

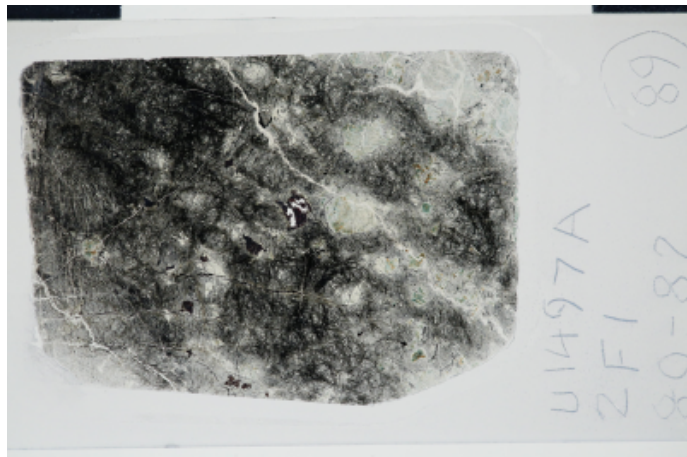
THIN SECTION LABEL ID: **366-U1497A-2F-1-W 80/82-TSB-TS\_89**

TS no.: 89

**Thin Section Summary Description**

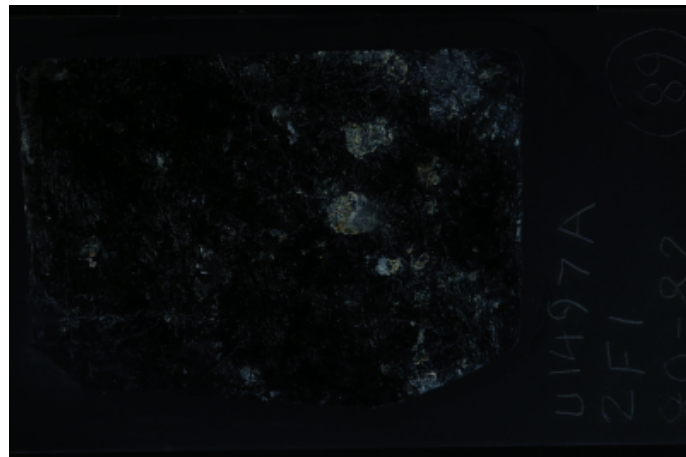
Observer(s): YI/BD/KM/JP

Serpentinized harzburgite (100% serpentinization). Porphyroclastic texture. The opx pseudomorphs are up to 5 mm in size and composed of serpentine with orange and green colors. Some spinel grains are coarse (1-2mm) with subhedral to holly leaf shapes.



LIMS image no.: 39781991

Plane-polarized. Slide width 27mm



LIMS image no.: 39782011

Cross-polarized. Slide width 27mm

**Intrusive Mantle****Lithology:** serpentinized harzburgite

Observer: YI/BD

Texture: pseudomorphic

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Olivine	78	0	100			mesh		
Serpentine	NA	98	NA	NA			pseudomorphic	
Orthopyroxene	20				NA		bastite	
Spinel	2			0.3	NA	amoeboid		NA

THIN SECTION LABEL ID: **366-U1497A-3G-CC-W 4/5-TSB-TS\_90**

TS no.: 90

**Thin Section Summary Description**

Observer(s): KJ/KM/JS/JP

Mildly serpentinized porphyroclastic cpx-bearing harzburgite (40% serpentinization). Elongated, strained olivine porphyroclasts are granulated but retain optical continuity over their original dimensions (0.2-3 mm). Serpentine rims olivine granules and fills veins. Orthopyroxene is 2-4 mm in sized and partially replaced by bastite and completely in some places. Clinopyroxene (0.2-0.4 mm) occurs as small grains in scattered locations. Serpentine of several generations cross-cut each other and cross-cut bastites. Large spinels are rimmed by serpentine and penetrate into grain boundaries of surrounding olivine and opx. JS: Harzburgite with Cpx. Opx partly deformed with undulatory extinction and kink folds; thin exsolution lamellae. Cpx commonly along Opx margins, possibly granule exsolution. Spinel associated with pyroxene, but not vermicular. Transitional texture from protogranular to porphyroclastic?



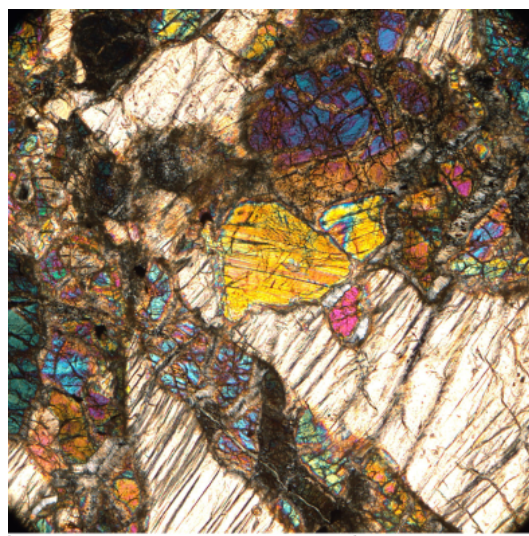
LIMS image no.: 39817741

Plane-polarized. Slide width 27mm



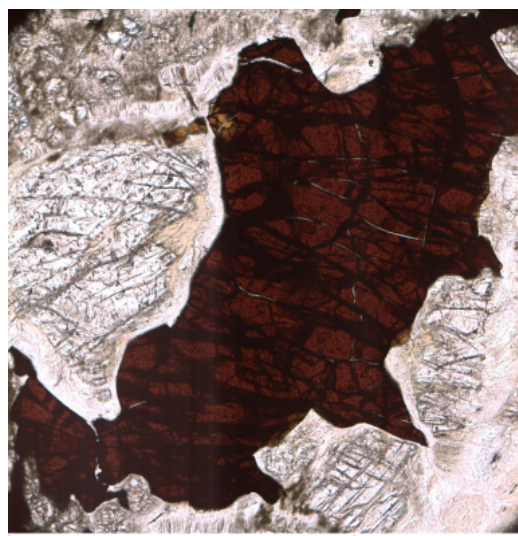
LIMS image no.: 39817761

Cross-polarized. Slide width 27mm



39817981

Cpx, opx, olivine in harzburgite. Scale bar 1mm.



39818051

Holly-leaf spinel. Scale bar 1mm.

**Intrusive Mantle**

Domain/Rock Comment: Harzburgite with Cpx. Spinel associated with pyroxene, but not vermicular. Transitional texture from protogranular to porphyroclastic?

