

173-1067A-13R-CC (24-25 cm)

No. 38

OBSERVER: SKE, RUB, MAN, BES

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Elongated amphibole grains displaying preferred orientation.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	COMMENTS
Amphibole	60	~1	Subhedral	Blue-green hornblende
Plagioclase	30	~1		Altered to sericite
Epidote	<5	<<1	Granoblastic	Probably secondary
Chlorite	5	<1	Sheafs	Replaces amphibole
Sphene	~1	0.05-0.3	Irregular	Rims magnetite
Apatite	<1	0.1-0.3	Granular	
Magnetite	<<1	0.1	Irregular	Rimmed by sphene
Ilmenite	<1			Hematite exsolution and marginal replacement
Calcite	~1			In veins
Limonite	<1			In veins

STRUCTURAL COMMENTS: Weakly developed, folded foliation, defined by lenses of plagioclase and elongate, strained amphibole crystals. Plagioclase has commonly recrystallized in a mosaic texture, or occurs as larger strained crystals. Chloritization is pervasive and post-dates the foliation. Calcite and limonite veins and microfaults cross cut other structural features.



173-1067A-14R-1 (Piece 3, 8-15 cm)**Nos. 40 and 43**

OBSERVER: HEB, GAR, MAN, SKE, FRO, BES

ROCK NAME: Tonalite gneiss.

GRAIN SIZE: Medium-grained.

TEXTURE: Porphyroclasts of plagioclase in a matrix of finely recrystallized quartz.

MINERALOGY:

NAME	MODE(%)	SIZE(mm)	SHAPE	IG/MET/VEIN	COMMENTS
Quartz I	30	0.5		IG	Undulatory extinction, size reduction during deformation
Quartz II	40	0.1	Granular	MET	Ribbons of polycrystalline neoblasts, size reduction during deformation
Plagioclase I	10	0.7-1.5	Porphyroclast	IG	Undulatory extinction, size reduction during deformation, An ₂₀
Plagioclase II	20	0.1	Granular	MET	Neoblasts rim plagioclase I
Biotite I	<<1	0.1	Platy	IG(?)	Brown
Biotite II	<5	0.05	Thin plates	MET	Pale brown, included in plagioclase I
Chlorite					Mixed with biotite II
Apatite	<1	0.05	Euhedral	IG	
Zircon	<1	0.05	Euhedral	MET	
Hematite	<<1			MET	Both metamorphic and replacing ilmenite(?)
Ilmenite	<<1			IG(?)	Relict grains

STRUCTURAL COMMENTS: Well-developed foliation defined by ribbons of dynamically recrystallized quartz with crystallographic preferred orientation, elongate plagioclase porphyroclasts, and trails of phyllosilicates. Strained plagioclase porphyroclasts are asymmetric (σ -type) with tails of recrystallized quartz, chlorite, and fine-grained material.

Thin veins with Fe oxide occur at 45° to the foliation. The rock contains a possible pseudotachylite band 0.6 cm thick: 20% rounded porphyroclasts of plagioclase+amphibole+sphene+epidote+quartz (refolded ribbons), 80% green-brown matrix, which is possibly devitrified glass.

Site 1067

173-1067A-14R-1 (Piece 4, 17-18 cm)

No. 41

OBSERVER: HEB, GAR, MAN, SKE, BES, FRO

ROCK NAME: Foliated amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Strong preferred orientation of elongate plagioclase and amphibole.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/ VEIN	COMMENTS
Amphibole	60	1-2	Elongate prisms	MET	Blue-green
Plagioclase	20-30	0.5-1	Elongate, irregular	MET	Relicts in previously larger crystals, now mostly replaced by sericite and "saussurite"
Chlorite	10	~0.1	Platy	MET	Replaces plagioclase and amphibole, associated with epidote
Biotite	3	0.5	Platy sheafs	MET	Yellow brown, replaces amphibole
Epidote	<1	~0.3	Granoblastic	MET	Occurs in veins and disseminated throughout rock
Quartz	<1	<0.2	Polycrystalline	MET	In veins
Sphene	~1	0.2	Idioblastic	MET	Aligned parallel to the foliation

STRUCTURAL COMMENTS: The foliation is defined by elongate, strained amphibole, plagioclase, and quartz lenses. Plagioclase is locally dynamically recrystallized, or occurs as larger strained crystals. Quartz lenses show evidence of dynamic recrystallization. Retrograde shear bands defined by chlorite and fine-grained material are oblique to the foliation. Anastomosing fractures filled with hematite (?) and chlorite perpendicular to and locally defining the foliation. Minor chlorite-epidote veining is present.

173-1067A-14R-1 (Piece 8, 87-91 cm)**No. 42**

OBSERVER: GAR, HEB, SKE, MAN, RUB, FRO, BES

ROCK NAME: Tonalite gneiss.

GRAIN SIZE: Medium-grained.

TEXTURE: Elongate plagioclase and ribbon quartz with preferred orientation.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase I	45	0.5	Porphyroclast	IG	Undulatory extinctions, boudinaged, An ₂₂
Plagioclase II	5	0.1	Granular	MET	Coronitic replacement of plagioclase I by sericite
Quartz I	5	0.5	Anhedral	IG	Undulatory extinctions
Quartz II	45	<0.1	Elongate	MET	Ribbons of polycrystalline quartz parallel foliation, elongation of individual grains oblique to foliation
Myrmekite	<1	<0.5		IG	
Biotite	<1	<0.5	Platy	MET	Replaced by chlorite and a cloudy aggregate of sphene
Chlorite	~1	0.1	Platy sheafs	MET	Pseudomorphs after biotite and filling veins; parallel foliation
Apatite	<<1	0.1-1	Euhedral	IG	
Zircon	Trace	<0.1	Euhedral	IG	
(?)Smectite+opaque		<1			Parallel foliation
Epidote	1	0.05	Granular	MET	Veinlets cutting foliation
Allanite	Trace	0.01	Euhedral	IG	Brown in color, metamict

STRUCTURAL COMMENTS: Quartz ribbons and elongate plagioclase porphyroclasts define a foliation. Extensive dynamic recrystallization of quartz results in strong crystallographic and shape preferred orientation. Strained plagioclase forms asymmetric porphyroclasts (σ -type).

Late chlorite, epidote, and quartz veins crosscut the foliation.

