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A PETROGRAPHIC STUDY OF MINERALIZED SAMPLES FROM THE MOUNT POLLEY PROPERTY

Introduction:

Five core specimens and one piece of surface rock were submitted for examination. Samples were prepared as polished thin sections.

Sample designations are as follows:

Sample No.	Location	Slide No.
1	Central Zone (trench)	89-026X
2	88-7 17'	89-027X
3	88-6 51'	89-028X
4	88-1 77'	89-029X
5	88-2 107'	89-030X
6	88-9 128'	89-031X

Summary:

The surface sample (#1) is a rock of syenitic composition cut by networks of strong crackle brecciation infilled by malachite and cuprite, with local marginal replacement of the host rock. The cuprite contains traces of native copper as minute inclusions.

The core samples are quartz-free monzonites to syenites, more or less altered and mineralized.

Sample 2 is of leuco-diorite composition, consisting predominantly of plagioclase with accessory chlorite.

Sample 3 shows probable primary syenitic composition.

Samples 4 and 5 are monzonites composed of mixed K-spar and plagioclase with accessory phlogopite.

Sample 6 is syenitic, being composed essentially of K-feldspar with chlorite.

Magnetite is a major component of most of these samples, making up from 17% - 70% (except for Sample 6). It occurs as dense disseminations and coalescent aggregates. Chalcopyrite constitutes from 2% - 20% of the rock in the portions sectioned. It is partially associated with magnetite - and probably essentially contemporaneous with it - but also forms irregular and veniform segregations.

Pyrite is notably rare, being present in trace amounts only. Traces of native gold were seen, as tiny discrete grains, 5 - 25 microns in size, within chalcopyrite.

The feldspars in these rocks are generally fresh, but a distinctive secondary or deuteric phase is developed in some of the samples. This consists of carbonate, zeolites, and a fine-grained prismatic mineral which may be prehnite or alunite. This association strongly pervades and replaces Sample 3, forms sporadic pockets in Sample 2, and occurs as a discrete veinlet in Sample 6. Sample 4 contains minor garnet.

The textural/mineralogical style of the mineralization in these samples in some respects resembles a skarn and, in others, a magmatic segregation. Additional work is required to establish a reliable genetic model.

Individual petrographic descriptions and a set of illustrative photomicrographs are attached.

J.F. Harris Ph.D.

PHOTOMICROGRAPHS

Photos are by reflected light at a scale of 1cm = 42 microns, except where otherwise stated.

SURFACE SAMPLE, Oxidized Ore.

Neg. 144-23: Plane polarized transmitted light. Scale 1cm = 0.17mm. Shows crackle brecciation in syenite (white; brownish alteration) infilled by secondary Cu minerals. Green (centre) is malachite. Opaque to dark red is cuprite. Note included K-spar fragments in the cuprite pocket at right.

Neg. 145-3: Well-crystallized pocket of cuprite (grey) enclosing partially replaced brecciated host-rock fragments (dark). Note small inclusions of native copper (pinky orange) in the cuprite (centre).

SAMPLE 88-1 77'

Neg. 144-24: Shows typical association of magnetite (grey) and chalcopyrite (yellow). Note form of magnetite as packed aggregates of subhedral grains. Chalcopyrite occurs as small and larger pockets within the magnetite aggregate. Note inclusions (core replacements?) of chalcopyrite in magnetite euhedra (upper left, top right).

SAMPLE 88-7 17'

Neg. 144-22: Scale 1cm = 85 microns. Shows relationship of chalcopyrite (yellow) and magnetite (grey granules, upper left). The magnetite is intimately intergrown with the host silicate matrix of plagioclase and chlorite (darker grey). Silicate inclusions in chalcopyrite, at bottom right, are epidote. Lighter, bluish-grey flecks in the magnetite are hematite. Note the mutual intergrowth between magnetite and chalcopyrite at the contacts of the major segregations.

Neg. 144-19: Shows 30 micron bleb of native gold (bright; centre) in chalcopyrite segregation (brownish yellow matrix). Chalcopyrite is cut by microfractures (dark), localizing incipient oxidation and secondary silicate development.

