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REPORT ON MINOR INVESTIGATIONS CARRIED OUT IN THE PETROLOGICAL AND MINERAGRAPHIC LABORATORY, GEOLOGICAL BRANCH October - December, 1957

Compiled by
G.J.G. Greaves.

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INTRODUCTION

This Record consists of a collection of reports completed by the petrographic and mineragraphic section of the Geological Laboratory during the period October to December, 1957. The reports have been placed in chronological order and each has its date of completion, and the relevant file number above the heading.

The officers responsible for these reports are W.B. Dallwitz, W.M.B. Roberts, and K.L. Lovering.

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CONTENTS (CONTD.)

Report No. 1

84Q/3
October 1957

PETROGRAPHIC EXAMINATION OF ROCKS FROM THE HALLS REWARD MINE AND GRAY CREEK AREAS, NORTH QUEENSLAND

by

W.B. Dallwitz

"Specimen A2101

This is a very coarse-grained rock apparently consisting of greenish-black amphibole and an unevenly distributed (and in places very concentrated) light greenish grey substance. Reflections from cleavages show that many of the grains of amphibole are several centimeters across. These large grains poikilitically enclose medium- to fine-grained aggregates of amphibole and are themselves separated by medium-grained aggregates of amphibole.

The thin section shows that the rock is virtually monomineralic. The amphibole is actinolite, which has X = almost colourless, Y = pale yellowish green, and Z = very pale bluish green. The light greenish grey material noted in handspecimen is also largely actinolite. This actinolite has probably been formed from colourless diopsidic augite, a little of which remains in one or two places. Dark, fine-grained aggregates of an indeterminate substance are irregularly distributed in this pseudomorphous actinolite, which contains abundant stumpy needles of slightly disoriented actinolite which give the masses a confused appearance compared with the clear cut appearance of the "primary" actinolite which encloses the pseudomorphs.

A small amount of a fibrous (?)epidote, pleochroic from pale yellow to colourless, occurs as sparse clots in the large actinolite grains; black iron ore is a very rare accessory.

The rock is an igneous one, and can, on available evidence, only be called an actinolitite.

Specimen A2102

Mineralogically this rock is generally similar to specimen A2101, and is medium- to coarse-grained.

It has none of the very large poikilitic grains of actinolite. The light greenish grey material is much less plentiful, and occurs as grains measuring up to 0.75 cm. in diameter. A pocket of quartz measuring, at a maximum, 2.5 cm. by 1 cm. is probably xenocrystic.

The section consists almost entirely of actinolite, but one large crystal of diopsidic augite, marginally replaced by actinolite, is present, and a few pockets of clinozoisite and of quartz are scattered through the slide.

The rocks is an actinolitite.

Specimen A2103

Macroscopically this rock consists of an aggregate of interlocking prisms of tremolite measuring up to 2 cm. by 3 mm., but generally very much smaller than this. The tremolite is mostly buff-coloured, but some large clots are green, and other smaller ones are grey. This difference in colour appears to be due to weathering, the green parts being

the freshest.

In thin section the rock is seen to consist entirely of tremolite whose only claim to lack of uniformity, apart from variability of grainsize, is the difference in concentration of dark streaks which mostly lie along the cleavage.

The rock is a tremolitite (if such a name exists) probably derived from an ultrabasic rock (iron free pyroxenite) or a siliceous magnesian limestone during regional metamorphism.

Specimen A2104

A pale yellowish grey serpentine containing "fracture"-fillings of hydrated iron oxide, and pockets of a soft, grey, micaceous material.

The thin section shows that the rock consists mainly of antigorite. Pockets and veinlets of hydrated iron oxide and veinlets of chrysotile are distributed through the slide. Associated almost exclusively with pockets of hydrated iron oxide is a fair amount of brucite - the micaceous mineral noted in handspecimen. The total quantity of brucite in the rock amounts to only 2 or 3 percent.

The rocks is a brucite-bearing serpentine.

Specimen A2105A

This appears to be a regionally metamorphosed gabbro consisting of irregular, elongated clots of very dark grey medium-grained amphibole and of white altered feldspar in about equal amount. Some of the (incomplete) clots of amphibole and of feldspar are over 2 cm. long, suggesting that the gabbro was originally a very coarse one which has been largely reduced to a much finer-grained rock.

Microscopically the rock is found to consist wholly of saussuritized plagioclase and an almost colourless amphibole, probably tremolite. The tremolite is, in fact, pleochroic from extremely pale buff to colourless.

The rock is a saussuritized, regionally metamorphosed gabbro, whose original pyroxene must have had a very low iron content.

Specimen A2105B is a finer-grained variety of the gabbro represented by specimen A2105A. The rock is also very much richer in amphibole. The handspecimen shows some sign of broad crenulation. It seems probable that this rock is either a more heavily sheared marginal phase of the gabbro or portion of the gabbro mass intersected by a zone of crenulation or shearing. Feldspar makes up only about 25 percent of this rock.

The slide shows that the rock consists of subhedral amphibole, probably tremolite identical with that in specimen A2105A. Most of the plagioclase has been saussuritized, but a little labradorite remains in one small area of the slide.

The rock is a saussuritized, regionally metamorphosed gabbro.

Specimen A2106A ((?) "Albitite")

A medium-grained white igneous rock consisting of feldspar and numerous thin prisms of brownish grey amphibole measuring up to about 5 mm. in length, but averaging between 1 and 2 mm. The amphibole makes up between 10 and 15 per cent of the rock.

In thin section the rock is found to consist of strongly saussuritized plagioclase and tremolite or similar pale amphibole. This amphibole is almost colourless (faintly brown) and appears to be optically positive. As 2V for tremolite is given up to (-)88° it would be surprising if this mineral were not occasionally optically positive. A little colourless (?)pyroxene is enclosed in one grain of amphibole.

The average grainsize of the plagioclase is between 1.5 and 2 mm. As far as can be seen from the little unaltered mineral remaining, the plagioclase is an andesine (possibly about An_{35-40}).

In the absence of specific information on mode of occurrence, form, and size of the body represented by this rock I can only suggest that the rock is a leucocratic rather acid differentiate from gabbro, possibly a gabbro aplite which has been extensively saussuritized.

Specimen A2106B

This appears to be a 3.5 cm.-wide vein bounded by very coarse-grained greenish grey tremolite containing a very minor amount of soft, light-coloured micaceous mineral and altered feldspar. The vein consists of white altered feldspar through which are scattered small (0.25 to 1 mm.) flecks of grey to pale grey mineral, probably tremolite. The vein encloses a layer of coarse tremolite cut off from the neighbouring material, and has most probably been intruded in two separate parts, to the first of which some of the wall-rock was frozen. The coarse tremolite is reminiscent of amphibole (generally actinolite) veins commonly formed at a late stage in cooling of gabbro bodies (e.g., sills in the Brock's Creek district, N.T.)

In thin section the rock is seen to be identical with specimen A2105A in every respect except in the quantity of tremolite, which amounts to only about 3 per cent of the rock.

The rock is probably best described as a saussuritized gabbro aplite.

Specimen A2107A

This rock appears to have been very coarse-grained originally, though it has now been recrystallized and altered to an aggregate of (mostly) medium-grained minerals which occur as large pockets measuring from several millimeters to over 10 cm. in size. Broadly, as seen in hand-specimen, four materials are present :

(1) pinkish cream material containing grains measuring up to nearly 1 cm. in diameter,

(2) yellowish grey material,

(3) grey amphibole, and

(4) a hard, dark grey mineral embedded in (1) and (2), and standing out on weathered surfaces.

Materials (1) and (2) probably represent original plagioclase.

In the thin section the distinction (if any) between materials (1) and (2) is not apparent, nor is a more detailed examination of the rock warranted at this stage. These materials may be entirely clinozoisite but a check of their identity should be made later. The grey amphibole is virtually colourless tremolite occurring as subhedral to euhedral grains. The grainsize of the tremolite and clinozoisite generally ranges between 0.2 and 1 mm.

