

Richter
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Samples:

7 samples for sectioning and petrographic examination. Samples are numbered as follows:

RTC-10m.
RTC-13m.
RTC L04
RTD L05
RTE L07*
RL 217
RL 221

*Two slides (designated A and B) were prepared from this sample: one to illustrate the vein quartz component, and one of the presumed wall rock.

Summary:

Samples RTC-10m. and 13m., RTC L04 and RTD L05 are albitites of very similar petrographic character and, presumably, of related type. They consist essentially of very fine-grained, felsitic aggregates of albite, with clumpy and veniform segregations of the same mineral of coarser grain size. The latter have the aspect of original deformed and disrupted beds or veins in a recrystallized matrix.

The principal accessory (making up from 2-10% of the rock) is olive-green biotite, of fine-grained felted mode. This occurs as flecks, wisps and hairline veinlets throughout the compact albite - sometimes defining an incipient foliation. Traces of disseminated sulfides (pyrrhotite, pyrite and rare chalcopyrite) are the remaining constituents.

Sample RTD L05 is distinctive for its more potassic character (being composed predominantly of a cryptoperthitic alkali feldspar rather than simple albite).

These rocks are of uncertain origin. There is no textural evidence to suggest that they are altered intrusives. More likely they are original porcellanitic albitite tuffs (of keratophyric affinities) which have been hornfelsed - causing recrystallization and development of the secondary biotite. The relict disrupted bedding(?) could be a soft sediment slump feature.

Alternative hypotheses (not so well explained by the petrographic observations) are that these rocks are albitite dykes, keratophyric flows, or some form of metasomatic product.

Re your query, there is no silicification. The rocks are devoid of quartz, except for the single cross-cutting veinlet in RTD L05. The sulfides are randomly disseminated, but tend to be associated with the biotite - and may, therefore, be related to the postulated thermal metamorphism.

Sample RTE L07(A) is essentially monomineralic quartz. Its textural features suggest that it may be recrystallized chert. The "B" portion of this sample is a recrystallized, hornfelsed albitite of closely similar character to the first four samples of the suite. It differs in containing contorted, dislocated threads of quartz - possibly representing original wispy intercalations of chert in a porcellanite tuff, disrupted by soft-sediment slumping. This genetic model appears consistent for material adjacent to the segregated chert band represented by the "A" portion.

Samples RL 217 and 221 are distinctly different from the other rocks of the suite. The first is a minutely laminated intergrowth of siliceous, meta-basic and meta-calcareous components. It is thought to be a thermally metamorphosed ash tuff, sediment or exhalite. The second sample is coarser-grained and consists of non-foliated greenstone (actinolite porphyroblasts in a feldspar-chlorite-epidote matrix) with an intercalated fine-grained band of calcareous feldspar. It is probably a metamorphosed tuff.

Individual petrographic descriptions are attached.



J.F. Harris Ph.D.

(929-5867)

SAMPLE RTC-10m.**ALBITITE**

Estimated mode

Albite	93
Biotite)	2
Chlorite)	
Limonite	1
Jarosite	1
K-feldspar	3
Pyrrhotite	trace

This sample consists essentially of albite, as an even, very fine-grained, anhedral aggregate, of grain size 10 - 30 microns. This locally shows clumps, lamellar/prismatic patches and veniform segregations of coarser grain size (to 100 microns or more). These features show diffuse, gradational relations with the felsitic matrix, and appear to be of relict nature, or are possibly the result of localized recrystallization.

Biotite or greenish chlorite is a minor accessory constituent, as dispersed wisps and tiny pockets of minutely felted texture (grain size 5 - 20 microns). It also concentrates as occasional, more distinct, hairline veinlets, in which it shows fibrous, radiate texture.

The most prominent veinlet is a fracture coated by crustified limonite and jarosite, with local, lensey concentrations of felted biotite. This is mantled by an alteration envelope, 0.5 - 1.0mm thick, of secondary K-feldspar (replacing of the albitite matrix).

The rock contains minor, fine-grained, disseminated sulfides. These appear to be predominantly pyrrhotite, which mostly survives as thin rims to central cores of probable limonitic altered material (now lost by plucking in slide preparation). The pyrrhotite remnants mainly occur in association with the coarser, veniform segregations within the albitite.

The petrographic features provide no definitive information on the origin of this rock.

