168-1026B-1R-01 (piece 7, 29-33cm)

ROCK NAME: Aphyric basalt

GRAIN SIZE: Aphanitic

TEXTURE: Hypocrystalline; sheaf-spherulitic ± plumose; microglomeroporphyritic; vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	0.4	0.4	≤0.5 (Ave 0.3)		Euhedral	Laths and stubby crystals; minor simple zoning.
GROUNDMASS						
Plagioclase	8.8	8.8	Ave 0.1		Euhedral laths	Microlites + microlaths form euhedral and quench crystals (swallowtail; hollow crystals etc.). Occur singly and within glomeroporphyritic clots.
Olivine	0	2.4	≤0.2 (Ave 0.1)		Euhedral-subhedral	Completely replaced by brown clay (saponite).
Clinopyroxene	3.2	3.2	≤0.06 (Ave 0.03)		Subhedral	Occurs as single grains throughout the groundmass, and as granular crystals in glomeroporphyritic clots with plagioclase.
Opaques			0.02-0.1		Subhedral-anhedral	Discrete 0.02-0.1mm grains of pyrite(?) only occur within the "fresh" interior of the rock; very fine (<0.01mm) opaques occur throughout the whole section. Point count together with mesostasis
Mesostasis	78	83.4				Gray-brown cryptocrystalline to granular material, with feathery plumes and sheafs separated by fine, disseminated opaques.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	4	Vesicles; mesostasis; olivine	Granular, tan brown. Only present within the inner core of the section (i.e. not in the alteration halo).
Celadonite	3.6	Vesicles; mesostasis; olivine	Granular, bright green. Occurs within the inner 4-5mm of the alteration halo only.
Iddingsite	1.3	Vesicles; mesostasis; olivine	Dark brown to orange; massive. Forms the outer 1-1.5mm band of the alteration halo.
Pyrrhotite	0.7	Vesicles, mesostasis	Sparse anhedral to subhedral grains (0.1-0.2mm) often associated with saponite; absent in the oxidation halo. Each grain is a mosaic of several smaller grains,
Hematite	Tr	Vesicles	Deep red; reflective. Occurs in the outer c.1mm layer of the alteration halo.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles		Even	0.05-0.1	Clay	Round	Completely filled by iddingsite, hematite, celadonite or saponite, depending on the location within the section; some vesicles are only partially filled by saponite.
Segregation vesicles		Even	≤0.2	Mesostasis ± clay	Round	Either completely filled by mesostasis, or with a partial fill of mesostasis followed by clay.

COMMENTS: The section has a very pronounced alteration halo around the margin, consisting of a brown-green 5-7mm band followed by a c.2mm light blue-gray band. Within the halo, there is a clear zonation of the alteration clays: 1) a 1-1.6mm band of iddingsite ± hematite, filling vesicles and replacing olivine ± mesostasis; 2) a ≤0.5mm iddingsite + celadonite mixed zone; some vesicles have a 0.005mm celadonite rim preceding the iddingsite ± celadonite infill; 3) a 4-5mm celadonite only zone, filling vesicles ± replacing mesostasis and olivine; 4) interior of the rock (beyond the alteration halo) with saponite only. Sub-anhedral grains of pyrrhotite are present only within this inner zone (i.e. they are absent in the alteration halo). Section contains microglomeroporphyritic clots (0.4-1.6mm) of plagioclase + pyroxene + opaques.

168-1026B-04R-01 (piece 7, 36–44 cm)
ROCK NAME: Aphyric basalt
GRAIN SIZE: Cryptocrystalline
TEXTURE: Varitextured; glassy to variolitic, subvariolitic, sheaf spherulitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	0.6	0.6	0.5-0.7		Euhedral laths	Present as solitary crystals and within monomineralic glomerocrysts; oscillatory zoning common.
GROUNDMASS						
Plagioclase	12.4	12.4	≤0.4		Euhedral laths; skeletal	Present as laths, microlites and quench crystals.
Olivine + pyroxene	0.4	4	0.05-0.2		Anhedral–subhedral	Completely to partially replaced by secondary minerals; a few fresh very fined grained crystals are still present.
Mesostasis	64.6	72				Texture varies from variolitic to subvariolitic to sheaf spherulitic.
Glass	3.2	5.8				brown, to light brown, to dark brown. Only the core is fresh (completely extinct in xpl).
Pyrite	Tr	Tr	≤0.005		Granular	Present in the glass rim, and as euhedral grains within very small vesicles within the glass.
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Celadonite	4	Vesicles; mafic phases				Bright green fibrous to cryptocrystalline aggregates infilling vesicles and partially to completely replacing groundmass mafic crystals.
Saponite	6.8	Vesicles; mafic phases; veins				Pale brown fibrous to cryptocrystalline aggregates infilling vesicles and partially to completely replacing groundmass mafic crystals.
Iddingsite	5.4	Vesicles; mafic phases				Bright orange-brown-red partially to completely infilling veins and replacing mafic phases.
Altered glass (palagonite?)	2.6	Quenched glass				From orange to pale brown.
Zeolites?	Tr	Veins				Colorless, low relief, possibly 2 types: 1) Fibrous radiate, birefringence white to gray; 2) Granular, forms within veins, very low birefringence.
Pyrite	Tr	Veins; vesicles				≤0.01mm; sparse, occurs within saponite within the rims of veins.
Hematite?	Tr	Veins				

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	1.6	Even	0.05-0.1	Clay; iddingsite	Round	See comments below.