Lithology: medium-grained harzburgite

Observer: KJ/JS

Texture:

medium grained [366]

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Olivine	70	40	30	0.5	elongate	network	oriented	olivine is now present as granulated porphyroclasts, but original olivine grains were up to 2 mm in size. Olivine granules define the original larger grain as optically continuous, strain-deformed porphyroclasts
Serpentine	NA	50	NA	NA				
Clinopyroxene	2			0.1	NA	NA	patchy	Cpx commonly along Opx margins, possibly granule exsolution.
Orthopyroxene	25			2	NA	aggregates	porphyroclast	Opx partly altered to bastite. Grains partly deformed with undulatory extinction and kink folds; thin exsolution lamellae. Granules of Cpx along margins of Opx. Opx altered to green amphibole in places, eg along fractures.
Spinel	1			0.3	NA	holly-leaf	interstitial [BJ84]	NA
Oxide	1				NA	interstitial		

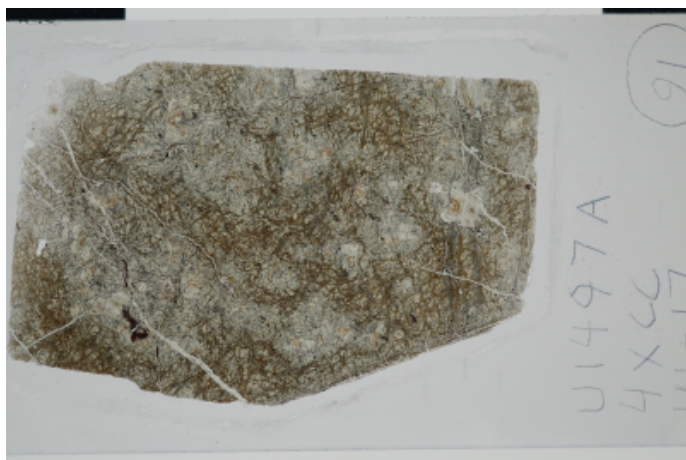
THIN SECTION LABEL ID: **366-U1497A-4X-CC-W 14/17-TSB-TS\_91**

TS no.: 91

**Thin Section Summary Description**

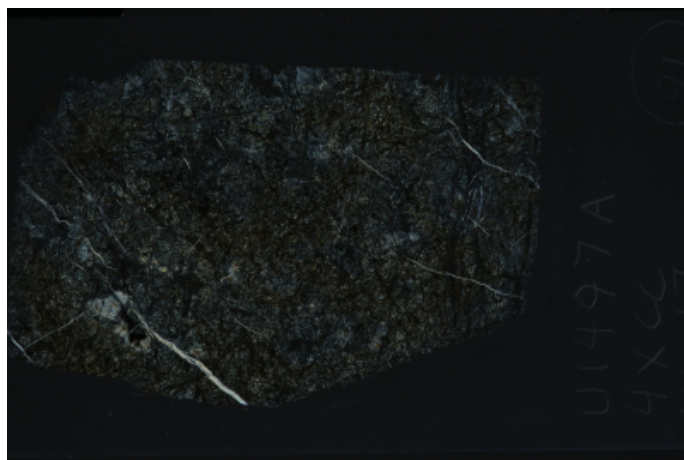
Observer(s): JS/JP

Serpentinized harzburgite with porphyroclastic texture. Spinel in Opx, but Opx highly elongated (e.g., 4 mm x 0.4 mm) with kinks, undulatory extinction. No visible texture in olivine mesh - totally serpentinized.



LIMS image no.: 39794471

Plane-polarized. Slide width 27mm



LIMS image no.: 39794491

Cross-polarized. Slide width 27mm

**Intrusive Mantle****Lithology:** serpentinized harzburgite

Observer: JS

Texture:

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Olivine	87	0	100					
Orthopyroxene	12			2	NA	elongate	bastite	
Spinel	1			0.4	NA	flattened		NA



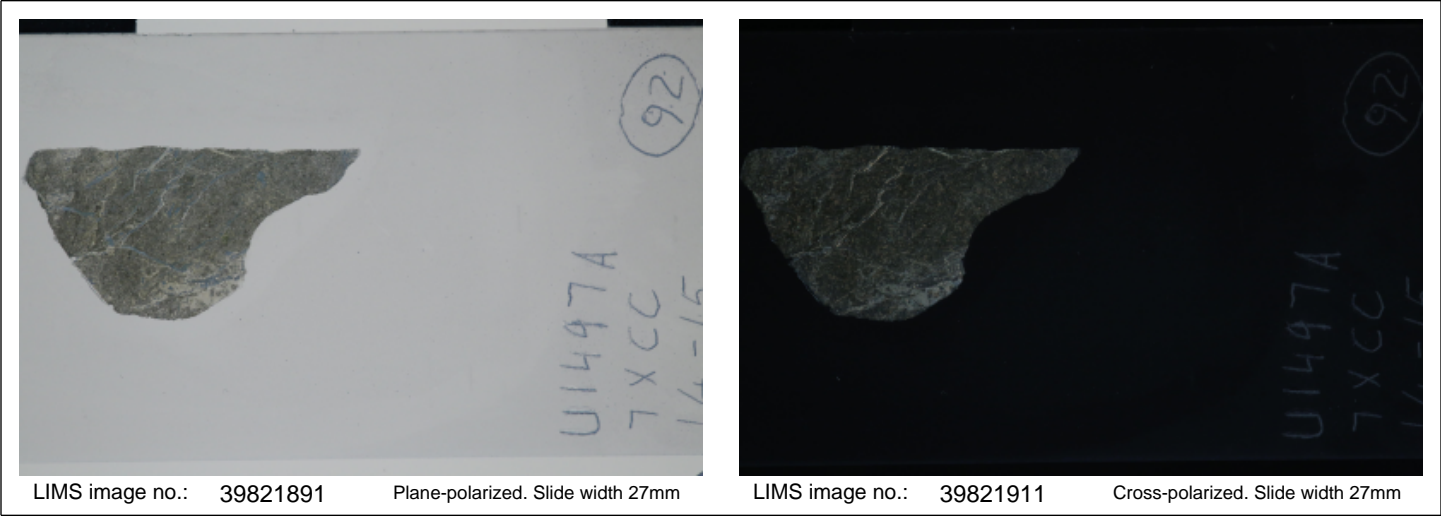
THIN SECTION LABEL ID: 366-U1497A-7X-CC-W 14/15-TSB-TS\_92

TS no.: 92

Thin Section Summary Description

Observer(s): YI

Highly veined aphyric basalt. Ground mass is intergranular subophitic and is composed of Cpx and Pl (altered).



