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DESCRIPTIONS OF NORTHERN TERRITORY ROCK SAMPLES FOR AGE DETERMINATION

by

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Following are the descriptions of various rock samples from Northern Territory, from which extracted micas have been sent to the Massachusetts Institute of Technology for age determinations.

The specimens described below are as follows:

Reference No.	Slide No.	Rock Type
F/53/2/1	BW1	Granite
F/53/2/2	BW2	Granite
F/53/2/3	BW3	Quartz-granite
F/53/2/4	BW4	Adamellite
F/53/2/5	BW5	Adamellite
F/53/11/1	HUC1	Alaskite
F/53/11/2	HUC2	Adamellite
F/53/11/3	HUC3	Garnetiferous amphibolite
F/53/11/4	HUC4	Garnet-biotite-sillimanite-quartz gneiss.
F/53/11/5	HUC5	Granite
E/53/14/1	TCK1	Granodiorite
E/53/14/2	TCK2	Granite
E/53/14/3	TCK3	Quartz-feldspar porphyry
F/53/6/1	BCK1	Adamellite
F/53/9/1	NAP1	Garnetiferous granite
F/53/7/1	ELK1	Adamellite

F/53/2/1, BW1

This is a medium-grained light grey granite. In the handspecimen the rock is seen to be very much weathered. Slight traces of foliation can be seen.

The essential constituents are quartz, potash feldspars, plagioclase and ferrophengite. Biotite, hematite and magnetite are the accessories.

Quartz occurs in medium to large anhedral grains. Undulose extinction is not seen. Inclusions of feldspars and mica are present.

Potash feldspars are microcline, microcline-perthite and perthite. They are slightly clouded due to alteration. Inclusions of plagioclase, quartz and mica are seen.

Plagioclase feldspars are very cloudy and have undergone severe alteration; the alteration products are usually sericite and kaolin. Traces of polysynthetic twinning are seen. Owing to intense kaolinisation of the plagioclase it is not possible to be certain of its composition. However, it appears to be mainly andesine.

Ferrophengite is the main accessory. It is slightly pleochroic from colourless to pale reddish brown, and owing to its small 2V, gives a pseudo-uniaxial figure.

Biotite flakes are very rare; only two or three of them were noticed in this particular thin section.

Hematite grains and stringers of hydrated iron oxide are quite common. Irregular small grains of magnetite are also present.

F/53/2/2, BW2

A moderately coarse-grained, pinkish biotite-muscovite granite. In the hand specimen the rock does not show any sign of foliation. Occasional xenolithic materials are seen; they consist essentially of biotite.

Under the microscope typical hypidiomorphic texture is apparent. The rock has undergone a fair amount of deformation as is evident by undulose extinction in quartz and slightly bent muscovite flakes.

The essential mineral constituents are potash feldspars (microcline, microcline-perthite and perthite), quartz, plagioclase (andesine), and muscovite. Biotite, a few isolated grains of zircon and fluorite, and iron ores are the accessories.

Potash feldspars are the predominant mineral, constituting up to 45.77% of the bulk. Inclusions of plagioclase, quartz and mica are present.

Quartz, which constitutes 27.86% of the total, occurs as anhedral grains; cracks are present, and minute inclusions of some transparent material having no set direction are seen.

Plagioclase (16.03%), occurs as medium-sized subhedral to euhedral grains, and is andesine. The plagioclase has undergone a fair amount of alteration, and thus appears rather cloudy in thin section. The alteration products are sericite and kaolin.

Biotite is greenish variety and constitutes only 1.87% of the total. It is strongly pleochroic and has partly altered to chlorite. Inclusion of iron ores are common.

Muscovite occurs in large flakes, and constitutes up to 8% of the bulk.

F/53/2/3, BW3.

A moderately coarse-grained massive light grey quartz-granite. In thin section it is seen that the rock has a typically granitoid texture and consists essentially of quartz (47.00%), potash feldspars (24.34%), plagioclase

(18.36%), biotite (4.31%), white mica (4.12%), and the accessories fluorite and iron ores.

Quartz occurs as medium to large anhedral grains, and does not show undulose extinction. However, irregular cracks and minute inclusions (probably fluid) are present.

Potash feldspars are microcline, microcline-perthite and perthite. They are cloudy due to alteration. Inclusions of quartz, plagioclase, biotite and muscovite are seen.

