

1. #2110 - * play ^{30%} - microcline - biotite - muscovite -
 topazite ^{5%} + quartz ^{30%} - sphene? - schectite? (trace)
 = yellow schist
 - plagioclase twinned - albite, calcite
 - microcline - good clear lines ∴ get composition.
 - biotite - strong pleochroism.
 - microcline - preferred lamellae
 - sphene (sheets) v. high relief, colorless
 to pale brown, high biref.
 - zircon - prismatic (twinned) xls in
 play.

Comp'n?

Nb: play grains commonly contain
 rounded cores of Qtz or play &
 different orientations?
 albization??

paragenesis: biot + musc → Qtz + play + k-sp
 sphene however not clear.

2. #2111 - diopside (?) - [vesuvianite?] - actinolite (?) - calcite
 garnet - gtz - plagioclase - sphene - schectite?
 opaque
 Extinction
 C's etc.

- notes: some play rounded? (up & down)
 - act. slightly pleochroic (lt. green)
 - diopside? twinned calcite?
 - sphene = colorless high biref. &
 acute rhombic x-sections.
 & sym. ext.
 - schectite - poss.
 - vesuv. anomalous 'berlin-blue'
 biref.
 - amdot - as a kind of play, along twinning lamellae

Nb
 poss. not
 known. cause get
 biref. may try
 + biref. pos.

para: sphene - gn - gtz + diops + sch + play + topazite → vesuv → act + calc.
 top. drb

#3 2112 ~~50~~ + ksp? 25% Bt 1/2 (blue int) 3 3
 play - actinolite - vesuvianite - calcite garnet -
 diopside - gtz - opaque - sphene.

* identical or quite?
 u. l. 90°
 biref. C's

- actinolite ✓ - high relief - pale green pleochroic &
 horizontal x-sections
 - vesuvianite? - high relief - anomalous blue int.
 lower relief than
 anomalous blue (biref. (-)). color - that of uni (-).
 play? - polysynthetic twinning, low biref. etc.
 ask. Bt. no could be clinopyroxene - but low biref.
 (note yellow biref.)

6
 14
 12
 15
 20
 1A

para. play + gt + k-sp + gn → topazite + sphene → calcite + epidote - vesuv. → opaque.

38
54
34

4) H19-74' ³ ² ^{anomalous blue.} ² ¹⁰
gtz - actinolite - biotite - vesuvianite - plagi. - opaque - calcite - sphene -
- granular rock - banded green. - micocline ³
small redd grains of plagi shows good sharp
twinning lamellae - possible to get a
composition.

para. biotite + gtz + plagi + ~~spinel~~ + mica → opaque → calc. - act. → vesuv. ?
epidote?

5) H19-86' ²⁵ ²⁰ ¹⁵ ³⁰ ¹ ¹⁰ ³ ²⁰ ^{scapolite?}
biotite - wollastonite? - muscovite - gtz - garnet
+ quartz + epidote

* *
- scapolite - unaxial mg. etc
- wollastonite - fibrous, almost birdseye brief. ...
parallel ext. low brief. 1st grey. \bar{c}
minute epidote inclusions elongate
intergrown \bar{c} biotite & muscovite
- muscovite - note change in relief, high brief.
- garnets - very small.

para. bio + gtz + (felds?) → mica + wollast + gtz + gn → epid.
vesuv(60) - calc(10) - wollast?(5) - gtz(5) -
gn(15) - scapolite - sphene
- vesuv + gtz → wollast → calc + vesuv?
+ gn.

see vesuv of
actinolite
to garnet

* \bar{c} same so true colours cause not flat
gn - opt calc. + horn? / chl.?
vesuv → calc + gtz + ep.
ep = chlor. (40%)
anomalous
5% (15)
gn
ves. opt.
gn
(31) \bar{c} → (10) - vesuv(5)
gn - sphene + epidote
(31) (31)
- wollastonite - elongate → fibrous, v. low side grey
 \bar{c} inclusions of epidote
gtz - in a segregated area \bar{c} calcite
calcite as above.
actinolite - high brief, inclined \bar{c} \bar{c} poss
cleavage \bar{c} at $\approx 59^\circ$
vesuv + gtz + gn → wollast. + ep + calc → act.