Extrusive Hypabyssal

Lithology:

aphyric basalt with veins

Observer:

YI

Texture:

intergranular subophitic

Average grain size modal name:

fine grained [366]

Groundmass Mineral	Original (%)	Replaced (%)	Size Mode (mm)	Shape	Habit	Comment
Plagioclase	60			subhedral		Completely altered
Clinopyroxene	40			anhedral		

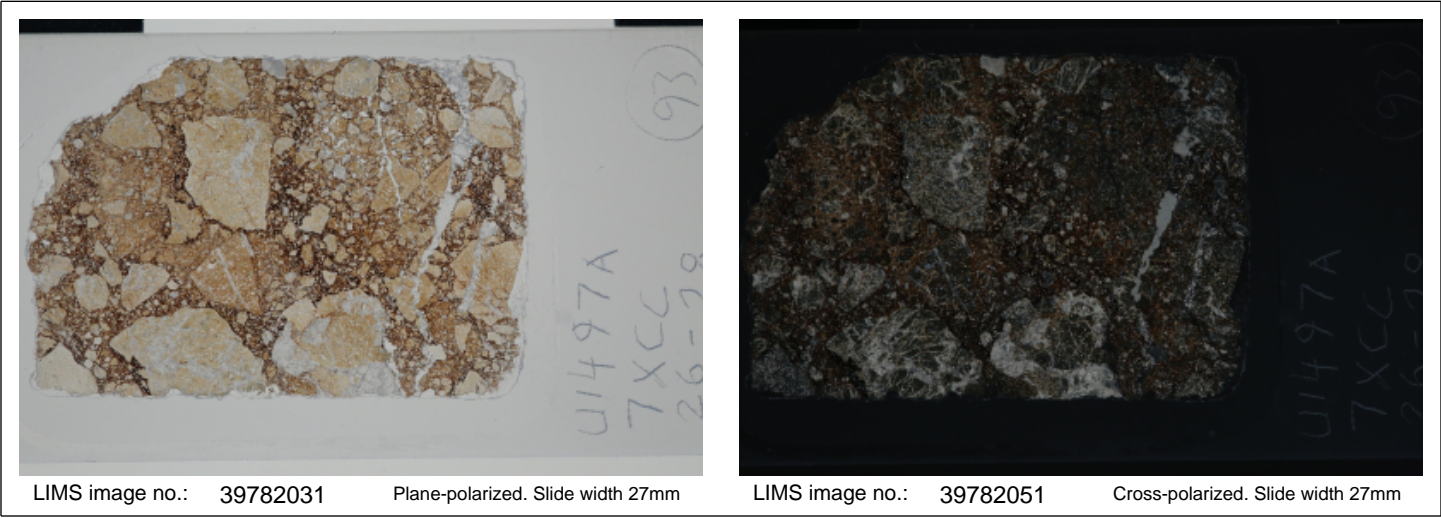
THIN SECTION LABEL ID: 366-U1497A-7X-CC-W 26/28-TSB-TS\_93

TS no.: 93

Thin Section Summary Description

Observer(s): WK/JP/KM

Siliceous carbonate breccia; micritic clayey to silty matrix with angular fragments of cemented calcareous chert. The clasts contain carbonate microfossils (foraminifera, and spherical recrystallized siliceous microfossils (radiolaria?); spherical parts are filled with microcrystalline chalcedony or calcite. Clasts are internally brecciated and cemented with sparitic calcite; multiple brecciation with carbonate cementation. Carbonate veins are irregular, filled with coarse blocky calcite, or filling is replaced by radially fibrous serpentine, often surrounded by thin carbonate rims.



Sediment

Domain/Rock comment:      clasts are veined by carbonate.

Lithology:      radiolarian-rich chert breccia      Observer:      YI

MICROSTRUCTURES

Structure:

Observer: WK

Structure Comment:

Siliceous carbonate breccia; micritic clayey to silty matrix with angular fragments of cemented calcareous chert. The clasts contain carbonate microfossils (foraminifera, and spherical recrystallized siliceous microfossils (radiolaria?); spherical parts are filled with microcrystalline chalcedony or calcite. Clasts are internally brecciated and cemented with sparitic calcite; multiple brecciation with carbonate cementation. Carbonate veins are irregular, filled with coarse blocky calcite, or filling is replaced by radially fibrous serpentine, often surrounded by thin carbonate rims.

Fracture/Foliation	Texture	Shape Fabric Intensity
cataclasite	protogranular [MN-BJ80]	weak

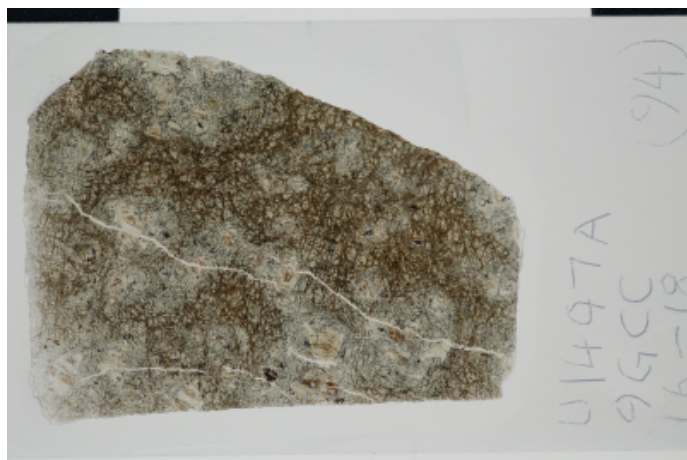
THIN SECTION LABEL ID: **366-U1497A-9G-CC-W 16/18-TSB-TS\_94**

TS no.: 94

**Thin Section Summary Description**

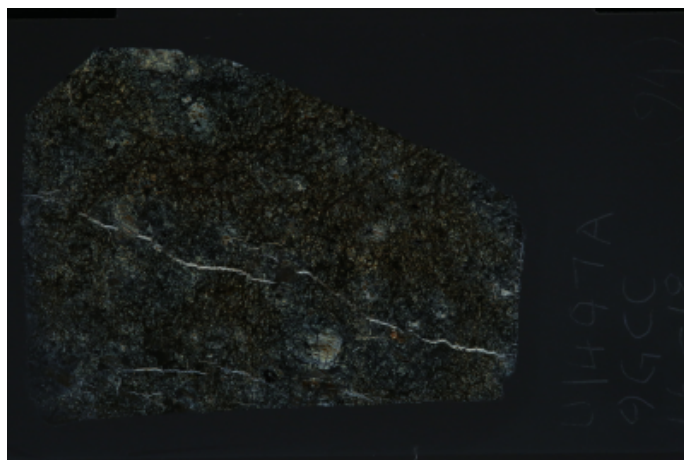
Observer(s): BD

Serpentinized harzburgite (100% serpentinized). The pseudomorphic textures are affected by a brownish alteration. The bastite centers can be associated with amphibole. Fibrous veins of serpentine are crossing the sections.



LIMS image no.: 39782071

Plane-polarized. Slide width 27mm



LIMS image no.: 39782091

Cross-polarized. Slide width 27mm

**Intrusive Mantle**Domain/Rock  
Comment:

Harzburgite, equigranular pyroxenes, no olivine texture. Pxs may show foliation. Several grains form lobes that fill in around "olivine" like melt texture. The Opx are small and space filling. Not PC or PG texture. New type: Coarse Equigranular texture, with melt infiltration to form more Opx (?). Boninite melt?