Plagioclase is generally more heavily altered and is andesine (An_{36}), and shows distinct polysynthetic twinning. The alteration products usually are sericite and kaolin.

Biotite is strongly pleochroic from straw yellow to dark dirty brown. Inclusions of fluorite, and feldspars are seen. Occasionally biotite has been replaced by chlorite, and in some instances iron oxide (ilmenite) forms elongated inclusions and penetrations lying along cleavage planes.

Both muscovite and damourite are present, they occur in medium to large flakes. Damourite is distinguished from muscovite by its smaller 2V (which is responsible for the pseudo-uniaxial interference figure).

Fluorite occurs as small amethyst coloured grains. Iron ores (1.58%), which include hematite, ilmenite and leucoxene, occur invariably as irregular grains and masses.

F/53/2/4, BW4.

The rock is a coarse-grained porphyritic muscovite-biotite adamellite, with average grains size of about 1.3 mm. The larger grains (phenocrysts) are potash feldspar (microcline-perthite) ranging in size between 2 mm. and 5.5 mm. These microcline-perthite phenocrysts, which are quite fresh, commonly occur as subhedral crystals, and contain numerous inclusions of muscovite, biotite, chlorite, plagioclase, quartz, apatite, zircon, tourmaline and iron ores.

In hand specimen the rock is pale pinkish grey. A slight indication of foliation is apparent in the arrangement of biotite flakes. Small clots of xenolithic material, composed essentially of biotite and muscovite, together with small amounts of quartz, feldspar and the accessories, is also present.

Under the microscope the rock shows a hypidiomorphic texture. Undulose extinction in quartz grains and bent biotite flakes suggest that the rock has undergone a fair amount of deformation. A moderate degree of alteration is also apparent.

The essential mineral constituents are quartz, plagioclase, potash feldspar and biotite. The accessories are muscovite, apatite, zircon, tourmaline, magnetite and ilmenite. Secondary chlorite, sericite and epidote are also present.

Quartz, which constitutes 33.55% of the total, occurs as anhedral grains. Undulose extinction is quite common. Inclusions of muscovite, biotite, apatite, zircon and tourmaline are seen.

Plagioclase feldspar (22.11%) occurs as subhedral to anhedral grains. This plagioclase has an anorthite content ranging between 40 and 48% (andesine), and is optically negative. The plagioclase has been subjected to a moderate degree of alteration, resulting in sericitisation, with the development of fine flakes of white mica. Occasionally the central portion of the crystals has altered to epidote, which suggests that the crystal had a calcic core. Polysynthetic twinning is quite common, and traces of zoning are also seen. Common inclusions are biotite, muscovite, chlorite, quartz and iron ores.

Potash feldspars (19.67%) occurs as subhedral to anhedral grains, and are microcline and perthite. Compared to plagioclase these potash feldspars have suffered very little alteration and are quite fresh. Microcline shows the typical cross-hatching. Perthite is usually the vein type. Inclusions of plagioclase, quartz, muscovite, biotite, apatite and iron ores are noticed.

Biotite (19.48%) occurs in long flakes and is strongly pleochroic from X = pale straw yellow; Y = brownish yellow; and Z = dirty greenish brown. Pleochroic haloes surround rare zircon grains. Alteration to chlorite is slight. This chlorite is distinctly pleochroic and gives an anomalous blue interference colour, and is probably penninnite. Numerous small inclusions of iron ore, apatite, zircon and muscovite are present.

Non opaque accessories constitute 4.35% of the total. Muscovite is the most important mineral among the non opaque accessories; it occurs in flakes and contains inclusions of iron ores. Apatite occurs in large euhedral crystals up to 0.26 mm. across.

Opaque accessories include mainly magnetite and ilmenite, which constitute 0.84 per cent of the total. The iron ores which are in irregular grains occur mainly as inclusions in biotite, muscovite and feldspar.

F/53/2/5, B 5.

This is a medium-grained light grey adamellite. In the handspecimen the rock does not show any directional structure. No xenolithic material has been noticed in the specimen provided.

Under the microscope the typical granitoid texture is seen. The essential mineral constituents are quartz (33.93%), potash feldspars (36.39%), plagioclase (21.51%), and biotite (5.85%). Non-opaque accessories constitute 1.66%, and the opaque accessories 0.66%.

Quartz occurs in medium to large anhedral grains. It shows slight undulose extinction. Inclusions of feldspars and mica, together with minute fluid inclusions (without any apparent orientation); are present.