SAMPLE RTC-13m.

ALBITITE

Estimated mode

Albite	95
Biotite	4
Sericite	1
Quartz	trace
Altered pyrrhotite	1
Pyrite	trace
Chalcopyrite	trace

This is another rock composed essentially of monomineralic albite. It differs texturally from other samples of similar composition in the suite, and contains slightly more sulfides.

In part it consists of a minutely felsitic aggregate of grain size 10 - 30 microns, similar to the other samples. This sometimes shows a weakly distinguishable, highly irregular (contorted laminar or flow-like?) preferred orientation, defined by diffuse, slender, elongate forms (relics? or accretive recrystallization?).

Much of the rock, however, consists of much coarser, crenulate-margined, subhedral, prismatic aggregates (of grain size 0.1 - 0.5mm or more). These occur as highly irregular, discontinuous, veniform bodies or masses - suggestive of disrupted, deformed beds or bands. The contacts of these areas with the hosting felsite are generally diffuse and gradational, sometimes with intergranular development of fine-grained material (like the matrix) between the coarse crystals.

This whole relationship suggests extensive recrystallization of a texturally heterogenous host. This rock could have been an original ash tuff, with coarser intercalations - perhaps deformed and disrupted by soft sediment processes.

Fine-grained, olive-brown biotite occurs throughout as tiny wisps, clumps and felted-textured veinlets. In one area sericite (of similar mode) is the principal micaceous accessory.

Sulfides are principally pyrrhotite - typically strongly altered in characteristic bird's-eye or wood-grained fashion. It occurs as small clumps and strings of grains, 0.05 - 0.2mm in size, often associated with the better developed pockets of felted biotite.

Rare traces of chalcopyrite are seen intergrown with the pyrrhotite. Pyrite occurs as a single clump, 1.5mm in size, in one of the coarse-grained albite areas; it has a few grains of quartz associated with it.

SAMPLE RTC L04**ALBITITE**

Estimated mode

Albite	90
K-feldspar	trace
Biotite	10
Limonite	trace

This rock consists predominantly of a monomineralic, very fine-grained aggregate of plagioclase.

This forms a homogeneous, feathery/felsitic, anhedral intergrowth, of grain size 5 - 30 microns. There are also scattered, pockety segregations of coarser grain size (to 0.1mm) and a few irregular, veniform bodies of still coarser, well-twinned grains, 0.2 - 0.5mm in size.

Twinning extinction measurements and the low R.I. indicate that the plagioclase is albite.

Fine-grained biotite of secondary aspect, showing a distinctive straw-coloured to bright green pleochroism, is a rather abundant accessory constituent. This occurs as felted aggregates, of grain size 5 - 50 microns, forming tiny wisps, pockets and networks throughout the albite matrix. These tend to define an incipient foliation and/or crypto-fragmental texture.

Biotite also concentrates as a few, better-defined, fracture-controlled veinlets, 50 - 200 microns in thickness. These are sometimes diffusely impregnated by limonite. Traces of intergrown K-feldspar occur in association with some biotite veinlets.

The distribution and habit of biotite in this rock suggests that it may be a secondary development - possibly related to mild hornfelsing.

The rock could be a minor intrusive or a metasomatic product, or possibly a porcellanitic felsic tuff.

Estimated mode

Albite	20
Crypto-perthite	66
Biotite	5
Quartz veinlet	8
Pyrite)	1
Pyrrhotite)	
Chalcopyrite	trace

This sample - though of similar fine-grained, feldspathic type to the previous rocks, is distinguished by its more potassic character (note strong cobaltinitrite stain on the cut-off block).

In thin section it is of essentially identical appearance to RTC-13, though with a somewhat lower proportion of the coarser-grained textural component. It consists of a fine-grained, feathery/felsitic matrix of feldspars, of grain size 10 - 30 microns, throughout which are developed - more or less diffusely - individual coarser grains and small clumps, of grain size 0.1 - 0.2mm. There are also some much coarser segregations, having the appearance of irregular, contorted/disrupted veins. These are composed of subhedral, well-twinned, albite grains in the 0.2 - 1.0mm size range, and are recognizable in the cut-off block by their inferior stain.

Fine-grained, felted, olive-brown biotite occurs throughout the fine matrix as tiny flecks, clumps to 0.1 or 0.2mm, and discontinuous hairline veinlets.