COMMENTS: Opaque minerals are mostly hematite after ilmenite(?), possible very rare relict ilmenite.

Site 1067

173-1067A-15R-1 (Piece 1, 0-4 cm)

No. 45

OBSERVER: HEB, GAR, MAN, RUB, BEA, FRO, BES

ROCK NAME: Tonalite gneiss.

GRAIN SIZE: Medium-grained.

TEXTURE: Mosaic of anhedral plagioclase with ribbon quartz, biotite and epidote aggregates showing preferred orientation

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/Vein	COMMENTS
Plagioclase	70	0.5-2	Subhedral to Irregular	IG	Partly replaced by sericite, An ₂₀
Quartz	20	0.5-2	Irregular	IG	Undulatory extinction, some grain size reduction
Sphene	<<1	0.1	Euhedral	MET	Poikilitic, quartz inclusions
Biotite	<1	0.5-1	Platy	IG(?)	
Chlorite	<1	0.5-1	Platy sheafs	MET	Replaces biotite
Epidote	5	0.5-1	Elongate	MET	Parallel to foliation
Sericite	3	0.05	Flaky	MET	Replacing plagioclase
Hematite	<<1				Secondary

STRUCTURAL COMMENTS: Foliation is defined by ribbons of quartz, some elongate plagioclase porphyroclasts, alignment of phyllosilicates, and locally elongate aggregates of epidote. Plagioclase and quartz commonly have lobate grain boundaries. In quartz grains, deformation bands, subgrains, and beginning recrystallization along grain boundaries are observed. Inclusion trails (healed cracks) in quartz are oriented perpendicular to the deformation bands.

173-1067A-15R-1 (Piece 8A, 37-39 cm) No. 46

OBSERVER: GAR, HEB, RUB, MAN, BES

ROCK NAME: Tonalite gneiss-amphibolite contact.

GRAIN SIZE: Medium-grained.

TEXTURE: Both lithologies are inequigranular and foliated.

TONALITE MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	70	~1	Subhedral to Irregular	IG	Cloudy, replaced by sericite
Quartz	20	0.1-0.5	Irregular	IG	Polycrystalline aggregates, recrystallized
Chlorite	~5	0.2-0.3	Sheafs	MET	Aligned parallel to foliation
Epidote	~1	~1-3	Granoblastic	MET	Concentrated near contact with amphibolite
Zircon	<1	0.2		IG	Included in plagioclase
Apatite	<<1	0.3	Euhedral	IG	
Hematite	<<1	0.3-0.5	Anhedral	MET	Red-black, some replacing ilmenite(?)
Amphibole	~60	0.5-1	Subhedral	MET	Elongate parallel to foliation
Plagioclase I	~30	1-2	Irregular	IG	Mostly altered to sericite, elongate, An ₂₂
Chlorite	~5	0.5-1	Sheafs	MET	In veins, pseudomorphs after amphibole
Epidote	<1	~0.1	Granoblastic	MET	Replacing plagioclase
Apatite	<<1	~0.1	Subhedral	IG	
Quartz	~1	~0.1	Granular	MET	Polycrystalline granoblasts replacing initial quartz, and in veins
Plagioclase II	~1	~0.1	Anhedral	MET	Replacing plagioclase I, clays and minute sericite
Ilmenite	~1	~0.1		MET/VEIN	Reddish black, largely replaced by hematite
Sphene	<1	0.3	Euhedral	MET/IG(?)	

STRUCTURAL COMMENTS: Tonalite: Foliation defined by elongate plagioclase porphyroclasts and quartz ribbons. Quartz shows dynamic recrystallization. Plagioclase locally dynamically recrystallized, or as larger strained porphyroclasts. Amphibolite: Foliation defined by alignment of elongate amphibole and lenses of plagioclase. Strained amphibole crystals. Plagioclase locally dynamically recrystallized, or as larger strained porphyroclasts. Foliation slightly deviates in shear bands. Sheared chlorite veins indicate late-stage ductile-brittle deformation.

COMMENTS: Some sphene with rutile inclusions. ROCK NAME: Tonalite Gneiss.

Site 1067

173-1067A-15R-1 (Piece 1, 57-59 cm)

No. 47

OBSERVER: FRO, SKE, HOP, ABE, BEA, BES

GRAIN SIZE: Medium-grained.

TEXTURE: Porphyroclastic, with preferred orientation of plagioclase, ribbon quartz, chlorite, and biotite.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	56	0.03-<4	Porphyroclast	IG/MET	Variably turbid, some dynamic recrystallization, (?)Ang
Zircon	<0.1	0.02	Euhedral	IG	Plagioclase hosted.
Apatite	<0.1	0.8	Euhedral	IG	Some show primary growth-zoned fluid inclusion arrays.
Sphene	<1	0.09	Euhedral	IG	Poikilitic inclusions in plagioclase
Quartz	20	<0.1	Anhedral	IG/MET	Polycrystalline dynamically recrystallized aggregates.
Ilmenite	<1	0.15	Euhedral	IG/MET	Hematite exsolution, poikilitic inclusions of sphene(?) and rutile(?)
Epidote	8	<0.4	Sub-anhedral	MET	
Chlorite	13	<0.15	Fibrous	MET	Concentrated along foliation planes.
Amphibole	<1	1	Anhedral	MET	Extensively replaced by chlorite

STRUCTURAL COMMENTS: Foliation defined by quartz ribbons, elongate plagioclase porphyroclasts, and layers rich in chlorite and opaque minerals. Foliation slightly deviated by shear bands (S/C fabric). Plagioclase forms asymmetric, strained porphyroclasts with pressure shadows filled with quartz and chlorite intimately intergrown with epidote. Some marginal, dynamic recrystallization of plagioclase and extensive dynamic recrystallization of quartz. Aggregates of prismatic and granular epidote overgrow the foliation (post-tectonic). Foliation-parallel layers enriched in chlorite and opaque minerals. Static sericitization of plagioclase porphyroclasts.

COMMENTS: Numerous quartz hosted inter and intracrystalline secondary two-phase liquid-vapor, and single phase liquid and vapor fluid inclusion trails, and grain boundary pinned inclusion arrays. Fill within two phase liquid vapor inclusions is commonly around 0.85. Inclusion morphologies range from irregular to spherical.

