DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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PETROGRAPHY OF TWELVE SAMPLES OF BASEMENT ROCKS FROM FITZGERALD'S DAM SOUTH OF COOBER PEDY

GEOLOGICAL SURVEY

by

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ABSTRACT

Two varieties of granitoid and one altered dolerite from a basement inlier in the Coober Pedy area have been sheared at a low temperature but do not exhibit evidence of regional metamorphism. The fabric produced by shearing is marked macroscopically by flattened spindles of granulated quartz but in thin section the granulation is seen to be of two types and is not confined to the spindles. Several episodes of shearing have taken place, the latest of which may be as late as Tertiary.

INTRODUCTION

Six samples of basement rock were received from S. Robertson and six from L. Barnes of the Mineral Resources Section. The rocks were collected from the vicinity of Fitzgerald's Dam, south of Coober Pedy. The samples were dominantly of a red granitoid but grey, green and yellow rocks were included. A preferred orientation was visible to varying extents in the hand specimen and some specimens included friable and slickensided material. Petrographic descriptions were requested, with particular reference to the nature of the oriented fabric and its implication on the age of the basement.

PETROGRAPHY

5839 RS 93, FD 4, Ts C40900

Rock Name: Sheared granitoid

Hand specimen:

The specimen consists essentially of coarse masses of quartz and a bright red feldspar with a few grains of a dark green platy mineral. One face of the specimen displays a weakly developed preferred orientation.

Thin section:

The fabric of the rock is seen in thin section to be dominated by a network of granulated bands with fragments of fractured coarse grains between them. The granulated material is of two types, one consisting of fine grained quartz and feldspar and a second, later type of coarser, partly recrystallised quartz. Although the granulated bands are very prominent in thin section, they do not produce a strong foliation in hand specimen because their orientation is not entirely consistent and some sets are superimposed on other sets. The granulation is intense enough to conceal any other preferred orientation which may originally have been present.

The coarse grained fragments, which constituted the original, pre-granulation fabric, consist mainly of feldspar with subsidiary quartz. Most of the feldspar is untwinned but orthoclase can be distinguished by a weakly perthitic texture. A few grains of plagioclase retain a faint polysynthetic twinning but all grains are so highly strained that undulose extinction prevents the optical determination of plagioclase composition by symmetrical extinction angles. Coarse fragments of fractured quartz also display strong strain polarisation.

The dark green platy mineral seen in hard specimen is a fragmented and altered biotite. It occurs as clusters of fine grained ragged flakes, many of which are contorted. The clusters probably originated as simple flakes which were disrupted by shearing.

The granitoid is distinguished by the presence of a few fragmentary garnets. Rare, very fine grained zircon is also present.

The two types of granulated material are distinct in grain size, composition and distribution. The finer grained material includes both quartz and feldspar and is mainly interstitial to coarse fragments with a random distribution. It appears to be older than the more coarsely granulated material which consists entirely of quartz and occurs mainly in coherent bands with an orientation which is generally consistent on a broad scale but varies considerably over short distances. The bands appear to have been superimposed on finer grained granulated material and coarse fragments alike.

The intergranular sutures of the coarsely granulated quartz and the type of extinction within individual grains show evidence of a complex history of strain, granulation and annealing, often followed by further strain. Intergranular boundaries vary from simple forms meeting in almost perfect 120° triple junctions to complex forms showing virtually no annealing and a large departure from equilibrium. Extinction varies from sharp to highly undulose. The latest episode of stress appears to have been comparatively recent in geological terms.

The red colouration of the feldspar fragments, and to varying extents of the whole rock, is due to the presence of fine granules of red iron oxide. The concentration of these is high in the relict feldspar, moderate in the fine grained, pulverised material and light in relict quartz fragments. The coarsely granulated quartz of the most recently sheared bands is free of iron oxide. This is the material recognisable as quartz in hand specimen.

Comment:

There is no evidence in this thin section that the rock originally was anything but a magmatic granite. However, if the texture was originally metamorphic the intensity of shearing may have totally destroyed any evidence of regional foliation. The shearing is quite distinct from high grade metamorphism and occurred at low temperature and probably under only shallow cover. The latest phase in a complex history of such shearing may be associated with the rupture of the Australian-Antarctic continent in the Late Mesozoic or Early Tertiary. The earliest phase may be as old as Proterozoic.

The presence of zircon raises the possibility of dating the rock by the uranium-lead method.