Potash feldspars are microcline, microcline-perthite and perthite. They occur as medium-sized subhedral to euhedral grains. Potash feldspars are slightly cloudy due to alteration. Some of the perthites show beautiful graphic texture. Inclusions of quartz, plagioclase and mica are present.

Plagioclase is very much clouded and has undergone a fair amount of alteration. It occurs as medium-sized subhedral to euhedral grains, and is Oligoclase (An_{12}). Polysynthetic twinning is seen, but at times due to severe alteration the twinning is obscured. The alteration products usually are kaolin and sericite. Myrmekitic intergrowth is also seen.

Both green and brown biotite are present and they occur as small to medium-sized flakes. They are strongly pleochroic from straw-yellow to deep green and from pale yellowish brown to dark reddish brown. Pleochroic haloes are seen in both types of biotite. Some of the brown biotite has been replaced by chlorite; a few flakes of the green biotite have been replaced by epidote. Inclusions of iron ores, zircon and feldspars are present in both the biotites.

Non-opaque accessories consist mainly of chlorite and epidote, though isolated flakes of muscovite and small grains of zircon have also been noticed.

Opaque accessories are ilmenite, leucoxene; and hematite; they occur either as inclusions in biotite or as small isolated grains.

F/53/11/1, BUCl.

This is a coarse-grained pinkish rock, without any foliation. Under the microscope the typical hypidiomorphic texture is seen. The essential mineral constituents are quartz (17.57%), potash feldspars (51.63%), plagioclase (26.85%), and biotite (1.19%), with non-opaque accessories (1.14%) and opaque accessories (0.97%). The rock with its very low colour index of 3.95 and high feldspar content, particularly its potash feldspar, is rather unusual, and can be named alaskite (according to Johannsen's classification).

Quartz occurs as medium-sized to large anhedral grains. Most of these grains are cracked and show undulose extinction.

Potash feldspars consist of microcline, microcline-perthite, and perthite. They occur as medium to large anhedral to subhedral grains. Usually the potash feldspars are fresh. Slight cloudiness due to alteration has been noticed in some of them. Common inclusions are plagioclase, quartz, and mica.

Plagioclase is albite, and occurs as medium-sized to large anhedral to subhedral crystals. They are very much clouded and have undergone a fair amount of alteration. Common alteration products are sericite and kaolin. Common inclusions are magnetite, chlorite, biotite and apatite.

Biotite occurs as small to medium-sized flakes and is pleochroic from pale yellowish brown to dark brown. Pleochroic haloes are rare. Most of the biotite has been replaced by chlorite. Inclusions of magnetite, sphene, zircon, apatite and epidote are quite common.

Non-opaque accessories are chlorite, muscovite, sphene, allanite, zircon, apatite, and epidote. Chlorite (penninite) is quite common. The penninite is secondary, replacing biotite. Large irregular grains of sphene up to 1.8 x 1.2 mm. are present; these grains are faintly pleochroic from honey yellow to orange yellow. Good subhedral to euhedral

crystals of allanite measuring up to 1.8 x 0.7 mm. were also noted. They show faint pleochroism. Subhedral to euhedral crystals of zircon and apatite are common. The epidote is a pleochroic variety, and occurs as small grains.

The only opaque accessory is magnetite. It occurs as large euhedral octahedral crystals or as irregular masses mostly as inclusions in mica, feldspar and allanite.

F/53/11/2, HUC2

A coarse-grained pink-coloured adamellite, without any apparent directional structure in the hand specimen.

The adamellite consists of quartz (30.57%), potash feldspar (30.19%), plagioclase (29.64%), biotite (5.99%), non-opaque accessories (1.10%), and opaque accessories (2.52%).

Under the microscope the typical granitoid texture is seen. Undulose extinction in quartz, and bent muscovite flakes, suggest that the rock has undergone a moderate amount of alteration.

Quartz occurs as medium to large anhedral grains. These grains have developed cracks. Inclusions of feldspars, muscovite and biotite are present.

Potash feldspars consist of microcline, microcline-perthite, and perthite. They occur as large to medium-sized anhedral to subhedral grains. Inclusions of plagioclase, quartz and mica are common.

Plagioclase feldspar has altered to sericite and kaolin. Due to severe alteration the determination of the plagioclase is difficult, but it seems to be andesine.

