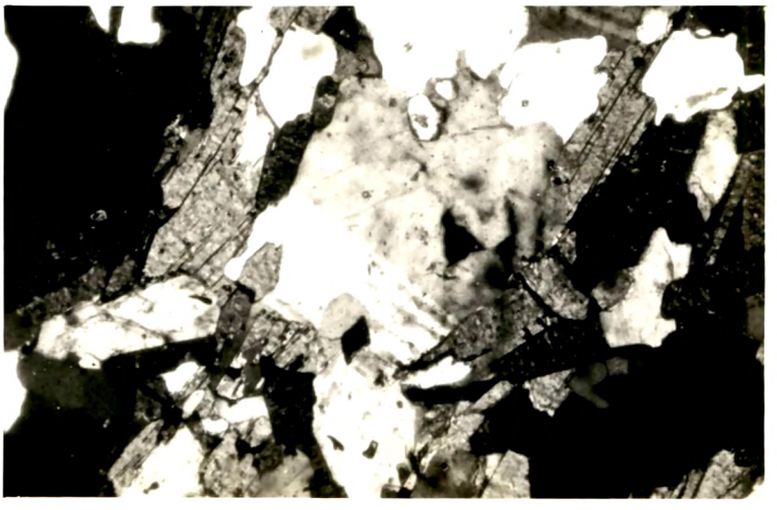
Under the microscope, the rock shows a holocrystalline, hypidiomorphic texture (Plate VI.18), and essentially consists of quartz, felspars - potash as well as plagioclase, muscovite and biotite. Accessory minerals are sphene, zircon, apatite, epidote and iron oxides. Mineral assemblages of this variety are as follows :

1. Microcline + plagioclase + quartz
2. Microcline + plagioclase + quartz + biotite
3. Microcline + plagioclase + quartz + biotite + muscovite

Quartz

Proportion of quartz almost equals to that of the two felspars. It shows a wide variation in grain size and often shows interlocking grains with felspars. It also occurs as inclusions in the felspars and micas.

PLATE VI.18



Textural characters of coarse grained granite
(Photomicrograph crossed nicols.
X 80).

Felspars

Felspars are both potash felspar and plagioclase. The potash felspar include orthoclase and microcline. Orthoclase forms large sub-hedral grains and is recognised by the Carlsbad type twinning and low refractive index. Microcline shows anhedral grains and characteristic cross hatching. The plagioclase is an oligoclase (An_{10-15}), always shows fine well defined Albite type twinning. Perthitic and vermicular intergrowths are quite common.

Micas

Both micas - biotite and muscovite are present, the former dominates. Muscovite forms large flake as also smaller flakes, the latter in close association with biotite. Biotite also shows a variation in size but not as much as that shown by muscovite. It forms ragged plates, pleochroic from straw yellow to dark brown. Numerous euhedral grains of apatite and sphene occur as inclusions. Zircon grains with pleochroic halos are also frequently recorded.

Accessory minerals

Scattered grains of sphene, zircon and iron-oxides (magnetite), apatite and epidote are the main acessories.

POST-ERINPURA BASIC ROCKS

These are oligoclase basalts representing the basic igneous activity that took place after the emplacement of

Erinpura granite. Megascopically these are dark grey, finegrained aphanitic rocks and under the microscope reveal their basaltic nature. They show a variolitic texture (Plate VI.19), comprising numerous radiating needles and clusters of plagioclase embedded in a very finegrained matrix of chlorite, ilmenite and leucoxene. Mineral assemblage of these rocks are as follows :

1. Plagioclase + chlorite + leucoxene + ilmenite

Plagioclase

Plagioclase is fresh to partly altered and is oligoclase (An_{10-20}). It occurs as radiating rosettes of almost microlitic needles that show distinct lamellar twinning.

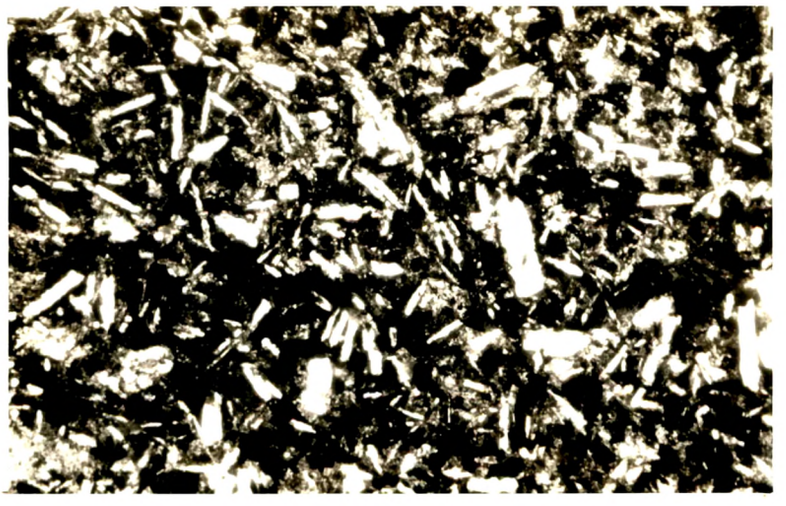
Chlorite

Chlorite is the dominant mineral of the matrix and is obviously the alteration product of the groundmass; usually green in colour and pleochroic in shades of green. Mostly it is almost isotropic though it may occasionally show low birefringence.

Accessory Minerals

Leucoxene and ilmenite occurring as skeletal grains, are the main accessory minerals.

PLATE VI.19



Oligoclase basalt showing variolitic texture (Photomicrograph. Polarised light. X 80).