The hard dark grains, embedded exclusively in the clinozoisite, are coloured pale greenish blue in thin section, and are most likely spinel. They are invariably separated from clinozoisite by a shell of (?)talc, and they are traversed by numerous cracks along which alteration to so far largely unidentified substances has taken place. Alteration is most intense - sometimes even complete - in the smaller masses. One of the alteration-products appears to be augite; another resembles fine-grained clinozoisite.

The rock is an altered gabbro pegmatite.

Specimen A2107B is essentially similar to specimen A2105A in handspecimen. The main difference is that the amphibole is much more abundant (about 75-80% of the rock) and is slightly more greenish. The rock was originally coarse-grained, but recrystallization and alteration have resulted in the formation of medium-grained monomineralic aggregates.

In thin section the rock is found to consist entirely of medium-grained tremolitic amphibole and completely saussuritized feldspar. Many of the cross-sections of tremolite tend to be euhedral.

The rock is a saussuritized and uralitized regionally metamorphosed gabbro.

Specimen A2108A

A sheared rock, originally coarse-grained, consisting macroscopically of approximately equal amounts of light grey tremolite and altered feldspar.

In thin section the rock is seen to consist of sub-parallel needles of tremolite, in places closely grouped, and in other places penetrating rather coarse-grained plagioclase. The shapes of the needles (including subhedral cross-sections) embedded in the plagioclase suggest that the mineral is of primary crystallization. Much of the plagioclase is partly, and some completely, saussuritized; the unaltered material has the composition of a basic labradorite.

Accessory minerals are scarce iron ore, partly hydrated, and scattered small crystals of rutile.

The rock is a saussuritized and uralitized regionally metamorphosed gabbro.

Specimen A2108B is a medium-grained to fine-grained greenish grey rock containing porphyritic crystals of amphibole measuring up to 0.5 cm. in length.

In thin section the rock is seen to consist of abundant porphyritic subhedral crystals of actinolite embedded in a matrix of saussuritized plagioclase, with subordinate epidote and quartz, and rare, altered iron ore.

The rock may be described as a uralitized and saussuritized (quartz) microdiorite, which is probably genetically connected with gabbro.

Specimen A2109A consists of two parts, one apparently a fine-grained amphibolite (slide A2109AA) and the other a fine-grained feldspathic rock (slide A2109A) containing small dark specks of (?)amphibole. This latter rock appears to have been intruded into the amphibolite, and in the process has wedged off a thin layer of amphibolite which now shows strong ptygmatic folding.

Slide A2109AA represents a rock consisting of about equal amounts of green hornblende and almost completely saussuritized plagioclase.

Quartz is a rather rare accessory.

The rock is a fine-grained saussuritized plagioclase amphibolite.

Slide A2109A represents a rather fine-grained holocrystalline rock consisting of strongly saussuritized basic oligoclase, subordinate quartz and actinolitic amphibole, accessory epidote (some of it bordering altered (?)allanite), and rare black iron ore and cubes of pyrite.

The rock is a saussuritized and uralitized microgranodiorite.

Specimen A2109B is a fine-grained amphibolite containing a coarser, amphibole-rich band which is 2 mm. wide and shows strong ptygmatic folding.

In thin section the rock is in all respects except two similar to specimen A2109AA; the only differences are that rock A2109B contains considerably more quartz and also a little black iron ore. The plagioclase appears to have a R.I. considerably greater than that of balsam, and may be andesine.

The presence of a narrow band much richer in amphibole than is the rest of the rock suggests that the rock as a whole is of sedimentary rather than igneous origin, but there may be strong field evidence contradicting this idea (see also specimen A2110, below).

The rock is a fine-grained saussuritized plagioclase amphibolite.

Specimen A2109C is essentially similar to A2109AA and A2109B, but contains in addition a large pocket of white material and some scattered pyrite.

The thin section shows that the main part of this specimen is a fine-grained saussuritized plagioclase amphibolite very closely similar to the two specimens named above.

The pocket of white material consists of coarse-grained saussuritized oligoclase, subordinate quartz, accessory prehnite, and rather scarse calcite and epidote.

Specimen A2110 is a persistently banded amphibolite consisting of alternating layers of strongly hornblendic and plagioclase-rich material. The width of the dark layers ranges from about 0.5 mm. to 1.75 cm., but the widest plagioclase rich layer is only about 2 mm. Epidote appears to be present in some of the plagioclase-rich layers.

The thin section shows that the rock consists of about equal amounts of pale green hornblende and completely saussuritized plagioclase. Quartz is very sparsely distributed through the slide, and small crystals of sphene become apparent on close inspection. Two veinlets of fine-grained (?)clinozoisite and two consisting of colourless diopside and quartz cut across the banding. No epidote was seen in the section, and none was expected in the place where the section was taken.

The persistent straight banding of this rock suggests at first sight a sedimentary origin, but it is possible, I suppose, that the banding is due to the intense shearing of a coarse gabbro or a layered gabbro. The field evidence will, I hope, enable the correct diagnosis to be made.

The rock is a fine-grained, strongly banded, saussuritized plagioclase amphibolite.

Specimen A2111B is a fine-grained, well-cleaved and distinctly banded grey amphibolite. The banding is far less perfect, far less closely spaced, and far less distinct than that in specimen A2110; parts of some bands appears to contain epidote.

In thin section the rock is seen to be made up of completely saussuritized plagioclase, pale green hornblende or actinolite, some bands carrying quite a high percentage of pale yellow-green diopside to the virtual exclusion of amphibole, colourless epidote, accessory apatite especially concentrated in one band, minute crystals of sphene, and rare black iron ore.

The rock is a fine-grained saussuritized plagioclase amphibolite with a fair amount of diopside and epidote. The origin of this rock is a matter for conjecture; the abundance of pyroxene in certain layers may not necessarily signify a marked difference in chemical composition, but may merely mean failure to achieve equilibrium during metamorphism due to uneven distribution of OH ions.

Specimen A2111C is a strongly banded, fine-grained, amphibolitic rock with light and dark bands ranging in width from less than 1 mm. to over 5 mm. wide. The darker bands are amphibole-rich and dark grey, and the lighter bands consist of white altered feldspar and a grey-green mineral.

Under the microscope the dark bands are seen to be made up of pale brownish green hornblende (80%) and completely saussuritized plagioclase (20%). The lighter bands are broadly of two types which tend to be gradational with each other and with the dark bands: (a) saussuritized plagioclase (50-80%) + hornblende (45-20%) + diopsidic augite and epidote; (b) diopsidic augite (45-50%) + saussuritized plagioclase 45-50% + hornblende (0-5%).

A veinlet consisting entirely of colourless augite cuts across the banding.

The rock is saussuritized plagioclase amphibolite interbanded with a saussuritized plagioclase-diopside granulite.

Specimen A2112A is a hard, cleavable, fine-grained rock made up of dark grey bands, irregular lenses, and streaks alternating and interfingering with pale greyish buff bands, lenses, and streaks.

In thin section the dark material is seen to be composed of pale green hornblende, almost completely saussuritized plagioclase, and subordinate clinozoisite. The prisms of hornblende show a marked tendency to lie in the same plane, but the orientation of their long axes within the plane is random.

The pale greyish buff parts of the rock consist of almost completely saussuritized plagioclase, and subordinate diopside and clinozoisite. A few pockets and lenses of quartz are also present.

The two rock types - saussuritized clinozoisite-plagioclase-amphibolite and clinozoisite-diopside granulite - have rather sharp boundaries, though there is slight intermingling; hornblende does occasionally occur in the granulite. It seems likely that the amphibolite has been derived from the granulite through the action of metasomatising solutions during retrograde metamorphism - at least, the nature of the two rocks and their spatial relationships point strongly to such a genetic connection. Whether the original rock was a basic igneous one or an aluminous and siliceous magnesian limestone cannot be decided from an examination of the thin section.

