CHAPTER VI

P E T R O G R A P H Y

GENERAL

The entire succession of the study area comprises a depositional sequence progressively changing over from arenaceous to increasingly argillaceous. Subsequent metamorphism has slightly modified these rocks, but as the textural and mineralogical changes were quite feeble; the original sedimentary nature of the various rock types is quite clearly discernible. Petrographic characters have adequately shown that the entire sequence from top to bottom represents sedimentation that started with exclusive accumulation of quartz sand which subsequently got

progressively more and more rich in argillaceous content; the upper portion more of the nature of graywackes. A brief account of the petrography of the various rocks is given here, though the detailed study was not possible mainly because of the deformed metamorphic nature of the rocks.

KUSMA QUARTZITES

In this formation, following rock types were encountered:

1. Thickly bedded massive quartzite
2. Micaceous quartzite
3. Crystalline limestone
4. Spilite and Tuff - as lenses and thin layers.

Massive quartzite

These are almost exclusively quartzose rocks and represent feebly recrystallised pure sandstones of the quartz arenite variety. The argillaceous content is less than 10%. The quartz occurs as sub-rounded to sub-angular clastic grains welded together. Flattening and stretching of grains is quite common. Some time elliptical quartz grains of large size are seen embedded in a mass of medium

to finegrained quartz (Plate No. VI.1). This bimodal grain size variation reflects the original nature of the sand. Mineralogically, the rock consists mainly of quartz with stray tiny streaks of sericite and chlorite. Small clastic grains of tourmaline are the only striking accessory mineral.

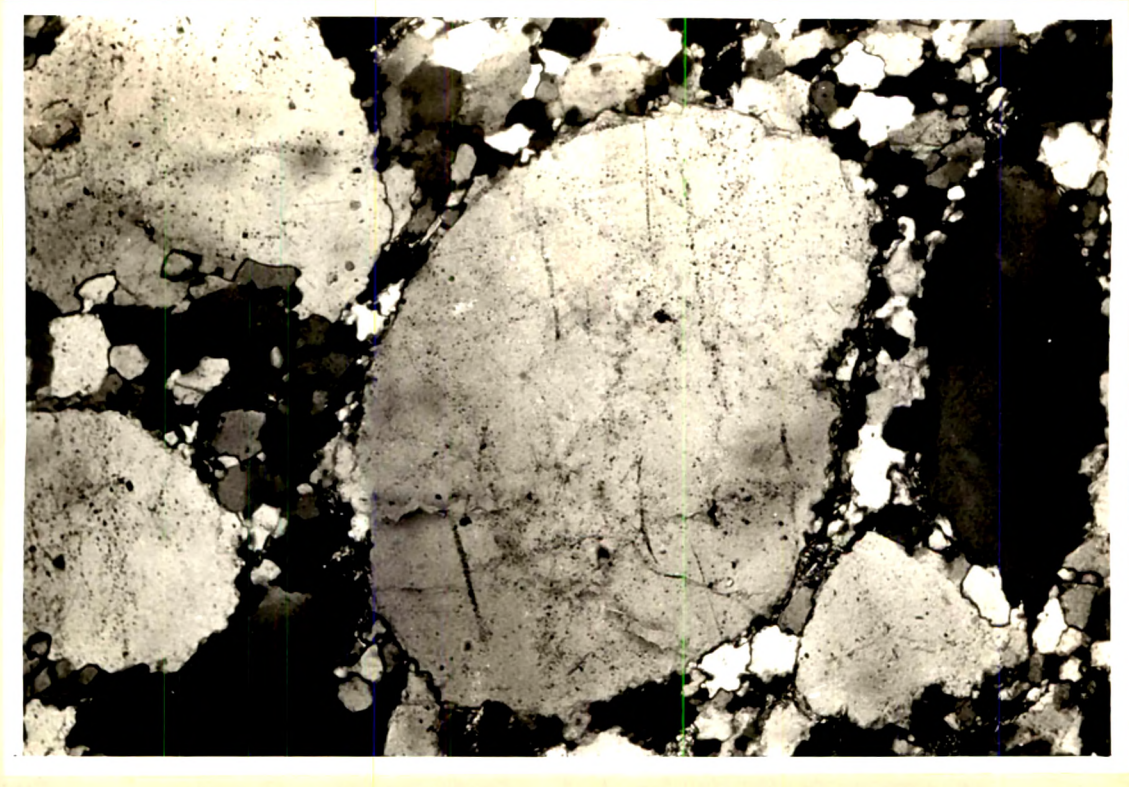
Minerals: Quartz, sericite, chlorite, and tourmaline.