Neg. 144-21: Shows area of chalcopyrite acting as matrix to cluster of magnetite grains (blue-grey; lower right). Cream-coloured grains (centre) are pyrite. Note tiny (10 micron) speck of gold (bright pale yellow) on contact of pyrite and chalcopyrite. Dark grey is various silicates.

SAMPLE 88-9 128'

Neg. 145-4: Cross-polarized transmitted light; scale 1cm = 0.17mm. Shows alteration assemblage in veinlet. Radiate clump (greys) at bottom left is zeolite. Orange-brown-grey prismatic grains (right) are prehnite or alunite. Carbonate (pastel pinks and greens) partially rims the fine-grained clump of prehnite(?) in centre of field.

SAMPLE #1: Central Zone (trench) Slide 89-026X

Estimated mode

K-feldspar	55
Plagioclase	8
Malachite	20
Carbonate	2
Cuprite	15

This sample is a brecciated syenite, intimately veined and permeated by secondary minerals.

The matrix consists largely of K-feldspar - fresh but for a very weak argillic turbidity. This forms an anhedral/subhedral, granular aggregate, of grain size 0.1 - 1.0mm, with minor intergrown plagioclase, and has the textural aspect of a fine-grained syenite - though the total lack of any accessory minerals is unusual. It is not recognizably porphyritic.

The rock has been affected by strong crackle brecciation, shattering it into angular, matching fragments, 0.05 - 2.0mm in size. Cuprite and malachite cement the brecciated mass as a network of veinlets ranging from 0.01 - 1 or 2mm in thickness. Some marginal replacement has probably also occurred, and patches of the secondary minerals sometimes contain abundant tiny silicate remnants. For the most part, the cuprite and malachite tend to be segregated, though occasionally they alternate in the same veinlet. The malachite often shows thin, diffuse selvedges of minutely fine-grained carbonate.

The only other constituent is native copper, which is recognizable as scattered, tiny inclusions, 10 - 25 microns in size, within the more compact, better-polished areas of cuprite. The latter is a compact, cryptocrystalline variety, exhibiting intense red internal reflections under cross-polarized light. These tend to obscure its birefringence, and the mineral could, in fact, be cuprite or hematite. The presence of inclusions of native copper favours identification as cuprite. This was confirmed by scanning electron microprobe analysis.

SAMPLE #2: 88-7 17' Slide 89-027X

Estimated mode

Plagioclase	20
Chlorite	13
Mineral X	6
Epidote	1
Apatite	trace
Magnetite	38
Hematite	2
Chalcopyrite	20
Pyrite	trace
Gold	trace

This slide includes abundant chalcopyrite as a veinlike segregation, plus some fine-grained disseminations. The associated silicate/oxide assemblage may represent a localized halo of alteration.

The rock is strikingly rich in magnetite. This occurs densely disseminated throughout, as individual subhedra, 10 - 200 microns in size, often coalescing to form semi-continuous clumps and networks. Small clusters of fine-grained, flaky hematite are sporadically intergrown.

The other principal constituents are plagioclase and chlorite. The plagioclase forms an anhedral granular aggregate, of grain size 30 - 300 microns, and the chlorite occurs evenly intergrown with it as small pockets and networks - often closely associated with the magnetite.

Another relatively abundant constituent is a colourless, low relief, low to medium birefringent, granular to sub-prismatic mineral (Mineral X) occurring as irregular patches, which appear to alternate with the plagioclase, and may be an alteration of that mineral. This resembles alunite, but could well be prehnite.

Minor accessories are epidote, as isolated, prismatic clusters, and apatite, as scattered, tiny subhedra.

Chalcopyrite occurs as an irregular, veniform segregation, 3 - 4mm thick, which is mineralogically homogenous except for occasional inclusions of silicates (mainly epidote) and occasional strings of magnetite grains.

Chalcopyrite also occurs in more dispersed form, intimately intergrown with magnetite, as irregular pockets 10 - 300 microns in size in the silicate rock matrix.

Pyrite, as tiny, individual euhedra, is sometimes associated with the latter form of chalcopyrite, and forms scattered grains peripheral to the main vein-like zone.

Sample #2 cont.