8. H20 - 46' ⁵⁰ ²⁰ ¹⁵ ⁵
- wollastonite - garnet - vesuvianite - calcite
diopside - quartz - epidote - actinolite?
- wollastonite - elongate, low side, some fibrous
- garnet - large continuous grains \bar{c} enclosed? vesuv.
+ fractures of calcite, partly invaded by wollast
- vesuvianite - within garnets
- calcite - within gn.
- diopside - broad positive \bar{c} inclined ext, high
relief? brief? cleavage \bar{c} $\approx 38^\circ$.
- epidote as inclusions in wollast? gtz
diop + gtz → gn + vesuv → wollast → calcite + ep.

same as #3

9)

wollastonite - garnet - quartz - vesuvianite
- diopside - calcite - epidote

not repeat slide

- wollastonite - elongate low order domains x-sections (aggregated) of 1st stage - red.
- garnet - large continuous mass & enclosed?
vesuvianite; contained Qtz - , calcite fractures.
- diopside as in previous.
- epidote - inclusions in quartz

9) see other side

10)

H2O - 65'6"

- vesuvianite - diopside - calcite - Qtz garnet.
- vesuvianite - uniaxial negative in large masses including everything else, some albite? twins
- diopside - rounded (?) grains, light relief. 2
- garnet - cleavage ~ 97°
- garnet - only small grains in one area.
- nb: section appears fresh in places - no Qtz upto yellow red domains

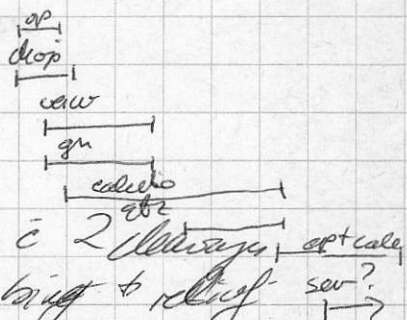
H4?

10 see other side

11.

H2O - 74'

- calcite - diopside - vesuvianite - garnet - Qtz - epidote - opaque
- ~ 25% + calcite.
- diopside - reddish grains biox. positive c 2 cleavages ~ 97° of high relief to relief
- vesuvianite - low relief, uniaxial negative, 1 poor cleavage
- garnet - aggregates of grains
- Qtz - very minor in one area only
- ep. - as inclusions



opt. view

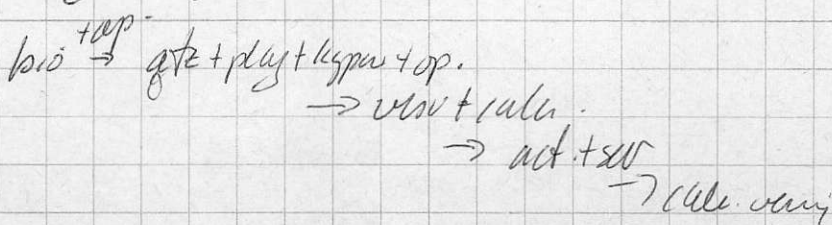
gn + ves. fractured = calcite + op?



12

H2O 96'6"

- biotite - Qtz - plagioclase - opaque - actinolite - vesuvianite + calcite veinings + sericite alteration + epidote
- biotite - strongly pleochroic & "beef" grains poss. holocrystalline & well sorted
- plug - good sharp carbons? periclase forming: pores to get comp.
- actinolite - amphibole cleavage 2 directions, high relief, high relief, reflects all the
- vesuvianite - high relief, anomalous beehive blue
- clays also formed along fractures in walls, Qtz - feldspar



9.

