

PETROGRAPHY OF POLISHED SECTIONS (n=18) FROM THE TURNAGAIN ULTRAMAFIC INTRUSION

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1) DDH04-48-8 Phlogopite clinopyroxenite

Description: massive granular clinopyroxene with minor interstitial olive-green hornblende at the left edge of the section is intergrown with coarse, strongly kinked phlogopite and large masses of deformed serpentine in the center and left side of the section. Fine-grained anhedral magnetite and traces of sulphides (pyrrhotite-pentlandite-chalcopyrite) are disseminated throughout. Secondary magnetite occurs in veins in serpentine. The serpentine is probably an alteration product of a primary oikocrystic Mg,Fe-silicate (olivine) and is overprinted by euhedral metamorphic tremolite crystals, which also rim primary hornblende. Phlogopite is partially replaced by chlorite. Sulphides are a late addition and not primary: chalcopyrite is squeezed into cracks in massive clinopyroxene and interstitial to amphibole and phlogopite. Pyrite forms euhedral crystals surrounding and intergrown with tremolite in serpentine, where it encloses magnetite grains and anhedral chalcopyrite. Trace millerite was found intergrown with pyrite and chalcopyrite.

Diopside (55%) fine- to medium-grained anhedral, medium relief, almost colourless grains in semi-massive to massive granoblastic masses, intergrown with altered phlogopite, hornblende and magnetite

Hornblende (1%) fine- to medium-grained green, pleochroic anhedral interstitial to pyroxene or serpentine

Phlogopite (9%) medium- to coarse-grained, anhedral, strongly kinked, pale orange, intergrown with serpentine and clinopyroxene

Serpentine (25%) colourless, extremely fine-grained fibrous to micaceous masses, veined by secondary magnetite

Tremolite (3%) fine-grained, euhedral elongate crystals overprinting serpentine and rimming anhedral hornblende remnants

Chlorite (3%) i) green pleochroic micaceous masses filling cracks in massive clinopyroxenite; ii) colourless, replacing phlogopite

Titanite (trace) very fine-grained anhedral grains in trails in altered phlogopite

Magnetite (2%) i) fine-grained subhedral to anhedral isometric grains intergrown with silicates; ii) very fine-grained secondary magnetite fills veins in serpentine

Ilmenite (trace) very fine-grained anhedral, pinkish-grey reflectance, lamellae intergrown with magnetite

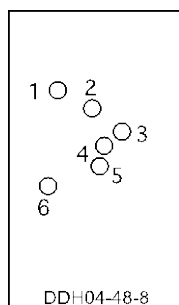
Pyrite (1%) fine-grained, subhedral to euhedral cubes in aggregates surrounding tremolite crystals in serpentine, enclosing chalcopyrite and magnetite

Chalcopyrite (trace) fine-grained anhedral intergrown with pyrite and with sheet silicates and amphibole

Millerite (trace) bright creamy pale yellow-reflecting, anisotropic, intergrown with pyrite and chalcopyrite

Sphalerite (trace) fine-grained euhedral inclusion in chalcopyrite intergrown with millerite

Location and description of areas analyzed by electron microprobe



1) fine-grained pyrite and chalcopyrite intergrown with tremolite (overgrowing green hornblende) in serpentine with magnetite; chlorite replacing phlogopite

2) magnetite rimming pyrite-millerite-chalcopyrite-sphalerite patch interstitial to serpentine with euhedral tremolite (trace remnant hornblende), secondary magnetite

3) coarse kinked ± chlorite-altered phlogopite intergrown with magnetite, pyrite, chalcopyrite

4) pyrite aggregate intergrown with anhedral chalcopyrite and granular magnetite in serpentine with tremolite, magnetite

5) hornblende remnants overgrown by tremolite in serpentine with secondary magnetite; chlorite pseudomorphs after phlogopite at edge of circle

6) green chlorite veining clinopyroxene

2) DDH04-58-5

Clinopyroxenite dunite

Description: massive clinopyroxenite consisting of granoblastic diopside with disseminated magnetite borders on highly serpentinized dunite with minor interstitial phlogopite and rafts of clinopyroxenite. Remnants of intact olivine are surrounded by large areas of serpentine with very fine-grained secondary magnetite in fractures and overprinted by talc or metamorphic diopside \pm carbonate. Primary phlogopite has recrystallized into aggregates of more fine-grained phlogopite intergrown with carbonate.