**Lithology:** serpentinized harzburgite

Observer: JS/BD

Texture: pseudomorphic

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Olivine		85	100			mesh		
Serpentine	NA	100	NA	NA			pseudomorphic	
Orthopyroxene	15			2	NA	blocky	bastite	Rims replaced by serpentine, centers by amphibole. Several grains form lobes that fill in around "olivine" like melt texture. The Opx are small and space filling.
Spinel	100			0.3	NA	subhedral		NA

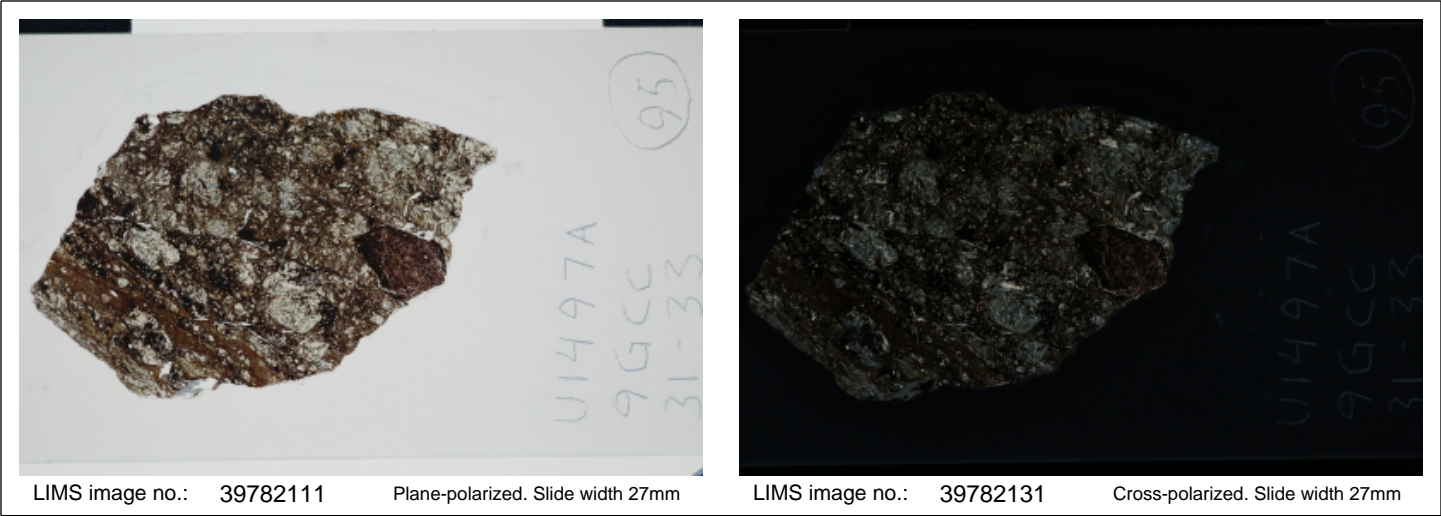
THIN SECTION LABEL ID: 366-U1497A-9G-CC-W 31/33-TSB-TS\_95

TS no.: 95

Thin Section Summary Description

Observer(s): WK/JP

Volcanic/volcaniclastic breccia, mainly matrix-supported; ultrafine-grained amorphous matrix with angular dolerite clasts and plagioclase and pink titanaugite crystals; poorly sorted clasts, highly variable grain size. Clasts are composed of mainly pink titanaugite and plagioclase ~300 micrometer in size. Euhedral-subhedral-elongate plagioclase is partly altered to clay minerals. Titanaugite is associated with aegirine-augite and is partly altered to chlorite. Ultracataclastic shear zone (1-2 cm thick), with rounded clasts of dolerite and pyroxene, accompanied by shear bands Single mm-thick veins with blocky calcite, irregular vein orientation.



Sediment

Domain/Rock comment:

Alkali basalt clasts contain apatite, biotite, kaersutite, ilmenite and aegirine. Most plagioclase crystals are altered to secondary mineral, some fresh crystals are relic. Cpx is purplish pink Ti-augite, sometimes with aegirine rim.

Lithology:

volcaniclastic breccia

Observer:

YI

MICROSTRUCTURES

Structure:

Observer:

WK

Structure Comment:

Volcanic/volcaniclastic breccia, mainly matrix-supported; ultrafinegrained amorphous matrix with angular dolerite clasts and plagioclase and pink pyroxene crystals; poorly sorted clasts, highly variable grain size. Clasts are composed of mainly of pink pyroxene and plagioclase ~300 micrometer in size. Euhedral-subhedral-elongate plagioclase is partly altered to clay minerals. Pink pyroxene is partly altered to chlorite. Ultracataclastic shear zone (1-2 cm thick), with rounded clasts of dolerite and pyroxene, accompanied by shear bands Single mm-thick veins with blocky calcite, irregular vein orientation.

Fracture/Foliation	Texture	Shape Fabric Intensity
cataclasite	protogranular [MN-BJ80]	weak



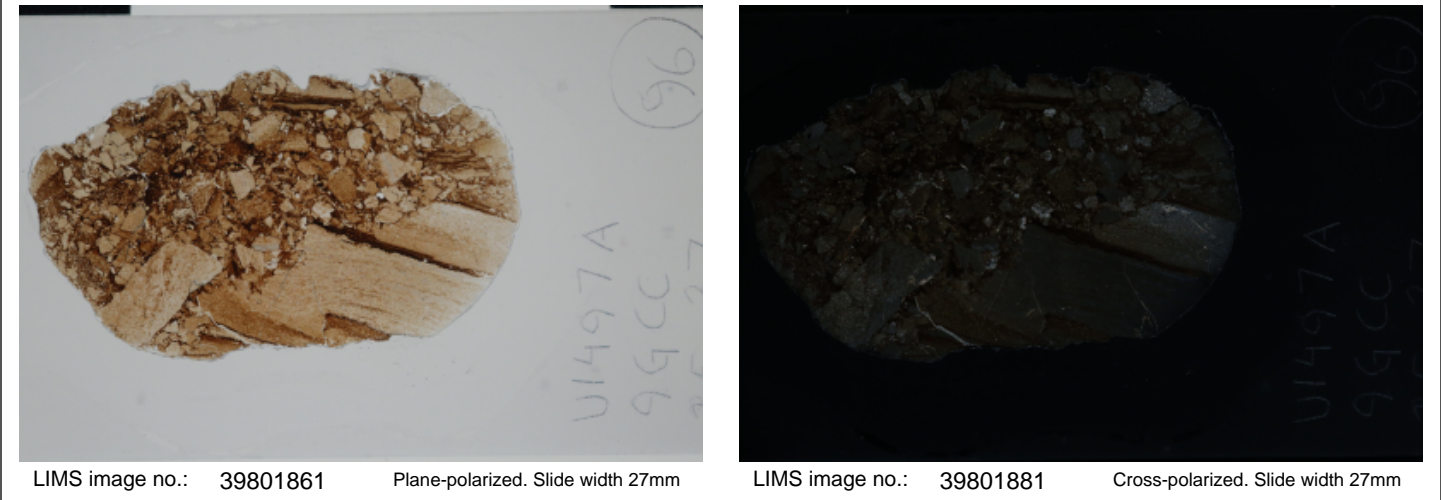
THIN SECTION LABEL ID: 366-U1497A-9G-CC-W 35/37-TSB-TS\_96