COMMENTS: The glassy margin has a highly fractured, hyaloclastic texture. Single fragments of glass exhibit decreasing concentric alteration bands from their rim to their cores. Alteration haloes exhibit a clear concentric zonation of secondary mineral phases from iddingsite to celadonite to saponite; this banding also occurs in the mesostasis and vesicle infills. Throughout the section, there is a network of veins, with individual veins 0.3-0.4mm wide, infilled by a mixture of saponite and minor amount of zeolite. One deep-red vein (≤0.1mm wide) is infilled by iddingsite ± hematite (deep red purple in ppl, light gray reflectance).

168-1026B-05R-01 (piece 1, 46–49cm)

ROCK NAME: Moderately phyric plagioclase–olivine-pyroxene basalt

GRAIN SIZE: Aphanitic

TEXTURE: Varitextured; intersertal; sheaf spherulitic; glomerophyric; vesicular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	Tr	0.4	0.5-0.7		Euhedral–subhedral	Present as pseudomorphs, completely replaced by celadonite ± saponite ± iddingsite.
Plagioclase	3	3	0.5-1.1		Euhedral laths	Commonly zoned; forms glomeroporphyritic clusters with interstitial groundmass material.
Clinopyroxene	0.2	0.2	0.5-0.8		Subhedral–anhedral	Present in glomeroporphyritic clusters with plagioclase.
GROUNDMASS						
Plagioclase	4	4	≤0.3		Subhedral	Present as laths, microlites and skeletal crystals.
Olivine	0	1.5	≤0.5		Euhedral to subhedral	Completely replaced by celadonite ± saponite ± iddingsite.
Clinopyroxene	3	3	≤0.2		Anhedral	Skeletal to granular, closely associated with interstitial plagioclase grains.
Opaques	0.4	0.4	≤0.05		Anhedral	Microcrystalline to cryptocrystalline grains present within the interstitial mesostasis ± forming skeletal chains.
Mesostasis	86.5	86.5				
SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING				COMMENTS:
Saponite	2.1	Olivine; vesicles				Yellow to pale brown; forms a thin rim within vesicles, as well as pseudomorphing olivine ± pyroxene.
Celadonite	0.6	Olivine; vesicles; mesostasis				Bright green; concentrated in the alteration halo.
Pyrrhotite	0.2	0.2	≤0.05		Anhedral	Disseminated individual grains where celadonite predominates or with saponite along the rim of gas vesicles. Absent in external alteration halo of the rock.
Iddingsite	Tr	Vesicles				Completely fills some vesicles, whilst being associated with celadonite in others.
VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	2.4					

COMMENTS: Saponite occurs throughout the section with the exception of the alteration halo, where celadonite and iddingsite are prevalent. There is an unusual abundance of sulfide grains (pyrrhotite) in the section (point count reveals 0.2%). These grains are absent in the alteration halo.

168-1026C-16R-01 (piece 10, 40–45cm)