173-1067A-16R-1 (Piece 4, 15-18 cm)**No. 48**

OBSERVER: HEB, GAR, MAN, RUB, FRO, BES

ROCK NAME: Tonalite gneiss.

GRAIN SIZE: Medium-grained (two parts in the same thin section).

TEXTURE: 1. Elongated plagioclase and quartz ribbons showing preferred orientation; 2. angular to irregular grains in fine-grained matrix.

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
PART 1 MINERALOGY:					
Plagioclase	80	1-2	Porphyroclast	IG	Kink-bands, fracture
Quartz	15	<1	Irregular	IG	Undulatory extinction, recrystallized
Zircon	<1	0.1	Euhedral	IG	
Epidote	<1	~0.1	Prismatic to granular	MET	
Sphene	<1	~0.1	Subhedral to euhedral	MET	
Hematite	Trace	0.1	Anhedral	MET	Possibly after ilmenite
PART 2 MINERALOGY:					
Quartz	95	0.1-0.5	Angular	MET	
Epidote	5	0.1-0.2	Prismatic to granular	MET	Concentrated on quartz grain boundaries

STRUCTURAL COMMENTS: Part 1: Quartz ribbons and elongate plagioclase porphyroclasts outline a foliation. Plagioclase occurs as elongate porphyroclasts displaying undulose extinction, lobate grain boundaries, kink bands, local dynamic recrystallization, and cracks infilled with recrystallized quartz. Quartz occurs as porphyroclasts, commonly with undulatory extinction, deformation bands, and fractures, and as ribbons or aggregates of small, recrystallized, elongate, undulatory neoblasts with lobate boundaries.

Part 2: Polycrystalline, partly dynamically recrystallized quartz aggregate, locally displaying a mosaic texture, locally as strained, elongate crystals.

Both parts of the thin section: Veins are filled with epidote, minor amounts of chlorite and smectite. One vein is still partly open with euhedral quartz grown into it.

Fine anastomosing fractures lined and infilled with epidote and minor chlorite occur throughout the rock. The epidote occurs as both small grains and aggregates of very fine-grained cloudy material.

Site 1067

173-1067A-16R-1 (Piece 15, 103-106 cm) No. 49

OBSERVER: GAR, HEB, SKE, BES

ROCK NAME: Amphibolite and Tonalite gneiss.

GRAIN SIZE: Medium-grained (amphibolite) to coarse-grained (tonalite).

TEXTURE: Plagioclase and amphibole showing preferred orientation in amphibolite, heterogranular in tonalite.

-----Amphibolite

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	60	0.3-0.5	Prismatic	MET	Wrapped around fold closure
Plagioclase	20	0.5-1	Subhedral	IG	Partly replaced by sericite, wrapped around fold, (?)An ₇
Quartz	10	0.3-0.5	Irregular	MET	Recrystallized
Chlorite	8	0.3-0.5	Platy sheafs	MET	Replaces amphibole along cleavage planes and fractures
Ilmenite	1-2	1.5		MET	Partially replaced by hematite
Hematite	<1	0.5		VEIN	

-----NAMEMODE

(%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	70	3-5	Subhedral to irregular	IG Partly replaced by sericite, fractured, undulose extinction, An ₇
Quartz	20-30	0.3-1	Irregular	IG Aggregates of elongate irregular crystals

STRUCTURAL COMMENTS: In the amphibolite, foliation defined by elongate strained amphibole and plagioclase porphyroclasts, and dynamically recrystallized quartz ribbons. Foliation is folded. Chlorite formed after folding. In the tonalite gneiss, dynamic recrystallization of quartz with patchy alignment of neoblasts. Plagioclase exhibits undulose extinction and subgrains.

173-1067A-16R-2 (Piece 1B, 5-9 cm)**No. 50**

OBSERVER: HEB, GAR, SKE, BES

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Strong preferred orientation of subhedral amphibole and plagioclase and elongated quartz aggregates.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	60-70	0.5-1	Subhedral, prismatic	MET	Elongate parallel to foliation
Plagioclase	20-30	0.5-1	Irregular	MET	Flaser texture, partly replaced by sericite, and clays
Quartz	<5	0.2-0.3	Irregular	MET	Polycrystalline aggregates
Sphene	~2	~0.5	Euhedral	MET	
Zircon	<1	~0.2	Euhedral	IG	
Apatite	<1	~0.2	Euhedral	IG	
Calcite	~2	~1		VEIN	
Hematite	<1			VEIN	In calcite veins, pseudomorphous after pyrite(?)

STRUCTURAL COMMENTS: Foliation defined by alignment of strained amphibole, plagioclase lenses, and elongated quartz aggregates. Extensive dynamic recrystallization of quartz and plagioclase. Amphibole grains are often sigmoidally distorted and associated with shear bands. Calcite veins are perpendicular to the foliation.

Site 1067

173-1067A-18R-2 (Piece 7B, 89-91 cm) No. 53

OBSERVER: GAR, MAN, RUB, SMI, BES

ROCK NAME: Foliated to brecciated amphibolite.

GRAIN SIZE: Fine-grained.

TEXTURE: Strong preferred orientation of elongate plagioclase and amphibole with thin cataclastic bands parallel to foliation.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	70	0.5-1	Elongated	MET	Green-brown to blue-green, some with undulatory extinction
Plagioclase	25	0.5	Elongated	MET	Undulatory extinction
Quartz	2	0.1	Granular	MET	Undulatory extinction, recrystallization
Sericite	1	0.05	Platy	MET	Replacing plagioclase
Chlorite	1	0.3	Platy	MET	Green, replacing amphibole
Sphene	0.5	0.2	Euhedral	MET	
Apatite	0.5	0.05	Euhedral	IG	
Magnetite	>1	0.1-0.3	Euhedral		
Pyrrhotite	Trace		Subhedral to anhedral		Commonly equant

STRUCTURAL COMMENTS: Foliation defined by elongated amphibole, sphene, and strongly altered plagioclase with lobate grain boundaries and neoblasts. Fractures overprint the foliation and are associated with microbreccias, with angular clasts deriving from the host rock. The matrix of the breccia is formed by minerals resulting from mineral reactions during alteration (e.g., chlorite, epidote, and calcite), and by fragments of cataclastic deformation (e.g., plagioclase and amphibole) <0.05 mm. The breccias and fractures are crosscut by calcite and chlorite veins.