TS no.: 96

Thin Section Summary Description

Observer(s): WK/KM

Breccia; micritic clayey to silty matrix with angular fragments of cemented chert, fossiliferous limestone, siltstone and foliated clay-siltstone (shale). Limestone clasts contain recrystallized relics of carbonate microfossils; cherts are recrystallized, too. Clasts are angular to subangular and cemented with sparitic calcite; multiple brecciation with carbonate cementation. Shale clasts are layered at microscale with layer-parallel stylolitic seams. Some calcareous cherts show pressure solution seams, too. Cherts contain spherical relics recrystallized siliceous microfossils (radiolaria?); spherical parts are filled with microcrystalline chalcedony or calcite. Carbonate veins are irregular, filled with coarse blocky calcite, or filling is replaced by radially fibrous serpentine, often surrounded by thin carbonate rims. It looks like very low-grade meta-chert (KM)



MICROSTRUCTURES

Structure: Observer: WK

Structure Comment: Breccia; micritic clayey to silty matrix with angular fragments of cemented chert, fossiliferous limestone, siltstone and foliated clay-siltstone (shale). Limestone clasts contain recrystallized relics of carbonate microfossils; cherts are recrystallized, too. Clasts are angular to subangular and cemented with sparitic calcite; multiple brecciation with carbonate cementation. Shale clasts are layered at microscale with layer-parallel stylolitic seams. Some calcareous cherts show pressure solution seams, too. Cherts contain spherical relics recrystallized siliceous microfossils (radiolaria?); spherical parts are filled with microcrystalline chalcedony or calcite. Carbonate veins are irregular, filled with coarse blocky calcite, or filling is replaced by radially fibrous serpentine, often surrounded by thin carbonate rims. It looks like very low-grade meta-chert (KM)

Fracture/Foliation	Texture	Shape Fabric Intensity
cataclasite	protogranular [MN-BJ80]	weak

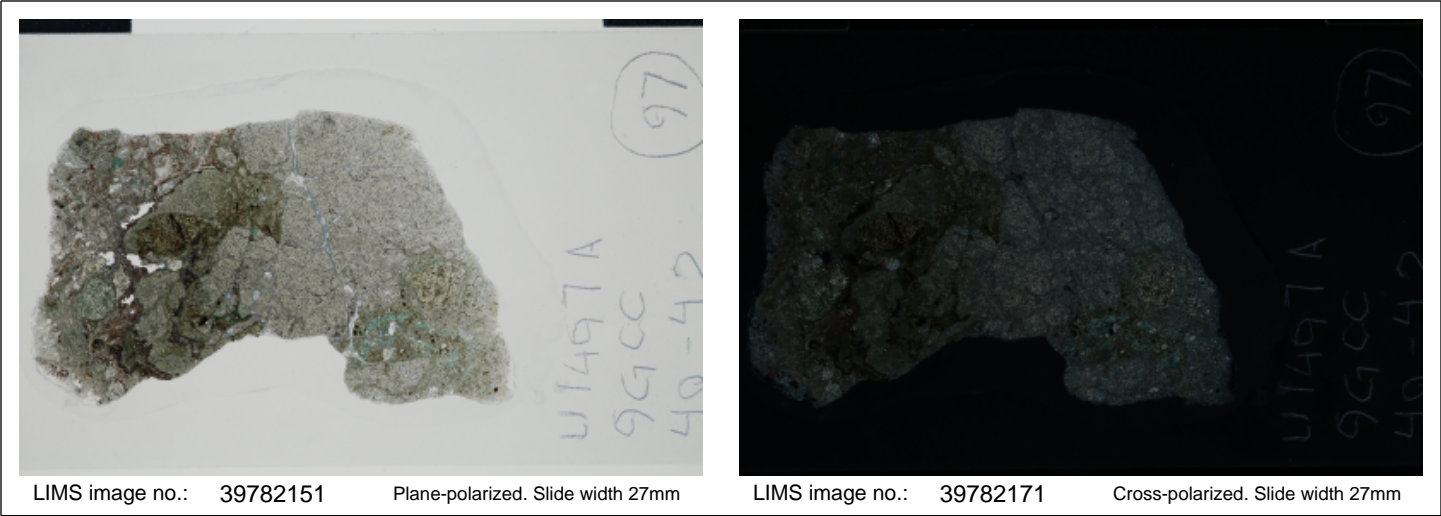
THIN SECTION LABEL ID: 366-U1497A-9G-CC-W 40/42-TSB-TS\_97

TS no.: 97

Thin Section Summary Description

Observer(s): WK

Basalt breccia - cataclasite. ultrafinegrained amorphous matrix with angular basalt clasts; poorly sorted clasts, highly variable grain size; internal texture with acicular plagioclase and subhedral to anhedral pyroxene crystals, less olivine (ophitic, intersertal intergranular) and opaque interstitial phases (pyrite); euhedral-subhedral-acicular plagioclase is partly altered to clay minerals. ultracataclastic shear zones (1-2 cm thick, with rounded clasts of basalt and pyroxene, with strong green alteration (glauconite). Conjugate carbonate veins with antitaxial carbonate fibres oblique to wall rock; partl blocky calcite vein mineralization.



Sediment

Lithology: volcaniclastic breccia

Observer: YI

MICROSTRUCTURES

Structure:

Observer: WK

Structure Comment:

Basalt breccia - cataclasite. ultrafinegrained amorphous matrix with angular basalt clasts; poorly sorted clasts, highly variable grain size; internal texture with acicular plagioclase and subhedral to anhedral pyroxene crystals, less olivine (ophitic, intersertal intergranular) and opaque interstitial phases (pyrite); euhedral-subhedral-acicular plagioclase is partly altered to clay minerals. ultracataclastic shear zones (1-2 cm thick, with rounded clasts of basalt and pyroxene, with strong green alteration. Conjugate carbonate veins with antitaxial carbonate fibres oblique to wall rock; partl blocky calcite vein mineralization.

Fracture/Foliation	Texture	Shape Fabric Intensity
cataclasite	protogranular [MN-BJ80]	weak