Specimen A2112B is macroscopically similar to specimen A2112A, but the interbanding and interfingering are on a broader scale. In addition a discontinuous veinlet of a hard, white mineral is present; this veinlet is up to 2 mm. wide.

The dark bands are found to consist of pale green hornblende, subordinate saussuritized plagioclase, and a little epidote; instead of epidote, a fairly large amount of clinozoisite may be present. The light bands contain epidote, subordinate saussurite and diopside, and rare hornblende. Some small lenses consist of medium-grained diopside and acid plagioclase.

The veinlet of hard white material noted in hand-specimen consists of rather coarse-grained prehnite, together with some quartz, acid plagioclase, epidote, calcite, and diopside, all very irregularly distributed.

The dark bands in this rock are schistose saussuritized plagioclase amphibolite, and the light ones are largely diopside-saussurite-epidote granulite.

Specimen A2113A is a grey, fine-grained, schistose banded rock, apparently consisting mainly of amphibole.

The thin section shows that the rock is made up almost entirely of actinolite (65%) and saussuritized plagioclase (35%). Quartz is a very rare accessory. The c-axes of the actinolite crystals show a marked parallelism, but they occupy almost random directions in the plane of schistosity.

The rock is a saussurite-actinolite schist or a schistose saussuritized amphibolite of unknown origin.

Specimen A2113B appears to consist of a vein of light-coloured, medium-grained rock injected into fine-grained, grey, schistose amphibolite. The vein is about 1.6 cm. wide, and encloses small lenses of amphibolite.

Microscopic examination shows that the amphibolite consists of pale green hornblende or actinolite containing thin bands rich in clinozoisite, accessory saussuritized plagioclase, and rather sparsely distributed minute crystals of sphene.

The light-coloured rock consists of augite or diopside, an unknown colourless mineral, epidote, accessory plagioclase (possibly andesine) and rare sphene. Two of the pyroxene grains were found to measure 1 cm. in length, though the average size is very much less. The unknown mineral has one fair cleavage, and may have a radiating structure; it is biaxial positive with a fairly small optic axial angle; its double refraction is rather low (maximum interference colour is 1st order pale yellow), and its R.I. is estimated to be about 1.7.

A lens of epidote-hornblende schist within the light-coloured band is notable for numerous conspicuous small grains of sphene.

It seems most probable that the light-coloured band is a calc-silicate rock; the large grainsize of some of the pyroxene argues strongly against the possibility of an igneous origin for such a narrow band.

The rock is an epidote-(unknown mineral)-diopside granulite within clinozoisite-actinolite (or hornblende) schist. If the ultimate sedimentary origin of the diopside granulite is taken for granted, there is a good chance that the enclosing rock is also of sedimentary origin.

Specimen A2114 is a light grey porphyritic rock containing abundant phenocrysts of altered feldspar and relatively few of a ferromagnesian mineral in a greyish buff, aphanitic groundmass. The grains of altered feldspar measure from about 1 mm. to about 4 mm. in length.

Judging from the saussuritic alteration-products of the original feldspar phenocrysts, it seems probable that these were plagioclase, rather than potash feldspar. No feldspar remains. The original ferromagnesian was probably hornblende or augite: it has now been altered entirely to chlorite, subordinate epidote and a little leucoxene and iron ore. A few rounded quartz phenocrysts are present; these are bordered by a shell of secondary quartz largely optically continuous with the original quartz, but containing also numerous minute disoriented quartz grains, sericite, and saussuritic material.

The groundmass now contains no feldspar. It consists of a fine-grained, rather indistinctly discernible mosaic of secondary quartz enclosing saussuritic alteration-products of feldspar and minute disoriented quartz grains within the larger irregular quartz grains which make up the mosaic; these extraneous materials obscure the mosaic effect.

Apatite, leucoxene, black iron ore, and hydrated iron oxides are rather rare accessories.

The rock is a saussuritized and silicified granodiorite porphyry.

Specimen A2115 is a grey serpentinous rock traversed by a network of light brown streaks.

In thin section the rock is found to consist of antigorite traversed by fibrous veinlets of what appears to be iron-stained chrysotile. However, the sign of elongation of the (?)fibres is opposite to that given for chrysotile, and the same as that given for antigorite, and the mineral must, therefore, be presumed to be antigorite. Nevertheless, many of the thinnest veinlets do have the correct orientation for chrysotile, and these veinlets are generally free from iron-staining.

Judging by the general appearance of the antigorite between crossed nicols it seems that this rock was originally a dunite, but no olivine remains now. Magnetite has separated out as a by-product of the alteration of olivine.

The rock is serpentine, probably derived from dunite.

Specimen A2116 is a light brown serpentinous rock containing scattered grains of a black mineral.

In thin section the rock is found to consist very largely of a network of (?)fibrous veinlets which, at first sight, appear to be chrysotile, but the mineral in them has the optical orientation of antigorite, and must, therefore, be presumed to be that mineral (see description of specimen A2115). Enclosed within the criss-crossing veinlets are isotropic or almost isotropic areas which are also presumed to be antigorite. A few fibrous veinlets wherein the optical orientation is correct for chrysotile are present. Trains of particles of iron oxide, and thin veinlets of iron oxide, by-products of serpentinization, are conspicuous. A little of the "serpentine" seems to be bastite, and the presence of this mineral indicates that the original rock may have been pyroxenite, or, more probably, that it was a peridotite containing some pyroxene.

Staining by hydrated iron oxide is fairly general. The black grains noted in handspecimen are rather weakly magnetic, and appear to be hydrated iron oxide.

The rock is serpentine.

Specimen A2117 is a medium- to coarse-grained grey rock apparently consisting largely of pyroxene. It contains a number of pockets of soft, iron-stained material.

Under the microscope diallage is found to make up about 80 percent of the rock. The soft material noted in handspecimen is iron-stained serpentinous material, and may have been derived from olivine, though there is no direct evidence of such a source; veinlets of secondary iron oxide and/or hydrated iron oxides, by-products of serpentinization, ramify through the serpentine. Marginal to and, much less commonly, within the serpentinous clots, some conversion of diallage to tremolite has taken place, but the change has not taken place continuously round the serpentine.

The rock is a diallagite.

Specimen A2118 is a fine-grained light grey rock containing thin, parallel streaks of pyroxene or amphibole. These streaks measure up to about 1 mm. in width and up to about 1.5 cm. in length. There is some suggestion that a little porphyritic feldspar is present.

In thin section the rock is seen to consist of partly saussuritized plagioclase (60%), subhedral pale brown amphibole (20%), and quartz (20%), together with a little black iron ore. The rock shows signs of having been rather severely sheared. The effects of shearing are best seen in amphibole grains whose long axes are subparallel; irregular drawn-out lenses, consisting of groups of such grains also have a subparallel disposition (see macroscopic description). A few partly crushed and saussuritized phenocrysts of plagioclase remain; the largest of these measures about 2 mm. The quartz and groundmass plagioclase show very little sign of actual disruptive crushing, but moderate to strong undulose extinction is almost general. Most of the plagioclase grains lie within the size-range 0.1 to 0.3 mm.; the upper size limit of the quartz grains is about 0.2 mm.

The composition of the plagioclase is about An_{32} (acid andesine).

Pleochroism in the amphibole is: X = very pale buff, Y = light brownish buff, Z = brownish buff; the colour suggests that it is an iron-poor variety of hornblende bordering on tremolite in composition, and possibly containing some of the ferrotremolite molecule.

The rock is a sheared, porphyritic hornblende microgranodiorite, possibly an acid differentiate from a gabbroic magma with an abnormally low iron content.

Specimen A2119 is a medium-grey porphyritic rock containing clots of amphibole measuring up to 8 mm. in length and porphyritic grains of white feldspar measuring from 0.5 to 2 mm. across. The groundmass is fine-grained.