5839 RS 94, FD8, TS C40901

Rock Name: Sheared granitic ? gneiss

Hand specimen:

In contrast to specimen RS 94, this rock is yellow to grey in colour with strong bands of vitreous quartz and a crumbly yellow-green mineral between the bands. A scaly green mineral coats a joint face.

Thin section:

Despite a very different appearance in hand specimen, the rock in thin section appears not dissimilar to specimen RS 93. The major difference in colour is due to the absence of red iron oxide granules and the presence instead of a strongly altered biotite in RS 94. The altered biotite is more abundant as well as more chloritic and gives the greenish yellow colour instead of the red of the iron oxide.

There is less finely granulated material in RS 94 than in RS 93, partly because the degree of initial fragmentation is somewhat less but also because the extent of annealing is considerably greater. There is also a more consistent orientation of the recrystallised bands which produces the strongly foliated appearance of the hand specimen.

There is considerably more feldspar than is apparent in hand specimen. Because the feldspar is virtually unaltered it has a clear vitreous appearance and is not easily distinguished from quartz in hand specimen. Microcline and twinned plagioclase are identified in thin section but much of the feldspar is untwinned and is not identifiable optically. Both quartz and feldspar display strong strain polarisation.

Biotite is strongly fragmented and is largely altered to a yellow chlorite.

A few grains of iron oxide, some opaque and some translucent, and a very few grains of zircon are also present.

A set of fine fractures perpendicular to the major foliation are occupied at scattered points by fine grained biotite.

The granulated material is similar to that of RS 93 but the two types are not as sharply distinct and the coarsely granulated quartz has annealed to a much greater extent, forming linear masses of continuous quartz rather than a mosaic of separate grains. It is this difference which gives the rock its more gneissic appearance. The masses of quartz are highly strained and show a mottled extinction which is either the result of incomplete annealing or of incipient regranulation.

Comment:

Despite the considerable difference in appearance, the two samples RS 93 and RS 94 are essentailly similar. The colour difference is due to the higher abundance in RS 94 of an altered biotite and the concentration of iron oxide in grains rather than

its dispersion as very fine granules. The textural difference is due to annealing overcoming granulation in RS 94. There is still no evidence that the original rocks differed except in minor mineralogical characteristics such as the substitution of microcline for orthoclase. However, this may indicate a different granitic parent.

Apart from a linear patch of mica at one end of the section, there is no indication of an oriented fabric prior to the shearing of the rock. Considering the hand specimen, however, it is possible that compositional banding may originate from a regional metamorphic episode.

5839 RS 95, FD12, TS C40902

Rock Name: Altered dolerite

Hand specimen:

The specimen is somewhat crumbly, probably due to weathering. It consists of a fine grained aggregate of grey crystals and yellow-green crystals. An occasional patch of coarse grained mica flakes of a bronze colour is present. Apart from the sectioned part of the specimen there are some broken fragments. In some of these there are substantial quantities of biotite and also of black ferromagnesiun silicate.

Thin section:

The grey mineral is readily identifiable as a well-twinned plagioclase. It is almost completely unaltered and may be identified by symmetrical extinction angles as a sodic labradorite, almost on the compositional boundary of andesine. There is often a fairly strong compositional zoning.

The ferromagnesium minerals are more varied and strongly altered. The original ferromagnesium component was probably pyroxene and much of this still remains. It is a colourless pyroxene with parallel planes of opaque inclusions, probably exsolved, in a schiller structure on the basal parting of the mineral. The optic axial angle is in the order of 30°-40° and the pyroxene is thus a pigeonite.

Relatively coarse crystals of an amphibole of hornblende type are fairly common. It is pleochroic from green through brown to pale straw yellow and is less altered than the pyroxene. It may be an alteration product of the pigeonite but, from its coarse grain size and light alteration, is more likely to be a later introduction.

A red-brown, strongly pleochroic biotite is almost certainly the product of a late, potassium rich metasomatism. It occurs in moderate abundance as fresh, well-shaped flakes of relatively coarse grain size.

Opaque minerals, probably iron-titanium oxides, are abundant and there are some scattered grains of apatite.

The alteration products of the pyroxene are of two types. One is a fibrous mineral which forms scaly masses composed of tufts of fibres with high birefringence and a faintly yellow brown colour. The mineral is probably a tremolitic amphibole but is not susceptible to optical identification. The yellow colour may be due to the exsolution of iron and its subsequent oxidation.