vesuvianite - diopside - calcite - ? - gtz - garnet - epidote

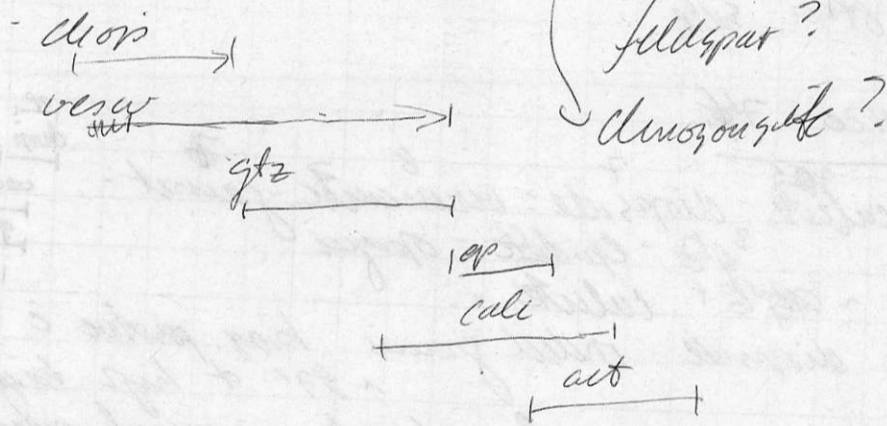
vesuvianite - large continuous grains surrounding the diopside, fractured by calcite & gtz and another phase (?) which closely resembles vesuvianite however displays anomalous blue tint & thus the ~~the~~ cleavage (poss another orientation of vesus?)

garnet - some large continuous ~~at~~ grains fractured by calcite + gtz?

is jnt vesus → calcite + gtz + ? ± epidote.
diopside → ep. + gtz?

16.

vesuv - gtz - diop - epidote - calcite - actinolite



alter

diop small grains in vesus. matrix. etc.
diop → cali + ep.?

13 #2124 H2O qtz 40 - pluz 20 - biotite 15 - actinolite 10 - vesuv - opaque 5 - sericite 15 - sphene

- pluz - good twinning, sl. alt'n to sericite
- actinolite - good anhedral, cleavage generally elongate subparallel to twinning at expense of vesuv & biotite
- vesuv - anomalous int., high relief
- sericite - hairline fracture fillings, even

14 #2122 k-spar 50 - qtz 25 - muscovite 10 - biotite 10? - opaque 2 - calcite 3

- NOTE: Pure rock stained!
- k-spar - some at least is microcline prob most orthoclase, ... must inclusions & alteration
 - muscovite - colorless, low to relief, high int. uniaxial basal neg. small 2U. no change in relief
 - pluz - good albite twinning
 - biotite - minor, brown, pleochroic
 - calcite - minor for fracture fill
- fresh only k-spar #pluz

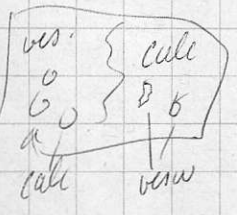
15 2123 - qtz 35 - k-spar 40 - pluz 13 - biotite 5 - muscovite 7 - sericite

- note stained
- c.j. rock & k-spar doms microcline (see twinning lamellae) prob some orthoclase see large furi in centre
 - pluz - good albite twinning
 - biotite - strong pleochroism brown
 - muscovite - colorless - high relief
 - sericite - particularly well developed in k-spar

16 qtz 20.5 - vesuvianite 40.33 - garnet 30 - calcite 7.09 - diopside 5 - garnet 7

- got vesuv → calcite → normal
- garnet replaced by vesuvianite & calcite
 - diopside - subroted → small grains included
 - garnet - replaces proximal portion of diopside =
 - very coarse granular
 - qtz + calc. last then alkali (w/ calcite vesuvianite)

17. 2130 - calcite 40 - vesuvianite 30 - diopside 10.11 - garnet 7 - qtz 6



- diopside - basal p.f.s.
- very minor garnet, qtz
- 1 end of section dom vesuv & inclusions of calcite & the other
- diop. first phase (qtz interstitial)

note 2 phases of anomalous band, by vesic (100) looks like ep. (100) H3-33' 10"

vs. argyrite - calcite - garnet - gtz - diopside
 35° - as before, except for order of grains
 calcite - vesuvianite - epidote - garnet - gtz - diopside

note number:

15. 2134. ³⁰ garnet - wollastonite - vesuvianite - ²⁰ gtz - calcite - diopside - actinolite - ²⁵ epidote
 garnet appears older phase (with diopside) fractured & brecciated by gtz + calcite
 vesuvianite and invaded by wollastonite
 gn → vesuv → ept calc. ²⁵ vesuvianite
 gn → gtz + wollust → wollust → calcite + act.

