168-1027B-60X-CC (piece 5, 33-38 cm)

ROCK NAME: Aphyric basalt

GRAIN SIZE: Aphanitic: cryptocrystalline to microcrystalline

TEXTURE: Pilotaxitic; intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.6	≤0.5		Euhedral-subhedral	Completely replaced by secondary minerals - clay and calcite.
Plagioclase	Tr	Tr	≤0.5-0.6		Euhedral-subhedral	Contains small spinel inclusions.
GROUNDMASS						
Plagioclase	30.4	30.4	≤0.15		Microlitic laths	Exhibit quench textures (hollow crystals, swallowtails).
Mesostasis	54.4	63.0				Cryptocrystalline to microcrystalline; ghost/skeletal pyroxenes and magnetite may be discernible; patchy alteration to birefringent clays.
Pyrite	Tr	Tr	≤0.04		Granular, subhedral	In mesostasis.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING			COMMENTS:
Clay (poss. saponite?)	11.4	Mesostasis. Outer rim of vesicles.		Cryptocrystalline to fibrous.	Gray to yellow fibrous; low birefringence
Chlorite(?)		Groundmass minerals (mainly pyroxene). Lining vesicle.		Fibrous	White to yellow brownish in ppl. Gray to yellow in XPL.
Calcite	0.8	Vesicles; mafic phases; mesostasis.		Patchy to granular.	Infilling of gas vesicles; replacement of mafic phases with phyllosilicates.
Pyrite	Tr			Anhedral to euhedral.	Forms discrete irregular grains within the groundmass and along the edge of vesicles after the clay lining but before the calcite infill.
Zeolites(?)	Tr	Mafic crystals		Anhedral to euhedral	Pseudomorphs whole or part grains of primary mafic mineral grains.

VESICLES/ CAVITIES	PERCENT	PERCENT ORIGINAL	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas Vesicles	1.4	1.8	≤0.3	Clay; calcite; (chlorite?).	Spherical to irregular	Gas vesicles may be lined by a fine (5-10 micron) rim of fibrous phyllosilicate (saponite?), followed by a partial to complete infill of radial to sparry calcite.
Segregation vesicles	1.6	1.8	≤1.3			Filled wholly or partially by groundmass material with feathery pyroxene and granular iron oxides; commonly with a gas vesicle (see description above).

COMMENTS:

168-1027B-61X-CC, 13-15 cm

ROCK NAME: Aphyric basalt

GRAIN SIZE: Aphanitic: cryptocrystalline to microcrystalline

TEXTURE: Intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	Tr	Tr	≤0.5		Euhedral-subhedral	Contains small spinel inclusions
Mafic minerals (olivine? + pyroxene?)	0	3	≤0.8-0.3		Euhedral-subhedral, skeletal	Completely replaced by secondary minerals including clay (Fe-saponite) + calcite. (Original mineralogy based upon euhedral grain shape.)
GROUNDMASS						
Plagioclase	30.4	30.4	≤0.2		Microlitic laths	Exhibit quench textures (hollow crystals, swallowtails)
Mafic phases (olivine? + pyroxene?)	0	≤7	≤0.1		Subhedral-anhedral	Completely replaced by secondary minerals, the most common being calcite (c.5%) and clay (Fe-saponite; c.2%).
Spinel	Tr	Tr	≤0.005		Euhedral	Associated or partially enclosed in microlitic plagioclase laths
Pyrite	Tr	Tr	≤0.03		Granular	In mesostasis.
Magnetite	Tr	Tr	≤0.05		Euhedral-subhedral	Disseminated in the groundmass
Mesostasis	54	54				Cryptocrystalline to microcrystalline; ghost/skeletal mafic minerals and euhedral to subhedral magnetite; some of the groundmass is replaced by a yellowish-brown clay mineral (fibrous to patchy).
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clay (Fe-saponite?)	10	Mesostasis. Outer rim of gas vesicles.			Patchy to fibrous	Colorless to yellow/light brown; low birefringence.
Calcite	2.4	Vesicles; mafic minerals; vein.			Anhedral to subhedral.	Completely replaces mafic mineral phenocrysts and microlites, as well as infilling the center of vesicles (see below).
Chlorite?	Tr	Interstitial to groundmass minerals.			Fibrous	Colorless in PPL and with very low birefringence in XPL
Pyrite	Tr	Interstitial.			Anhedral to euhedral.	Forms concentrations (percolation veins?) within groundmass; a massive vesicle rim; lines some gas vesicles (preceding calcite); one area of mesostasis is 40% pyrite.
VESICLES/ CAVITIES	PERCENT	PERCENT ORIGINAL	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.4	3.6	≤0.5	Clay; calcite.	Spherical to irregular	Gas vesicles may be lined by a fine (0.03 mm) rim of fibrous phyllosilicate (Fe-saponite) mostly followed by a partial to complete infill of anhedral to subhedral to calcite.
Segregation vesicles	2.8	2.8	≤1		Spherical	Filled wholly or partially by groundmass material with feathery pyroxene and granular iron oxides; commonly with one or more gas vesicle (see description above). In one case a massive pyrite rim is present (see above).

COMMENTS: Bifurcating calcite-filled vein (0.1mm width) with partly detached groundmass fragments. It cross-cuts plagioclase crystals as well as calcite filled vesicles. There is no associated alteration halo around the vein within the groundmass.

168-1027B-61X-CC, 25-28 cm

ROCK NAME: Aphyric basalt

GRAIN SIZE: Aphanitic: cryptocrystalline to microcrystalline

TEXTURE: Intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	Tr	Tr	1		Euhedral-subhedral	Contains small spinel inclusions
Mafic minerals	0	5			Euhedral-subhedral, skeletal	Completely replaced by secondary minerals (calcite and clay [Fe-saponite])
GROUNDMASS						
Plagioclase	32.6	32.6	0.1-0.8 (Ave 0.4)		Microlitic laths	Exhibit quench textures (hollow crystals, swallowtails)
Spinel	Tr	Tr	≤0.01		Euhedral	Associated or partially enclosed in microlitic plagioclase lath
Pyrite	Tr	Tr	≤0.015		Granular	In mesostasis and plagioclase.
Magnetite	Tr	Tr	≤0.01		Euhedral-subhedral	Disseminated in the groundmass
Mesostasis	56.8	59.2				Cryptocrystalline to microcrystalline; texture varies throughout section with: i) intersertal texture with plagioclase microlites; ii) patches of comb-texture; iii) feathery pyroxene ± mt crystals; and iv) faint sheaf-spherical to branching texture. Contains ghost/skeletal mafic minerals and euhedral to sub-euhedral magnetite; some of the mesostasis is replaced by yellowish-to brown clay mineral (fibrous to patchy).
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clay (poss. saponite?)	7.2	Mesostasis. Outer rim of gas vesicles.			Patchy to fibrous	Colorless to yellowish to light browns; low birefringence.
Calcite	1.8	Vesicles; mafic minerals; vein.			Anhedral to subhedral; fibrous to platy.	Completely replaces mafic mineral phenocrysts and microlites, as well as infilling the center of segregation vesicles (see below).
VESICLES/ CAVITIES	PERCENT	PERCENT ORIGINAL	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.8	2.4	≤0.5	calcite ± saponite or empty	Spherical to irregular	Gas vesicles may be lined by a fine (0.03 mm) rim of fibrous phyllosilicate (saponite?) which is generally followed by a partial to complete infill of anhedral to subhedral sparry calcite.
Segregation vesicles	0.8	0.8	≤0.8		Spherical	Filled wholly or partially by groundmass material with feathery pyroxene and granular iron oxides; commonly with one or more gas vesicle (see description above).

