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Sample 3-1 Skarny Volcanic Tuff

The rock has been strongly altered; relic textures suggest that the rock is a fine grained, slightly porphyritic, banded volcanic tuff. A few plagioclase phenocrysts (1-2%) up to 0.5 mm across are altered to clay (?) pervasively, and in patches to K-feldspar and actinolite. The matrix is very fine grained (0.005-0.015 mm) and consists mainly of equant plagioclase grains with lesser quartz. Throughout the rock is abundant (3-5%) dusty opaque and/or high-relief minerals (Ti-oxides). Banding in the rock is prominent in hand sample, but not obvious in thin section; it is probably of primary origin.

The rock has been altered strongly to the assemblage actinolite-K-feldspar. Actinolite (30%) forms ragged short prismatic crystals (0.05-0.15 mm); these show no preferred orientation or distribution. They appear not to be replacing any given mineral, but rather to be a replacement of the rock as a whole. K-feldspar (20-25%) forms similar grains which appear to replace the fine grained matrix. K-feldspar grain size is from 0.02-0.05 mm. Epidote forms scattered irregular grains (1%).

The rock also contains coarser grained zones consisting of sub- to euhedral epidote, K-feldspar, and calcite in about equal amounts (much calcite is leached from the section during staining or preparation). These zones are up to 2 mm across, are generally slightly elongated parallel to banding, and contain epidote and K-feldspar more along the borders, with calcite in the centers. Euhedral epidote crystals occur in the calcite.

Sample 4-2 Dacite Flow (?) and Tuff

The rock consists of two main rock types, both of dacitic composition and both fragmental.

The finer grained rock (0.003-0.010 mm) is a tuffaceous sedimentary rock. It contains 10-15% fragments up to 3 mm across of various porphyritic dacitic rocks. Some fragments consist of laths of plagioclase up to 0.2 mm long with interstitial quartz and dusty epidote. One of these also contains abundant tiny acicular actinolite. Another fragment contains scattered acicular plagioclase phenocrysts 0.03 mm long in a very fine grained groundmass. A third fragment type consists of equant plagioclase phenocrysts 0.05 mm across in a groundmass 0.005 mm in grain size. Generally the matrix contains very abundant (10%) dusty high-relief minerals (Ti-oxides?).

The coarser grained rock has a matrix 0.015 mm in size, and contains scattered plagioclase phenocrysts up to 1.0 mm across. The matrix appears igneous, suggesting that this is a flow or intrusive rock. It is fragmental, with fragments similar to those in the finer grained rock.

The rock is altered in part, with patchy replacement by K-feldspar, and coarse patches to veins of epidote-K-feldspar-calcite-quartz. The patchy and vein alteration is much more abundant in the coarser grained rock.

Coarse grained pyrite is scattered in the coarser grained rock, and may be related in origin to the patchy and veiny replacement assemblage.

Sample 4-3 Coarse Volcanic Tuff

The rock is composed of abundant fragments of a wide variety of volcanic and volcano-sedimentary rocks in a fragmental matrix. Fragments are generally less than 3 mm across, but a few of fine grained volcano-sedimentary rocks are up to 10 mm long. Fragment types are mainly fine tuffs and tuffaceous sedimentary rocks, with a few porphyritic flow rocks and crystal tuffs. Plagioclase crystals and crystal fragments comprise 5% of the matrix.

The overall mineralogical composition of the sample is roughly plagioclase (55-60%), chlorite (15-20%), biotite (15-20%), actinolite (2-3%), hornblende (1-2%), opaque (3-5%), and minor apatite.

Plagioclase is relatively fresh to slightly altered to chlorite and minor sericite. Chlorite and biotite are patchy secondary minerals; both occur mainly as fine grained aggregates. Some chlorite is coarser grained and appears to occupy cavities or replacement zones.

Actinolite is similar to actinolite in sample 3-1. Hornblende consists of coarse crystal fragments.

Sample 4-11 Fina Banded Tuff

The sample consists of bands of fine grained tuffs of variable composition, ranging in thickness from 2 to 10 mm. Some bands are repeated in the sequence, which will be described from the end labelled "4-11" to the other.

1) Unit 1 consists of a repetition of two different rock types; each being repeated three times. The first is fine grained (0.015-0.04 mm) and consists mainly of quartz with abundant disseminated opaque (pyrite, magnetite), patches of calcite, and scattered epidote. Leucoxene and other very fine grained minerals form a dusty alteration. Some of the fine grained matrix may be plagioclase. This unit could represent a distant relative to a cherty iron formation.

The second rock type is finer grained (0.01-0.015 mm) with 25-30% coarser plagioclase laths to 0.07 mm. Calcite patches are abundant. Quartz is not prominent, but may comprise part of the fine grained matrix. This is a fine grained slightly porphyritic tuff.

2) Further along in the section the first rock type contains actinolite (5-10%), and the border with unit 2 is marked by a veinlet of medium grained actinolite with opaque (pyrite) in the center.

2) Unit 2 consists of a very fine grained tuff, with plagioclase crystals (up to 0.04 mm) (75%), calcite (10%), actinolite (10%), quartz (5%), Ti-oxides(?) (2-3%). Much of the rock is fine grained (0.01 mm). Calcite and actinolite become more abundant in the last half of the unit. The unit is cut by an irregular calcite-rich veinlet containing calcite (up to 0.3 mm), scattered actinolite, and lesser hematite (after pyrite).

3) Unit 3 consists of coarser grained tuff with 35-40% plagioclase laths and prismatic crystals up to 0.15 mm, grading down to very fine grained matrix (0.003 mm grain size). The rock also contains 10% disseminated calcite and minor opaque (magnetite). Quartz may be present in the matrix. The unit is cut by an irregular vein containing mainly calcite with hematite (or sphalerite) and opaque, actinolite, and quartz.