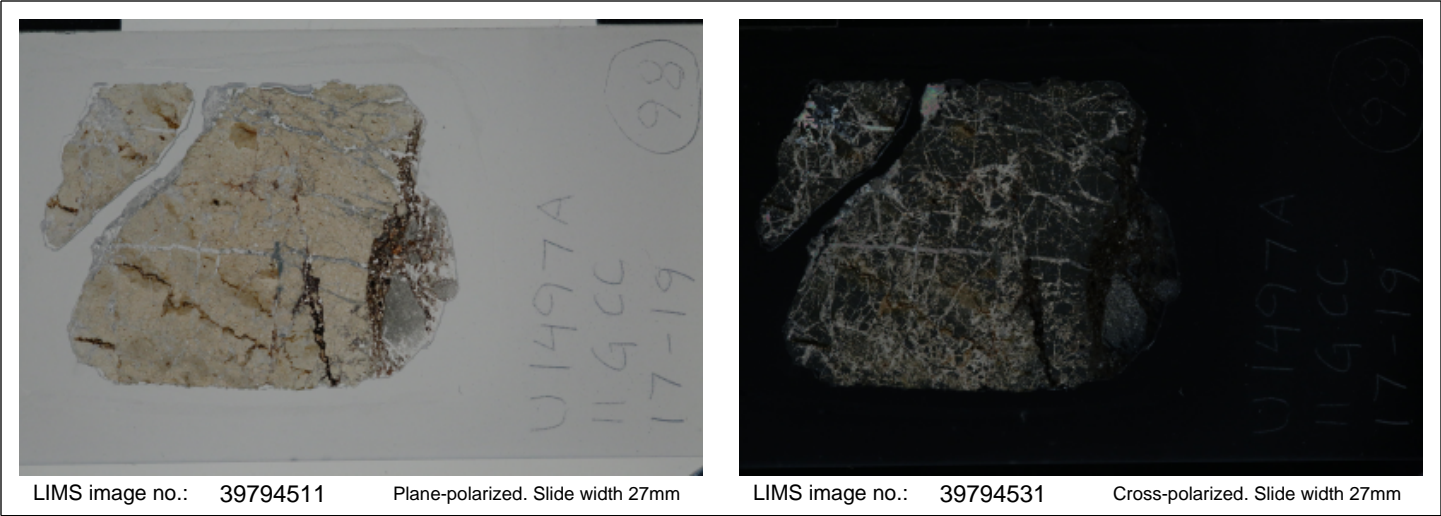
THIN SECTION LABEL ID: 366-U1497A-11G-CC-W 17/19-TSB-TS\_98

TS no.: 98

Thin Section Summary Description

Observer(s): WK/JP/KM

Basically the same as TS 93. Siliceous carbonate breccia; micritic clayey to silty matrix with angular fragments of cemented calcareous chert. The clasts contain carbonate microfossils (foraminifera, and spherical recrystallized siliceous microfossils (radiolaria?)); spherical parts are filled with microcrystalline chalcedony or calcite. Clasts are internally brecciated and cemented with sparitic calcite; multiple brecciation with carbonate cementation. Carbonate veins are irregular, filled with coarse blocky calcite, or filling is replaced by radially fibrous serpentine, often surrounded by thin carbonate rims.



MICROSTRUCTURES

Structure:

Observer: WK

Structure Comment:

Siliceous carbonate breccia; micritic clayey to silty matrix with angular fragments of cemented calcareous chert. The clasts contain carbonate microfossils (foraminifera, and spherical recrystallized siliceous microfossils (radiolaria?)); spherical parts are filled with microcrystalline chalcedony or calcite. Clasts are internally brecciated and cemented with sparitic calcite; multiple brecciation with carbonate cementation. Carbonate veins are irregular, filled with coarse blocky calcite, or filling is replaced by radially fibrous serpentine, often surrounded by thin carbonate rims.

Fracture/Foliation	Texture	Shape Fabric Intensity
cataclasite	protogranular [MN-BJ80]	weak

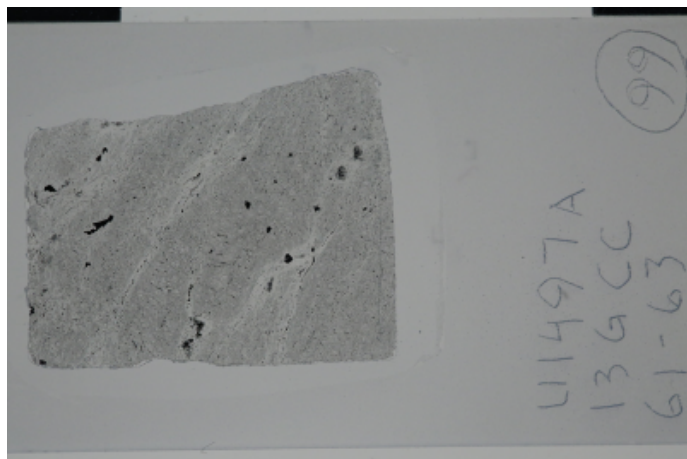
THIN SECTION LABEL ID: **366-U1497A-13G-CC-W 61/63-TSB-TS\_99**

TS no.: 99

**Thin Section Summary Description**

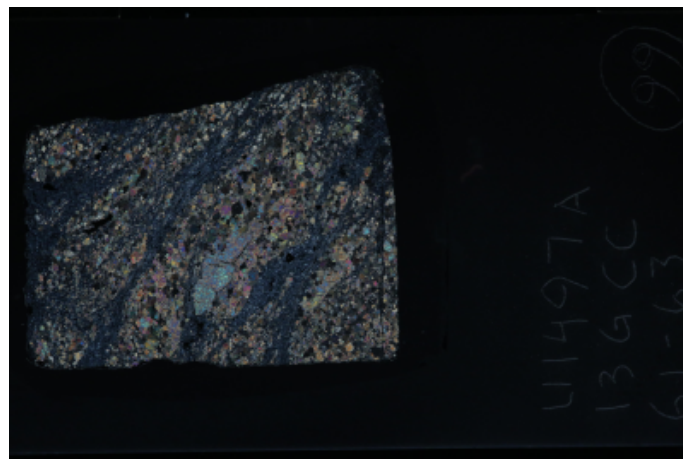
Observer(s): BD/JP/JS

Deformed serpentized dunite (serpentinization degree about 25%). There are three domains: (1) olivine porphyroclastic with elongate grains to 7 mm long by 1 mm wide. Kink banding and undulatory extinction common. Rare flattened spinels to 0.4 mm long. (2) equigranular mosaic domain with equigranular olivines 0.4 mm in size and and chromian spinels 0.33 mm in size. Minor undulatory extinction, smooth straight grain boundaries, 120 TGB common, (3) serpentine veins that cross cut slightly oblique to foliation. Serpentine veins consist of interpenetrating serpentine, talc and magnetite. In domains (1) and (2) Olivines are partly altered to mesh textured serpentine.



LIMS image no.: 39779891

Plane-polarized. Slide width 27mm



LIMS image no.: 39779911

Cross-polarized. Slide width 27mm

**Intrusive Mantle**Interval domain no: **1**

Domain rel. abundance (%): 20

Domain name: Foliated

Domain/Rock  
Comment:

Deformed dunite with porphyroclasts recrystallized as small granoblasts.