COMMENTS: Anastomosing calcite vein (0.1mm width) infilled by calcite crystals (≤0.7mm long and ≤0.1mm wide), containing partly detached groundmass fragments. The vein cross-cuts plagioclase crystals and may be partially lined by a very fine layer of saponite. There is no associated alteration halo around the vein within the groundmass.

168-1027B-62X-CC, 07-10cm

ROCK NAME: Aphyric basalt

GRAIN SIZE: Aphanitic: cryptocrystalline to microcrystalline

TEXTURE: Varied: intersertal; pilotaxitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	Tr	Tr	≤1.6-0.5		Subhedral to euhedral laths.	Crystals exhibit a faint preferred parallel orientation across the section. Some crystals have an irregular to embayed shape possibly caused by i) skeletal growth; ii) alteration; and/or iii) partial resorption.
Mafic minerals (olivine? + pyroxene?)	Tr	1.2	≤0.55		Subhedral to anhedral.	Crystals have been completely to partially replaced by either calcite ± Fe-saponite. Some crystals exhibit an anhedral calcite replaced core, surrounded by a sub- to euhedral rim of fibrous clay. In a zone of highly altered groundmass, remnants of fresh anhedral to subhedral pyroxene crystals (0.3-0.15mm) are recognizable.
GROUNDMASS						
Plagioclase	30.4	30.4	0.1-0.5 (Ave ≤0.3)		Sub- to euhedral laths.	Skeletal and hollow laths; minor rim resorption (see plagioclase comment above.)
Mafic phases (olivine? + pyroxene?)	0	4.8	≤0.1		Sub- to anhedral.	All mafic groundmass phases have been replaced by calcite or Fe-saponite. Some skeletal/comb-textures crystals can be identified as pyroxene.
Magnetite	Tr	Tr	≤0.01		Euhedral	Disseminated throughout the groundmass.
Mesostasis	50.6	57.8				Cryptocrystalline; some of the groundmass is replaced by a yellowish-brown clay mineral (fibrous to patchy), mixed locally with fine fibrous calcite. Texture varies from i) intersertal; ii) pilotaxitic; iii) comb texture; to iv) faint sheaf-spherulitic.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clay (Fe-saponite?)	7	Mesostasis; mafic minerals; outer rim of vesicles; veinlet.			Patchy to fibrous	Colorless to yellow/light brown; low birefringence. Forms a ≤0.05mm fibrous rim around some of the spherical and irregular shaped vesicles. On one side of the section, an amorphous brown clay rim (≤0.4-0.15mm thick) partially coats the rock.
Calcite	2.4	Vesicles; mafic minerals.			Granular to anhedral.	Completely replaces mafic mineral phenocrysts and microlites, as well as infilling the center of vesicles (see below). Calcite in vesicles appears dusty and granular rather than clear and sparry.
Pyrite	Tr	Vein				Granular crystals, ≤0.005mm, in saponite vein.
Iddingsite	Tr	Mesostasis.			Anhedral	Forms irregular dark brown-red blebs in highly altered zone in mesostasis.
VESICLES/ CAVITIES	PERCENT	DISTRIBUTION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Vesicles	3.4	Even	≤0.5	Clay; calcite.	Spherical to irregular	Vesicles are either i) empty; ii) lined by a fine (0.04 mm) rim of fibrous Fe-saponite, or iii) lined by Fe-saponite and then partially to completely infilled by granular to anhedral calcite.

COMMENTS: The degree of alteration varies across the section from slight (<2%) to very high (>80%), producing a patchy texture. In very highly altered zones, the mesostasis is replaced by fibrous Fe-saponite. A 0.04mm wide veinlet infilled by fibrous Fe-saponite, cross-cuts the section, cutting through plagioclase crystals and bifurcating around patches of mesostasis. There is no alteration halo associated with the veinlet.

168-1027B-62X-CC, 39-42 cm

ROCK NAME: Aphyric basalt

GRAIN SIZE: Aphanitic: cryptocrystalline to microcrystalline

TEXTURE: Pilotaxitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	Tr	Tr	≤1.2		Euhedral-subhedral	Lath-shaped crystals exhibit a preferred parallel orientation. Some crystals have a swallowtail structure. Crystals are present singly and within monomineralic and bimineralic clusters.
Mafic minerals (olivine? + pyroxene?)	0	3	≤0.8		Euhedral-subhedral, skeletal	Completely replaced by secondary minerals including clay (Fe-saponite) + calcite. (Original mineralogy based upon euhedral grain shape.) Present as single crystals and in bimineralic clusters with plagioclase.
GROUNDMASS						
Plagioclase	14.8	14.8	≤0.2 (two populations: 0.2 & 0.05)		Microphenocrysts; microlitic laths and needles.	Most form perfect euhedral laths, although a few skeletal crystals exist. Crystals occur singly and in stellate groupings.
Mafic phases (olivine? + pyroxene?)	0.3	3.5			Skeletal, subhedral-anhedral	Pseudomorphs of skeletal to anhedral-subhedral crystals (olivine) isolated or intergrown with plagioclase are completely replaced by secondary calcite and clay. A trace amount of fresh microlitic pyroxene also occurs in the groundmass.
Spinel	Tr	Tr	≤0.01		Euhedral-subhedral	Associated or partially enclosed in microlitic plagioclase laths.
Pyrite	Tr	Tr	≤0.01		Granular	In mesostasis.
Magnetite	1.8	1.8	≤0.01		Euhedral-subhedral	Disseminated in the groundmass.
Mesostasis	68.8	75.2				Cryptocrystalline; some of the groundmass is replaced by a yellowish-brown clay mineral (fibrous to patchy).
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clays	5	Mesostasis; outer rim of vesicles; interstitial to groundmass phase.			Patchy to fibrous; radiating fibrous.	Colorless to yellow/light brown; low birefringence. Two different clay minerals can be identified. The first (Fe-saponite) has a yellow-brown color in PPL, with low birefringence and commonly lines vesicles. The second clay is very pale to colorless, with a radiating fibrous texture, occurring within the groundmass and as vesicle infills; this may be a non-pleochroic chlorite or a mixed layer phase (chlorite-smectite).
Calcite	1.4	Vesicles; mafic minerals; vein.			Fibrous to anhedral.	Completely replaces mafic mineral phenocrysts and microlites, as well as infilling the center of vesicles (see below). Some calcite in vesicles is dusty and granular near the vesicle wall, and clear and sparry inside.
VESICLES/ CAVITIES	PERCENT	DISTRIBUTION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Vesicles	1.4	Even	≤0.6	Clay; calcite.	Spherical to irregular	Gas vesicles can be i) lined by a fine (0.03 mm) rim of fibrous phyllosilicate (Fe-saponite); ii) lined by clay followed by a partial to complete infill of fibrous to anhedral calcite; ii) completely infilled by fibrous saponite.

COMMENTS: The groundmass is represented by patches of dark cryptocrystalline to lighter microcrystalline (pilotaxitic) material. A discontinuous band of coarser-grained material may represent a magmatic fracture or vein, filled with non-aligned crystals (which may have cooled slowly). In addition, a second (0.04mm) fracture crossing the section which is infilled by fibrous clay, appears to be associated with a zone of dusty alteration within the mesostasis.