The slide is cut by a single, sharply defined veinlet of quartz, 2 - 3mm thick, composed of strained, crenulate-margined, anhedral grains, 1.0 - 2.0mm in size.

The rock contains minor fine-grained, disseminated sulfides. These consist of altered pyrrhotite, as small clusters of irregular grains, often mantled by biotite and tending to be more abundant and coarser in areas of relatively coarser feldspar segregations. Rare traces of chalcopyrite are associated. Pyrite occurs as a few clumps within, and marginal to, the quartz veinlet.

The origin of this rock is debatable, as with the other related samples. Its potassic character is seldom recognizable in thin section, and the constituent feldspar is presumably cryptoperthitic.

SAMPLE RTE L07 (A)

RECRYSTALLIZED CHERT(?)

Estimated mode

Quartz	97
Biotite)	1
Chlorite)	
Carbonate	2
Pyrrhotite	trace
Chalcopyrite	trace

This sample consists essentially of monomineralic quartz. This is predominantly in the form of an evenly fine-grained, anhedral mosaic aggregate, of grain size 20 - 50 microns, which forms a matrix to sub-parallel, sometimes anastomosing strings and lenses of coarser, polygonal-mosaic quartz, of grain size 0.05 - 0.2mm (with rare grains to 0.5mm).

Biotite and carbonate are very minor accessories. The biotite occurs as rare, sporadic, tiny flecks, and as a few concordant wisps or veinlets of fine-grained, felted, partially chloritized aggregates. The carbonate is a brown, inclusion-filled variety (probably siderite), essentially confined to a single, sharply defined, 1.5mm veinlet, in which it occurs segmented with coarse, partially comb-textured quartz. Occasional pockets of felted biotite also occur in this association.

Disseminated sulfides are very sparse. They consist of a localized clump of partially plucked, altered pyrrhotite grains in the granular quartz matrix. Traces of chalcopyrite are associated.

The texture of this quartz aggregate is more characteristic of a recrystallized chert than conventional vein quartz.

SAMPLE RTE L07 (B) RECRYSTALLIZED CHERTY ALBITITE (TUFF?)

Estimated mode

Albite	70
K-feldspar	2
Biotite	10
Apatite	trace
Quartz	17
Carbonate	1

This is a crudely foliated rock consisting predominantly of a minutely felsitic aggregate of albite, resembling the first four samples of the suite. It is especially similar to RTC L05 in the relative abundance of accessory biotite and the lack of coarser feldspar segregations. However, it differs from any of the previous samples in its content of contorted/disrupted threads of microgranular quartz.

The principal component is albite, as a homogenous, minutely interlocking, somewhat diffuse-margined aggregate, of grain size 5 - 20 microns.

Abundant accessory biotite (olive-brown in colour, and of minutely felted, non-oriented texture) forms tiny flecks and more or less concentrated zones of sub-parallel, sinuous/anastomosing wisps and schlieren throughout - defining a distinct foliation.

Quartz occurs throughout this matrix, in sharply segregated mode, as contorted lenses and interconnected, thread-like veinlets composed of polygonal mosaics of grain size 0.03 - 0.1mm (rarely to 0.2mm). The quartz bodies often contain accessory intergrown carbonate, and sometimes include pockets and streaks of felted biotite.

The relationship of the matrix biotite to the quartz bodies is ambiguous. Generally the matrix biotite wisps diverge around, or concentrate on the contacts of the quartz. However, in some cases, biotite wisps continue through the quartz, or are incorporated within it as disrupted shreds.

Traces of fine-grained K-feldspar are associated with some of the concordant biotite wisps, and also concentrate as late, cross-cutting threads.

The observed features seem best explained by this rock having originated as a porcellaneous, albitic ash tuff with delicate interlamination of ferruginous clays and chert. The latter apparently underwent early deformation and remobilization (possibly under soft sediment conditions). Subsequent mild hornfelsing caused recrystallization and the development of biotite.

Estimated mode

Plagioclase	23
K-feldspar	1
Quartz	22
Actinolite	32
Epidote	4
Chlorite	10
Sphene)	6
Leucoxene)	
Pyrrhotite	2
Chalcopyrite	trace

This rock shows a fine-grained, delicately laminated fabric, locally contorted and disrupted - as if by soft-sediment slumping.