COMMENTS: Poikiloblastic calcite containing plagioclase+amphibole inclusions.

173-1067A-17R-1 (Piece 12, 82-85 cm)**No. 52**

OBSERVER: GAR, MAN, RUB, SMI, BES

ROCK NAME: Epidosite.

GRAIN SIZE: Fine-grained.

TEXTURE: Equigranular, weakly foliated.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Epidote	90	0.02-0.05	Granular	MET	Pale yellow
quartz	5	0.02-0.1	Granular	MET	Recrystallized, undulose extinctions, triple junctions
Actinolite/tremolite	1	0.1	Fibrous	MET	
Pyrrhotite	<1	0.05	Anhedral		
Sphene	2-3	1-0.15	Euhedral		

STRUCTURAL COMMENTS: Foliation defined by elongate, dynamically recrystallized quartz aggregates. Coarse quartz grains (>1 mm) with subgrains and deformation bands. Strain-free quartz grains smaller than 0.1 mm are also present. Epidote does not show a shape preferred orientation and overgrows the foliation. Shear fractures underlined by fine-grained material crosscut the foliation.

Site 1067

173-1067A-19R-1 (Piece 5C, 41-44 cm)

No. 51

OBSERVER: GAR, HEB, RUB, MAN, BES

ROCK NAME: Amphibolite-anorthosite contact.

GRAIN SIZE: Fine-grained (amphibolite) to coarse-grained (anorthosite).

TEXTURE: Plagioclase aggregates and amphibole showing preferred orientation (amphibolite) to subhedral equigranular (anorthosite).

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibolite					
Amphibole	60	1.50-00.5	Subhedral	MET	Elongated in the foliation plane
Plagioclase	30	0.5		MET	Elongated in the foliation plane
Epidote	3	0.05	Granular	MET	Mainly concentrated at the contact
Chlorite	<1	0.05	Platy	MET	Replacing
Zircon	<1	0.02	Euhedral	?	
Apatite	<1		Euhedral		
Ilmenite	1	0.5	Anhedral	MET	Elongated parallel to foliation, partially replaced by hematite
Pyrrhotite	Trace	≤0.5	Anhedral		
Sphene	Trace	?	Euhedral		
Anorthosite					
Plagioclase	95	0.5-5	Subhedral	IG	Some recrystallization, some undulatory extinctions and kink bands.
Clinozoisite(?)	5	0.2	Subhedral	IG	Undulatory extinction
Quartz	Trace	0.02	Granular	IG	Rounded inclusions in plagioclase
Pyrrhotite	Trace			VEIN	

STRUCTURAL COMMENTS: Anorthosite: large, undulose plagioclase crystals recrystallized along some grain boundaries to smaller neoblasts. Along some microfractures the plagioclase has recrystallized to much finer neoblasts. Along late stage thin fractures minor cataclasis of plagioclase has occurred and the fractures have been infilled with epidote, calcite and minor chlorite. Amphibolite: foliation defined by aligned strained hornblende, polycrystalline aggregates of recrystallized plagioclase, and alignment of opaque minerals. Veinlets of calcite cut both lithologies

COMMENTS: some relics of the amphibolite in the leucocratic lithology.

173-1067A-19R-1 (Piece 7D, 108-112 cm) No. 54

OBSERVER: GAR, MAN, RUB, SMI, MOB

ROCK NAME: Breccia with amphibolite, tonalite, and epidosite clasts.

GRAIN SIZE: Fine-to medium-grained.

TEXTURE: Cataclastic (inequigranular) with fine-grained matrix.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	50	0.01-0.1	Angular	MET	Cloudy
Unknown	20	0.01		MET	Brown, very fine grained cloudy material
Amphibole	5	0.5		MET	Replaced by chlorite
Quartz	10	0.05	Angular	MET	Undulatory extinction, recrystallization texture
Epidote	5	0.03	Granular	MET	Matrix filling
Chlorite	3	0.02	Platy	MET	Associated with very fine material
Garnet	<1	0.5	Granular	IG	
Pyrrhotite/Ilmenite	<1	<0.5	Anhedral	MET	
Hematite			Anhedral	VEIN	Alteration, partial replacement of ilmenite

STRUCTURAL COMMENTS: Foliation defined by quartz ribbons and some elongate strained plagioclase porphyroclasts. The foliation is overprinted by microbrecciation and transgranular fractures. Clasts of the breccias are angular and of variable size. The matrix is locally defined by chlorite, in other places by epidote and undefined minerals. In some places epidote grains and pieces of epidote veins form clasts.

Site 1067

173-1067A-19R-2 (Piece 1B, 38-41 cm)

No. 55

OBSERVER: GAR, MAN, RUB. BES

ROCK NAME: Breccia (cataclasite).

GRAIN SIZE: Fine-grained.

TEXTURE: Cataclastic (inequigranular) with very fine-grained matrix.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Quartz	20	0.01-0.1	Granular	MET	Occurs in aggregates
Plagioclase	20	0.5	Angular	MET	Replaced by epidote
Epidote	10	0.02	Granular	MET	
Opaque	3	0.03	Granular	MET	Pseudomorphs after sphene(?)
Chlorite	2	<0.01	Platy	MET	Occurs in matrix
Apatite	2	0.01	Euhedral	IG	
Ilmenite	1	<0.5	Anhedral		Broken grains, partially replaced by hematite
Pyrrhotite	Trace	<0.1	Anhedral		Broken grains
Hornblende	5	0.2	Anhedral	MET	
Matrix	40				Very fine grained

STRUCTURAL COMMENTS: Angular clasts of quartz and plagioclase aggregates within a fine-grained matrix display remnants of a foliation, defined by elongate plagioclase and quartz crystals. The matrix of the breccia (~40%) is mainly made of cloudy material partly formed by epidote and by minute angular clasts of plagioclase, quartz, and amphibole (<0.05 mm). Epidote also occurs as clasts in the matrix. Calcite veins crosscut the breccia.

COMMENTS: The rock appears to originate from a brecciated tonalite gneiss. One plagioclase grain has 'graphic' intergrowths of quartz.

173-1067A-19R-3 (Piece 3, 14-16 cm)**No. 56**

OBSERVER: MAN, RUB, ABE, BEA, HOP, BES

ROCK NAME: Tonalite-Amphibolite cataclasite.