168-1027C-01R-01 (piece 1A, 10-16cm)

ROCK NAME: Diabase

GRAIN SIZE: Phaneritic; holocrystalline; fine to medium grained

TEXTURE: Diabasic; ophitic to subophitic; intergranular

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	2.4	14.6	≤0.6 (Ave 0.4)		Rounded – anhedral	Partially (outer rim) to completely replaced by olive brown clay (Fe-saponite?)
Plagioclase	50.4	50.4	0.2-1.6 (Ave 0.8)		Subhedral-euhedral laths	Normal zoning; seriate texture.
Clinopyroxene	21.8	21.8	0.15-2 (Ave 0.5;1)		Subhedral - anhedral	Fresh; subophitic to ophitic; contains minor opaque inclusions.
Opaque	3.2	3.2	0.02-0.4 (Ave 0.07-0.1)		Anhedral-skeletal	Occurs primarily in olivine and at grain boundaries of all silicate phases. Includes Fe-oxide and trace sulfide.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	18	Vesicles; vein; interstitial olivine	Pale brown to olive brown saponite (Fe?); fibrous to granular cryptocrystalline texture.
Carbonate	4	Vein	Anhedral to fibrous aggregates; both calcite and aragonite are present.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Vesicles	0.2	Even.	0.6-0.7	Clay	Round	Fibrous to cryptocrystalline granular brown saponite infills vesicles (fibrous at rim to granular in core).

COMMENTS: A vein (≤2mm wide) anastomoses across the section. The infill is uneven, with a patchy to intermingled mixture of granular carbonate to fibrous saponite. Associated with the vein is an uneven 0.2-0.8mm alteration halo (saponite rich).

168-1027C-01R-01 (piece 1B, 38-42cm)

ROCK NAME: Diabase

GRAIN SIZE: Phaneritic; holocrystalline; fine grained

TEXTURE: Diabasic; ophitic to subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	6.4	8.8	≤0.3	Fo85	Sub–euhedral	Colorless (ppl); interstitial and enclosed in clinopyroxene.
Plagioclase	54.2	54.2	≤1		Subhedral-anhedral laths	Strong normal zoning, plus some oscillatory zoning in larger stubby laths.
Clinopyroxene	29.5	32.8	≤1		Anhedral	Pinkish pale brown (ppl), strongly zoned; 2V ≈ 45°; ophitic to subophitic.
Opaques	4.2	4.2	≤0.2		Granular, elongate	Both magnetite and ilmenite are present as discrete or intergrown crystals. Some globular pyrite ± chalcopyrite is present.
Pyrite	Tr	Tr	≤0.05		Granular	Disseminated; interstitial; solitary or intergrown with magnetite; may be in contact with secondary clay.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	5.7	Pyroxene; interstitial; olivine	Fibrous to granular cryptocrystalline texture.
Carbonate	Tr	Olivine	Anhedral to fibrous aggregates.
Pyrite	Tr		Disseminated, replacing magnetite; very fine grained.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
None						

COMMENTS: Olivine is altered to a weakly pleochroic nearly colorless to pale green to darker olive green phase. The darker orientations have first order red birefringence, whilst the colorless sections exhibit second order colors; may be saponite.

168-1027C-01R-02 (piece 1A, 35-42cm)

ROCK NAME: Diabase

GRAIN SIZE: Phaneritic; holocrystalline; fine grained

TEXTURE: Diabasic; subophitic to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	6.6	8.4	≤0.3	Fo85	Subhedral to rounded	Interstitial and enclosed in clinopyroxene; partially replaced by clay.
Plagioclase	53.2	53.2	0.2-1.3 (Ave 0.7)	An60	Subhedral laths	Normal zoning; partially to completely enclosed in clinopyroxene.
Clinopyroxene	25.6	25.6	0.2-2 (Ave 0.8)		Anhedral-subhedral	Pinkish pale brown (ppl), strongly zoned; 2V ≈ 45-50°; ophitic to subophitic.
Opaques	4	4	≤0.1		Skeletal; rounded to euhedral	Both magnetite and ilmenite are present; ilmenite forms skeletal grains, magnetite is rounded to euhedral.
Pyrite	Tr	Tr	≤0.05		Granular	Interstitial; solitary or intergrown with magnetite; may be in contact with secondary clay.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	10.6	Vesicles; interstitial	Fibrous to cryptocrystalline texture; pale olive green color.
Carbonate	Tr	Vesicles; interstitial	Cryptocrystalline to subhedral to fibrous aggregates.
Pyrite	Tr		Rounded grains (≤0.03mm); present as small grains in the clay.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Vesicles	Tr	Even	0.8	Clay; carbonate	Rounded	

COMMENTS: (Plagioclase composition estimated using the Michel-Levy technique.)

168-1027C-01R-04 (piece 1C, 65-69cm)

ROCK NAME: Diabase

GRAIN SIZE: Phaneritic; holocrystalline; fine to medium grained

TEXTURE: Diabasic; subophitic to ophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
Olivine	5.4	9.2	0.1-0.2	Fo75	Subhedral to rounded	Colorless; interstitial; 2V≈80-30°.
Plagioclase	51.8	51.8	0.2-2.2 (Ave 1)		Subhedral laths	Normal simple ± oscillatory zoning; trace amount of hollow crystals.
Clinopyroxene	27.4	27.4	0.7-5 (Ave 1.6)		Anhedral	Pinkish pale brown (ppl), strongly zoned; 2V ≈ 50°; ophitic to subophitic.
Opaques	3.4	3.4	≤0.3 (Ave 0.1)		Skeletal; euhedral	Both magnetite and ilmenite are present; ilmenite forms skeletal grains, magnetite is euhedral to skeletal.
Pyrite	Tr	Tr	≤0.05		Granular	Interstitial; solitary or intergrown with magnetite; may be in contact with secondary clay.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	11.6	Olivine; interstitial	Cryptocrystalline texture; pale olive green color.
Carbonate	Tr	Veinlets	Fibrous carbonate infilling ≤0.02mm veinlet (straight extinction).
Pyrite	Tr		Rounded grains (≤0.03mm); present as small interstitial grains and included in magnetite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Vesicles	0.4	Even	≤0.8	Clay or empty	Rounded	Rimmed by clay or empty.

COMMENTS: A ≤0.02mm veinlet crosses clay filled interstitial areas whilst cutting around unaltered mineral phases; infilled by fibers of carbonate perpendicular to the vein margins.

168-1027C-01R-06 (piece 2, 67-70cm)

ROCK NAME: Aphyric basalt (chilled margin of diabase above)

GRAIN SIZE: Aphanitic; microcrystalline to cryptocrystalline.

TEXTURE: Intersertal; seriate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.2	0.15-0.5 (Ave 0.2)		Subhedral–euhedral	Broken and whole crystals completely replaced by brown fibrous to amorphous saponite.
Plagioclase	1.2	1.2	0.4-1.2 (Ave 0.8)	An48	Euhedral to subhedral laths	Some large broken phenocrysts (≤1.6mm), plus laths and skeletal grains; simple or no zoning. Glomerocrysts up to 2mm.
GROUNDMASS						
Plagioclase	46.2	46.2	0.2-0.5 (Ave 0.2)	An50	Euhedral to subhedral laths	Microlaths to microlites; skeletal and hollow laths present, as well as stellate clusters forming an irregular network of crystals.
Olivine	0	4.6	≤0.2		Sub–euhedral	Completely replaced by brown saponite.
Pyroxene			≤0.05		Fibrous to granular	Intersertal granular to subcrystalline (microcrystalline to cryptocrystalline); partially replaced by clay.
Mesostasis	37.8	38.8				Interstitial pockets of skeletal crystals (fibrous cpx) to sheaf spherulitic cryptocrystalline brown material; partially altered by brown saponite.
Pyrite	Tr	Tr	≤0.005		Granular	In mesostasis.
Opaques	4.4	4.4	0.01-0.02		Euhedral to granular to skeletal	Enclosed in granular pyroxene as well as disseminated throughout the mesostasis.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	6	Olivine; pyroxene; mesostasis	Brown saponite with a fibrous to amorphous fine cryptocrystalline texture, replaces parts of the mesostasis (including fine pyroxenes) as well as microcrysts of olivine.
Saponite	0.2	Veins	Olive brown clay (yellow-gray birefringence) infills fractures.
Carbonate	2.4	Veins; vesicles	0.2-0.25mm veins infilled by fibrous carbonate; fibrous, radiating carbonate infills some vesicles.
Pyrite	Tr		Very fine grains; disseminated through the mesostasis and enclosed in magnetite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	1.8	Even	0.4-2	Carbonate or empty	Irregular to rounded	Irregular vesicles are empty; round vesicles are infilled by fibrous carbonate.
Segregation vesicles	Tr	Even	≤0.8	Mesostasis	Rounded	Filled by microcrystalline (px + opaques) to cryptocrystalline material; outer margin rimmed by plagioclase microlites.