**Lithology:** serpentized dunite

Observer: BD/JS

Texture: flow fabric

medium grained [366]

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Olivine		70	30	1.4	elongate			
Serpentine	NA	30	NA	NA			mesh	

Interval domain no: **2**

Domain rel. abundance (%): 70

Domain name: Equant-mosaic

Domain/Rock  
Comment:

Dunite is crosscut by serpentine vein containing talc and magnetite

**Lithology:** serpentized dunite

Observer: JP/JS

Texture: granular [BJ84]

fine grained [366]

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Olivine	99	80	20	0.4	equant	mesh		
Serpentine	NA	20	NA	NA		mesh	pseudomorphic	
Spinel	100			0.2	NA			NA



Interval domain no: 3	Domain rel. abundance (%): 10	Domain name: vein
Lithology: serpentinite vein	Observer: JS	
Texture:		

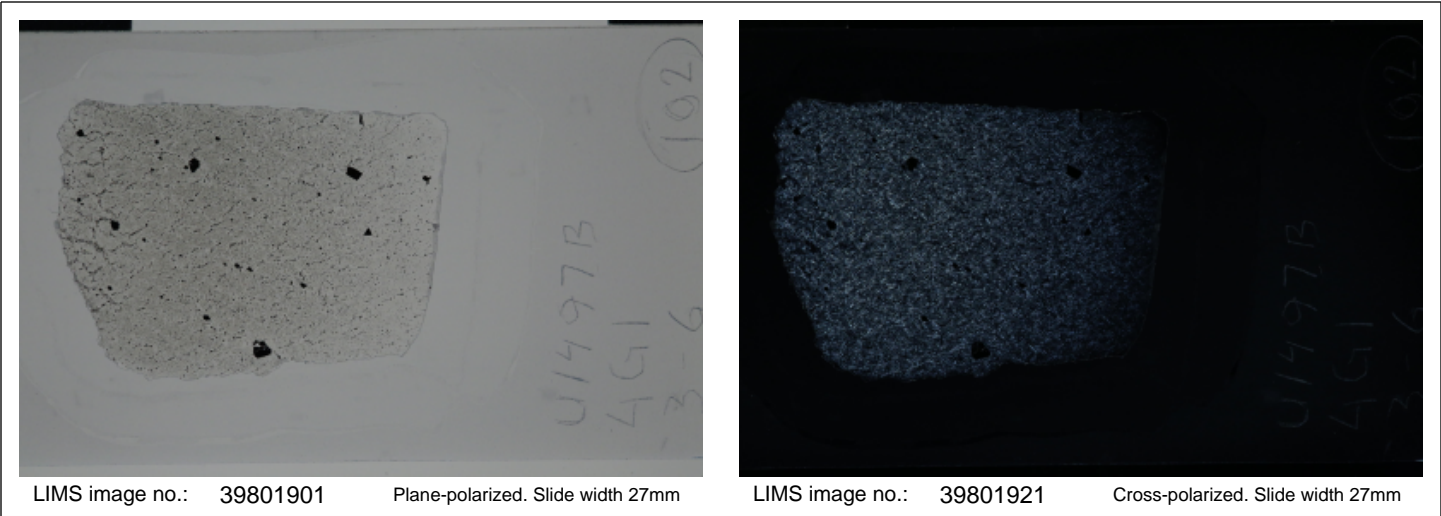
THIN SECTION LABEL ID: 366-U1497B-4G-1-W 3/6-TSB-TS\_102

TS no.: 102

Thin Section Summary Description

Observer(s): BD/KM

Serpentinite displaying interpenetrating blades (possibly antigorite). The rock is crossed by orientated veins of serpentine and magnetite. Relict euhedral spinels are observed and are surrounded by a magnetite corona. No bastite. Primarily, it was dunite



Intrusive Mantle

Lithology: serpentinite

Observer: BD

Texture: nonpseudomorphic

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Serpentine	NA	100	NA	NA			interpenetrating	

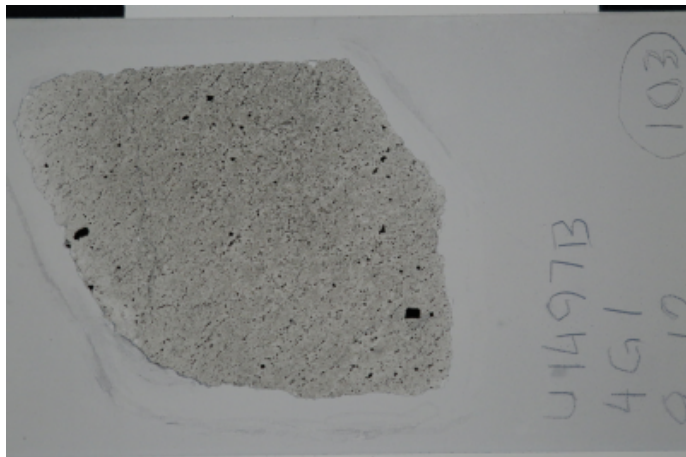
THIN SECTION LABEL ID: **366-U1497B-4G-1-W 9/12-TSB-TS\_103**

TS no.: 103

**Thin Section Summary Description**

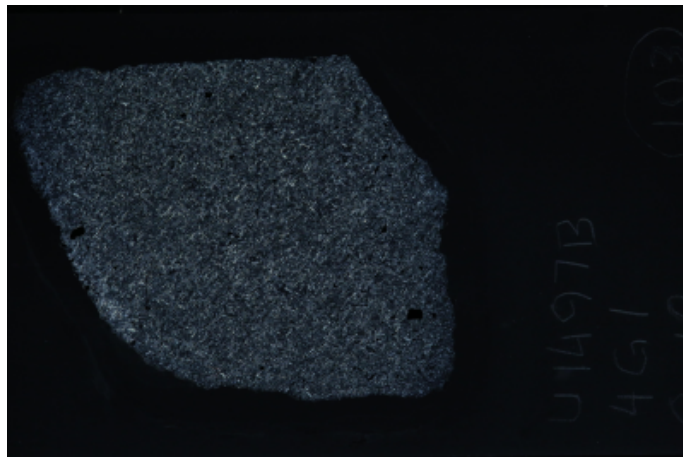
Observer(s): BD/KM

Serpentinite displaying interpenetrating blades (possibly antigorite). The rock is crossed by orientated veins of serpentine and magnetite. Relict euhedral spinels are observed and are surrounded by a magnetite corona. The same as TS102. No bastite, it was dunite before.



LIMS image no.: 39801941

Plane-polarized. Slide width 27mm



LIMS image no.: 39801961

Cross-polarized. Slide width 27mm

**Intrusive Mantle****Lithology:** serpentinite

Observer: BD

Texture: nonpseudomorphic

Mineral	Estimated Original (%)	Present (%)	Altered (%)	Size Avg. (mm)	Shape	Habit	Texture	Comments/Special Features
Serpentine	NA	100	NA	NA			interpenetrating	