The second alteration product is of varied colour from olive green to bright orange. Much of the colour is also due to the exsolution of iron. The mineral has a low birefringence and no pleochroism. It is probably a chlorite. Exsolved iron is probably more responsible than the silicates for the colour of the hand specimen.

The fabric of the specimen shows a marked preferred orientation in the elongation of grains and in a weakly banded disposition of feldspars and ferromagnesium minerals.

Comment:

The rock has not been subjected to the shearing that has granulated the granitic rocks. The plagioclase remains fresh and even the calcium content has not been substantially diminished while the pyroxene is still abundant despite a strong alteration of many grains. These factors suggest that the dolerite is very much younger than the granitic rocks. On the other hand there appears to have been some potash metasomatism in the rock, suggesting that is older than one episode of acid activity.

The banding visible in the rock is possibly a primary gravity stratification rather than a subsequent metamorphic differentiation. An intrusivé of this type may be of economic interest.

Hand specimen F.D. 12(a)

Some broken fragments of material from the specimen which was particularly strongly coloured in a bright green shade were examined in refractive index oils. The material is composite and includes pyroxene, fibrous amphibole and chlorite. The same minerals are present as occur in the ferromagnesium layers of the rock. The source of the green colour could still not be determined. It is probably a stain rather than a mineral.

The fibrous amphibole is particularly common in the green, crumbly material and some fragments consist of spheroidal rosettes of radiating fibres.

Optical methods are not ideal for the identification of this type of material and an examination by X-ray diffraction is recommended.

The crumbly material is slickensided and suggests that the material sectioned was probably chosen deliberately as the most coherent rock available. The effects of shearing and consequent accelerated decomposition were deliberately avoided and the thin section C40902 is not typical of the whole specimen RS 95.

Comment:

The shearing of the dolerite is evidence that it is older than at first supposed. However, if the latest shearing is Tertiary, the dolerite could be as young as Late Mesozoic.

5839 RS 96, FD11, TS C40903

Rock Name: Sheared gneissic granitoid

Hand specimen:

In this specimen a thin compositional banding predates some of the shearing which is oriented at a shallow angle to the banding. The earlier fabric may be the result of early shearing or of regional metamorphic gneissosity. The banding is in red, grey and orange-yellow.

Thin section:

The regular banding of the hand specimen is not detectable in thin section. The rock is richer in garnet than the other granitoids examined but otherwise closely resembles them. The feldspar is essentially granitic rather than metamorphic and the quartz is either finely granular or highly strained fragments of coarse grains.

The most abundant feldspar is a weakly perthitic orthoclase. It occurs as coarse grained fragments separated by wide bands of finely granulated material, some of which is recognisably feldspathic. Much of the orthoclase contains rounded and probably corroded inclusions of plagioclase. This is a texture frequently encountered in calc-alkali granitoids in which potash feldspar is the product of a late stage, low temperature eutectic with quartz.

A little plagioclase is recognisable in addition to that included in orthoclase but much may be untwinned and virtually indistinguishable from quartz. Extinction is undulose.

Biotite is present as ragged, deformed fragments surrounded by the chloritic alteration products which, together with iron oxide, form the orange-yellow patches seen in hand specimen.

The garnet occurs as fragmentary and fractured grains, mainly in patches of granulated material. If is faintly pink and probably of almandine composition.

Zircon is very rare but a few very fine grains are present.

The two forms of granulated material, fine and coarser, familiar from the other granitoids examined are also present in this specimen. The fine material includes feldspar and tends to form thin, intergranular zones between fragments of coarse feldspar and quartz. Particles tend to be equidimensional and unstrained. The coarser grained material is quartz and forms large patches of strained grains which usually show a corrosive relationship with surrounding material. Some patches show an almost completely annealed fabric but in places the stress has been renewed and the mass of material with faintly distinguished grain boundaries has an overall undulose extinction.

Comment:

Owing to the orientation of the plane of section, the compositional banding observed in hand specimen is not visible in the thin section. From the available evidence, however, it is probable that the banded fabric is the result of the invasion of shear planes by quartz rather than of a gneissic foliation. Despite the occurrence of garnet, the mineralogy is that of an aluminous granite rather than a regional metamorphic rock.