COMMENTS: An alteration halo (≈8mm wide; pale gray-brown) occurs on either side of the main vein. Veins are primarily infilled by carbonate with patches of brown clay along its length; veins cuts across crystals.

168-1027C-03R-02 (piece 5, 125–126cm)

ROCK NAME: Moderately phyric plagioclase-olivine-pyroxene basalt

GRAIN SIZE: Aphanitic; cryptocrystalline to microcrystalline

TEXTURE: Varitextured; glomeroporphyritic; intersertal; sheaf-spherulitic; vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	3.6	0.2-0.8 (Ave 1.3)		Euhedral	Solitary or intergrown with plagioclase laths; completely replaced by celadonite and/or saponite.
Plagioclase	5.8	5.8	1-2.4		Euhedral	Stubby zoned laths as well as more slender laths. Mostly glomerocrysts either monomineralic (pl alone) or polymineralic (pl+cpx).
Clinopyroxene	1.6	1.6	0.4-0.6 (Ave 0.5)		Anhedral–subhedral	Intergrown with slender plagioclase laths; some bowtie structures.
GROUNDMASS						
Plagioclase	14.0	14.0	0.1-0.5		Subhedral	Microcrysts of plagioclase (0.1-0.4mm) as well as microlites (0.2-0.05mm; average ≤0.1mm). Hollow, swallowtail and skeletal forms abound.
Olivine	7.4	7.4	≤0.1		Subhedral to granular	Microcrystalline to feathery, dendritic crystals, intergrown with opaques.
Opaques	1.5	1.5	Ave 0.02		Granular, elongate, skeletal	Intergrown with pyroxene and mesostasis.
Pyrite/pyrrhotite	Tr	Tr	≤0.008		Spherical bleb	In plagioclase crystal; lamellar intergrowth.
Pyrite	Tr	Tr	≤0.01		Granular	In mesostasis.
Mesostasis	65.1	65.1				Forms patches with sheaf spherulitic to sub-plumose texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Celadonite	4.0	Olivine; vesicles; mesostasis	Bright green, replacing rims to cores of olivine and filling vesicles; fibrous to granular cryptocrystalline texture.
Saponite	0.6	Olivine; vesicles	Tan brown saponite replacing cores of olivine, and infilling vesicles.
Carbonate	Tr	Olivine	Replaces the cores of some olivines.
Pyrite	Tr	Olivine, vesicles	Occurs as granules ≤0.005mm in saponite-celadonite pseudomorph of olivine, and as granules ≤0.001mm within celadonite vesicle fillings.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	1.0	Even	≤0.5	Clay	Round	Filled by bright green celadonite and brown saponite layers (see comments below).
Segregation vesicles	0.2	Even	≤0.6	Mesostasis	Round	Filled by cpx+opaques microcrystalline mesostasis, with incipient bright green celadonite alteration.

COMMENTS: Vesicles fills are simple (bright green celadonite) to complex (bands of bright green celadonite, blue green clay, tan saponite ± opaques). Most commonly have green clays followed by tan clay at core. Within the mesostasis there are altered patches dominated by either celadonite or a mixture of celadonite + saponite.

168-1027C-04R-01 (piece 11, 63–67 cm)

ROCK NAME: Moderately to highly phyric plagioclase–olivine–pyroxene basalt

GRAIN SIZE: Aphanitic; cryptocrystalline to microcrystalline.

TEXTURE: Varitextured; glomeroporphyritic; intersertal to intergranular; sheaf-spherulitic; vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	2.8	0.1-0.7 (Ave 0.4)		Euhedral	Solitary or intergrown with plagioclase; phenocrysts and microphenocrysts present; completely replaced by celadonite ± saponite.
Plagioclase	5.8	5.8	0.4-1.6 (Ave 0.8)		Sub-euhedral	Large stubby laths form phenocrysts (≤1.6mm); more slender laths vary from 0.4-1.0mm and form microphenocrysts.
Clinopyroxene	1.4	1.4	0.2-1.2 (Ave 0.3)		An-euhedral	One 1.2mm euhedral phenocryst, plus numerous 0.2-0.5mm anhedral microphenocrysts, intergrown with plagioclase.
GROUNDMASS						
Plagioclase	14.8	14.8	<0.5		Thin microlaths	Microlites and skeletal, hollow crystals; no preferred alignment.
Clinopyroxene	8.6	8.6	0.02-0.05 (Ave 0.04)		Anhedral; sheaves	Small round crystals plus very fine fibrous grains; intersertal to sheaf-spherulitic between plagioclase laths.
Opaques	1.6	1.6	≤0.01		Granular; dendritic	Occurs disseminated throughout the mesostasis.
Mesostasis	55.8	63.8				Consists of sheaf spherulitic cryptocrystalline material + fibrous cpx(?) + opaques; partially altered to brown saponite ± green celadonite.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Celadonite	6.4	Vesicles; olivine; mesostasis; vein	Bright green color; fibrous texture.
Saponite	3.8	Vesicles; olivine; mesostasis; vein	Light brown to tan color; granular cryptocrystalline texture.
Iddingsite	1.8	Vesicles; olivine; mesostasis; vein	Includes some highly reflective hematite.
Carbonate	Tr	Olivine	Precedes celadonite at the rim of one vesicle.
Pyrite	Tr	Vesicles	Irregular pyrite-magnetite intergrowth (0.01mm) attached to a celadonite patch; globular pyrite (0.02mm) attached to a vesicle wall and covered by celadonite fill.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.6	Even	≤0.5	Clays	Round	Primarily occur within segregation vesicles; some occur within the mesostasis. Infilled by celadonite ± saponite ± iddingsite ± pyrite (see comments below).
Segregation vesicles	0.6	Even	≤0.6	Mesostasis	Round	Filled by cpx+opaque+plag rich mesostasis ± celadonite clay.

COMMENTS: Section cross cut by a 0.08-0.01mm wide vein, infilled locally by iddingsite, celadonite and saponite; everything is stained orange. Iddingsite is generally along the margins of the vein, whilst clay fills the interior. Vesicle fill chronology: minor pyrite, followed by isopachous celadonite, orange-stained green clay (also celadonite); celadonite followed by iddingsite; saponite (brown-orange) followed by celadonite; green–orange saponite followed by iddingsite, brown saponite and celadonite.

168-1027C-04R-01 (piece 17, 110–113 cm)

ROCK NAME: Sparsely to moderately phyric plagioclase-pyroxene-olivine basalt.

GRAIN SIZE: Aphanitic; hypocrystalline.