Except for the absence of quartz this rock is mineralogically very similar to specimen A2118. It consists of partly saussuritized plagioclase (70%) and pale brown hornblende or tremolite (30%). The amphibole is slightly paler than that in specimen A2118; the fringes of many grains are light green, and they are pleochroic in green and greyish lilac, indicating that they are somewhat sodic ((?)richterite). The plagioclase is andesine (An_{35}).

Accessory minerals are very scarce. They comprise black iron ore, sphene (both in minute grains), and light brown magnesia-rich biotite.

The large clots of amphibole noted in handspecimen are made up of groups of medium-sized grains, and may represent original porphyritic crystals of pyroxene.

The average grainsize of the plagioclase and tremolite in the groundmass is between 0.1 and 0.2 mm. in diameter.

The rock is a porphyritic hornblende microdiorite or a uralitized porphyritic microdiorite.

General Remarks

There are certain obvious similarities (cleavability and the presence of fine-grained green hornblende and saussuritized plagioclase) between specimens A2109AA, A2109B, A2109C, A2110, A2111B, A2111C, A2112A, A2112B, A2113A, and A2113B. As indicated in the individual descriptions, some of these rocks are almost certainly of sedimentary origin, and it is quite likely that all represent metamorphosed sediments. However, there is a reasonable chance that the three A2109A specimens, at least, represent regionally metamorphosed gabbros. It may not be possible to come to firm decisions about the true origin of some of these rocks even after field examination, but I should like to discuss the problem with Mr. White.

Judging by the presence of light-coloured amphibole, it seems fairly clear that the following rocks are genetically related to one another: A2105A, A2105B, A2106A, A2106B, A2107A, A2107B, A2108A, A2118, and A2119; it is possible that specimens A2108B and A2117 also belong to this suite, and just possible that specimen 2109A is also related. However, I would not be prepared to support the inclusion of the last three against field evidence.

The iron-poor amphiboles in the first nine rocks mentioned were probably derived from original iron-poor pyroxene, though the amphibole in some of the rocks is sufficiently euhedral to be considered to be virtually of primary origin. The most acid of these rocks, specimen A2118, contains the darkest (richest in iron) amphibole and the most iron ore; it must be emphasized, however, that the amphibole is still very low in iron, and that the percentage of iron ore is also very low. This relative enrichment of amphibole in iron is exactly what would be expected in an acid differentiate from gabbro. It seems likely that the association of iron-poor gabbroic rocks (and their differentiates) with serpentine, dunite, and pyroxenite is a common one. Some serpentines, serpentinized dunites, and pyroxenites from the Koreppa nickel prospect, New Guinea, were recently examined by me; closely associated with these rocks is a uralitized bytownite gabbro (locally heavily sheared) containing virtually no iron ore and a light-coloured tremolitic amphibole which is only very slightly darker than that present in the gabbros from your area."

Report No. 2

84N/1
10th October, 1957.

IDENTIFICATION OF SUSPECTED RADIOACTIVE SPECIMENS RECEIVED FROM MR. A.H. MILLER 43 CARP STREET, BEGA. 7C. N.S.W.

by

W. B. Dallwitz

The samples were tested with a Geiger counter, and they show no radioactivity. The green mineral is epidote, which is a silicate of calcium, aluminium and iron, and is a mineral found in quite a variety of rocks. In your samples it has quartz and feldspar associated with it. Probably the rock was originally a granite, but the introduction of a large amount of epidote has entirely altered its appearance and composition.

Report No. 3

120NT/2
10th October, 1957.

IDENTIFICATION OF A SPECIMEN FROM THE OENPELLI AREA, NORTHERN TERRITORY, RECEIVED FROM Mr.W. PATTERSON

by

W. B. Dallwitz

Apart from quartz, the specimen contains chalcopyrite, pyrite, covellite, and iron oxide (hematite and hydrated iron oxide). The black mineral, which Mr. Patterson wanted identified, is covellite. Close examination shows that this mineral has a distinct indigo blue tinge. It occurs partly as a thin coating on small grains of chalcopyrite (as was established by scratching what appeared to be a solid mass of black mineral) and partly as a lining of voids left by weathering of chalcopyrite.

Report No. 4

46NT/1
10th October, 1957.

IDENTIFICATION OF SPECIMENS FROM MT. HARRIS AREA, NORTHERN TERRITORY RECEIVED FROM MR. W. McQUEEN

by

W. B. Dallwitz

Following is a description of two specimens of rock from the Mt. Harris area (Jessop's Lode).

"Macroscopically the specimens appear to be siliceous gossan consisting of quartz and hydrated iron oxide. Many large voids lined by iron oxide are present. A number of pseudomorphs of iron oxide after cubes of pyrite are present; some of these pseudomorphs retain the traces of striations existing on the original pyrite. The pseudomorphs measure up to 4 mm. across. Cubic voids of about the same maximum dimension are conspicuous in places.

As no details of field occurrence or description of the material have been given, and as no specific information, other than description, has been requested, a more detailed examination of this material is not warranted at this stage. Its mineralogical constitution seems fairly obvious from the handspecimens.

Report No. 5

167PNG/1
23rd October, 1957.

OF IDENTIFICATION/AND PETROGRAPHIC NOTES ON ROCKS FROM NEW GUINEA.

by

J. K. Lovering

Following is a description of rocks collected in New Guinea by Dr. E. Reiner, C.S.I.R.O.

R 54. Marum River Waterfall.

The two handspecimens are deep green with a silica coating.

In thin section both specimens are seen to be ultrabasic and the rock consists of interlocking grains of olivine with a negative 2V. The grains are being serpentinized and replaced by chrysotile and a little antigonite. There is accessory chromite.

The rock is dunite.

R 55. Ainan Way to Fahahatan Hills.

The rock is greenish-yellow.

It consists entirely of olivine with a negative optic axial angle about 85°. Accessory iron-oxide makes up about 7% of the rock. Cracks are filled with chlorite (3%).

The rock is dunite.

R 59. From above Faita, on road to Mia Creek.

The dark green rock is medium-grained and holocrystalline.

The rock consists entirely of interlocking grains of a pyroxene with a positive 2V about 35°. On the (001) faces the usual 2 directions of cleavage at almost right angles is crossed diagonally by a third striation.

The rock is pyroxenite.

R 60. From above Faita, on road to Mia in grassland hills.

The handspecimen is a dark green massive rock. There is a small inclusion about 2" long in the rock which shows evidence of slight shearing.

The rock consists mainly of crushed olivine grains with here and there the development of a few enstatite grains (5%). The shear veins are filled with limonite and chrysotile. Chromite is accessory.

The inclusion consists of diallage pyroxene forming pyroxenite with accessory chromite.

The rock is dunite.

R 61 From above Faita on road to Mia in grassland hills.

The handspecimen is a dark green ultrabasic rock.

It consists of olivine (55%) and enstatite (20%) Chrysotile and antigonite vein and replace about 20% of the rock. Brown chromite (5%) is accessory.

The rock is peridotite.

M 52. Ongan River, at end of gorge.

The handspecimen is fawnish, medium-grained rock.

Grains of plagioclase about 2 to 3 mm. in size are quite extensively kaolinized and some grains are partly replaced by quartz. Quartz (20%) is interstitial. Iron oxide makes up 7% of the rock. Fragments of biotite are replaced by chlorite (5%).

The plagioclase is andesine An_{30}. There may also be some potash feldspar.

The rock is a granodiorite.

R 77. From ridge above Wau, Cenival Range. E. of Imbrum River.

The specimen is a buff-coloured, fine-grained rock with distinct jointing. Orange spots about 1 mm. in diameter are seen on the cut surface. In this section these are seen as a concentration of limonite. The rock consists of very fine grains of sericite and quartz and actinolite.

It is probable that the rock is a slightly metamorphosed shale.