Micaceous quartzite

This variety represents a slight increase in the argillaceous content, and is seen under the microscope to consist of a quartzose mass in which are interspersed tiny streaks of fine micaceous minerals. The quartz is typically bimodal, large clastic grains embedded in a matrix of fine grained quartz (and some feldspar - mostly a sodic plagioclase). The micaceous minerals are confined to the matrix only.

Metamorphic changes have slightly modified the original nature of these argillaceous sandstones. The quartz grains show stretching, fracturing, strain shadows and some recrystallisation also. The argillaceous matrix is now represented by fine aggregates of sericite, muscovite and chlorite. The usual detrital tourmaline is present, and occasionally stray grains of magnetite are observed.

PLATE VI.1



Photomicrograph showing bimodal clastic quartz grains in massive quartzite (crossed nicols X 60).

Minerals: Quartz, sericite, muscovite, chlorite, tourmaline and magnetite.

Crystalline limestone

This limestone, which occurs sporadically as thin intercalations within the quartzites, shows white, buff or grey colour. Under the microscope, it is seen to be made up of medium to finegrained granular aggregate of dominantly calcite with some dolomite (Plate No.VI.2). Some detrital quartz, either scattered as subrounded or discrete grains, forming lensoid aggregates is also recorded.

The rock represents recrystallised derivative of originally carbonate sediments with some detrital quartz grains. Pyrite and chalcopyrite are seen as authigenic minerals.

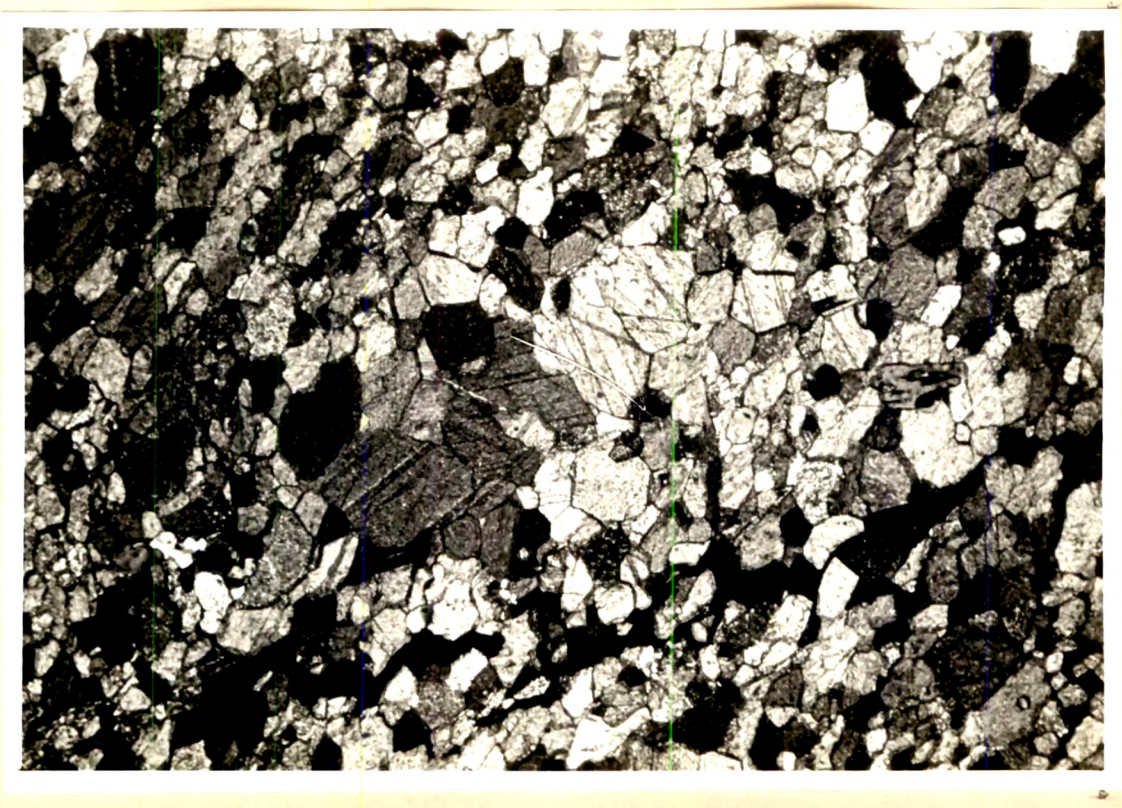
Minerals: Calcite, dolomite, quartz, pyrite and chalcopyrite.