Diopside (45%) fine- to medium-grained anhedral, medium relief, almost colourless grains in massive granoblastic masses, intergrown with \pm serpentine-altered olivine

Olivine (3%) medium-grained, colourless, fractured, anhedral remnants in serpentine

Phlogopite (1%) fine-grained subhedral recrystallized primary phlogopite interstitial to serpentinized olivine, partially altered

Serpentine (45%) colourless, extremely fine-grained fibrous to micaceous masses, veined by secondary magnetite (chrysotile grading into antigorite)

Talc (trace) very fine-grained patches overprinting serpentine and filling veinlets

Diopside 2 (trace) very fine-grained acicular aggregates forming brownish, medium relief patches overprinting serpentine

Calcite (trace) very fine-grained interstitial to recrystallized phlogopite and intergrown with talc overprinting serpentine

Cr-magnetite (trace) very fine-grained euhedral grains in olivine and clinopyroxene

Magnetite 2 (5%) very fine-grained secondary magnetite fills abundant veins in serpentine and olivine; overgrows primary magnetite when exposed to alteration

Pyrite (trace) rare, very fine-grained, anhedral, intergrown with chalcopyrite; one euhedral porphyroblast with chalcopyrite, pentlandite and magnetite inclusions in serpentine

Chalcopyrite (trace) very fine-grained, anhedral, intergrown with pyrite in cracks and on grain boundaries

Siegenite $[(\text{Ni}, \text{Co})_3\text{S}_4]$ (trace) very fine-grained white square grain associated with chalcopyrite at edge of section; many creamy-white pin prick inclusions in serpentine

Pentlandite (trace) fine-grained, anhedral, pinkish-cream, intergrown with chalcopyrite in pyrite

Location and description of areas analyzed by electron microprobe

1) small white cubes of siegenite associated with chalcopyrite and magnetite in serpentine surrounded by clinopyroxene

2) more siegenite cubes with magnetite in serpentine and with chalcopyrite and magnetite in cracks

3) creamy white specks in magnetite in serpentine adjacent to clinopyroxene

4) olivine remnants veined by serpentine-magnetite, chalcopyrite in clinopyroxene

5) deformed phlogopite with interstitial carbonate and magnetite, with serpentine and clinopyroxene

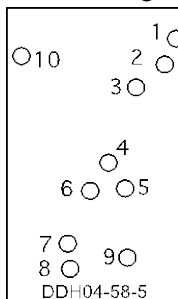
6) olivine remnants rimmed by serpentine-magnetite, small euhedral chromite-magnetite in clinopyroxene

7) brownish medium relief patches overgrowing serpentine: diopside

8) pyrite porphyroblast with chalcopyrite-pentlandite-siegenite and magnetite inclusions

9) talc-carbonate patches overgrowing serpentine and same in veinlet

10) chalcopyrite-pyrite-magnetite droplet in serpentine veined by secondary magnetite and overprinted by diopside



3) DDH05-83-1

Clinopyroxenite with massive pyrrhotite vein

Description: massive pyrrhotite (vein?) bordering clinopyroxenite consisting of fine-grained granoblastic diopside intergrown with a few patches of serpentine (formerly olivine?) and minor interstitial olive hornblende, fine-grained red biotite, trace chlorite, magnetite and abundant pyrrhotite blebs. The pyroxene is strongly textured and appears "dirty" and mottled due to parallel exsolutions and alteration. The pyrrhotite blebs in the pyroxenite are intergrown with very, very fine-grained acicular tremolite that has developed on grain boundaries, giving them a fuzzy appearance around the edges. Very fine-grained chalcopyrite and secondary magnetite may be intergrown with pyrrhotite. Massive pyrrhotite shows deformation lamellae and contains inclusions of gangue (phlogopite, amphibole, carbonate), fine-grained primary magnetite, anhedral chalcopyrite and tiny cream coloured cobaltite and white Pd-melonite, which are typically associated with magnetite or gangue inclusions.