ROCK NAME: Sparsely phyric plagioclase-pyroxene basalt

GRAIN SIZE: Aphanitic

TEXTURE: Sheaf-spherulitic; glomeroporphyritic; vesicular

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	1.4	1.4	0.8-1.5 (Ave 0.8)		Euhedral-subhedral	Occurs singly, but is more common in monomineralic, bimineralic and polymineralic glomeroporphyritic clots with pyroxene ± olivine.
Clinopyroxene	0.2	0.2	0.6-0.8 (Ave 0.8)		Subhedral-euhedral	Subophitic to ophitic arrangement with plagioclase in bimineralic glomeroporphyritic clots.
GROUNDMASS						
Plagioclase	11.6	11.6	0.1-0.5 (Ave 0.3)		Subhedral	Microlaths, microlites and quench crystals. Occurs in monomineralic, bimineralic and polymineralic glomeroporphyritic clots.
Olivine	0	1.8	0.1-0.3 (Ave 0.3)		Euhedral	Occurs in polymineralic glomeroporphyritic clots, as well as singly. All olivine is replaced by saponite ± iddingsite.
Clinopyroxene	6.4	6.4	0.05-0.3		Anhedral-euhedral	Anhedral grains are intergrown with plagioclase ± olivine in glomeroporphyritic clots. Smaller solitary euhedral-subhedral crystals (0.05-0.1mm) occur in the mesostasis.
Opaques	Tr	Tr	«0.01		Granular	Minor opaque oxides and sulfides occur in the mesostasis.
Mesostasis	71.1	77				Sheaf-spherulitic texture; cryptocrystalline with microcrysts of pyroxene + opaque oxides + opaque sulfides.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	4.2	Vesicles; olivine	Forms >0.02mm fibrous linings in vesicles inside of the alteration halo. Also forms <0.01mm granular bands followed by a fibrous filling in some vesicles.
Celadonite	4	Vesicles; olivine	Fibrous; lines some vesicles and fills others.
Iddingsite	1.1	Vein	Massive texture.
Hematite	Tr	Vein; olivine; vesicles	Limited to the alteration halo, associated with iddingsite and celadonite. The grains are irregular in shape and ≤15mm. Hematite fills some vesicles and forms a band between celadonite bands in others.
Calcite	Tr	Vein; vesicles	Sparry crystals.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	1.6	Even	0.05-0.4	Clay	Round	Partially to completely infilled by secondary clays and opaque oxides.
Segregation vesicles	Tr	Even	0.1-0.15	Mesostasis	Round	Infilled by mesostasis + opaque rods.

COMMENTS: Vein at the rock edge has a 0.1-0.2mm layer of iddingsite + isotropic opaque mineral, followed by a ≈0.07mm layer of anhedral, granular calcite (uniaxial). This is followed by an incomplete zone of rounded iddingsite "clasts" set within a clay(?) matrix. The alteration halo is 2-5mm wide, containing celadonite band followed by iddingsite filling vesicles, or celadonite followed by saponite.

Glomeroporphyritic clots vary in form; some exhibit a rounded external margin whilst others have mesostasis included between the crystals, frequently surrounded by a fine, lighter band of mesostasis. These may represent rip-up clots, rather than clots formed in the circulating magmatic melt.

168-1026C-17R-01 (piece 8, 31-38cm)
ROCK NAME: Aphyric basalt
GRAIN SIZE: Aphanitic
TEXTURE: Hypocrystalline; sheaf-spherulitic; glomeroporphyritic; vesicular

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPO-SITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	0.8	0.8	0.4-0.9 (Ave 0.4)		Euhedral-subhedral	Blocky and elongate laths (one lath is 2mm long) occur singly and within monomineralic (1-2mm long) and bimineralic glomeroporphyritic clots. Simple to faint oscillatory zoning.
Clinopyroxene	0.2	0.2	0.5-0.7 (Ave 0.7)		Subhedral-euhedral; poikilitic	Subophitic to ophitic arrangement with plagioclase in bimineralic glomeroporphyritic clots.
GROUNDMASS						
Plagioclase	14.6	14.6	0.1-0.6 (Ave 0.35)		Euhedral-subhedral	Quench crystals, microlaths and microlites occurring singly and within glomeroporphyritic clots; some stellate clusters.
Olivine	0	1.6	0.1-0.2		Euhedral-subhedral	Occurs singly or attached to plagioclase; totally replaced by saponite.
Clinopyroxene	6	6	0.05-0.2		Euhedral-anhedral	Occurs singly or attached to/intergrown with plagioclase.
Opaques	Tr	Tr	≤0.02		Granular-skeletal	Intergranular in the mesostasis.
Mesostasis	61	75.2				Cryptocrystalline; brown-gray color with a massive to sheaf-spherulitic texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS:
Saponite	8.6	Vesicles; olivine; mesostasis	Granular; olive-brown.
Celadonite	7.2	Vesicles; mesostasis	Fibrous in vesicles; granular to fibrous in mesostasis.
Iddingsite	1.6	Vein; vesicles	Granular to massive; hematite is associated with iddingsite.
Pyrite/pyrrhotite	Tr	Vein; vesicles	Interstitial at leading edge of alteration halo, ≤0.01mm grains.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS:
Gas vesicles	1.6	Even	0.1-0.25	Clay	Round	Lined to filled by fibrous ± granular saponite in the rock inside of the halo. Within the alteration halo, the vesicles are filled with iddingsite ± hematite; fibrous celadonite + iddingsite layers; fibrous celadonite.

COMMENTS: Alteration halo (≤8mm) shows bands of celadonite, iddingsite, then ± saponite in successive linings and fillings of the vesicles. Iddingsite dominates the fractured side of the halo, whereas celadonite dominates the rock core side. The leading edge of the halo is marked by a 0.2mm ± band of concentrated interstitial pyrrhotite/pyrite.

When viewed in PPL, a number of glomeroporphyritic clots exhibit pseudo-crystal outlines with cross-cutting plagioclase laths. The pseudocrystal is infilled by granular pyroxene and may represent the disequilibrium break-down of olivine or pyroxene, and replacement by fine grained pyroxene.