Both green and brown biotite are present. The former is more common. Biotite flakes are strongly pleochroic, and pleochroic haloes have also been noticed. In some cases biotite has been replaced by chlorite. Common inclusions are muscovite, iron oxide, fluorite, zircon and apatite.

Among the non-opaque accessories muscovite and chlorite are most prominent. Chlorite is of secondary origin. Muscovite occurs as small to medium-sized flakes. Minor accessories are apatite (which occurs in large grains), fluorite (pale amethyst), epidote and zircon (small euhedral to subhedral crystals).

The opque accessory is magnetite, which occurs as irregular grains.

F/53/11/3, HUC3

This is a fine- to medium-grained dark green garnetiferous amphibolite. In the hand specimen schistosity is apparent.

Under the microscope the amphibolite is found to consist of hornblende, plagioclase, and accessory pyroxene and garnet, with very minor iron oxide, sphene, and apatite.

Hornblende is the most abundant mineral, and may constitute up to 70% (approximately) of the bulk. It occurs as fine- to medium-sized subhedral to anhedral grains, and

is moderately pleochroic from pale yellow green to dark bottle green. Common inclusions are plagioclase, iron oxide, and pyroxene.

Plagioclase is labradorite and occurs as fine- to medium-grained anhedral grains. It is quite fresh. Twinning is common, but occasional untwinned grains have also been noticed.

Pyroxene is probably augite, and occurs as fine-grained anhedral grains. Garnet occurs as medium-sized anhedral grains.

F/53/11/4, HUC4

A fine- to medium-grained greyish gneiss containing porphyroblasts of pink garnet. In the hand specimen the gneissic banding is very well marked.

Under the microscope the banding is apparent and metamorphic texture is noticeable. The gneiss consists of quartz, sillimanite, biotite and garnet, with accessory feldspar.

Quartz is the most abundant mineral, and occurs as fine- to medium-sized anhedral grains. It shows undulose extinction. Inclusions of biotite are present.

Long needle-like and prismatic crystals of sillimanite are quite common. Clusters of small crystals are plentiful.

Biotite occurs as small flakes, and is strongly pleochroic from straw yellow to dark reddish brown. Garnet occurs as medium to large-sized anhedral grains.

Isolated grains of plagioclase and microperthite have also been noticed.

The rock is a garnet-biotite-sillimanite-quartz gneiss, and is of sedimentary origin. The rock has undergone high grade metamorphism and could also be called a granulite.

F/53/11/5, HUC5

This is a coarse-grained hornblende-biotite granite, without any apparent directional structure in the hand specimen.

Under the microscope the typical hypidiomorphic texture is seen. The granite consists of potash feldspar, quartz, plagioclase and biotite, with minor chlorite, hornblende and magnetite and accessory zircon, apatite, epidote.

Quartz occurs as medium to large subhedral grains. These grains have been cracked, and undulose extinction is common. Undulose extinction in quartz and bent and twisted biotite flakes suggest that the rock has suffered a moderate amount of deformation.

Potash feldspar occurs as large to medium-sized, anhedral to subhedral grains. They are perthite, and occasionally show undulose extinction. Inclusions of plagioclase fledspar, biotite, quartz, and magnetite are common.

Plagioclase feldspar is andesine, and is largely fresh. Occasional alteration to sericite and kaolin has been noticed. Here again the effects of deformation are noticeable, in the form of bent twin lamellae and undulose extinction. Common inclusions are quartz and mica.

Biotite occurs in small to medium-sized flakes, which are strongly pleochroic, from pale yellow to dark reddich brown. Basal sections are deep reddish brown. Pleochroic haloes are present. Occasional replacement by chlorite has been noticed. Common inclusions are magnetite, apatite and zircon.

Green hornblende occurs as medium-sized anhedral to subhedral grains. These are pleochroic from yellowish green to green. Inclusions of magnetite and zircon are present.

Magnetite is an important accessory and may constitute up to about 3% of the rock. It occurs in irregular grains and masses. Some of them are as large as 4.2 x 1.6 mm.

E/53/14/1, TCK1

A medium-grained light grey gneissic granodiorite. In the hand specimen the foliation, which is caused by the parallelism of the biotite flakes, is quite marked. Xenolithic material, forming dark, grey clots up to 2½" x 1" are prominent.

The granodiorite consists of plagioclase, quartz, potash fledspar and biotite, with minor spehen and epidote, and accessory chlorite, muscovite, zircon, apatite, and iron oxides.