R 80. E. of Fao, edge of Hills.

The green handspecimen is very fine-grained and shows a development of pyrite. The specimen is cut by a vein of quartz, feldspar, pyrite and some black mineral.

The rock consists mainly of fragments of quartz and fine actinolite fibres. Pyrite is accessory and there are a very few grains of zircon. Limonite colours part of the rock.

The rock is a metamorphic of probable sedimentary origin.

B.C.

The deep green handspecimen is cut by a vein of quartz. The green rock is very fine-grained and homogeneous; there is a development of pyrite throughout. The rock is very similar to R 80. It consists of quartz fragments and actinolite fibres, most of which are replaced by penninite and limonite.

The rock is a metamorphic, probably of sedimentary origin.

R 84. E. of Sao Suangu.

The handspecimen is a purplish slate.

It is well-laminated and consists of rounded quartz grains and sericite fragments in a matrix of hematite films.

R 96. Junction of Guap-Ramu.

The handspecimen is a grey, medium-grained rock.

It consists of partly rounded grains of quartz (70%), oligoclase (10%) and aggregates of chlorite (5%), clay and epidote (5%), with a matrix of sericite (5%) and limonite (5%).

The rock is a greywacke.

R 97. Junction of Guap-Ramu.

The handspecimen is a well-laminated, fine-grained grey rock.

It consists mainly of fine fragments of quartz, with interstitial fragments of muscovite, actinolite and clay materials.

The rock is a sandy shale; it is cut by thin veins of quartz.

Report No. 6

84Q/1
29th October, 1957.

IDENTIFICATION OF MONAZITE FROM THE MT. ISA AREA.

by

W. B. Dallwitz

"All five specimens are moderately radioactive. The material of the two larger pieces has a specific gravity of 5.24, high refractive index and double refraction, and small positive optic axial angle. Part of one of the three small pieces, which are obviously similar to each other and to the two larger pieces, has similar optical properties and a specific gravity of 5.36. The properties listed, taken in conjunction with the brown colour and the hardness, identify the mineral as monazite."

Report No. 7

66NT/1
30th October, 1957.

IDENTIFICATION OF MINERALS FROM CORONATION HILL, NORTHERN TERRITORY.

by

W.M.B. Roberts

The following is a report on a concentrate sample from Waggon Drill Hole No. 36, Coronation Hill. The sample was submitted by J. Ward for mineragraphic examination.

The specimen consisted of several grammes of a dark coloured mineral concentrate of fairly high specific gravity. The mineral grains were mounted and polished and were found to consist of 90-95% pitchblende and 5-10% of pyrite.

The pitchblende was recognized by the fact that the polished face of the specimen gave 20,000 + C.P.M. on the Austronic B G R.1 counter, it effervesced and turned black with dilute HNO_3. An X-ray powder diffraction photograph confirmed the identification.

Report No. 8

87Q/1
31st October, 1957.

IDENTIFICATION OF A WHITE ROCK FROM WEIPA, NORTH QUEENSLAND.

by

W. B. Dallwitz

Following is a report on a specimen of white rock from the bauxite area at Weipa, North Queensland, submitted by I. Crespin. The specimen had an earthy odour when breathed upon, was soft, friable, and very fine-grained, and seemed to be most unpromising as a subject for thin-section study. Accordingly an X-Ray examination only was made.

During grinding of the sample it was found that only very few grains of quartz sufficiently coarse to be noticeable under the pestle were present. When crushed between the fingers the rock gave an almost smooth powder, showing that most of the material is of silt grade or finer.

Examination of the X-Ray powder photograph showed that the rock is made up entirely of quartz (50-60%) and kaolin (50-40%); it can probably be satisfactorily described as a kaolinitic quartz siltstone.

Report No. 9

120NT/9
November, 1957.

EXAMINATION OF MANGANESE SPECIMENS FROM THE CALVERT HILLS AREA, NORTHERN TERRITORY.

by

W.M.B. Roberts

Four specimens from the Calvert Hills area were submitted by J. Firman for identification of the manganese minerals. A polished section was made from each specimen and because of the difficulty in accurately identifying the manganese oxides, X-ray powder photographs were taken on each separate mineral present.

The only minerals present are pyrolusite (MnO_2) and cryptomelane ($K_2Mn_8(O,OH)_{16}$), which occur in roughly equal amounts. The specimens consisted almost entirely of these two minerals, with the exception of specimen 9029 which contained a high proportion of granular quartz.

The description of the individual specimens follows :

Specimen 9026 -

The principal mineral present is pyrolusite; it forms finely crystalline aggregates, the largest crystals measuring 0.07 mm. in diameter. These aggregates are fringed by very fine grained colloform cryptomelane, the width of the borders fairly constant at 0.15 mm. Some shrinkage cracks have developed in these borders which have filled with a coarser grained cryptomelane.

Specimen 9027 -

The section is similar to 9026, except that the grainsize of the pyrolusite is generally larger - ranging up to 0.2 mm.

Specimen 9028 -

Cryptomelane forms the bulk of this section, bordering fairly coarsely crystalline pyrolusite, and forming large fine-grained masses throughout the section. These masses are cut by a dense network of shrinkage cracks which have been filled with a coarser grained variety of this mineral.

Specimen 9029 -

Cryptomelane and pyrolusite are present in roughly equal amounts in this specimen. The pyrolusite is fine grained (up to 0.03 mm. in diameter, and forms a series of discrete irregular areas which are bordered by colloform cryptomelane. These areas contain a high proportion (approx. 30%) of clastic quartz grains ranging up to 0.15 mm. across.

Report No. 10

84NT/10-A
4th November, 1957.

EXAMINATION OF TWO MINERAL SPECIMENS FROM NORTHERN TERRITORY.

by

W. B. Dallwitz

(1) "Amber or light brown mineral from Waggon Drill Hole No. 36 drilled by United Uranium N.L. at Coronation Hill.

This specimen weighed 2.885 mg.; its S.G. was determined on the Berman Density Balance as 5.00, but, on account of the small weight, this figure may not be accurate. An X-Ray powder photograph showed that the mineral is barytes. On optical examination it was found that the refractive indices and double refraction are of the right order for barytes.

The mineral is optically positive and has an optic axial angle of about 40°; it is pleochroic from yellow to pale yellow (most coloured specimens of barytes are pleochroic). An estimated 1 to 1.5 mg. of the specimen, finely ground and spread over a 4 cm. agate mortar, was tested with an Austronic B.G.R.1 ratemeter with the Geiger-tube casing held against the top of the mortar - i.e. about 1 cm. above the deepest part of the mortar. Against a background of 30-40 c.p.m. 100 to 120 c.p.m. were registered (a blank on the agate mortar was found to be zero.) This portion of the specimen was then entirely used up in a sodium-fluoride bead test; only a very faint white fluorescence was n ted. The radioactivity of this small weight of specimen was surprisingly high, and if it had been due to uranium a positive test should, it seems to me, have been obtained.

It occurred to me that, on chemical and environmental grounds, the radioactivity in the barytes might be due to isomorphous substitution of radium for barium in the crystal lattice (radium sulphate is even more insoluble than barium sulphate). As the half-life of radium is 1,600 years, the possibility of its presence in barytes would be dependent on the (geologically) very recent formation of the barytes. It would mean that radium from the continuing disintegration of the pitchblende known to exist at Coronation Hill would have to be carried in solution to the place where barytes was crystallizing. (It is well-known that barytes is widely distributed in limestones and other sedimentary rocks as veins and lenses, cavity fillings, or replacement deposits formed by solutions of either hypogene or meteoric origin).

To check the possibility that radium might be present in the barytes a few textbooks on geochemistry were consulted. The most specific and suggestive information was found in "Geochemistry" by V.M. Goldschmidt, edited by Alex Muir (O.U.P., 1954), pp. 257-258. Here it is stated -

"We can, therefore, expect only young minerals or rocks to contain radium without its ancestors ionium (which is an isotope of thorium and has, therefore, exactly the same chemical properties) and uranium - i.e., up to an age of a few hundred thousand years, after which their radium content will become so small that it will escape detection".