GRAIN SIZE: Medium-to fine-grained.

TEXTURE: Cataclastic.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	55	1.2-<0.01	Anhedral	IG/MET	Turbid, patchy recrystallization and fragmentation
Amphibole	10	2.0-0.1	Anhedral	MET	
Chlorite	10	<0.05	Fibrous	MET/VEIN	
Epidote	2	<0.05	Anhedral	MET	
Fe-oxyhydroxide	1	<0.01		VEIN	Locally anastomosing and as grain boundary films
Fine matrix	20	<0.01		MET	Cloudy high relief material, may be epidote group mineral
Pyrrhotite	<1	<0.04	Anhedral	MET/IG	
Ilmenite	<1	<1	Anhedral	IG/MET	Partly replaced by hematite

STRUCTURAL COMMENTS: A breccia where fragmented plagioclase grains have been infilled with chlorite, epidote, and unknown mineral. Some larger plagioclase are angular and show subgrains and new grains along microfractures.

COMMENTS: Large subhedral plagioclase may be relict igneous grains.

Site 1067

173-1067A-20R-1 (Piece 5B, 70-72 cm)

No. 57

OBSERVER: GAR, MAN, RUB, MOB

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Equigranular.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	70	2	Prismatic	MET	Green to bluish-green, contains inclusions of euhedral plagioclase
Plagioclase	25	0.1	Granular	MET	Undulatory extinction, An ₃₂
Quartz grain	3	0.01	Granular	MET	Fine-grained recrystallized quartz, undulatory extinction, interlocking boundaries, triple junctions
Sericite	1	0.01	Flaky	MET	Replacing plagioclase
Chlorite	1	0.02	Platy	MET	Replacing amphibole, filling veinlets
Opaque minerals	<1	0.03	Granular	MET	
Ilmenite	<1	<0.2	Anhedral		Polygonal subgrains
Pyrrhotite	Trace	<0.1	Anhedral		

STRUCTURAL COMMENTS: Folded foliation weakly defined by elongate and locally recrystallized amphibole, plagioclase porphyroclasts (>1 mm) surrounded by aggregates formed of plagioclase neoblasts (<0.01 mm), and recrystallized quartz aggregates, all suggesting dynamic recrystallization. Cataclastic overprint is weak. Chlorite, epidote veins crosscut the foliation and are cut by calcite veins.

173-1067A-20R-1 (Piece 5B, 80-83 cm)**No. 58**

OBSERVER: MAN, RUB, HOP, BEA, ABE, MOB

ROCK NAME: Amphibolite.

GRAIN SIZE: Coarse-grained.

TEXTURE: Inequigranular mosaic of elongated hornblende and plagioclase with preferred orientation.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	35	<0.1-0.8	Subhedral to Anhedral	IG/MET	Undulatory extinction, rare primary plagioclase, variably sericitized, variably-sized recrystallized grains and subgrains
Amphibole	45	0.3-8	Subhedral	MET	Ophitically encloses plagioclase
Zircon	<0.1	<0.05	Euhedral	IG	Poikilitic inclusion in amphibole
Ilmenite	<1	<0.1	Euhedral	IG/MET	Recrystallized
Fe-oxyhydroxide	<0.5	<0.05	Subhedral to anhedral	VEIN	Associated with vein calcite
Calcite	<1	<0.3	Anhedral	VEIN	
Hematite	<1	<0.1	Anhedral	MET	Replacing ilmenite and pyrite(?), also present as discrete grains
Quartz(?)	10(?)	<0.1	Anhedral	MET	
Chlorite	6	<0.5	Fibrous	MET	Replacing amphibole
Pyrrhotite	Trace	<0.2	Anhedral	MET	

STRUCTURAL COMMENTS: Folded foliation defined by strained, elongate amphibole, opaque minerals, and plagioclase porphyroclasts surrounded by aggregates of fine-grained plagioclase neoblasts suggesting dynamic recrystallization of the latter. Veins of calcite cut the foliation.

COMMENTS: One large hornblende has inclusions of euhedral plagioclase, suggestive of a relict ophitic texture.

Site 1067

173-1067A-21R-1 (Piece 16, 101-104 cm)

No.59

OBSERVER: MAN, RUB, ABE, HOP, BEA, MOB

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Preferred orientation of elongated amphibole and plagioclase aggregates.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	55	0.1-2	Anhedral	IG/MET	Cloudy, some euhedral crystal included in amphibole, An ₃₂
Amphibole	35	0.5-2	Subhedral to anhedral	MET	Green to greenish brown, elongate to foliation
Apatite	1	<0.1	Anhedral	IG	
Ilmenite	1	<1	Anhedral	IG(?)	Some replaced by Ilmenite
Sphene(?)	1	~0.5	Subhedral	IG(?)	
Hematite	1	~0.3	Anhedral	MET	
Chlorite	5	<0.1	Anhedral	MET/VEIN	Replaces amphibole
Epidote	2	<0.1	Anhedral to euhedral	VEIN	

STRUCTURAL COMMENTS: Foliation defined by elongate, strained amphibole and plagioclase aggregates of strained crystals with lobate grain boundaries. Fractures locally filled with microbreccias overprint the foliation. The breccias include angular clasts lying in a matrix of epidote and minute angular clasts (<0.05 mm) of the host rock. Feldspar (albite?) veins are crosscut by the fractures.

COMMENTS: Large, broken plagioclase grains (locally subhedral) may be relict igneous crystals.

173-1067A-22R-2 (Piece 3, 43-47 cm)**No. 61**

OBSERVER: GAR, MAN, RUB, MOB

ROCK NAME: Amphibolite (metagabbro).

GRAIN SIZE: Medium-grained.

TEXTURE: Subhedral equigranular to weakly foliated.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	70	2-0.5	Subhedral	MET	Green-brown
Plagioclase	25	0.6-0.2	Subhedral	MET	Undulatory extinction, cloudy, An ₃₂
Opaque	2	0.3	Euhedral	MET	Replacing sphene
Chlorite	<3	0.4-0.1	Platy	MET	
Epidote	<1	0.4	Granular	MET	Granular
Sphene	<1	0.3	Euhedral		
Apatite	<1	0.1	Euhedral		
Ilmenite	Trace	<0.3	Anhedral		Partially replaced by hematite

STRUCTURAL COMMENTS: Preferred orientation of strained, elongate amphibole and plagioclase aggregates. Subhedral equigranular plagioclase is interpreted as a relict igneous microstructure. Fractures, filled with cloudy material and fragments of plagioclase and amphibole, crosscut the foliation.