TEXTURE: Intersertal to intergranular; seriate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	1.0	0.2-0.7 (Ave 0.6)		Euhedral	Replaced by bright green/yellow celadonite at rim and deep brown-red iddingsite in core.
Plagioclase	1.6	1.6	0.6-1.2 (Ave 0.8)		Sub–euhedral laths	Laths plus skeletal forms; solitary crystals and in glomeroporphyritic clusters with pyroxene (some bowtie structures); variable alteration.
Clinopyroxene	1.0	1.0	0.2-0.6 (Ave 0.4)		Euhedral–subhedral	Fresh; occurs as solitary crystals and in glomeroporphyritic clusters with plagioclase, or subophitic arrangements.
GROUNDMASS						
Plagioclase	42.0	42.0	0.1-0.2		Euhedral-subhedral	Laths plus quench crystals.
Olivine	0.0	3.0	0.1-0.2		Sub–euhedral	Completely replaced by colorless to pale green clay (saponite ± celadonite).
Clinopyroxene	24.0	24.0	0.05-0.12 (Ave 0.7)		Subhedral	Crystals become more euhedral and larger in unaltered areas of mesostasis.
Opaques	4.8	4.8	0.02-0.08 (Ave 0.04)		Granular; anhedral	Forms euhedral cubes as well as anhedral needles and laths; disseminated throughout the mesostasis.
Pyrite	Tr	Tr	≤0.01		Granular	In plagioclase.
Mesostasis	13.8	21.0				Varies from brown glass to cryptocrystalline material; altered to brown clay (saponite) in alteration halo.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clay (celadonite, saponite, iddingsite)	4.0	Olivine				Bright green celadonite rims to replaces olivine. After rim often find deep brown-red iddingsite. Microlites of olivine replaced by pale green clay (saponite?).
Clay (celadonite, saponite, iddingsite)	1.6	Vesicles				Either completely filled by bright green celadonite ± saponite, or rimmed by celadonite followed by brown saponite ± brown-red iddingsite.
Clay (celadonite, saponite, iddingsite)	6.4	Mesostasis				Brown saponite ± green celadonite replaces mesostasis in alteration halo.
Hematite	0.8	Olivine; vesicles				Forms the red "oxide" core in some vesicles, after a rim of celadonite. Also occurs within olivines which have been altered to celadonite.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	1.6	Even	0.2-0.8	Clays; empty	Round	Only filled in the alteration halo by green celadonite ± brown saponite. In the fresh rock, the vesicles can have a patchy ≤0.05mm pale green saponite(?) rim.

COMMENTS: The type of clay is controlled by the location of the alteration halo. The margin of the rock has a 0.8-1.2mm band in which the mesostasis + olivine is replaced by orange-brown-red clays with a granular to fibrous texture. This grades into a ≤2.5mm band with lime green celadonite alteration clays + brown-red iddingsite + hematite. Vesicles can be rimmed by green to brown saponite ± brown-red iddingsite or just green fibrous clay. The mesostasis in the next 6mm band of rock is altered to brown clay (saponite). There is a sharp boundary between the alteration halo and fresh rock.

168-1027C-04R-01 (piece 20, 131–136 cm)

ROCK NAME: Moderately phyric plagioclase-pyroxene-olivine basalt.

GRAIN SIZE: Aphanitic.

TEXTURE: Varitextured; glomeroporphyritic; intersertal to intergranular; sheaf spherulitic; vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	2.2	0.25-1 (Ave 0.6)		Sub–euhedral	Completely replaced by olive brown-green clay.
Plagioclase	5.0	5.0	1-3		Euhedral laths	Laths and stubby crystals; coarse laths are zoned; glomeroporphyritic and solitary crystals; smaller phenocrysts are typically subhedral, elongate laths.
Clinopyroxene	3.0	3.0	1-2 (Ave 1.6)		Euhedral	Included plagioclase microlites embedded in the rim, as well as a common mesostasis embayment.
GROUNDMASS						
Plagioclase	30.0	30.0	≤1 (Ave 0.6)		Subhedral	Subhedral elongate laths intergrown with pyroxene; skeletal forms also present.
Olivine	0.0	2.8	≤0.25		Subhedral	Completely replaced by clays (see above).
Clinopyroxene	28.2	28.2	≤0.4		An-subhedral	Granular microphenocrysts, intergrown with plagioclase.
Opaques	3.8	3.8	≤0.1		Skeletal	Elongate skeletal crystals.
Pyrite	Tr	Tr	≤0.03		Granular	In plagioclase (≤0.015mm); interstitial.
Mesostasis	24.8	24.8				Patches of fined grained pyroxene(?) + opaques+clay throughout section.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	5.0	Olivine; vesicles; mesostasis				Olive green, non-pleochroic.
Calcite	Tr	Olivine				Trace amounts replace the cores of some olivines.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.2	Even	≤0.5	Clay	Round	Occur in mesostasis and within segregation vesicles.
Segregation vesicles	Tr	Even	≤0.6	Mesostasis	Round	Infilled by microcrystalline pyroxene (≤0.02mm) + opaque oxides (≤0.35mm) + plagioclase (≤0.04mm).

COMMENTS: This varitextured rock is dominantly intergranular, although portions are intersertal, plumose and sheaf-spherulitic. 1-5mm plagioclase-pyroxene glomerocrysts occur. One large pyroxene phenocryst contains a 25 micron glass inclusion with multiple vapor bubbles.

168-1027C-04R-02 (piece 2, 09–15 cm)

ROCK NAME: Moderately phyric plagioclase-olivine-clinopyroxene basalt.

GRAIN SIZE: Aphanitic, cryptocrystalline to microcrystalline.

TEXTURE: Varitextured: intergranular to intersertal, poikilitic, vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	2.2	0.1-1.0 (Ave 0.4)		Sub-euhedral	Completely replaced by pale brown granular Mg-saponite; some in poikilitic arrangement with plagioclase.
Plagioclase	4.2	4.2	≤1.4 (Ave 0.6)		Sub-euhedral	Stubby and slender laths.
Clinopyroxene	1.6	1.6	0.2-0.6 (Ave 0.3)		Sub-anhedral	Fresh; normally subophitic with respect to plagioclase.
GROUNDMASS						
Plagioclase	31.8	31.8	≤0.2		Laths, needles	Stellate arrangements; hollow crystals abound.
Olivine	0.0	0.8	≤0.01			
Clinopyroxene	36.2	36.2	≤0.15 (Ave 0.1)		Anhedral	Normally associated with plagioclase microlites in crystal clusters.
Opaques	5.2	5.2	0.01-0.05		Euhedral-skeletal	Located within mesostasis or within or at rims of olivine phenocrysts.
Pyrite	Tr	Tr	≤0.01		Granular	In plagioclase groundmass grains.
Mesostasis	14.8	17.2				Cryptocrystalline pyroxene and opaques, distributed heterogeneously.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	5.4	Vesicles; olivine; mesostasis				Granular.
Carbonate	0.2					Occurs as euhedral rhombs(?) along some vesicle walls; the vesicles were subsequently filled by clay.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.6	Even	≤0.5	Clay	Round	Infilled by amorphous Mg-saponite or empty.
Segregation vesicles	Tr	Even	≤0.5	Mesostasis	Round	Infilled by mesostasis with saponite-filled gas vesicle in center in most cases.

COMMENTS:

168-1027C-04R-02 (piece 9C, 85–89 cm)

ROCK NAME: Sparsely phyric plagioclase-olivine basalt.

GRAIN SIZE: Aphanitic, hypocrystalline to glassy.