As the half-life of radium is 1,600 years, "after about 200,000 years the radium content of any mineral, in the absence of uranium and ionium, will have diminished to $(1/2^{125}) = (1/10^{38})$ of its original amount."

"We actually know of geologically young minerals that contain radium without uranium or ionium, e.g. certain barytes (sic) ($BaSO_4$), and pyro-morphites (sic) ($Pb_{10}(PO_4)_3Cl_2$), which have been formed from hydrothermal solutions, in some cases from hot springs containing the ions of barium, radium, and sulphate. The entrance of radium into such crystals is governed by the similarity of the ionic radii of the metals, which are Ra^{2+}, 1.52Å; Ba^{2+}, 1.43Å; Pb^{2+}, 1.32Å".

In view of the possibility that radium is present in recently-formed barytes at Coronation Hill, it is obviously important that every effort should be made to try to separate more of the mineral for further testing and identification of radium (if present) by radiomatric, spectrographic, or chemical means. The high radioactivity of any newly-formed radium-bearing barytes could vitiate radiometric assay results completely. We should be pleased to deal with the problem in the laboratory, and we should like as much geological information as possible on the occurrence of the barytes - e.g., depth in drill-holes and height above nearby valley floor, and plan and sectional position of drillholes with relation to known surface and subsurface uranium mineralization.

United Uranium N.L. would possibly be able to help by carrying out a preliminary concentration of the heavy minerals in the waggon-drill dust by passing it over their concentrating tables at El Sharand, and we could take over from there. If the Company is unable to help, a sufficiently large sample of the dust could be sent to Canberra.

(2) The specimen of supposed samarskite from the Harts Range seemed to have a degree of radioactivity much too low to conform with the stated 2.6%equiv. U_3O_8. Only 100 c.p.m. against a background of 30-40 c.p.m. were obtained from the specimen (about 12.5 gm.) on an Austronic type B.G.R. 1 ratemeter. A sodium fluoride bead test for uranium was negative. It seems likely that the specimen received here is a mineral outwardly somewhat similar to samarskite but differing therefrom in certain important respects. (In fact the mineral looks more like columbite or tantalite - it is not vitreous as samarskite generally is, and its cleavage is more like that seen in columbite-tantalite; nor is its fracture conchoidal). It is quite likely that columbite-tantalite could occur with samarskite in pegmatite.

Samarskite is ordinarily metamict and isotropic. Anistropic samarskite has been reported, but without verification. The mineral examined is translucent, brown, and strongly anistropic in thin splinters; thicker grains are opaque. Some of the translucent grains are pleochroic.

The specific gravity of the mineral was found to be 5.73. A.D. Haldane found major-columbium and iron spectrographically, and also an appreciable amount of Ti. Ta content was very much lower than that of Cb. The plate was too dark to be sure of the presence of Mn. No rare earths (always present in samarskite) were detected. The X-ray powder data for the mineral conform well with those given for columbite-tantalite, but show very little similarity to those for samarskite (preheated to restore order to the lattice). The weight of the evidence therefore strongly suggests that this mineral is columbite. According to its S.G. it contains 80% = 5 to 10% of the (Fe, Mn) Cb_2O_5 molecule. However, complete chemical analysis is the only certain way of identifying complex columbates and tantalates, and such a procedure is not warranted at this stage, as determination of most of the constituents is extremely difficult and time consuming.

Report No. 11

47NT/5
6th November, 1957.

EXAMINATION OF SPECIMENS FROM HATCHES CREEK, NORTHERN TERRITORY

by

W.M.B. Roberts.

Two of the specimens, consisting of massive vein quartz and containing large areas of wolframite, scheelite and molybdenite were received directly from W.C. White, and were not numbered.

Four sections of these 2 specimens were examined and the following ore minerals were found to be present:

Wolframite, scheelite, molybdenite, pyrite, chalcopyrite, bismuth and (?)tetrahedrite.

Wolframite is quantitatively the principal mineral present; it forms typical large blade-like intergrowths with quartz and accounts for about 75% of the total ore mineral.

Scheelite, the next most abundant mineral in the specimens, forms euhedral crystals and has grown along the cleavages and filled small fractures in wolframite. In places it appears to have replaced this mineral.

Molybdenite occurs as small isolated blade-like structures moulded by scheelite and bismuthinite, but there is no concrete evidence of its paragenesis.

Pyrite is quantitatively unimportant and appears to have been deposited after molybdenite. It fills vughs in the specimen, moulding and cementing the euhedral scheelite, and forms small irregular masses and veinlets in both scheelite and wolframite.

Bismuthinite forms irregular areas in the ore minerals throughout the specimen, and appears to have replaced chlorite, wolframite, and scheelite, the last-named mineral to a lesser extent than the preceding two. It forms distinct continuations of the grain boundaries of these minerals and can be seen to have grown along the cleavage planes of the chlorite.

Chalcopyrite occurs both with bismuthinite and isolated in the quartz gangue. It is an extremely minor constituent, the largest areas measuring 5.0 mm. across.

Bismuth forms thin, elongate lenticular bodies oriented along a cleavage of bismuthinite, and also small irregular veinlets in wolframite and scheelite.

(?)Tetrahedrite is of extremely minor quantitative importance in the ore, and was seen only twice during this examination, once as a small irregular area in bismuthinite,

measuring roughly 0.3 mm. across, and is a small vein in wolframite. It was possible to separate the mineral for positive identification, but etching with HNO_3 and concentrated HCl produced an irridescent film.

From the foregoing examination a tentative paragenesis would be:

Wolframite
Scheelite
Molybdenite?
Pyrite
Chalcopyrite)
Bismuthinite) ?
Bismuth)

The position of tetrahedrite is obscure due to its limited and isolated occurrence.

I would like to point out that this paragenesis need not be correct and should not be used as a basis for any conclusions relating to the origin of the ore minerals. The reason for this being that any paragenetic sequence based on textural evidence alone can be quite misleading unless it takes into account the behaviour of such a heterogeneous system under the conditions of temperature and pressure operative during and after deposition. Unfortunately at the present time these complex systems have yet to be studied and until such evidence is available any paragenesis based on textures alone should be treated with reserve.

The other specimens were submitted for examination; they were labelled 49,50, 51.

Specimen 49.

This appeared to consist of a nodule of crystalline pyrite containing a small quantity of white vein quartz. The polished section confirmed that the major one mineral is pyrite; however, extremely small quantities of chalcopyrite, covellite, sphalerite and (?)bornite were observed. Some idea of their abundance may be gathered from the sizes of the grains. Chalcopyrite - 0.06 mm. across; covellite - very thin fringes on the chalcopyrite areas; sphalerite - 1.2 mm. across and (?)bornite 0.004 mm. across.

Specimen 50.

This consisted of massive chalcocite containing some copper carbonate and white quartz.

The only important opaque mineral is chalcocite, fairly coarsely crystalline and showing a very distinct cleavage. Small irregular areas of bornite were randomly distributed throughout the chalcocite, the largest measuring 0.05 mm. across. Small masses of a yellowish-white highly reflecting mineral were observed; these could have been native bismuth, but no positive identification could be made.

Specimen 51.

Two specimens were included under this number. One appeared to be a vein filling of iron oxide containing some copper carbonate, and having selvedges of white mica, this last mineral having its (001) cleavage arranged at right angles to the vein walls.

The vein filling itself is a very fine grained hydrated iron oxide containing some malachite and very small grains of chalcocite and covellite.

The other specimen was of massive vein quartz containing large quantities of chalcocite and malachite. In polished section very minor amounts of chalcopyrite ranging up to 0.02 mm. across, and possibly some native bismuth were observed, the latter mineral could not be positively identified.