Site 1067

173-1067A-22R-2 (Piece 4, 92-96 cm)

No. 62

OBSERVER: GAR, MAN, RUB, MOB

ROCK NAME: Amphibolite-anorthosite contact.

GRAIN SIZE: Medium-grained.

TEXTURE: Elongate plagioclase and amphibole (amphibolite) to subhedral equigranular (anorthosite) with cataclastic overprint

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibolite:					
Amphibole	50	5-0.5	Subhedral	MET	Elongated in foliation, undulose extinction, plagioclase inclusions
Plagioclase	35	3.5-0.5	Subhedral	IG/MET	Undulatory extinction, recrystallization, grain size reduction, cloudy
Epidote	10	0.05-0.2	Granular	MET	Replacing plagioclase and in fractures
Chlorite	5	0.02	Platy	MET	Replacing amphibole
Sphene	<1		Euhedral	MET	Coronae around ilmenite
Ilmenite	<1			MET	
Anorthosite					
Plagioclase	80	3-0.5	Subhedral	IG	Some undulatory extinction, replaced by sericite, cloudy
Epidote	15	0.3-0.05	Granular	MET	
Chlorite	5	0.3	Platy	MET	
Sericite	<1		Platy	MET	
Hematite					Probably replacing ilmenite or sulfide

STRUCTURAL COMMENTS: In the amphibolite a foliation is weakly marked by elongate, strained amphibole and aggregates of plagioclase. These remnants are found as angular clasts within a cloudy, epidote, plagioclase and amphibole rich matrix. The amphibolite, and mainly its contact to the anorthosite, is affected by a strong microbrecciation along anastomosing fractures filled with epidote and chlorite. In the anorthosite a weak foliation is parallel to the one in the amphibolite and defined by elongate, strained plagioclases with lobate grain boundaries and local recrystallization of smaller neoblasts. A later cataclastic overprint is shown by intra- and transgranular fractures and a brecciation of the rock. Veins within the plagioclases predate fracturing and chlorite has statically overgrown the matrix.

COMMENTS: Small veins filled by second generation of plagioclase and epidote.

173-1067A-22R-3 (Piece 1, 3-6 cm)**No. 60**

OBSERVER: ABE,HOP,BEA,MAN, RUB, MOB

ROCK NAME: Amphibolite (metagabbro).

GRAIN SIZE: Medium-grained.

TEXTURE: Subhedral equigranular to weakly foliated.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	39	<1.5	Anhedral to subhedral	I G/MET	Turbid, variable sericitization, and limited recrystallization, An ₃₂
Zircon	<0.01	<0.05	Euhedral	IG	
Amphibole actinolite/tremolite	43	<2.2-0.5	Anhedral to subhedral	MET	Brown-green hornblende, and lesser quantities of acicular
Chlorite	9	<0.2	Fibrous	MET/VEIN	Primarily vein associated.
Epidote	6	<0.6-0.2	Anhedral to subhedral	MET/VEIN	Plagioclase replacement and vein
Sericite	<1	<0.2	Anhedral	MET	Plagioclase alteration product
Ilmenite	1	<0.2	Anhedral	IG(?)	Hematite exsolution
Hematite/Limonite	1	<0.2	Anhedral	MET	Replacement after ilmenite

STRUCTURAL COMMENTS: Foliation is weakly defined by elongate, strained amphibole crystals with lobate boundaries, and plagioclase aggregates. Plagioclase is granular and preserved locally within aggregates. In one part of the thin section there is an anastomosing network of thin fractures lined with limonite and chlorite. There are some thin epidote veins which appear to be truncated by the limonite fractures.

Site 1067

173-1067A-23R-1 (Piece 2B, 30-33 cm)

No. 63

OBSERVER: GAR, RUB, MAN, MOB

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-to fine-grained.

TEXTURE: Inequigranular (cataclastic) with relict foliation defined by elongate amphibole and plagioclase.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	60	3-0.5	Subhedral	MET	Green amphibole, undulatory extinction
Plagioclase	30	1-0.5	Granular	IG/MET	Undulatory extinction, recrystallization, An ₃₃
Apatite	1	0.5	Euhedral	IG	
Chlorite	2	0.05	Platy	MET	Replacing amphibole
Epidote	3	0.05	Granular	MET	Replacing plagioclase
Zircon	<1	0.02	Granular		Inclusions in apatite
Clay	<2	<0.01			Dark brown
Ilmenite	<1	<0.4	Anhedral		Partially replaced by hematite

STRUCTURAL COMMENTS: Only small fragments of the original rock are preserved from cataclasis. These exhibit a foliation marked by strained, elongate amphibole crystals, aggregates of plagioclase, and alignment of opaque minerals. Pervasive cataclasis is documented by transgranular fractures and angular clasts lying in a matrix (grain size <0.05 mm) which is composed of alteration products (chlorite and epidote) and minute angular fragments of plagioclase and amphibole. Clasts consist of fragments of foliated amphibolites and more commonly single mineral fragments.

COMMENTS: Poikilitic inclusions of euhedral plagioclase in amphibole and subhedral equigranular plagioclase are interpreted as relict igneous textures. Fine-grained matrix is composed of dark brown cloudy material+epidote+oxyhydroxide+epidote+plagioclase.