Plagioclase (33.76%) is andesine (An_{36}), and is the most abundant mineral. It occurs as medium-sized subhedral grains, and is usually much altered. The alteration products are sericite, kaolin, and rarely epidote. Some myrmekitic intergrowths are present.

Quartz (32.12%) is next in abundance and occurs as small to medium-sized anhedral grains. These grains show slight undulose extinction.

Potash feldspar (13.84%) consists of microcline, microcline-perthite, and perthite. They occur as medium-sized anhedral grains. These grains show slight undulose extinction.

Potash feldspars (13.84%) consists of microcline, microcline-perthite, and perthite. They occur as medium-sized subhedral grains which have suffered very little alteration. Some graphic intergrowths with quartz has taken place. Inclusions of plagioclase, quartz, and mica are present.

Biotite (17.73%) occurs as small to medium-sized flakes, and is strongly pleochroic from pale yellow to dark greenish brown. Pleochroic haloes are rarely seen. Some replacement by chlorite and epidote has taken place. Inclusions of sphene, zircon, apatite, and iron ore are present.

Sphene and epidote are most common among the non-opaque accessories, which constitute up to 2.54% of the total. Sphene occurs as small to medium-sized subhedral grains, and is faintly pleochroic. Epidote occurs in irregular grains and is moderately pleochroic from colourless to grass-green. Apatite and zircon occur usually as inclusions in biotite, and are not very common. Magnetite and ilmenite are rare and constitute only 0.01% of the total.

E/53/14/2, TCK2

This is a medium grained greyish granite. In the handspecimen quartz grains, which are bluish grey, are quite noticeable. No directional structure is seen and the rock seems to be free of xenolithic materials.

The granite is very close to adamellite in composition and consists of quartz (36.51%), potash feldspars (36.75%), plagioclase (18.86%), and biotite (5.02%). Non-opaque accessories (2.44%), are muscovite, chlorite, epidote, and rare zircon and apatite. Opaque accessories (0.42%) are magnetite, and hematite; the latter is rare.

Quartz occurs in small to medium-sized anhedral grains. The grains show cracks and undulose extinction, suggesting that the rock has undergone some deformation. Inclusions of feldspars and mica are seen.

Potash feldspars are microcline, microcline-perthite, and perthite. These are slightly cloudy, due to alteration. Inclusions of quartz, plagioclase, and mica are present.

Plagioclase is andesine (An_{32}), and occurs as medium sized anhedral to subhedral grains. These are very cloudy, and have undergone severe alteration, to sericite and kaolin; in most cases only traces of polysynthetic twinning can be seen.

Biotite occurs as small to medium-sized flakes and is strongly pleochroic from pale yellowish brown to dark greenish brown. Pleochroic haloes are rare. Most of the biotite present has been replaced, either by chlorite or epidote; thus fresh biotite flakes are rather rare. Inclusions of iron oxides, apatite and zircon are seen.

Muscovite and chlorite are secondary minerals. Muscovite occurs as small flakes usually as inclusions. Chlorite is penninite. Epidote is moderately pleochroic from almost colourless to pale grass green. Small euhedral to subhedral crystals of zircon and irregular grains of apatite are also present.

Magnetite occurs usually as irregular grains or masses in biotite.

E/53/14/3, TCK3

This is a fine to medium grained dark grey quartz-feldspar porphyry. Under the microscope it shows the typical porphyritic structure. Quartz, potash-feldspar (microperthite) and plagioclase occur as phenocrysts, in a groundmass composed of quartz and feldspar. Plagioclase and microperthitic phenocrysts occur as medium-sized subhedral grains. Plagioclase is very much altered and thus it is difficult to determine its composition. Quartz phenocrysts occur as medium-sized anhedral grains and show undulose extinction.

Chlorite and iron oxide are the main accessories. Chlorite is quite common and may constitute up to 10% (approx.) of the bulk. Minor accessories are sphene, zircon, and muscovite.

The rock could also be called an ademellite-porphyry.

F/53/6/1, BCK1.

A medium grained light grey massive adamellite. In the handspecimen the rock is quite homogeneous and free of any xenolithic materials.

In thin section it is seen that the texture is typically granitoid. The adamellite consists of quartz, potash feldspars, plagioclase, biotite, muscovite and damourite, with minor apatite and accessory fluorite, zircon and iron oxide.