TEXTURE: Glassy-variolitic-sheaf spherulitic-honeycomb; vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	Tr	1.0	0.2-2.8 (Ave 0.2)		Euhedral-skeletal	Fresh olivine is present only in the glassy chilled margin; elsewhere, completely replaced by pale brown clay.
Plagioclase	1.4	1.4	0.5-3.0 (Ave 0.7)		Euhedral to subhedral laths	Laths and skeletal, hollow and swallowtail forms.
GROUNDMASS						
Plagioclase	6.8	6.8	0.1-0.2 (Ave 0.2)		Microlites, skeletal	Swallowtail, hollow forms.
Olivine	0.0	1.8	≤0.2		Euhedral	Completely replaced by clay.
Clinopyroxene			0.1		Euhedral-anhedral	Solitary euhedral or granular, intergrown with plagioclase.
Mesostasis	82.0	82.0				
Pyrite	Tr	Tr	≤0.05		Granular	In mesostasis; heterogeneously distributed.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clay	2.8	Olivine				Pale brown granular to fibrous Mg-saponite(?) completely replaces olivine.
Clay	2.8	Veins				Colorless granular to fibrous, low birefringence.
Carbonate	1.4	Olivine(?), veins				Aragonite(?); fills center of large vein and some smaller fractures; replaces one large (2.8mm) phenocryst.
Zeolite	2.8	Veins				Granular/fibrous and columnar, possibly two types; colorless, lines and fills veins.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	Tr	Even	≤0.15	Saponite	Round	Infilled by fibrous saponite radiating into vesicle center; some vesicles are empty.
Segregation vesicles	Tr	Even	≤0.4	Glass	Ovoid	Infilled by glass and lined by plagioclase microlites.

COMMENTS: Section passes from chilled margin to sheaf spherulitic groundmass; percentage of microlites and phenocrysts increases with distance from chilled margin. Section is cut by a number of anastomosing and bifurcating veins, ranging from ≤0.1mm to 1.2mm wide; there are no alteration haloes. Some veins are infilled symmetrically by multiple layers of clay and zeolite ± a medial carbonate infill. Others are completely filled by granular or fibrous clay and zeolite. Veins cut across crystals and are themselves mutually cross-cutting.

168-1027C-04R-03 (piece 2, 09–14 cm)

ROCK NAME: Sparsely phyric olivine-plagioclase basalt.

GRAIN SIZE: Aphanitic cryptocrystalline to microcrystalline.

TEXTURE: Sheaf spherulitic, plumose, vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	Tr	1.8	≤0.7 (Ave 0.3)		Subhedral skeletal	Partially to completely replaced by either granular pale brown saponite ± iddingsite or massive celadonite.
Plagioclase	1.4	1.4	0.3-2.0 (Ave 0.7)		Subhedral-anhedral	Larger grains exhibit simple to oscillatory zoning; occurs singly or in glomerophyric clots; some swallowtail and hollow crystals.
Clinopyroxene	Tr	Tr	0.1-0.15		Subhedral-anhedral	One 0.4mm round crystal occurs in a plagioclase-olivine-pyroxene glomerophyric cluster.
Spinel	Tr?		0.2		Rounded	Single grain.
GROUNDMASS						
Plagioclase	11.4	11.4	≤0.5 (Ave 0.2)		Skeletal laths	Microlites, swallowtails, hollow crystals.
Olivine	0.0	2.0	≤0.2		Subhedral rounded	See above.
Clinopyroxene	0.4	0.4	≤0.1		Subhedral-anhedral	Intergranular with respect to plagioclase.
Opaques			0.01-0.02		Anhedral-dendritic	Part of mesostasis.
Pyrite	Tr	Tr	≤0.015		Granular	In mesostasis.
Mesostasis	75.8	77.6				Plumose, sheaf-spherulitic.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	3.4	Olivine, vein, vesicles				Granular Mg-saponite partially to completely replaces olivine; fibrous-granular saponite fills or lines vesicles and veins.
Celadonite	3.6	Olivine, vesicles, mesostasis				Celadonite and mixed saponite replaces olivine; fibrous to granular celadonite fills or lines vesicles.
Aragonite (+ calcite)	2.2	Vein, vesicles				Granular, fills center of large vein and part of iddingsite vein; fibrous-granular fills vesicles. (Determined by XRD)
Talc?	Tr	Olivine				
Iddingsite	1.8	Olivine, vein, vesicles				Partially replaces olivine; fills vein (mixed with brown saponite); fills some vesicles.
Hematite/FeO(OH)	Tr	Vesicles				Fills center of some gas and segregation vesicles.
Pyrite	Tr	Vesicles				Granular, ≤0.006mm, in celadonite vesicle fills.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.5	Even	≤0.5 (Ave 0.3)	Clay, iddingsite, hematite/ FeO(OH)	Round	Filled by pale brown saponite; or by iddingsite ± hematite close to the fracture; or by celadonite ± saponite ± iddingsite ± hematite/FeO(OH).
Segregation vesicles	Tr	Even	≤0.2	Clay, mesostasis, hematite/ FeO(OH)	Round	Filled by mesostasis plus either saponite or celadonite.

COMMENTS: Magmatic: glomeroporphyritic clots of olivine + plagioclase + pyroxene occur; some skeletal plagioclase crystals (large, 1-2mm, anhedral rounded, zoned, embayed). Alteration: dark haloes containing celadonite and iddingsite are linked to the location of the clay veins; one clay veinlet is ≤0.05mm wide, partly rimmed by iddingsite; another is 0.5mm wide and is filled by pale green and brown clays, and has iddingsite preferentially near the margins. A late stage carbonate vein with clay minerals at the edge is irregular and tortuous and it crosses halo boundaries with impunity (i.e., having no effect on the haloes). Vesicle infill can be monomineralic or consist of bands of celadonite, saponite ± iddingsite ± hematite/FeO(OH) core. Some are rimmed by opaques.

168-1027C-05R-01 (piece 2, 06–10 cm)

ROCK NAME: Moderately phyric plagioclase-olivine basalt.

GRAIN SIZE: Aphanitic.

TEXTURE: Subvariolitic, glomeroporphyritic, vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	2.4	0.2-0.9		Euhedral	Completely replaced by fibrous-granular clay.
Plagioclase	3.0	3.0	0.8-2.0		Euhedral	Simple and oscillatory zoning.
GROUNDMASS						
Plagioclase	3.8	3.8	≤0.5		Laths	Swallowtail, hollow forms common.
Olivine	0.0	0.4	≤0.2		Euhedral	Completely replaced by clay.
Clinopyroxene	2.2	2.2	≤0.1-0.5		Euhedral-anhedral	Solitary euhedral microphenocrysts; anhedral glomerophyric clots intergrown with plagioclase and olivine.
Pyrite	Tr	Tr	≤0.005		Granular	In mesostasis.
Opaques	Tr	Tr	≤0.005			In mesostasis at margins of cryptocrystalline sheafs.
Mesostasis	87.4	87.4				Sheaf-like varioles of fibrous pyroxene(?) and dusty opaques.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	2.8	Olivine, vesicles, vein				Vesicle fills comprise a lining of fibrous clay followed by spherulitic clay filling.
Celadonite	Tr	Vesicles				Restricted to one corner of the thin section.
Iddingsite/FeO(OH)	Tr	Olivine, vesicles, vein				Associated with the limited celadonite alteration.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.8	Even	0.1-0.4	Clay	Round	Filled by fibrous bands (≤0.02mm) or saponite.
Cavities			≤0.3	Clay	Irregular	≤0.02mm saponite band rims cavities; then infilled by radiating fibers of saponite.

COMMENTS: Several branching veinlets, ≤0.03mm wide, with saponite ± iddingsite/FeO(OH).

168-1027C-05R-01 (piece 8, 92-96 cm)

ROCK NAME: Moderately phyric plagioclase-olivine basalt.

GRAIN SIZE: Aphanitic.