No attempt could be made to determine the paragenesis of the accessory minerals in the above three specimens, due to their almost general distribution as isolated grains.

Report No. 12

84N/1
13th November, 1957

IDENTIFICATION OF SUSPECTED RADIOACTIVE SPECIMENS RECEIVED FROM MR. V.K. WILLIAMSON

Mr. V.K. Williamson,
5 Kent Street,
WEST TAMWORTH. N.S.W.

by

W.B. Dallwitz

All of the specimens have been tested for radioactivity, and none gave a positive result.

Specimen 2P was mostly serpentine, but some slate containing vein quartz was included.

Specimen 5M - mostly serpentine; some hornfels and marble.

Specimen 4A - chert.

Specimen ID - quartz vein with a little feldspar.

Specimen 6H - iron - stained siltstone.

Specimen 3P - iron - and manganese - stained siltstone and iron-stained quartz.

Report No. 13

84N/1
14th November, 1957

IDENTIFICATION OF SUSPECTED RADIOACTIVE SPECIMENS SUBMITTED

by E.F. Voss,
"Gawder",
ASHFORD 5.N. N.S.W.

by

W.B. Dallwitz

All specimens have been tested for radioactivity and none gave a positive result.

The three light coloured specimens consist mainly of quartz (two contain some feldspar as well). Embedded in the quartz are small quantities of copper minerals. One specimen contains the green carbonate, malachite, and the blue carbonate, azurite. Another contains the yellow sulphide of copper and iron, chalcopyrite. The percentage of copper in these specimens is not high enough to be of economic interest.

The five dark grey specimens consist of quartz and tourmaline, which is a complex silicate of sodium, calcium, aluminium, iron, magnesium, manganese, titanium, and boron. Tourmaline is of no commercial value unless it is coloured pink or green; flawless material of these colours is used as gem-stones.

The specimens of quartz-tourmaline rock were examined for tin, but none was found.

Report No. 14

84Q/2
22nd November, 1957

MINERAGRAPHIC EXAMINATION OF A SPECIMEN FROM ORTONA MINE, NORTH QUEENSLAND

By

W.M.B. Roberts

The specimen was submitted by D.A. White, and measured roughly 5 cms x 3 cms. It appeared to consist mainly of an iron oxide and a silvery white, fairly hard sulphide mineral.

Two sections were polished and the opaque minerals identified were: gersdorffite ((Ni Co Fe) As S,) hematite, a hydrated iron oxide, probably geothite, and very minor amounts of pyrite.

Gersdorffite forms approximately 30% of the specimen, occurring as large irregular areas and as typical cubes having a good cleavage developed in two directions at 90°. Etching with HNO_3 produced a clearly defined zonal texture also typical of this mineral. Its identity was confirmed by an X-ray powder photograph.

Microchemical tests on the mineral gave positive results for Ni, Fe, As, and Co, in that order of abundance.

The only other sulphide present is pyrite, observed only once in this examination in a small irregular area enclosed in the hydrated iron oxide. This hydrated oxide is the principal iron mineral present in the specimen; in places it has formed along the cleavage planes in the gersdorffite, obviously replacing this mineral. It also commonly occurs as large stellate areas and fine-grained aggregates. Within the hydrated oxides, and having the same forms developed, are small masses of hematite, which are probably residuals of the original iron oxide mineral of the rock.

Patches of yellow earthy material coating parts of the surface of the specimen are probably "yellow earthy cobalt", a name given to the decomposition product of certain cobalt minerals.

Report No. 15

A167PNG/1
9th December, 1957

PETROGRAPHIC EXAMINATION OF IGNEOUS ROCKS FROM PORGERA RIVER AND TINNUN RIVER AREAS, NEW GUINEA

By

J.K. Lovering

The following is a report on rocks submitted by J. Best, from the Porgera River area and from the Tinnun River area, New Guinea.

B1. From the Porgera River Area.

The handspecimen is a dark green, black and white mottled rock.

Large grains of brown amphibole and diopside lie in a groundmass of clay minerals, actinolite and calcite with accessory pyrite and apatite.

The diopside is marginally altered to green chlorite. Some grains are noticeably zoned.

The groundmass was largely feldspathic; remnants of feldspar are found to be albite. These grains may have been altered from a more calcic feldspar.

The rock is a hornblende micro-gabbro; the zoning of the pyroxene suggests a volcanic or hypabyssal occurrence but no field relations are available for these rocks.

B.2.

The handspecimen is a grey medium-grained rock containing numerous porphyritic grains.

The rock consists of porphyritic grains of feldspar and amphibole in a fine-grained groundmass. Pyrite and apatite are accessory.

The rock is fairly altered. The feldspar is zoned oligoclase; epidote, clay minerals, sericite, and calcite partly replace the grains. The amphibole grains are partly uralitized and the groundmass which consists of feldspar microlites is mainly replaced by sericite and clay minerals.

The rock is an altered porphyry. There is also a possibility that it was an andesite or andesitic tuff.

B3.

The handspecimen is a light grey porphyritic rock.

It consists of grains of feldspar and amphibole in a fine-grained groundmass. The whole rock is very much altered to clay minerals, calcite and uralite. Secondary quartz is present. The accessory iron oxide is partly altered to limonite.

The rock was probably a porphyry, or a porphyritic volcanic.

B6.

The handspecimen is a dark green-grey with red "phenocrysts".

Laths, about 3 mm. in length, of pleochroic brown to green hornblends which invariably have altered margins, pyroxene grains, about 0.5 mm. in size, and serpentine pseudomorphs (probably of olivine) surrounded by very small hornblende grains lie in a groundmass of altered feldspathic and pyroxene microlites and small grains of iron oxide.

Some pyroxene grains are pigeonitic with a 2V of about 30°. Diopside is also present. Calcite has replaced some of the grains.

It is probable that the rock is a lava of basaltic andesite composition. The red "phenocrysts" consist of a calcite-hematite accumulation, probably an alteration of some ferromagnesian mineral.

C1. From the Tumun River Area.

The handspecimen is a grey and fine-grained rock.
The rock consists of:
irregularly-shaped grains of pyroxene, plagioclase and pyrite in a mass of chlorite and clay minerals.

The rock is a basic tuff.

C2.

The medium-grained grey lava contains a black, coarse-grained xenolith.

The black xenolith is a hornblendite consisting of grains of hornblende up to 6 mm. in length, and a few interstitial grains of sericitized feldspathic material and some accessory sphene and iron oxide.

Marginally-altered phenocrysts of green hornblende, extensively-altered phenocrysts of feldspar, grains of pyroxene and accessory pyrite are in a groundmass of small stumpy andesine grains, actinolite, clay minerals and iron oxide.

The rock is hornblende basaltic andesite.

C4.

The handspecimen is a dark grey rock with numerous phenocrysts.

Phenocrysts of feldspar and chlorite and calcite pseudomorphs of amphibole and grains of magnetite are in a groundmass of feldspar microlites, chlorite, calcite and hematite grains.

The feldspar is labradorite.

The rock is probably basaltic andesite.

C5.

The handspecimen is a dark grey rock with coarse black phenocrysts.

Beautifully-zoned phenocrysts of pyroxene (10%) a few chlorite pseudomorphs of amphibole (5%) and a few grains of plagioclase (2%), are set in a groundmass of feldspar microlites (50%), pigeonitic granules (25%) and iron oxide granules (8%).

The pyroxene phenocrysts are diopside with a distinct rim of pigeonite.

The feldspar is bytownite.

The rock is pyroxene dolerite. The presence of pigeonite suggests the magma cooled quickly perhaps as lava.

C8.

The fine-grained grey handspecimen has a number of medium-sized black phenocrysts.