20 (2135) ²⁵ diopside - k. spm (microcline) - ²⁰ plagi - ²⁵ biotite - vesuvianite - ²⁰ sphene - opaque

(green dom) - diopside - mtded lgt. bright green; brown positive
 is diopside - microcline - good lamellar twinning
 - plagi - good albite twinning
 - biotite - brown, pleochroic
 - vesuv - lgt. relief, anomalous int (v. minor)

good one to look at

21 apt sphene (thin) diop. + bio (thin) gtz + plagi + vesuv. (thin) vesuv.
²⁵ gtz - actinolite - ²⁰ vesuvianite - ²⁵ diopside - ²⁰ garnet - calcite - ²⁰ sphene - opaque - ²⁵ epidote ± sericite.
 gn → ept calc. dio → ept horn dio → act + calc. act → ep + gtz

22. ³⁰ k. spm - ¹⁰ biotite - ²⁵ gtz - ¹⁰ opaque - ²⁰ plagi - ²⁰ muscovite - ⁵ sphene?

guess
 - banding evident in thin section however it's c.f. & not distinct, ... but mica aligned

unusual see last photo
 - k. spm - domin. microcline
 - biotite - very pleochroic - brown, l. brown
 - opaque - seen remaining gtz (+ plagi + vesuv?) in a unique fashion
 - muscovite - colorless, change in relief, light bright
 - sphene - sh. more colorless than normal, poss. etc.?
 - note: bands of almost pure k. spm & gtz + opaque quite evident

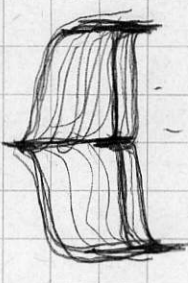
23. #2139 - ²⁰ vesuvianite - ²⁰ quartz - ¹⁵ diopside - ¹⁵ actinolite - ¹⁵ garnet - ³ sphene - calcite - plagi - opaque - ⁶ epidote
 - ? vesuvianite - large distinct masses showing anomalous l. int., some zoning.

8 plagi.
 7 vesuv.
 30 ep.

- diopside - mtded grains etc.
 - act - fibrous - high relief, bright ny.
 - sphene - v. abundant 3-5%
 vesuv + gtz → act + calcite → epidote
 diop → epidote + gtz?

24.

³⁶ microcline - ³⁵ qtz - ¹⁰ biotite - ¹⁶ opaque - ³ muscovite - ² sphene
plagioclase - vesicular?



- muscovite - intergrown with biotite at one end of section
- sphene - large grains (continuous) in middle of section
- small subhedral grains included within qtz microcline, almost isotropic, high relief, -> view? plagioclase?

25.

#2140

⁵ clinochlore - ³⁰ calcite - ²⁵ actinolite - ²⁵ qtz - ¹⁰ garnet - ⁵ sphene

comp? / 11

- vesuvianite - in large continuous masses, anomalous
- calcite - interstitial to grains and as alteration with actinolite (after diopside?)
- garnet - euhedral grains
- sphene - minor
- wollastonite - at one end of section appears to be wollastonite grading (altering?) to actinolite.

26.

2141

H12-63

⁴² calcite - ²⁰ actinolite - ¹⁵ plagioclase - ¹⁰ qtz - ³ schelite - ³ garnet - ³ opaque - ³ vesuvianite - ¹ sphene + (wollastonite?) + garnet? + quartz?

epidote anomalous bi. eff. box (1) low relief 30s-40s + ep as ltn. of qtz.