It is made up essentially of three intercalated and intimately intergrown components (see cut-off block): quartz (dark); feldspar (white etched and lightly yellow stained); and fine-grained actinolite (light grey).

The quartz is in the form of discontinuous, contorted, partially mobilized lenses, 0.2 - 1.5mm thick, made up of sub-polygonal strained mosaics of grain size 0.02 - 0.2mm.

The feldspathic component consists of minutely fine-grained (5 - 20 microns) felsite, recognizable only as thin wisps intercalated in varve-like fashion with abundant chlorite, epidote and leucoxene.

The actinolite occurs in the form of meshwork aggregates of acicular grains, 0.05 - 0.1mm in size, locally segregating as distinct thin laminae, but also intimately intergrown with the impure feldspathic assemblage.

The rock contains disseminated pyrrhotite (notably fresh in comparison with other samples of the suite) as angular grains, 20 - 200 microns in size - mainly within the wisps and clumps of microgranular quartz. Traces of K-feldspar are sometimes associated.

This rock is almost certainly an original laminated sediment. It may have originated as finely interlayered, cherty, mafic tuffaceous and carbonate-rich material - possibly of exhalative affinities. Disruption of the cherty laminae may have resulted from soft-sediment deformation, or in connection with later thermal metamorphism which caused the development of calc-silicates. Note that the original primary layering is perfectly preserved, and there is no stress-related orientation of the metamorphic components.

Estimated mode

Plagioclase	33
K-feldspar	1
Quartz	3
Actinolite	22
Chlorite	8
Sphene)	8
Leucoxene)	
Epidote	12
Carbonate	12
Apatite	1
Pyrrhotite	trace
Chalcopyrite	trace

This rock shows a crudely-banded texture. A central fine-grained, carbonate-feldspar band is flanked by coarse amphibole-rich zones.

The central band consists of minutely felsitic plagioclase and intergrown epidote, with carbonate as diffuse permeations and coarser-grained, clumpy and streaky veniform segregations. A little cherty quartz may also be present.

The flanking bands consist of a matrix of microgranular/felsitic plagioclase set with abundant, randomly-oriented, sub-prismatic individuals and clumps of pale green, actinolitic amphibole, 0.1 - 1.0mm or more in size. These commonly show ill-defined, fibrous/acicular outlines, and appear to be the result of modification of original hornblende phenocrysts.

The matrix in this assemblage also includes more or less abundant fine-grained chlorite and epidote, as streaky, patchy impregnations. Another component is brown sphene or leucoxene, as prismatic pseudomorphs and fine, dispersed granules.

The rock includes traces of fine-grained disseminated sulfides (pyrrhotite and chalcopyrite), essentially confined to the actinolitic zones.

This rock is, again, of somewhat debatable origin. The amphibolitic zones are probably of mafic igneous origin, possibly representing crystal-rich tuff. The central band may have been an interbed of calcareous ash.

The lack of any preferred grain orientation in this rock suggests that, like others of the suite, its recrystallization has been mainly in response to thermal influences.

Thin Sections - Hand Sample Descriptions

RTC - 10 metres

Testalinden gossan, siliceous, white to pale blue, highly fractured, fine to very fine grained, oxidized pyrite in fractures, fine grained phenos (black,)

RTCL07

Testalinden quartz vein? highly silicified rock? white to grey massive quartz w/ secondary 1mm qtz veinlets w/ manganese?

RTC - 13 metres

Testalinden Gossan, bleached white with numerous parallel 1/2mm veinlets carrying pyrite?, silicified

RTCL04 -

Testalinden fresh gossan - fine grained, light blue-grey, massive, very fine grained blebs of pyrite?, definite intrusive texture

RTD 605

Testalinden gossan - very fine grained, highly silicified w/ a^{tr} veinlets (up to 1/2 cm), pyrite filled fractures, a^{tr} veinlets w/ pyrite, light blue to white, disseminated blebs of pyrite throughout.

RTD 607

Testalinden sheared intrusive?, dark blue grey laminated, fine grained w/ a^{tr} veinlets (up to 1/2 cm) subparallel to laminations.

RL 221

Britite porphyry intrusive (diorite?), light green, very fine grained matrix, sheared?, mildly silicified?

RL 217

- from blast hole on Ridge Grid.
Foliated, massive, dark green volc?, oxidized along fr. planes 10% dis p₀.