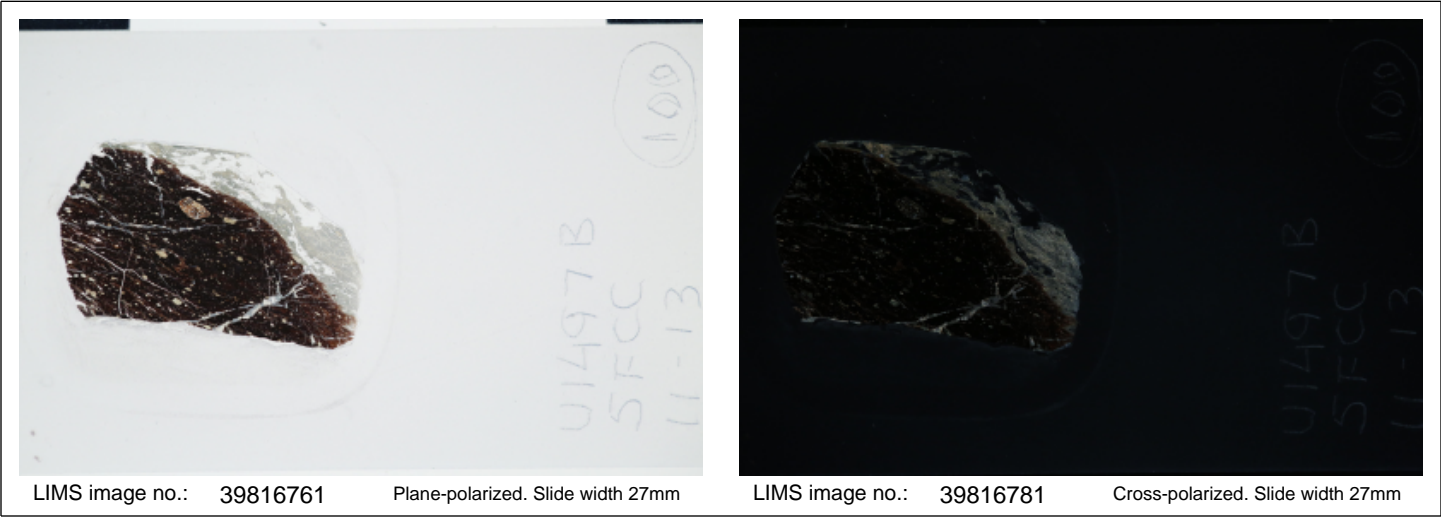
THIN SECTION LABEL ID: 366-U1497B-5F-CC-W 11/13-TSB-TS\_100

TS no.: 100

Thin Section Summary Description

Observer(s): WK

ultrafinegrained shale, almost amorphous matrix (reddish-brown and bright green domains); with clasts of serpentinite, fine-grained mafic rock (basalt), (devitrified volcanic glass with vesicles, chert (fossiliferous); matrix supported; strongly sheared, ultramylonitic; clasts are subrounded to rounded, with strain asymmetric shadows; clasts are of sigma-type and delta-type (kinematic indicators); might be derived from wider shear zone; irregular vein network with fibrous syntaxial calcite.



MICROSTRUCTURES

Structure: shear

Observer: WK

Structure Comment:

ultrafinegrained shale, almost amorphous matrix (reddish-brown and bright green domains); with clasts of serpentinite, fine-grained mafic rock (basalt), (devitrified volcanic glass with vesicles, chert (fossiliferous); matrix supported; strongly sheared, ultramylonitic; clasts are subrounded to rounded, with strain asymmetric shadows; clasts are of sigma-type and delta-type (kinematic indicators); might be derived from wider shear zone; irregular vein network with fibrous syntaxial calcite.

Fracture/Foliation	Texture	Shape Fabric Intensity
strongly foliated/lineated	protogranular [MN-BJ80]	strong



THIN SECTION LABEL ID: **366-U1497B-6F-1-W 60/62-TSB-TS\_104**

TS no.: 104

**Thin Section Summary Description**

Observer(s): YI

Highly vein-brecciated variolitic basalt. Carbonate and chlorite veins.



LIMS image no.: 39821821

Plane-polarized. Slide width 27mm



LIMS image no.: 39821841

Cross-polarized. Slide width 27mm

**Extrusive Hypabyssal****Lithology:** aphyric basalt

Observer: YI

Texture: variolitic

Average grain size modal name:

THIN SECTION LABEL ID: **366-U1497B-6F-3-W 56/58-TSB-TS\_114**

TS no.: 114

**Thin Section Summary Description**

Observer(s): YI

Altered aphyric basalt. Intergranular cpx and pl groundmass. Original glass is replaced by chlorite. Many chlorite veins cut the rock.



LIMS image no.: 39821931

Plane-polarized. Slide width 27mm



LIMS image no.: 39821951

Cross-polarized. Slide width 27mm

**Extrusive Hypabyssal****Lithology:** aphyric basalt

Observer: YI

Texture: intergranular

Average grain size modal name: fine grained [366]

Groundmass Mineral	Original (%)	Replaced (%)	Size Mode (mm)	Shape	Habit	Comment
Plagioclase	60	100	0.1	subhedral		Completely altered
Clinopyroxene	40	0	0.1	anhedral		
Orthopyroxene		0				

THIN SECTION LABEL ID: **366-U1497B-6F-3-W 64/66-TSB-TS\_105**

TS no.: 105

**Thin Section Summary Description**

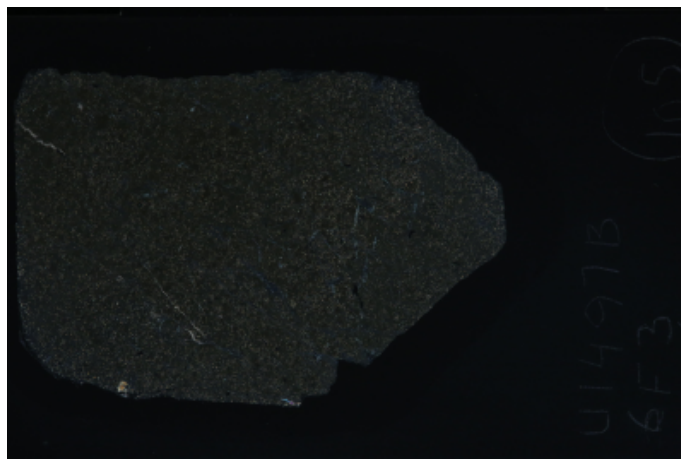
Observer(s): JS

Cpx microphyric basalt (1%) with rare plagioclase microphenocrysts. Groundmass is augite (unaltered), plagioclase laths (altered) and glassy mesostasis (altered), cut by small carbonate-rich veins. Extremely fine grained - typically 0.05 to 0.07 for Cpx and Plag in GM.



LIMS image no.: 39801981

Plane-polarized. Slide width 27mm



LIMS image no.: 39802001

Cross-polarized. Slide width 27mm

**Extrusive Hypabyssal**

Interval domain no.:

Domain rel. abundance (%):

Domain name: mafic lava

**Lithology:** sparsely augite bearing basalt clast

Observer: JS

Texture: intergranular

Average grain size modal name: fine grained [366]

Phenocryst Mineral	Present (%)	Size (mm)	Shape	Habit	Comments
Plagioclase	0.5	100	euhedral-subhedral	tabular	Rare microphenocrysts of plagioclase, altered to low Bf minerals. but perfectly pseudomorphic.
Clinopyroxene	1	1	subhedral	blocky	
Opaques	5	0.01	equant		

Groundmass Mineral	Original (%)	Replaced (%)	Size Mode (mm)	Shape	Habit	Comment
Plagioclase	40	100	0.1	subhedral	tabular	Network of small plag laths, totally altered to low Bf phase - clay?
Clinopyroxene	30	0	0.05	subhedral	blocky	Small equant grains between plagioclase lathes, also some former glass.
Orthopyroxene		0				