Rare, minute inclusions of native gold, 5 - 25 microns in size, are seen within the main concentration of chalcopyrite.

The texture of this sample is somewhat suggestive of skarnic affinities.

SAMPLE #3: 88-6 51' Slide 89-028X

Estimated mode

K-feldspar	20
Zeolite(?)	14
Chlorite	2
Alunite(?)	10
Carbonate	19
Epidote	trace
Pyroxene	1
Apatite	trace
Magnetite	17
Chalcopyrite	17
Pyrite	trace
Hematite	trace
Gold	trace

This is a texturally heterogenous, intensely altered rock whose original character is uncertain. The relict mineralogy suggests that it is of syenitic affinities and possibly fragmental.

The rock includes K-feldspar, as fragment-like clumps of finely equigranular, aggregate-texture, on the scale 20 - 100 microns. These are scattered throughout a matrix of presumed secondary origin, consisting of fine-grained carbonate, clusters of tiny prismatic grains, tentatively identified as alunite, and diffuse pockets of a water-clear, low birefringent, low R.I. mineral of blocky to fibrous habit which appears to be a form of zeolite.

Occasional relict, partially replaced grains (original phenocrysts?) of pyroxene are seen, plus tiny euhedra of apatite.

Additional alteration components are chlorite, which occurs as a minor associate of the alunite(?) clusters, and occasional small grains of epidote.

The rock has a high content of opaques, mineralogically and texturally similar to those in Sample #2.

Magnetite occurs as randomly disseminated, subhedral grains, 0.02 -0.5mm or more in size, often clumped and forming irregular semi-coalescent aggregate patches and networks. It appears to favour the areas of K-feldspar and carbonate, and is generally not seen in the zeolite-rich pockets.

Chalcopyrite is of similar abundance, and forms irregular flecks, patches and elongate segregations, 0.02 - 1.0mm in size. It is generally separate from the magnetite, though a minor degree of intergrowth is seen (in the form of occasional magnetite grains within chalcopyrite pockets, or tiny specks and threads of chalcopyrite within magnetite).

Sample #3 cont.

Traces of pyrite and rare minute specks of native gold (to 15 microns in size) are the other constituents, both occurring as inclusions in chalcopyrite.

SAMPLE #4: 88-1 77' Slide 89-029X

Estimated mode

K-feldspar	45
Plagioclase	17
Phlogopite	12
Chlorite	2
Garnet(?)	2
Carbonate	1
Apatite	1
Magnetite	18
Chalcopyrite	2

This is another texturally heterogenous rock.

It consists, predominantly, of an anhedral, granular aggregate of perthitic K-feldspar, of grain size 0.1 - 1.0mm. Locally this is intergrown with subhedral plagioclase (oligoclase) of similar grain size. The feldspars are fresh but for weak argillic turbidity and sparse flecks of carbonate.

The rock appears to be a rather leucocratic monzonite.

The principal accessory is a pale olive green (pleochroic to almost colourless) mica, as randomly scattered, subhedral flakes and somewhat deformed clumps, 0.1 - 1.0mm or more in size. This mineral appears to be of phlogopitic composition, and has the aspect of a primary constituent. It is sometimes partly altered to chlorite.

Apatite is a relatively abundant, minor accessory, as small, individual euhedra, 0.05 - 0.15mm in size - often as inclusions within the coarser feldspars and associated with phlogopite.

Another minor component is a brown, high-relief, low-birefringent to sub-isotropic mineral which appears to be garnet. It occurs as sporadic, small pockets and wispy areas of very fine-grained, embryonic growth, often associated with concentrations of phlogopite and minor carbonate.

As with the previous samples, the rock is rich in magnetite. This occurs as individual, subhedral-euhedral grains, 0.02 - 0.2mm in size, often aggregating as more or less extensive mosaic-textured clumps and veniform streaks. It is often closely associated with concentration of phlogopite and garnet (though these also occur without magnetite). The magnetite mostly shows a strongly segregated distribution which appears independent of the matrix fabric.