5839 RS 97, FD14, TS C40904

Rock Name: Sheared, gneissic granitoid

Hand specimen:

The specimen resembles RS 94 in its strongly marked banding and grey and yellow colour. The yellow colour is due to altered biotite and the grey to a combination of quartz and vitreous feldspar. There is no red colouration.

Thin section:

The vitreous appearance of the feldspar is the result of a total absence of alteration or exsolution of iron granules and to a virtual absence of twinning. Both quartz and feldspar extinguish with strong strain polarisation and are almost indistinguishable.

From the few grains of twinned feldspar that are identifiable it is clear that this specimen, like RS 94, is of the microcline-plagioclase type.

A pale, fragmented, contorted and altered biotite tends to occur in patches and as discontinuous and fairly sparse grains with a roughly banded distribution. The bands are controlled by fine fractures cutting coarse relict fragments and finely granulated material. Only the coarsely granulated quartz is free of fracture-controlled biotite. This type of banding is clearly not the product of metamorphic differentiation.

No garnet was identified in this specimen, another similarity with specimen RS 94.

A few grains of fine zircon are present.

Irregular grains of opaque iron oxide are relatively common. This may be related to the absence of red iron oxide granules.

The two types of granulated material are again recognised. The fine material containing feldspar occurs interstitially, often along grain boundaries, to the coarse fragmental grains. The coarser, quartzose, granulated material occurs in large masses, often elongated, in which the grain boundaries are sometimes almost eliminated. Much of the mass of granulated quartz occurs in conformable bands but some of it is in cross-cutting or random patches. Strain polarisation is common evidence of renewed stress which has not been suficient to cause further granulation.

Comment:

This specimen is only the second of its type to be examined but on this somewhate limited evidence there appears to be a distinct type of microcline granite without garnet or dispersed granules of red iron oxide but with coarser grains of opaque oxide. These minor compositional differences apparently coincide with a more annealed, less granulated quartz fraction which tends to exhibit more consistent banding than the red granites. However, the two types are essentially similar despite these minor differences.

5839 RS 98, TS C41282

Rock Name: Sheared granitoid

Hand specimen:

The rock is coarse grained and massive on most faces of the specimen. It consists of a mosaic of red and dark grey glassy grains with occasional yellowish patches. On two faces a weak preferred orientation of dark, elongated patches is observed.

Thin section:

The rock is a typical example of the red type of granite. Red granules of iron oxide are abundant except in the coarsely granular quartz and fragmentary garnets are present.

The major feldspar present is a weakly perthitic orthoclase with inclusions of plagioclase. Rounded quartz inclusions are also present. Plagioclase is either very weakly twinned or completely untwinned. The feldspar and fractured coarse grains of relict quartz are highly strained and, in places, contorted.

Fragmentary and altered biotite is widely, though not very abundantly, distributed in ragged and irregular patches. The alteration product is a greenish yellow chlorite.

Garnet is not abundant but one large group of fragmentary crystals is present.

Zircon occurs as rare crystals of somewhat larger size than in most of the specimens.

A few irregular grains of opaque oxide are present.

The granulated material follows the same pattern as in most specimens. The fine, feldspathic type is interstitial while larger areas of coarser quartz form partially annealed mosaics with a weak preferred orientation. In some patches a contorted foliation is observed.

Comment:

The rock has been strongly stressed but at a low temperature and probably under a light confining pressure. There is no evidence of a regional metamorphism.

5839 RS 99, TS C41283

Rock Name: Sheared granitoid

Hand specimen:

The oriented fabric is more evident in this specimen than in RS 98 but this is probably because it is visible on a long face of the hand specimen. The fabric appears to be a lineation rather than a foliation since it is only visible on one set of faces. One wide but irregular quartz vein is present. The feldspars are bright red.

Thin section:

The evidence of deformation is weaker in this section than in RS 98 but this may be a result of the orientation of the thin section. The coarse grained feldspar and quartz of the original granite is less fragmented than in other specimens examined and many grain boundaries do not contain a layer of finely granulated material.

The feldspars are the igneous type and the biotite is strongly altered to a green chlorite. A few garnet fragments, opaque iron oxide and zircon, which is fairly abundant for a trace mineral, are also present. One irregular grain of opaque oxide is closely associated with a green isotropic mineral with a high refractive index which may be pleonaste, a calcium-iron spinel.

The finely granulated, feldspathic material occurs along many grain boundaries and fractures in coarse grains but it is less abundant than in most of the specimens examined. The coarser, quartzose granulated material is moderately abundant but tends to be highly annealed. It is almost gradational towards coarse grains of quartz from the original rock which have been strained enough to produce a mottled extinction probably signifying incipient granulation.