TEXTURE: Glomeroporphyritic, intersertal, vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	1.2	≤1.0		Euhedral	Completely replaced by clay (saponite); forms glomeroporphyritic clusters with plagioclase as well as solitary crystals.
Plagioclase	3.0	3.0	0.5-2.8 (Ave 0.8)		Euhedral-subhedral laths	Euhedral laths and stubby crystals. Some crystals exhibit resorption along the rims ± in the core. Strong oscillatory zoning is common. Inclusions of glass and spinel occur in the cores of some crystals.
Spinel	Tr	Tr	≤0.06		Euhedral	Occurs within plagioclase phenocrysts; deep red color.
GROUNDMASS						
Plagioclase	15.2	16.2	0.1-0.3 (Ave 0.15)		Euhedral; microlites	Occurs as solitary microlites and microlaths, as well as forming an intersertal network. Quench crystals are abundant.
Olivine	0.0	2.8	0.1-0.3		Euhedral	Completely replaced by fibrous saponite.
Clinopyroxene	6.4	6.4	≤0.1 (Ave 0.05)		Granular; subhedral-anhedral	Forms granular grains within the groundmass or attached to plagioclase microlites. Also present as very fine microlites (feathery to rodlike texture) in the mesostasis.
Opaques	1.0	1.0	≤0.005		Skeletal-euhedral	Disseminated throughout the mesostasis.
Mesostasis	51.0	68.6				Microcrystalline to cryptocrystalline; varitextured from plumose to comb to sheaf-spherulitic consisting of brown amorphous matter + feathery cpx(?) + opaques.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	20.6	Vesicles; mesostasis; mafic minerals; plagioclase	Fibrous and granular varieties; fibrous saponite commonly forms at the edges of vesicles and minerals, whilst the granular variety is restricted to the cores.
Celadonite	1.6	Vesicles; mesostasis	Fibrous; present as either pure celadonite or in a celadonite-saponite mixture.
Iddingsite/FeO(OH)	1.2	Mesostasis	Occurs in the center of irregular alteration patches within the mesostasis, following celadonite and saponite.
Pyrite	Tr		25-50µm euhedral to subhedral grains, associated with celadonite ± saponite alteration.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.8	Even	≤0.5	Clay	Round	Completely infilled by clays (saponite + celadonite)

COMMENTS: Numerous 1-2cm patches of intense clay alteration where the groundmass is completely replaced by saponite ± celadonitic clays, with vestiges of plagioclase microlites (±unaltered mesostasis) included. A few 0.4-1mm alteration patches consist primarily of celadonitic clay (either pure celadonite or a mixed celadonite-saponite clay). Within these patches, iddingsite/Fe(OH) staining and growth occurs. In addition, relatively coarse pyrite grains may be found associated with these patches. The clay + pyrite generally occur in the outer layers of the alteration patches, whereas iddingsite occurs within the center (oxidation gradient?).

168-1027C-05R-02 (piece 1A, 01–09 cm)

ROCK NAME: Moderately phyric plagioclase-olivine basalt.

GRAIN SIZE: Cryptocrystalline.

TEXTURE: Varitextured (glassy, variolitic, subvariolitic, spherulitic, intersertal)

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.8	1.0	0.3-1.0		Euhedral to subhedral	Single microphenocrysts are fresh in the glass rim and completely altered to clay ± talc in the crystalline rock.
Plagioclase	2.0	2.0	1.0-1.5		Euhedral to subhedral	Equant to lath-shaped, mostly single phenocrysts.
GROUNDMASS						
Plagioclase	7.8	7.8	≤0.5		Skeletal laths	Microlites.
Olivine/ clinopyroxene	0.0	2.6	≤0.3		Pseudomorph/ subhedral	Completely replaced by clay ± talc
Spinel	Tr	Tr	0.1		Subhedral	
Mesostasis	68.6	71.5				
Glass	14.1	14.1				Fresh, transparent, pale brown. Contain few spherulites, grades to the variolitic zone.
Pyrite/pyrrhotite	Tr	Tr	0.03		Rounded, lamellar intergrowth	Spherical bleb in glass, lamellar intergrowth.
Pyrite	Tr	Tr	≤0.05		Granular	In mesostasis.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Clay (saponite?)	6.7	Olivine, mesostasis, vesicles, vein			Fibrous to cryptocrystalline grain	Yellow to colorless to pale brown. 2.2% after mafic mineral, 1.2% pseudomorph after olivine, 2.2% in vein, 1.1% as alteration of mesostasis (total 6.7%)
Talc	Tr	Olivine			Fibrous	Pale yellow to colorless
Zeolites	Tr	Veinlets			Fibrous	Colorless
Pyrite	Tr	Glass			Irregular bleb	Altered glass halo around the zeolite vein
Carbonate	Tr	Vein	≤0.05		Fibrous	Fibrous vein (0.4mm wide) with 0.02mm saponite selvages
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	Tr		≤0.3	Clay	Round	Completely filled

COMMENTS: Quench margin with complete gradation from fresh glass (7mm) to variolitic (1-2mm), subvariolitic (3-4mm) and spherulitic zone (honey comb, plumose, sheaf spherical and branching textures)

168-1027C-05R-02 (piece 2, 49-51 cm)

ROCK NAME: Moderately phyric plagioclase-pyroxene-olivine basalt.

GRAIN SIZE: Cryptocrystalline

TEXTURE: Varitextured: intersertal to intergranular

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	Tr	1.0	0.5-1.2		Euhedral to subhedral	Almost completely replaced by clay or fibrous talc
Plagioclase	3.2	3.2	0.8-2.4		Laths	Normal and oscillatory zoning
Clinopyroxene	0.4	0.4	1.0-2.4		Subhedral	Polymineralic glomerocrysts with plagioclase; contain devitrified glass inclusion
GROUNDMASS						
Plagioclase	15.2	15.2	≤0.5		Laths	Skeletal crystal are common
Olivine	0.8	1.0	≤0.3		Euhedral	Variable from fresh to completely altered
Clinopyroxene	2.3	2.3	≤0.3		Anhedral	Intergrowth with plagioclase lath
Opaques	1.0	1.0	≤0.05		Skeletal grains	
Pyrite	Tr	Tr	≤0.015		Granular	In mesostasis
Mesostasis	67.1	74.4				Sheaf-spherulitic
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	3.8	Vesicles, olivine, vein, mesostasis				Pale brown, cryptocrystalline to fibrous aggregates
Celadonite	4.8	Vesicles, vein, mesostasis				Bright green, cryptocrystalline to fibrous aggregates
Iddingsite	0.4	Vesicles, vein				Bright orange to red
Carbonate	Tr	Vesicles, mesostasis				
Pyrite	Tr					0.01mm grains associated with saponite
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas/segregation vesicles	0.8		≤0.6	Iddingsite, celadonite, saponite		Complex filling are common

COMMENTS: Vein (0.05-0.1mm wide) consists of green celadonite margin and pale saponite interior, with some iddingsite-FeO(OH) patches
Significant groundmass replacement in millimetric patches (saponite+celadonite)

168-1027C-05R-03 (piece 8, 105-109 cm)

ROCK NAME: Moderately phyric plagioclase basalt.

GRAIN SIZE: Cryptocrystalline

TEXTURE: Varitextured (glassy, variolitic, subvariolitic, spherulitic, intersertal)

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	3.6	3.6	0.5-1.3		Subhedral, lath	Single megacryst (lath 8x1.4 mm) with labyrinthine amoeboid, devitrified glass inclusion
Spinel	Tr	Tr	0.2		Euhedral	
GROUNDMASS						
Plagioclase	15.4	15.4	0.1-0.5		Lath, skeletal	Local pilotaxitic
Olivine	0.4	3.0	≤0.6		Euhedral	Occur singly and in clots with plagioclase. Usually altered; some fresh crystal in glass margin
Clinopyroxene	Tr	Tr	≤0.001		Anhedral	Intergrown with plagioclase
Pyrite	Tr	Tr	≤0.4		Rounded	In mesostasis
Glass	0.3					Pale brown; fresh
Mesostasis	76.7	77.5				Variolitic, subvariolitic, honey comb, plumose, sheaf spherical, branching texture
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	3.6	Vesicles, vein, olivine, mesostasis				Pale brown, fibrous to cryptocrystalline aggregates
Carbonate	Tr	Olivine				

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.2		0.1-0.25	Clay	Rounded	
Segregation vesicles			0.2-0.4	clay+ mesostasis	Ovoid	

COMMENTS: Vein (0.01-0.02 mm wide) filled by fibrous saponite

168-1027C-05R-04 (piece 5, 68-70 cm)

ROCK NAME: Sparsely phyric plagioclase-olivine basalt.