Chalcopyrite occurs closely associated with the magnetite as irregular, interstitial pockets, 0.01 - 0.2mm in size, locally expanding to patches of 1mm or so, which act as matrix to included

Sample #4 cont.

magnetite grains. Tiny chalcopyrite specks are also seen in the silicate matrix, peripheral to magnetite, and as occasional inclusions within actual magnetite grains.

SAMPLE #5: 88-2 107' Slide 89-030X

Estimated mode

K-feldspar	3
Plagioclase	5
Phlogopite	10
Chlorite	2
Actinolite	6
Apatite	trace
Magnetite	70
Chalcopyrite	4
Chalcocite	trace

This sample consists largely of magnetite, as a semi-massive aggregate of more or less close-packed, individual, subhedral grains, 10 - 200 microns in size.

Silicate minerals form an accessory phase of interstitial pockets and networks, alternating with areas of essentially monomineralic, compact magnetite.

The silicates consist of fine-grained feldspars, intergrown with abundant mafics - principally phlogopite (partially chloritized) and fine-grained, acicular, prismatic actinolite.

Chalcopyrite is the only sulfide. It occurs sporadically throughout the magnetite as tiny, interstitial specks, 10 - 100 microns in size, but is chiefly concentrated as a number of irregular 'pools' or elongate, gash-like segregations. Some of these grade from the interstitial form, and are packed with magnetite grains; others are more or less clear of inclusions, and are semi-gradationally bounded by magnetite aggregates; still others are developed within silicate-rich enclaves in the magnetite.

The chalcopyrite shows traces of chalcocite development, in hair-line fractures and as rims around silicate or magnetite inclusions.

SAMPLE #6: 88-9 128' Slide 89-031X

Estimated mode

K-feldspar	44
Chlorite	17
Apatite	1
Epidote	1
Chalcopyrite	20
Magnetite	4
Pyrite	trace
Secondary Cu minerals	trace
Gold	trace
Veinlet	
Carbonate	6
Prehnite(?)	3
Zeolite	4

This rock is composed essentially of a fine-grained aggregate of brownish, turbid K-feldspar, as anhedral grains, 0.05 - 0.3mm in size. Occasiona, slightly coarse, subhedral/prismatic grains to 0.5mm occur, and the rock has a texture similar to an aplite. It could be a micro-syenite dyke.

Chlorite is a major accessory, occurring throughout as a network of small, semi-connected, felted-textured pockets. Disseminated tiny, individual euhedra of apatite are a prominent trace to minor constituent.

The rock is cut by a veinlet, 3 - 8mm thick, composed of sparry carbonate (probably dolomite) and pockets of blocky to fibrous/radiate zeolite. These minerals form a matrix to clusters and individual prismatic grains of a mineral tentatively identified as prehnite. This is probably the same component designated as Mineral X or 'possible alunite' in previous samples. It does strongly resemble alunite, but gives a biaxial interference figure, and is more likely prehnite.

The rock is strongly mineralized with chalcopyrite, as clusters of small grains, 20 - 200 microns in size, coalescing to irregular network permeations and massive patches several mm in size.

Accessory magnetite occurs, but in much lower relative proportion than in previous samples of the suite. It forms small grains (20 - 100 microns in size) included within chalcopyrite at the peripheries of major segregations. It also occurs, in coarser form, as randomly disseminated clumps in the silicate host. In the latter context it is often intimately intergrown with chalcopyrite, on the scale 10 - 100 microns, (including tiny chalcopyrite specks within magnetite).

The impression is that chalcopyrite and magnetite are paragenetically contemporaneous.

Sample #6 cont.

Chalcopyrite (and magnetite) is seen as scattered grains within the carbonate-zeolite veinlet, but is much more abundant in the adjacent host rock. In parts of the rock the sulfide-oxide assemblage forms hairline veinlets, with associated cryptocrystalline epidote. These sometimes appear to cross-cut (i.e. post date) similar threads of carbonate-prehnite.

Rare specks of native gold are seen, as discrete, bleb-like, equant inclusions, 5 - 25 microns in size, within chalcopyrite. Traces of pyrite occur in similar mode.

Traces of secondary Cu minerals (chalcocite, covellite, and digenite) form occasional threads or rims in the chalcopyrite.