Comment:

The orientation of both the thin section and faces of the hand specimen relative to the lineated fabric of the rock is clearly critical in controlling the appearance of the rock. A

variation in the balance between granulation and annealing is, however, the main control of the fabric regardless of the angle of inspection. This variation is not after all correlated with compositional variation as was suggested by the fabric of the microcline granitoid. The stress which produced granulation was somewhat less in this specimen.

5839 RS 100, TS C41284

Rock Name: Sheared granitoid

Hand specimen:

The specimen appears to be even less strongly sheared than RS 99. Extremely coarse grained and apparently unfractured red feldspars occur between large patches of interstitial quartz. On an even greater scale there appear to be quartz-rich zones and feldspathic zones but the distribution of the zones appears to be random rather than oriented.

Thin section:

Granulation of two types has occurred in the rock but to a relatively minor extent.

Large areas of ungranulated feldspar, sometimes without fracturing, remain of the porphyritic crystals. The full extent of these crystals does not appear to escape some dislocation. The feldspars include a coarsely perthitic orthoclase and a plagioclase which is too strongly altered for optical determination of the composition. Both feldspars are impregnated with fine granules of red iron oxide and the fractures are often filled by limonitic oxide. Orthoclase is more abundant than plagioclase but is so coarsely perthitic than some grains consist of a mass of interlocking patches of the two feldspars.

Quartz has absorbed the major part of the applied stress. Coarse grains of probably original quartz are highly strained and incipiently brecciated in the centre with marginal zones of granulated quartz. Zones of granulation are often linear but do not display a consistent preferred orientation.

Scattered patches of highly fragmented biotite, strongly altered to a yellow chlorite, are distributed partly at random and partly on a line across the centre of the section.

A few, relatively coarse grains of zircon are present.

Comment:

The evidence of this specimen confirms the variability of stress applied to the rock. The stress field is not regional and results in local shearing, possibly along a linear zone.

5839 RS 101, TS C41285

Rock Name: Sheared granitoid

Hand specimen:

The specimen is somewhat finer grained than RS 100 but is otherwise similar. There is no oriented fabric but signs of granulation of both quartz and red felspar are visible.

Thin section:

The finer grain size observed in hand specimen is confirmed in thin section. The original porphyritic grains are smaller and those that are present have been fractured. Broken fragments of feldspars are often separated by thin layers of granulated material but many have not been moved from their original position. Another source of finer grain size in the feldspars is that many of them are coarse perthites.

The potash feldspar is again a perthitic orthoclase with heavy impregnation by red iron oxide granules. Plagioclase is strongly altered and is more abundant in this specimen than in RS 100.

Quartz is less abundant than in RS 100 but is similar in consisting of strained but integral centres surrounded by granulated zones.

Biotite is scattered in highly fragmented and highly altered patches.

Zircon and opaque oxides are rare.

Comment:

The rock is slightly different mineralogically from the average red granitoid and is slightly less stressed than most of them. Otherwise there is no significant difference from the average.

5839 Rs 102 A, TS C41286 A

Rock Name: Sheared granitoid

Hand specimen:

Elongated quartz pods give an oriented fabric to the rock but the orientation is not always consistent. The overall grain

size is finer than that of the last two sections examined. One end of the hand specimen is coated with a yellow, amorphous material.

Thin section:

The section is cut perpendicular to the preferred orientation. This is imparted to the rock by a series of sub-parallel bands of granulated quartz which are much more regular than those encountered in the other specimens examined.

The feldspars are fragmented and consist of an orthoclase perthite and an altered plagioclase. Biotite is sparse, green and highly altered to a yellow chlorite. Iron oxide is rare except as red granules and zircon is very rare.

Finely granulated feldspathic material occurs both marginally to coarse grain fragments and as discordant bands and lenses. The coarsely granulated quartz is also abundant. the sub-parallel bands which are responsible for the oriented fabric are frequent and finer than those of most other specimens examined. Bands and lenses which do not conform to the prevalent orientation are also present. Most of the quartz in the bands is granulated but occasional coarse fragments are either not granulated or re-aggregated from granules. Granulation has absorbed the stress to a considerable extent and many of the grains are free of strain. They extinguish sharply and their boundaries often meet in 120° triple junctions. Grain size is relatively fine and very regular.