- calcite generally interstitial to other minerals
 - actinolite - masses of marked elongate grains in random fashion.
 - plagioclase - zoned euhedral to subhedral grains (normal? oscillatory) plus smaller granular grains with albite? perthite? ternary
 - qtz - occurs as calcite but included with calcite
 - garnet - large euhedral to subhedral masses of anisotropic garnet.
 - schelite - large masses euhedral
- also plagioclase - calcite + actinolite? plagioclase - actinolite? schelite - garnet? quartz? - calcite

comp? *

* schelite

27

2142

H12-65

³⁰ calcite - ²⁰ actinolite - ¹⁵ qtz - ¹⁰ vesuvianite - ¹⁰ plagioclase - ¹⁰ sphene - ¹⁰ schelite

comp? *

- as before with less plagioclase. more relative calcite + actinolite. plagioclase is zoned with good sharp boundaries.
 - clinopyroxene is bi-modal, high relief - anomalous bi. eff.
- plagioclase - actinolite + calcite.

28

2143 - 68'6"

univ. interstitial? 2097. zircon
opp. univ. (could be low 2V)
10 - dk blue/brist 3
12 3
dilatation & g.
anomalous yellow/b.c.
c. part (+) low 2V

look at
suspect both anomalies
epidote? univ. (matrix blue b. part)
one tabular
xl grains
may figure
epidote?

30
25
10
3
calicite - diopside - actinolite - garnet
~~plagioclase~~
- vesicular - plagioclase - quartz - sphene - opacite
ep. 4
univ. (opt univ?)
- calcite latent phase - interstitial
- diopside ruled grains generally distinct
from actinolite possibly abnormal?
garnet isotropic
omniverted conig some plagioclase alteration?
- plagioclase & tremolite - altered to univ.
plug -> opt calc. etc.
ep? -> univ?

29

H12 900

35
20
20
5
5
diopside - actinolite - univ. - plagioclase - quartz -
calcite - biotite - sphene - sericite & schistite?
3 + 3 -> muscovite

- diopside in ruled grains c. eroded edges &
- act. in lath (matrix) penetrates all other
phases (latent)
- univ. - a large common grain shown
common lat. univ?
- plagioclase - as zoned interstitial & in
aggregates of smaller twinned grains
highly altered to sericite

*
muscovite
microclites in univ.
oriented subparallel
(some actually biotite)

- biotite - occurs only at one end in
assoc. c. univ. - brown, pleochroic
high brief - parallel to
diop -> act + calcite? plagioclase -> sericite
univ. -> act + calcite
biot + univ. -> act + calcite?
30
5
5
5
univ. - quartz - garnet - diopside - schistite - (sericite?)
- sphene - calcite - epidote

- diopside - ruled grains c. px cleavages
high positive
- schistite - large aggregate masses c.
amorphous (low order grain)
- amphibole - some of diopside material
is slightly grayer and exhibits
amphibole cleavage
- calcite - as fracture fills in plagioclase & quartz
- epidote - columnar, pleochroic high brief
mineral (not musc.) included in
quartz - as subhedral prisms

no
act
except calcite
univ. in gm.

(diop + univ + epidote + sphene)
then
(quartz + garnet)
then
(sericite)
then
(calcite)

31

25 gn - calcite - ²⁵ vesuvianite - ²⁵ epidote - ⁸ diopside - ⁸ sphene - ⁸ schwebite (+ wollast.?)

- gn. as large irregular masses surrounding

- calcite - as fracture fill in gn and as veins + gtz (c.f.)

epidote
↓
diffused

ves - as calcite (veins gn) and as euhedral discrete grains imbedded - gn. biaxial negative, large 20° & anorthous int.

- epidote - as inclusions in gtz. (some grains quite + up. chro. = 40)
- sphene - acc. v. sh. shaped sl.
- schwebite - rd. small grains
- poss. wollast. in one edge. & s.d. inclusions?

gn + diop → epid + calcite

32

30 diopside - ²⁰ vesuvianite - ²⁵ actinolite - ² gtz - ² wollastonite - ² sphene - ² calcite - ² epidote - ² schwebite + ² humate (oth) ²

- diopside - as mixed round grains (sucrosa) heavily altered to epidote + hum. & rounded impact

- vesuvianite - as diopside - large mixed grains & sucrosa contains, partly altered to epidote & actinolite.