GRAIN SIZE: Aphanitic, cryptocrystalline to microcrystalline.

TEXTURE: Intersertal to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	1.6	0.8-2.8		Euhedral	Replaced by saponite ± talc ± carbonate. Millerite (?) inclusion.
Plagioclase	1.0	1.0	0.6-2.0		Laths	Both stubby and slender, normally zoned.
Spinel	Tr	Tr	≤0.2		Euhedral	Enclosed or attached to olivine and plagioclase; may contain glass inclusions with bubbles.
GROUNDMASS						
Plagioclase	22.8	22.8	≤0.5		Euhedral lath, subhedral	Slender; quench forms abound.
Olivine	0.0	2.4	≤0.3-0.1 (Ave 0.2)		Anhedral to euhedral	Partially to completely replaced by saponite ± talc ± carbonate. Remnant olivine frequently left in core.
Clinopyroxene	2.8	2.8	≤0.3		Anhedral	Granular interstitial to plagioclase. Microcrystalline fibrous sheafs of cpx.
Pyrite	Tr		≤0.01		Anhedral	Granular crystals in mesostasis.
Mesostasis	61.2	69.0				Sheaf-spherical texture. Microcrystalline cpx fibers and opaques.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	11.0	Olivine, vesicle	Granular.
Carbonate	0.4	Olivine, vesicle	Fibrous to partially infill.
Talc	0.6	Olivine	Pseudomorph after olivine.
Millerite (?)	Tr	Olivine	Acicular sulfide fibers and laths in olivine pseudomorphs.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	0.4	≤0.4		Saponite ± carbonate filled	Round	
Segregation vesicles	Tr	≤0.5		Groundmass	Round	Infilled by mesostasis and microcrystalline cpx fibers + opaques. Some contain inner fill of granular saponite.

COMMENTS:

168-1027C-05R-05 (piece 3, 32-43 cm)

ROCK NAME: Moderately phyric plagioclase-olivine basalt.

GRAIN SIZE: Aphanitic, microcrystalline to cryptocrystalline.

TEXTURE: Intersertal to intergranular with locally sheaf-spherulitic patches.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.0	1.0	0.7-1.2		Euhedral to subhedral	Fresh to pseudomorph (replaced by talc, iddingsite, saponite).
Plagioclase	2.2	2.2	0.5-2.2		Euhedral	Single crystals to glomerocrysts. Two grain size populations: 2mm and 0.5-0.8mm.
GROUNDMASS						
Plagioclase	42.2	42.2	≤0.2-0.5		Euhedral lath to platy.	Arrange randomly or in stellate form.
Olivine/Pyroxene	31.5	32.5	≤0.2		Subhedral to anhedral	Olivine? replaced by clays and iddingsite. Skeletal and fresh pyroxene crystals (sheaf-spherical).
Opaques	Tr		≤0.05		Euhedral-anhedral and skeletal	Individual grains occurs singly or in pods
Mesostasis	18.3	21.0				Cryptocrystalline and also skeletal sheafs of fibrous crystals.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Celadonite	0.8	Vesicles, veins, groundmass				Bright green, fibrous to granular in vesicle and veins. Occurs as mixture with saponite. Fills vesicles completely or just core.
Saponite	1.2	Vesicles, veins, groundmass				Yellow to pale brown. Fills whole vesicles.
Carbonate	Tr	Vesicles, mafic phenocrysts				Fibrous in veins. Cross-fibers texture.
Iddingsite	3.8	Vesicles, veins, groundmass (olivine)				Red-brown rims (≤0.05mm) around olivine and some vesicles. Fills completely other vesicles.
Talc	Tr	Olivine				Replaces the core of some olivine crystals and forms isolated grains in saponite-replaced olivine pseudomorph.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	Tr		0.4-0.15	Clays	Round-ovoid	Mono or polymineralic infills including iddingsite, celadonite, olive brown, orange and pale brown saponite.
Segregation vesicles	Tr		≤0.45	Mesostasis, clays	Round	Mesostasis infills vesicle with celadonite or saponite.

COMMENTS: Sample is cut by a 0.5mm-wide vein filled by celadonite (green), saponite (yellow), iddingsite, carbonate. Smaller bifurcating and anastomosing (≤0.1mm) fractures diverges off main vein and partially line/to fill by layers of saponite ± iddingsite ± celadonite.

168-1027C-05R-05 (piece 11, 121-123 cm)

ROCK NAME: Sparsely to moderately phyric plagioclase-olivine basalt.

GRAIN SIZE: Aphanitic, microcrystalline to cryptocrystalline.

TEXTURE: Intersertal to intergranular with locally sheaf-spherulitic patches.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	1.0	1.0	0.6-1.6 (Ave 1.0)		Euhedral to anhedral	Fresh to variably altered crystals; replaced to pseudomorph by clay and carbonate.
Plagioclase	1.2	1.2	0.8-2.0 (Ave 1-2)		Euhedral to subhedral	Laths and stubby sections; simple to oscillatory zoning; crystals has core full of amoeboid glass inclusions.
Spinel	Tr	Tr	0.05		Euhedral	Single inclusion in plagioclase phenocryst.
GROUNDMASS						
Plagioclase	18.0	18.0	0.5-0.1 (Ave 0.2)		Euhedral	Microlaths and microlites; numerous quenched crystals.
Olivine	0.0	0.8	0.1-0.2 (Ave 0.15)		Euhedral to subhedral	Fresh to variably replaced by red-brown iddingsite and brown saponite and carbonate.
Clinopyroxene	1.0	1.0	≤0.1		Sub/anhedral and fibrous	Occurs as small grains interstitial to plagioclase and as microcrystalline fibrous sheafs in mesostasis.
Mesostasis	74.6	78.0				Cryptocrystalline to microcrystalline sheaf-spherical texture, intersertal.
Pyrite	Tr	Tr	≤0.025		Anhedral	Granular disseminated crystals in mesostasis.
Opaques	Tr	Tr	≤0.04		Anhedral to skeletal	Disseminated throughout mesostasis at margins of micro- to cryptocrystalline bundles.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	3.2	Olivine, vesicles	Granular pale brown.
Celadonite	0.4	Vesicles	Fibrous bright green.
Carbonate	Tr	Olivine, vesicles	Sparry aragonite (2V≈20°) after olivine.
Iddingsite	0.6	Olivine, vesicles, vein, groundmass	Brown-red, fibrous-granular; sometimes intermixed with celadonite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	Tr	Even	0.3-0.05	Clay	Round, irregular	Some are empty. Variable infill either monomineralic or polymineralic in bands. Includes pale brown saponite, fibrous celadonite, opaques.
Segregation vesicles	Tr	Even	≤0.2	Mesostasis and clay	Round	Infilled partially by opaque-rich mesostasis and inner core filled by rim of saponite, iddingsite followed by core of carbonate.

COMMENTS: Groundmass is variably altered by saponite, iddingsite ± celadonite. Some vein (≤0.02mm) crosscuts section. Vein is anastomosing and bifurcates at points. It is infilled by iddingsite with mixed celadonite in patches. Associated with celadonite + iddingsite zones is a ≤0.02mm alteration halo. Groundmass proximal to iddingsite vein is altered by iddingsite, elsewhere saponite is the dominant alteration phase.