The rock contains phenocrysts of feldspar (10%) pyroxene (5%, small chlorite pseudomprphs (5%) of amphibole (?), patches of epidote and clay minerals (2%) and grains of iron oxide (1%) are in a matrix of feldspathic microlites (37%), pigeonite granules (20%) and grains of iron oxide (10%) and clay minerals (10%).

The feldspar is bytownite. The pyroxene of the phenocrysts is diopside rimmed with pigeonite.

The rock is porphyritic bytownite basalt.

Another piece of the rock is more extensively altered. Most of the pyroxene and some of the feldspar phenocrysts are replaced by epidote; chlorite is interstitial in the groundmass.

C9.

The handspecimen is a fine-grained grey rock containing some specks of pyrite.

Crushed grains of quartz (40%), feldspar (30%), and interstitial actinolite (20%) make up most of the rock with grains of pyrite and accessory grains of apatite, sphene and zircon.

The rock is a metamorphosed sandstone.

C11.

The rock is greenish grey and is streaked with white patches. It is hard with a conchoidal fracture; grainsize is extremely fine.

The rock consists mainly of saussuritized feldspar with very fine pyroxene. The streaks are outlined by yellowish-green pyroxene.

It is suggested that this rock was a flaser gabbro in which the feldspar has been almost granulated and has been saussuritized.

C12.

The handspecimen is dark grey and friable.

The rock appears to be tuffaceous. Fragments of quartz and of labradorite, patches of chlorite and fragments of iron oxide are all bound together by chlorite, limonite and calcite.

The rock is a tuff.

Report No. 16

94Q/3
20th December, 1957.

EXAMINATION OF A DRILL CORE FROM CONSTANCE RANGE, QUEEN LAND

by

W.M.B. Roberts

The section of core was submitted by the Chief Geologist for general identification of the minerals present, in particular a black mineral which formed large irregular masses throughout the core.

A polished and a thin section were prepared from the specimen and a scraping of the black mineral removed from the surface of the polished section under the microscope. The powder was X-rayed and the mineral proved to be chamosite containing some hydrated iron oxide. The only other opaque mineral in the core is a very minor quantity of pyrite, which forms irregular areas ranging up to 0.2mm across, occurring in both the chamosite and siderite.

The rock is a siderite "marble" containing sub-angular to rounded grains of quartz ranging from 0.06 to 0.4 mm across, which form roughly 20% of the surface area of the section. The rock also contains numerous oolites which suffered ranging degrees of replacement by siderite, not many of which still show the typical concentric structure, composed of bands of hydrated iron oxide and chamosite, as well as containing small very thin flakes of hematite. Other curved elongated structures in the rock could be either flattened oolites or shell fragments; the latter possibility could not be proved as none of the fragments had any structure preserved. Chamosite also forms irregular vein-like areas throughout the specimen and in places is attacking and replacing the margins of the quartz grains.

The rock was probably a sandy siderite mudstone consisting essentially of finely granular siderite; a marine sediment which has been later recrystallised to its present compact form.

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URANIUM ORE FROM A SHEAR ZONE, PARALLEL TO GIANT'S FAULT, WHITE'S OPEN CUT, RUM JUNGLE, NORTHERN TERRITORY

By

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The hand specimen is an almost black chlorite schist containing irregular veins of pitchblende ranging up to 0.75 cm across. The rock is iron stained in places and veins of a white carbonate follow fairly closely along the schistosity. Other carbonate material forms random small patches and coatings which have in places a reddish brown colour apparently due to iron staining. No sulphides are visible.

The following non-opaque minerals were found to be present: chlorite, quartz, dolomite, siderite and leucoxene.

The quartz grains, ranging in size from 0.03 to 0.65 mm., in diameter, are angular to sub-angular in outline, the larger ones being very strongly fractured. They are set in a matrix of green chlorite, some of which has a marked orientation. The chlorite matrix itself occurs as massive fine-grained aggregates as well as sheaf-like groups, containing a few irregular areas of a very fine-grained mineral, probably leucoxene.

The distribution of pitchblende differs slightly in each section, but mainly it is vein like in character, although some has a random distribution throughout the section, chiefly as small aggregates of colloform individuals. Siderite is closely associated with the pitchblende, forming irregular masses and filling transverse fractures in the pitchblende veins which are probably the result of shrinkage following colloidal deposition.

Dolomite, identified by its X-ray powder photograph, forms veins having a comb-like structure and which have an average width of 0.5 mm. These veins intersect the whole mineral assemblage and are roughly parallel to the schistosity.

In polished section the principal opaque mineral is found to be pitchblende; minor quantities of pyrite, galena and chalcopyrite are present.

Pitchblende forms large irregular veins which at high magnification are cellular in form and have a colloform texture (plate 1). Pyrite, galena and chalcopyrite are confined mainly within the pitchblende, pyrite and galena being far more abundant than chalcopyrite, which is of very limited occurrence, forming minute irregular areas in both pitchblende and chlorite.

Galena forms large irregular masses and are commonly nearly perfect cubes (plate 2); a typical occurrence is an even distribution in pitchblende of small cubes which average approximately 0.001 mm across. This is very similar to the galena in the pitchblende in the ore from the Blind River district, Canada, which Ramdohr (personal communication) considers to be radiogenic in origin. The similarity of the finely divided galena in both ores is marked, and it is possible that in this case also it owes its formation to the

same process. It is evident that some of the galena at least, is younger than the pitchblende, as some small cubes form chains arranged along the more oxidised bands in the colloform structure of this mineral, these bands evidently offering a more suitable environment for the emplacement of the lead.

It may be of interest to note that a specimen examined some time ago from the N.W. cross-cut 100' level at 59' from the west wall, White's mine, contains abundant siderite and pitchblende. No chlorite or dolomite was observed in this section, which is a phyllite consisting of muscovite, siderite, quartz and probably some clay mineral.

Of the fifty three Rum Jungle sections examined (collected up to January, 1955), only the one mentioned above contained siderite, and none so far has contained any visible dolomite. In general the specimen differs from those hitherto examined, in that:

a. chlorite takes the place of muscovite

b. dolomite veins are present

c. siderite is present in quantity

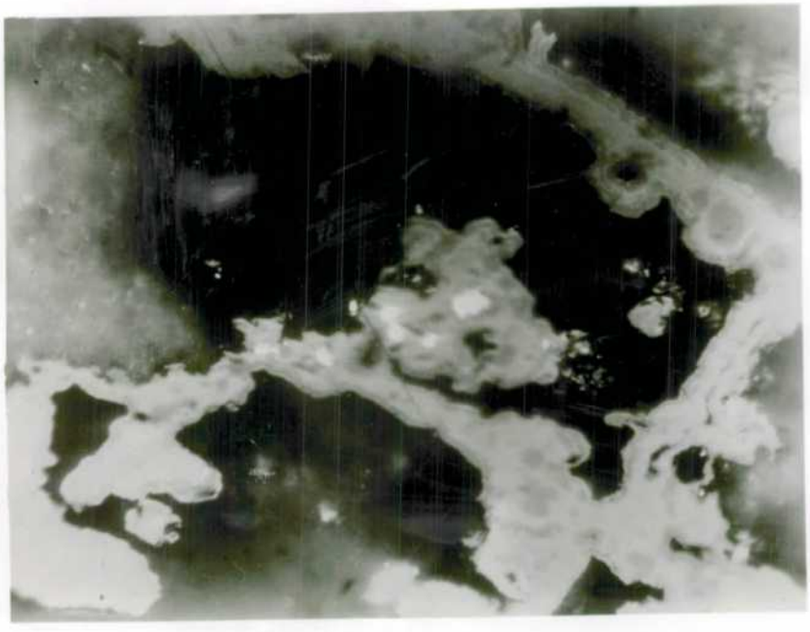

Plate (1) Pitchblende (light grey) showing colloform structure and alternate bands of more oxidised uranium oxide (darker grey). The white areas are galena.
X 1050

Plate (2) Cubes of galena in pitchblende. X 1050.