- actinolite - interstitial as separation (in epidote inclusions) fibrous etched masses, mostly torn out in section grinding

- areas of sphene large in minute grains

- epidote - as often product, inclusions in gtz.

- calcite - as large interstitial, infilling cracks fracture fill, in.

- opaque - assoc. & epid + hum.

- schwebite - poss. minute grains

diop → gtz + ep → act + calc.

33

30 gtz - ³⁰ microcline - ²⁰ plagioclase - ⁵ muscovite - ⁴ sericite - ¹ epidote - ¹ schwebite

- gtz as discrete grains & as graphitic separation from microcline

- microcline - fine, little altered large grains & lamellar twinning

- plagioclase - large mixed grains & remnant euhedral grains, highly altered to sericite + ep.

- muscovite as an alt. after plagioclase + poss. primary grains (large)

- epidote - fine inclusions in gtz & as alt. after plagioclase

- schwebite - very small round grains.

some vesuvianite as one and max. inclusions in large grains as per gn. and assoc. to gn.

30 epidotes
5 zones
low buff
+ 12 clear
12 ep.

no alt. after sericite

34

³⁰ microcline - ³⁰gtz - ²⁵plg - ⁵calcite - ⁵epidote muscovite
²epidote - ²sericite

- microcline large irregular grains in lamellae + sl. attached to calcite + ep.
- plg - as microcline but heavily attached to calcite + sericite + epidote.
- musc - primary? and as sericite attn.

plg → ep + calc.
→ musc + gtz?

37

37. rock #2105

²⁵gtz - ²⁵diop - ¹⁵calcite - ²⁰actinolite - ⁵epidote - ⁵plagioclase
²sericite - ¹opaque - ¹scheelite ± ¹epidote

- calcite - interstitial and as attn of gn
- act. - after diopside
- seric - interstitial and after gn } see zoned gn
green biotite near gytz } details about 2 layers
epidote? (attn) of calcite + seric
- plg - zoned, twinned grains (v. fine) - prof. beds.
- gn - good isotropic hex. xl.
- ep. as attn of plg + diop? and as inter.
- scheelite - large grains in amorphous gtz
in seric

plg → ep + calcite plg + gtz? → act + calcite
diop + gtz - act + calcite

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rock 2105A

⁴⁰gtz - ²⁵diopside? - ²⁰epidote - ⁵calcite - ⁵actinolite
¹sericite? - ¹opaque - ¹plagioclase

- gtz as interstitial matrix (strained) - continuous grains
- diopside - as pseudohex. xls, biot. positive 20-40°
- epidote - greenish, sl. pleochroic showing anomalous
birefr. (berlin blue - yellow), inclined
att. strong cleavage, polysyn. twinning
- calcite - as above
- scheelite - high birefr. relief xl. (hex?)
is parallel ext. to strong cleavage.
- plg - small grains assoc. c. above.
- opaque -

diop prior to primary epidote

ep → act.
diop → ep + calcite

diop? quartz
biot +
2V-20°



biot - 1?
yell. - so. band
2V 40°

+ attn. dk. blue
biot
blocky - 10
fine hair
fig.

39.

H19-46

²⁰gtz - ²⁰play - ²⁰vesuvianite - ²⁰epidote - ¹⁵diopside - ¹⁵actinolite -
³epidote - ³sericite - ³sphene - ²scheelite - ²calcite -
 k-spru??

- rock - finely laminated & laminae segregated in gtz rich, diopside rich etc., highly altered.
- play - highly altered (sericite + epidote) but faint albite + calcite twinning visible. in part preserved laminae often exp. in gtz. possibly altered to vesu.
- vesuvianite - anomalous blue/yellow int. irregular felted fine masses, good crystal (poor cleavage gave max. negative $2V > 50^\circ$, alt. to epidote? act. + calc.)
- epidote - large submic grains highly alt. but exhibit px. cleavage; alt. to actinolite, epidote.
- sericite - as alt. prod.
- scheelite - small grains assoc. in vesu.
- sphene - abundant in certain lamellae good wedges etc.

dk/