Quartz occurs as medium-sized anhedral grains and constitutes up to 31.27% of the bulk. It shows slight undulose extinction, and most of the quartz grains have developed cracks. Inclusions of feldspars and mica are present.

Potash feldspars (33.91%) consist of microcline, microcline-perthite, and perthite. It is usually fresh, and occurs as medium-sized subhedral grains. Inclusions of plagioclase, quartz, biotite and muscovite are seen.

Plagioclase feldspar (23.33%) is Oligoclase (An_{12}) and occurs as subhedral grains. It is cloudy and has undergone a fair amount of alteration. The alteration products are usually white mica and kaolin. Plagioclase feldspar shows traces of zoning. Polysynthetic twinning is quite common. Myrmekitic intergrowth has also been noticed.

Biotite (5.17%) occurs as small to medium-sized flakes, which are strongly pleochroic from pale yellow to dark greenish brown. Pleochroic haloes are rare. Some of the biotite has been replaced by chlorite. Inclusions of feldspars, zircon, apatite, and iron oxide are present.

Non-opaque accessories which constitute 5.98%, consist of muscovite and damourite mica, with minor chlorite and apatite, zircon and isolated grains of fluorite. Damourite is almost colourless, though it does show very faint pleochroism, and looks much like ordinary muscovite. But it is easily distinguished from the latter by its small axial angle, which gives practically a uniaxial interference figure. Damourite occurs as small to medium-sized flakes and does not contain many inclusions.

Irregularly-shaped apatite grains are common. Some of these grains are as large as 0.41 x 0.38 mm.

Opaque accessories which constitute 0.35% of the bulk, consist of small grains of magnetite and hematite, and occur usually as inclusions in mica.

F/53/9/1, NAP1.

A medium- to coarse-grained, pale greyish garnetiferous granite. In the hand specimen the rock does not show any directional structure.

Under the microscope the typical granitoid texture is seen. The granite consists of quartz, potash feldspar, plagioclase, and garnet, with minor biotite and muscovite, and accessory chlorite, fluorite, apatite, and zircon. The proportion of dark minerals and accessories in the slide provided is very low - about 5%.

Quartz and feldspars are the predominant minerals and may constitute up to 95% (approximately) of the total. Quartz occurs as medium- to large-sized irregular grains and shows undulose extinction.

Potash feldspar consists mainly of perthite (though occasional microcline grains have also been noticed), and occurs as medium to large sized anhedral to subhedral grains. Common inclusions are plagioclase and quartz.

Plagioclase is subordinate to potash feldspar and is albite. Both potash feldspars and plagioclase are slightly cloudy and have suffered very little alteration. Polysynthetic twinning is common in plagioclase, and inclusions of quartz and mica have been noticed.

Garnet occurs as round grains, and has a pale pinkish colour. Some alteration to chlorite has taken place.

Biotite occurs in small flakes and is strongly pleochroic, from pale straw yellow to dark greenish brown. In the slide examined, biotite is rare and constitutes less than 1% (approximately) of the total. These small flakes are rather fresh and free from inclusions.

F/53/7/1, ELK1

This is a coarse-grained pinkish muscovite-biotite adamellite; without any directional structure in the hand specimen. The rock has undergone a fair amount of deformation as is evident from bent and twisted mica flakes and bent twin-lamellae of plagioclase.

The adamellite consists of quartz, potash feldspars, plagioclase, muscovite, and biotite, with minor chlorite and accessory apatite, magnetite, and hematite.

Quartz grains have developed cracks, and show marked undulose extinction. Inclusions of feldspar, mica, iron oxide, and apatite are present.

Potash feldspars consist of microclines, microcline perthite, and perthite. They occur in medium-sized subhedral to euhedral grains. Slight cloudiness due to alteration is noticed. Common inclusions are plagioclase, quartz and mica.

Plagioclase is andesine and occurs as small to medium-sized subhedral to euhedral grains. The plagioclase feldspars are much more cloudy than the potash feldspars, and have undergone some alteration. Common alteration products are sericite and koalin. Inclusions of muscovite, biotite, chlorite, quartz and iron oxides have been noticed.

Muscovite occurs in small to medium-sized flakes, which are usually bent or twisted. Common inclusions are quartz, feldspars and chlorite.

Biotite is strongly pleochroic from pale yellowish brown to dark brown, and occurs in small to medium-sized flakes; some alteration to chlorite has taken place.