173-1067A-23R-1 (Piece 2E, 113-116 cm)**No. 64**

OBSERVER: GAR, HEB, MOB, RUB

ROCK NAME: Garnet-bearing amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Subhedral equigranular to weakly foliated, with foliation defined by preferred orientation of amphibole and plagioclase.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole inclusions	45	<1-4	Sub-anhedral	MET	Green to blue-green hornblende, some contain euhedral plagioclase
Plagioclase	35	<1-3	Anhedral	IG/MET	Zoned, turbid, partially sericitized, triple junction grain boundaries
Epidote	10	<0.3	Sub-anhedral	MET/VEIN	Radiating aggregates to euhedral, replacing plagioclase
Apatite	<1	0.2	Euhedral	IG	
Pyrrhotite	<1	<0.3	Anhedral	IG(?)/MET(?)	
Ilmenite	2	<0.3	Anhedral	IG(?)/MET(?)	Brown, vermicular
Garnet	<3	<0.3	Anhedral	MET	
Chlorite	<1	<0.3	Sheafs	MET	Colorless to green, locally replaces amphibole and garnet
Hematite	<1	<0.05	Anhedral	MET	Partially replaces magnetite
Sericite	1	<0.05	Platy	MET	Replacing plagioclase

STRUCTURAL COMMENTS: Weak foliation defined by some elongate, strained amphibole crystals and partly recrystallized plagioclase aggregates. Fractures filled with cataclastic material, epidote and chlorite.

COMMENTS: Subhedral equigranular texture of plagioclase is interpreted as a relict igneous texture. Interconnected fractures filled with epidote.

Site 1067

173-1067A-23R-2 (Piece 1C, 70-73 cm) No. 65

OBSERVER: SKE, FRO, BEA

ROCK NAME: Brecciated Amphibolite (Metagabbro).

GRAIN SIZE: Medium-grained

TEXTURE: Subhedral equigranular to porphyroclastic (inequigranular with fine-grained matrix).

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	40	<2	Equant to anhedral	IG/MET	Green to brownish green, some included in plagioclase
Plagioclase I	16	0.5-2	Subhedral to anhedral	IG	Some large crystals weakly zoned, broken and faulted, An ₃₃
Plagioclase II	37	<0.5	Anhedral	MET	An ₃₃
Zircon(?)	<1	<0.1	Subhedral	IG	Inclusion in amphibole
Apatite	1	<0.1	Subhedral	IG	Inclusion in amphibole
Sphene	<1	<0.1	Anhedral	IG(?)	
Ilmenite	<1	<0.4	Anhedral	IG(?)	Hematite exsolution
Pyrrhotite	Tr.	<0.1	Anhedral	IG(?)	
Hematite	Tr.	<0.3	Anhedral	MET	
Epidote	5	<0.3	Anhedral to euhedral	MET/VEIN	

STRUCTURAL COMMENTS: High-T structure: isotropic (igneous?) texture. Low-T structure: shallow inclined (apparent attitude: 090/20) cataclasite zones, the widest of which (0.6 cm) is in the middle of the section and has sharp boundaries with the wall rock. Plagioclase within and to a lesser extent outside the cataclasite zone exhibits undulatory to patchy extinction, and fractures offsetting twin lamellae. Amphiboles also show undulatory extinction. Thin epidote veins are associated with the cataclasite zones.

173-1067A-23R-2 (Piece 1C, 80-83 cm)**No. 66**

OBSERVER: GAR

ROCK NAME: Amphibolite (metagabbro).

GRAIN SIZE: Medium-grained.

TEXTURE: subhedral equigranular.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	50	3-0.5	Subhedral	IG(?)/MET	Undulatory extinction
Plagioclase	40	0.7-0.2	Granular	IG/MET	Some fractured crystals with kink bands, An ₃₄
Oxide	3	0.3	Granular		
Epidote	5	0.5-0.05	Granular	MET	Replacing plagioclase
Chlorite	2	0.5	Platy	MET	Replacing amphibole
Calcite	<1				
Ilmenite	<1	<0.3	Anhedral		Partially replaced by hematite
Pyrrhotite	<1	<0.3	Anhedral		

STRUCTURAL COMMENTS: High-T-structure: Isotropic (igneous?) texture, no evidence for high-T deformation Low-T-structure: Epidotization along veins and grain boundaries of plagioclase and amphibole. Some veins contain cataclastic material. Veins are randomly oriented. Some plagioclase and amphibole show undulatory extinction. Twin planes in some plagioclases are kinked. Static replacement of amphibole by chlorite and calcite is locally associated with epidotization.

COMMENTS: Subhedral equigranular texture of plagioclase is interpreted as a relict igneous texture. Fractures are filled by epidote and clasts of plagioclase in a dark brown matrix.

Site 1067

173-1067A-23R-2 (Piece 1D, 107-111 cm)

No. 67

OBSERVER: FRO, SKE, HOP, ABE, BEA

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Elongate amphibole and aggregates of plagioclase with preferred orientation.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	50	<2.5-0.3	Subhedral-bladed	MET	
Plagioclase	30	0.1-0.4	Subhedral to anhedral	IG/MET/VEIN	An ₃₂
Zircon	<0.1	<0.02	Euhedral	IG	Poikilitic inclusions in plagioclase
Apatite	1	0.01-0.04	Subhedral	IG	Poikilitic inclusions in amphibole
Ilmenite	3	0.01-0.5	Subhedral	IG	Hematite exsolution.
Sphene	<1	<0.15	Subhedral	IG/MET	
Epidote	1	<0.3	Sub-euhedral	MET/VEIN	Concentrated in calcite veins; also occurs as interstitial grains
Chlorite	10	<0.1	Fibrous	MET	Replacement of amphibole, alteration associated with calcite veins
Calcite	4		Anhedral	VEIN	
Pyrrhotite	Trace	<0.1	Subhedral		

STRUCTURAL COMMENTS: High-T structure: foliation defined by elongate amphibole, mosaic-like recrystallized plagioclase and opaque minerals. Low-T structure: 3 stages of veining: (1) large rhombs of carbonate (dolomite?), epidote and cataclasite. (2) wide chlorite vein. (3) thin meandering calcite vein, in addition calcite occupies fractures in wall rock amphiboles.

COMMENTS: Some parts of the thin section have subhedral equigranular plagioclase, which is probably a relict igneous texture.

173-1067A-23R-3 (Piece 1A, 19-23 cm)**No. 68**

OBSERVER: FRO, SKE, HOP, BEA, ABE

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Inequigranular with fine-grained matrix (cataclastic), with relict foliation defined by elongate amphibole.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	50	<4	Subhedral to anhedral	MET	
Plagioclase	30	<2	Anhedral	IG/MET	Locally turbid
Sphene	<0.1	<0.15	Subhedral	IG	
Zircon	<0.1	0.03	Euhedral	IG	Included in amphibole
Ilmenite	2	<4	Subhedral to anhedral	IG	Hematite exsolution
Pyrrhotite	2	<7	Anhedral	IG	
Epidote	5	<0.4	Anhedral	MET	
Chlorite	10	<0.15	Fibrous	MET/VEIN	

STRUCTURAL COMMENTS: High-T structure: in the upper part of the section, foliation is defined by elongate amphibole and minor amounts of recrystallized plagioclase.