Comment:

The specimen marks a return to strong strain in the fabric. The composition is similar to that of RS 101.

5839 RS 102 B, TS C41286 B

Rock Name: Sheared granitoid

Hand specimen:

The specimen has no detectable oriented fabric on the face which has been cut.

Thin section:

The section is virtually parallel to the plane of foliation or along which the linear pods of quartz lie. These pods are still distinguishable to some extent but as somewhat irregular bodies. This suggests that the quartz bodies are actually shaped like flattened spindles with an irregular outline in the plane of the intermediate axis.

As well as coherent, though irregular, bodies of granulated quartz there are scattered patches and grains of granulated quartz and an almost continuous layer of finely granulated material. The concentration of granulated material relative to coarse grained material in the plane of section is extremely high.

The concentration of biotite is also high and includes some relatively coarse brown flakes as well as scattered fragmentary patches of a green, highly altered biotite.

Opaque oxide is common and zircon is rare.

Comment:

Seeing the specimen both in the plane of the imposed fabric and perpendicular to this plane underlines the point raised earlier that the observed fabric depends on the angle through which it is observed. The earlier observation that the granulated quartz may have a linear rather than planar structure is supported and the shape of a flattened, irregular spindle for the quartz bodies is suggested.

DISCUSSION

The specimens examined included a red orthoclase granite, coloured by dispersed iron oxide, a grey and yellow microcline granite, coloured by biotite altered to chlorite, and an altered dolerite. Oriented textures are more prominent in the grey and yellow granite than in the red granite but there is no obvious basis for correlation between composition and fabric. Strain textures in the red granite vary considerably in severity and the appearance of the rock depends a great deal on the angle at which it is observed relative to the plane of lineation. One sample of the dolerite is altered but apparently unstrained but another sample is slickensided and friable due to severe shearing.

Mineralogical evidence of shearing in the granitic rocks includes the production of at least two generations of granulated material. One of these is a fine granulation which tends to be interstitial, often along grain boundaries, but also forms patches and lenses along fractures. It includes potash feldspar, plagioclase and quartz. The second form of granulation is confined to quartz and shows evidence of annealing and renewed granulation, possible in several cycles. It occurs as discordant lenses, patches and bands which have been imposed on the earlier,

more general granulation. The quartz bodies are coarser in grain size than the feldspathic material and impart a visible preferred orientation to the specimens.

Other mineralogical evidence is the fragmentation and alteration of biotite. This leads to some mobility in the alteration products, which sometimes show a compositional banding which may be due to movement along fractures. The latest set of fractures is sometimes occupied by fresh biotite.

Severe shearing raises the temperature enough to homogenise feldspars and give them a glassy appearance. Alteration products are eliminated from recrystallised feldspar. This is particularly apparent in the yellow granite. The presence of coarse grained biotite in the dolerite indicates an episode of potash metasomatism.

Recrystallisation of feldspars is the only thermal effect observed in the sheared rocks and is confined to those in which shearing is most severe. There is no conclusive evidence that a regional deformation under deep cover has ever affected the rocks and the variation in severity of the shearing suggests the presence of a shear zone rather than a widespread deformation. Stress is still evident in much of the granulated quartz and in relict quartz and feldspars. If the temperature had been elevated the strained fabric would have been annealed.

The presence of garnet in many of the red granite specimens does not necessarily indicate a metamorphic origin. Highly aluminous granites, possibly derived from the granitisation of pelitic rocks under deep cover, frequently contain garnet. It would be classified as an 'S' type granite.

The significance of the petrographic evidence in terms of the age of the basement is hard to assess. In the absence of any optically detectable deformation apart from granulation, which appears to have occurred at low temperature and probably under little cover, the most likely age appears to be post-Kimban. However, the similarity of the rocks to others dated as Archaean, deformed by the Kimban orogeny suggests that interpretation based on petrographic features alone should be assessed in relation to the field occurrence. Possibly the rocks were massive enough to resist foliation by the Kimban deformation, which was more intense to the south, and reacted to stress by shearing. Alternatively some of the rocks may have been deformed but the evidence is now obscured by shearing.

Since the red granite carries an appreciable zircon content, it would probably be suitable for dating by the uranium-lead method. Sufficient material could be collected from the outcrop and the zircons do not appear to have been altered. If the granite is pre-Kimban, zircon ages are the only ones likely to be significant.

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