Spilites and tuffs are described separately in the next chapter.

BALEWA FORMATION

The rocks of this formation typically show an increase of argillaceous content upward, and point to the transition

PLATE VI.2



Photomicrograph showing textural characters of crystalline limestone (crossed nicols X 60).

of arenites to wackes. All transitions are observed, and on the basis of relative proportions of the sand and clay matrix, and the size of the quartz grains, following varieties have been worked out:

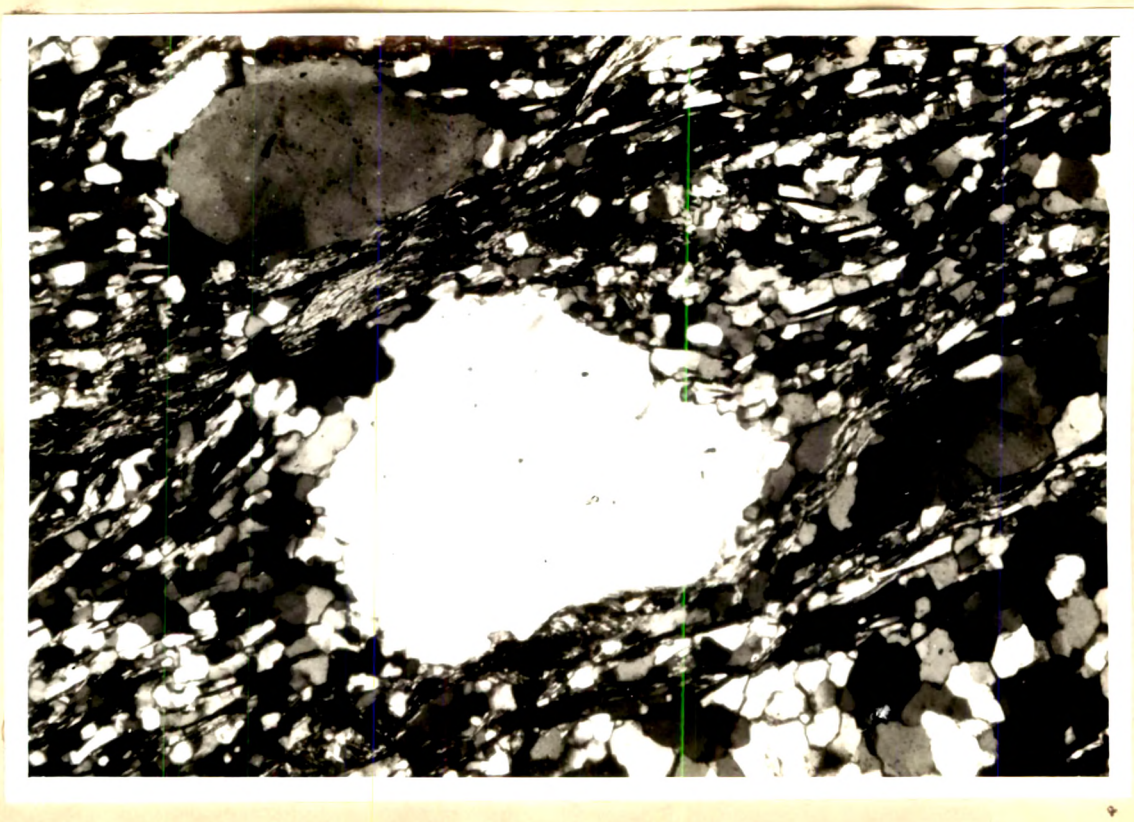
1. Gritty quartzose phyllite
2. Quartzose phyllite
3. Phyllite