Low-T structure: cataclastic overprint, most intense in a horizontal zone across the middle part of the section. High-T foliation is dragged into the cataclastic zone. Cataclasis is accompanied by chlorite and epidote growth (both deformed and undeformed chlorite and epidote observed). Veins of Fe-oxyhydroxide are observed in the cataclastic zone. Chlorite replaces amphibole along cleavage planes pervasively throughout the rock. Plagioclase show undulatory extinction, kinks and deformation bands. Amphiboles are kinked.

Site 1067

173-1067A-23R-4 (Piece 8, 74-77 cm)

No. 70

OBSERVER: FRO, SKE, HOP, BEA, ABE

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Elongate amphibole and plagioclase ribbons with strong preferred orientation.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Amphibole	55	<1-4	Subhedral	MET	Brownish-green to brown hornblende, strongly pleochroic
Plagioclase	39	<0.4-1	Anhedral	IG/MET	Turbid, variably recrystallized, An ₃₆
Apatite	<1	<0.7	Subhedral to euhedral	IG	Poikilitic inclusions in green hornblende
Sphene	<1	<0.5	Subhedral	MET	Replacing some opaque minerals
Epidote	2	<1	Anhedral	VEIN	
Ilmenite	1	<1	Anhedral	IG/MET	
Pyrrhotite	1	<1	Anhedral	IG/MET	
Chlorite	1	<0.3	Anhedral	MET	Partially replacing amphibole
Fe oxyhydroxide	<0.5	<0.01	Anhedral	MET	
Carbonate(?)	<1	<0.8	Subhedral	?	

STRUCTURAL COMMENTS: High-T structure: well developed foliation (apparent attitude 270/50) defined by elongate amphibole grains, some of them representing porphyroclasts, and plagioclase ribbons with mosaic-like grains. Plagioclase shows some marginal recrystallization. Low-T structure: thin epidote veins with minor chlorite and Fe oxyhydroxide crosscut all other structures. The veins preferentially follow boundaries between plagioclase grains and cleavage planes in amphibole. Some cataclastic bands composed of dark brown, fine-grained material. Static sericitization of plagioclase.

173-1067A-23R-4 (Piece 1, 1-4 cm)**No. 69**

OBSERVER: ABE, BEA, HOP, FRO, SKE

ROCK NAME: Amphibolite.

GRAIN SIZE: Medium-grained.

TEXTURE: Preferred orientation of elongate amphibole and ribbons of plagioclase (foliated), to inequigranular with fine-grained matrix (cataclastic).

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase An ₃₅	40	<1-3	Subhedral to anhedral	IG/MET	Turbid, variably strained, recrystallized into neoblastic albite+epidote,
Amphibole	40	<1-4	Subhedral to anhedral	MET	Tabular, poikilitic, green-brown to blue-green hornblende
Apatite	<2	<0.4	Subhedral to euhedral	IG	
Pyrrhotite	~0.1	<0.1	Anhedral	IG(?) MET(?)	
Ilmenite	<2	<0.7	Anhedral	IG(?) MET(?)	
Sphene	<1	<0.2	Subhedral to euhedral	IG	
Zircon	<1	<0.05	Subhedral	IG(?)	
Epidote	10	<0.4	Anhedral	MET/VEIN	See comments below
Chlorite	2	<0.7	Anhedral	MET/VEIN	Partially replacing amphibole
Calcite	<1	<2	Anhedral	VEIN	Partially replacing plagioclase

STRUCTURAL COMMENTS: High-T structure: foliation defined by elongated amphiboles and ribbons of plagioclase. Foliation oriented 270/55 (apparent dip). Plagioclase dynamically recrystallized; some plagioclase grains show core-mantle structure and pressure shadow of recrystallized small grains (0.05-0.1 mm). Low-T structure: 0.5 cm wide cataclastic zone, sub-parallel to the foliation in the amphibolite, shows concentration in plagioclase/epidote/sphene/zircon, and comparative depletion in amphibole relative to adjacent amphibolite. In this zone, granular epidote+albite mantles larger plagioclase and amphibole grains. Another similar zone with apparent horizontal orientation (cross-cutting the amphibolite foliation) is located in the upper third of the thin section.

Site 1067

173-1067A-23R-5 (Piece 4, 33-36 cm)

No. 71

OBSERVER: GAR

ROCK NAME: Amphibole-bearing anorthosite.

GRAIN SIZE: Medium-grained.

TEXTURE: Inequigranular, with preferred orientation of amphibole.

MINERALOGY:

NAME	MODE (%)	SIZE (mm)	SHAPE	IG/MET/VEIN	COMMENTS
Plagioclase	80	0.1-10	Subhedral	IG/MET	Fractured, some with undulatory extinction, An ₁₀ (?) or An ₃₀
Amphibole	10	0.5-2	Anhedral	MET	Blue-green to dark green
Apatite	1	<0.02	Euhedral	IG	
Chlorite	2	<1	Platy	MET	Green
Sericite	2	<0.2	Flaky	MET	Replacing plagioclase
Epidote	2	<1	Granular	MET	Replacing plagioclase
Ilmenite	<1	0.5	Granular	MET	Filling fractures and partially replacing hematite

STRUCTURAL COMMENTS: High-T structure: amphibole-rich, lenticular patches define (apparent) vertical foliation. Individual amphibole grains are oriented parallel to this foliation. Low-T structure: Undulatory extinction and kink bands in plagioclase. Pervasive replacement of amphiboles by chlorite along cleavage planes. Shallow inclined anastomosing network of veins containing epidote and chlorite. Vein (apparent attitude 270/15) filled with (1) plagioclase growing in optical continuity with wall rock plagioclase, and (2) epidote filling the center of the vein. Static sericitization of plagioclase.

COMMENTS: Subhedral equigranular texture of plagioclase is probably a relict igneous texture. Thin cataclastic zones are present. Small fractures are filled with epidote whereas larger fractures are filled with both epidote and plagioclase. Fractures have no apparent preferred orientation.