Diopside (45%) fine- to medium-grained anhedral, medium relief, almost colourless grains in massive granoblastic masses, intergrown with \pm serpentine-altered olivine

Hornblende (trace) fine-grained, olive pleochroic, anhedral interstitial to clinopyroxene

Phlogopite (1%) fine-grained tan to red-brown, partially chloritized anhedral interstitial to clinopyroxene and as anhedral inclusions in pyrrhotite

Serpentine (3%) colourless, extremely fine-grained fibrous to micaceous masses interstitial to clinopyroxene and possibly intergrown with edges of pyrrhotite

Chlorite (trace) fine-grained green pleochroic intergrown with clinopyroxene (probably replacing phlogopite)

Magnetite (trace) fine-grained euhedral to subhedral isometric grains in massive pyrrhotite; finer grained inclusions in clinopyroxene

Goethite (trace) very fine-grained alteration in gangue inclusions in pyrrhotite, bluish-grey reflectance

Carbonate (trace) as fine-grained elongate anhedral inclusion in massive pyrrhotite

Pyrite (trace) fine-grained euhedral aggregates (secondary) in veins in massive pyrrhotite

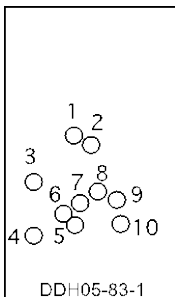
Pyrrhotite (50%) massive deformed in vein and as blebs in clinopyroxenite

Chalcopyrite (trace) fine-grained anhedral intergrown with pyrrhotite

Cobaltite (trace) very fine-grained isometric creamy-white grains in massive pyrrhotite

Pd-melonite [(Ni,Pd,Co)Te₂] (trace) extremely small bright white specks associated with magnetite in massive pyrrhotite

Location and description of areas analyzed by electron microprobe



1) clinopyroxene intergrown with olive hornblende and pyrrhotite blebs

2) phlogopite (with secondary magnetite) and chlorite intergrown with clinopyroxene and pyrrhotite blebs

3) creamy white isometric grain in pyrrhotite close to magnetite-gangue inclusion (not found)

4) secondary pyrite in vein in massive pyrrhotite

5) creamy white isometric Pd-melonite between gangue inclusion with magnetite in pyrrhotite

6) tiny white speck of Pd-melonite at edge of pyrrhotite in gangue inclusion with magnetite

7) creamy white isometric grain of cobaltite close to edge of massive pyrrhotite, with chalcopyrite and gangue

8) pyrrhotite intergrown with chalcopyrite and clinopyroxene with magnetite inclusions

9) extremely thin Pd-melonite inclusions in pyrrhotite (pentlandite? at edge of pyrrhotite)

10) bright white speck (Pd-melonite) attached to tip of magnetite inclusion in pyrrhotite

4) DDH05-88-1

Massive clinopyroxenite with disseminated sulphides

Description: massive clinopyroxenite consisting of medium- to coarse-grained, mottled diopside intergrown with a few patches of green chlorite (formerly phlogopite), minor euhedral magnetite (surrounded by titanite alteration) and trace disseminated pyrrhotite-chalcopyrite-pentlandite blebs. Very fine-grained titanite grains occur in chlorite and euhedral tremolite overgrows clinopyroxene in chlorite. Sulphide blebs are composite and consist of pyrrhotite, chalcopyrite and pentlandite. In one case, a tiny white (Pd-Sb) inclusion was discovered in pyrrhotite and another pyrrhotite was rimmed and veined by very fine-grained sperrylite.

Diopside (96%) medium- to coarse-grained anhedral, medium relief, almost colourless grains massive, intergrown with chlorite

Chlorite (3%) fine-grained, green pleochroic, anhedral, interstitial to and mottling clinopyroxene

Tremolite (trace) fine-grained, euhedral, overgrowing clinopyroxene at edge of chlorite patches

Titanite (trace) fine-grained, high relief, pale brown grains intergrown with magnetite and in chlorite

Calcite (trace) very fine-grained, anhedral, intergrown with sulphides

Magnetite (0.5%) fine-grained euhedral to subhedral isometric grains in clinopyroxene

Pentlandite (trace) fine-grained, cream reflectance, intergrown with pyrrhotite and chalcopyrite

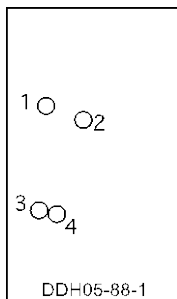
Pyrrhotite (trace) fine-grained, anhedral, intergrown with chalcopyrite and pentlandite in clinopyroxene