Gritty quartzose phyllite

These are the transitional rocks containing 10 to 15% of argillaceous matrix. The clastic grains are mostly recrystallized quartz and some felspar, and show sub-rounded flattened shape, embedded in a foliated matrix of fine quartz and micaceous minerals. The quartz is typically bimodal (Plate No.VI.3), hence the rock has been designated as gritty quartzose phyllite. Originally the rock must have been a quartz- and feldspathic graywacke (Turner & Gilbert, 1969, pp. 294). Clastic grains of tourmaline and magnetite are common.

Minerals: Quartz, feldspars (microcline and sodic plagioclase), sericite, muscovite, chlorite, tourmaline and magnetite.

PLATE VI.3



Photomicrograph showing the textural characters of gritty quartzose phyllite (crossed nicols X 60).

Quartzose phyllite

These are identical to the previous variety, except that they are not gritty i.e. the quartz is usually unimodal.

Minerals: Quartz, feldspars (microcline and sodic plagioclase), sericite, muscovite, chlorite, tourmaline and magnetite.

Phyllite

These comprise metamorphosed derivatives of rather fine clastic sediments of silt size. The argillaceous component dominates, but fine quartz is also equally conspicuous and points to the fact that original sediments were not exclusively clayey. In the present form, they show a finely foliated aggregates of fine chlorite, sericite and quartz with occasional larger flakes of muscovite. Sporadic larger size quartz grains are also present. The rock is scattered with powder like mass of iron-oxide.

Minerals: Chlorite, sericite, quartz, muscovite and iron-oxide.

SUMSA FORMATION

Lying to the south of the Phalebas Thrust, this formation is supposed to be the youngest in the sequence. Allowing for the isoclinal folding in the area further

south, the Sumsa Formation has been found to show (B.N. Upreti, personal communication) following succession:

1. Grey slate and slaty phyllite
2. Impure feldspathic sandstone (graywacke)
3. Purple slate and dolomite.

In the study area, only the first two i.e. grey slates and slaty phyllites with intercalations of graywackes are encountered.

Grey slate and slaty phyllite

These are somewhat identical to the graywackes, except that the clastic grains are scarce, and the total bulk of the rock comprises of a finegrained aggregates of quartz, chlorite, sericite and some calcite. Quartz sometimes forms slightly larger grains and typically shows its clastic - sub-angular nature. The rocks are obviously derived from silty to argillaceous immature sediments, which have been subjected to deformation and incipient crystallisation.

Minerals: Quartz, feldspar, chlorite, sericite and calcite.

Impure feldspathic sandstone (graywacke)

Though B.N. Upreti has recorded quartz graywacke, feldspathic graywacke and as well as lithic graywacke, the

author has come across only feldspathic graywackes in his area. The rock is dirty green colour, and its true nature is seen under microscope only. It shows clastic grains of quartz and feldspar (mostly potash feldspar, sometimes a plagioclase) embedded in a heterogeneous matrix of fine quartz, chlorite, sericite and muscovite (Plate No. VI.4). The matrix shows only a faint foliation. The clastic grains are usually sub-angular to sub-rounded.

Minerals: Quartz, feldspars (mostly potash feldspars and sometimes plagioclase), chlorite, sericite and muscovite.

When the rock shows crude foliation and grade, chlorite, sericite and muscovite it can no longer be described as a sedimentary rock. The further association of slate and early low grade or dynamo thermal metamorphic

Purple slate and dolomite

Southward, the above rocks change over to a group of purple slates with dolomitic intercalations. Within the study area, of course, their occurrence is limited and sporadic. The purple slates are calcareous and are seen to be made up of fine mass of sericite, chlorite, carbonates and quartz. Quartz is subordinate to carbonates. With this rock is intercalated purple dolomite layers, thin sections of which reveal a fine dolomitic aggregates with frequent oolitic structures (Plate No. VI.5). Quartz is always present but in a much diminished quantity.

Minerals: Carbonates (calcite/dolomite), quartz, sericite and chlorite.