Chalcopyrite (trace) fine-grained, anhedral, yellow reflectance, intergrown with pyrrhotite

unidentified PdAgSbBiTe (trace) extremely fine-grained, isometric, creamy white grain in pyrrhotite

Sperrylite (trace) very fine-grained, white-reflecting grains lining and in pyrrhotite

Location and description of areas analyzed by electron microprobe



- 1) euhedral tremolite overgrowing chlorite and clinopyroxene in chlorite patch with titanite
- 2) two large magnetite grains intergrown with titanite and chlorite in chlorite-mottled clinopyroxene
- 3) pyrrhotite-pentlandite-chalcopyrite droplet with tiny white inclusion (PdAgSbBiTe) in clinopyroxene
- 4) very fine-grained white sperrylite lining and veining pyrrhotite in clinopyroxene with chalcopyrite inclusions

5) DDH05-88-104

Massive clinopyroxenite with disseminated sulphides

Description: massive clinopyroxenite consisting of medium-grained granoblastic diopside, intergrown with minor olive-green hornblende, medium-grained magnetite and fine-grained pyrrhotite-chalcopyrite blebs. The assemblage is cut by a sheared vein filled with strongly deformed carbonate, intense green Na-amphibole, fine-grained olive biotite and lace-like pyrite aggregates. Hornblende is abundant and in some cases very coarse in the vicinity of the vein. It is rimmed first by colourless tremolite and then by intense blue green Na-amphibole, all replacing clinopyroxene. The alkali-amphibole also infiltrates the clinopyroxenite on grain boundaries. Sulphide blebs in these areas show orange to tan tarnished chalcopyrite intergrown with pyrrhotite. Pyrrhotite also contains euhedral porous (secondary?) pyrite and flames of white marcasite (alteration). A second form of pyrite occurs in the form of "dirty" beige colloform patches in strongly altered pyrrhotite. Magnetite in the pyroxenite forms fairly coarse subhedral to anhedral grains with thin exsolution lamellae that have been replaced by titanite. It is intergrown with anhedral ilmenite and both are rimmed and partially replaced by titanite.

Diopside (85%) medium- to coarse-grained anhedral, medium relief, almost colourless grains massive, intergrown with hornblende

Hornblende (5%) fine- to coarse-grained anhedral to euhedral dark olive-green to brown pleochroic, intergrown with clinopyroxene

Tremolite (trace) fine-grained colourless overgrowths on hornblende in vicinity of carbonate vein

Na-amphibole (2%) intense blue-green elongate deformed crystals in vein, rimming and replacing hornblende adjacent to vein

Biotite (1%) fine-grained pale olive-green pleochroic, anhedral, in aggregates in vein

Titanite (trace) fine-grained, high relief, pale brown, rimming and replacing ilmenite and magnetite

Carbonate (6%) medium-grained anhedral, strongly deformed (sheared) in vein; also pseudomorph, replacing magnetite in clinopyroxenite

Magnetite (2%) medium-grained euhedral to subhedral isometric grains with weathered exsolution lamellae in clinopyroxene

Ilmenite (trace) fine-grained anhedral intergrown with magnetite

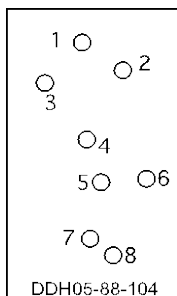
Pyrrhotite (4%) fine-grained anhedral, intergrown with chalcopyrite and pentlandite in clinopyroxene

Chalcopyrite (trace) fine-grained anhedral, yellow-orange (?) reflectance, intergrown with pyrrhotite

Pyrite (1-2%) fine-grained, cream-reflecting aggregates and lace-like impregnations of amphibole and carbonate in vein and in clinopyroxenite; also fine-grained porous overprinting pyrrhotite in clinopyroxenite

Marcasite (trace) very fine-grained white flames (anisotropic) in pyrrhotite

Location and description of areas analyzed by electron microprobe



- 1) pyrite and marcasite replacing pyrrhotite interstitial to clinopyroxene + green hornblende
- 2) two types of pyrite altering pyrrhotite with trace chalcopyrite in clinopyroxene
- 3) pyrrhotite blebs in unaltered clinopyroxene
- 4) + 5) pyrrhotite blebs with orange-brown chalcopyrite in clinopyroxene with green Na-amphibole on grain boundaries (more pronounced in 5)
- 6) carbonate replacing magnetite-ilmenite, green amphibole surrounding clinopyroxene
- 7) intense blue-green Na-amphibole with olive biotite, pyrite and carbonate in vein
- 8) edge of coarse hornblende rimmed by tremolite and Na-amphibole (\pm titanite?) adjacent to carbonate vein with olive biotite

6) DDH05-89-2

Clinopyroxenite with disseminated sulphides

Description: massive clinopyroxenite consisting of medium-grained granoblastic diopside with fine-grained, disseminated sulphide blebs and pockets of serpentine intergrown with coarse, slightly altered phlogopite and anhedral magnetite-ilmenite. The sulphide blebs consist of pyrrhotite-pentlandite-chalcopyrite±magnetite. Chalcopyrite (and rare sphalerite) has been remobilized into cracks and grain boundaries. Secondary magnetite occurs between sheets of altered phlogopite. A very bright white PGM (ungavaite?) occurs as very small grains attached to pyrrhotite-chalcopyrite blebs, but most of them do not reach the surface and could not be analyzed.

Diopside (79%) fine- to medium-grained, anhedral, medium relief, almost colourless grains in massive granoblastic masses, intergrown with ± serpentine-altered olivine

Hornblende (trace) medium-grained, anhedral green pleochroic, intergrown with serpentine and phlogopite

Phlogopite (4%) fine-grained, subhedral, recrystallized primary phlogopite interstitial to serpentinized olivine, partially altered

Serpentine (14%) colourless, extremely fine-grained fibrous to micaceous masses, overprinted by tremolite; grading from chrysotile to antigorite

Tremolite (trace) very fine-grained oriented crystals overprinting serpentine

Chlorite (trace) fine-grained, grey green, anhedral, in pockets in clinopyroxene and replacing phlogopite (colourless); also very fine-grained, colourless, anhedral, mottling clinopyroxene, also in titanite

Titanite (trace) very fine-grained, almost colourless, high relief grains in clinopyroxene and associated with magnetite

Magnetite (1%) fine-grained euhedral isometric grains in clinopyroxene and sulphides; ii) secondary anhedral magnetite infiltrates phlogopite and serpentine

Pyrrhotite (2%) very fine-grained, anhedral, with flames of pentlandite; intergrown with chalcopyrite and fine-grained magnetite

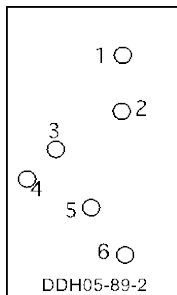
Pentlandite (trace) very fine-grained, anhedral, flames in pyrrhotite

Chalcopyrite (trace) very fine-grained, anhedral, intergrown with pyrrhotite

Sphalerite (trace) fine-grained, anhedral, red-brown translucent filling crack in clinopyroxene together with pyrrhotite

Ungavaite? [Pd₄Sb₃] (trace) extremely small, bright white-reflecting, euhedral isometric grain attached to pyrrhotite

Location and description of areas analyzed by electron microprobe



1) large pyrrhotite with flames of pentlandite and acicular inclusions of tremolite or serpentine bordering on coarse phlogopite

2) sphalerite, pyrrhotite and chalcopyrite in crack in clinopyroxene

3) extremely bright white-reflecting aggregates associated with pyrrhotite-chalcopyrite in clinopyroxene

4) extremely bright white square in gangue associated with pyrrhotite-chalcopyrite in clinopyroxene

5) antigorite with secondary magnetite bordering on phlogopite intergrown with primary magnetite

6) tiny white PdSb attached to pyrrhotite-pentlandite-chalcopyrite intergrown with magnetite and hornblende in serpentine

7) DDH05-101-1

Clinopyroxenite with serpentine patches hosting cobaltite

Description: massive clinopyroxenite consisting of medium-grained mottled diopside with fine-grained, disseminated sulphide blebs and anhedral magnetite, contains medium to large pockets of serpentine. Other pockets contain green chlorite, subhedral magnetite and titanite. Rare green hornblende and brown phlogopite remnants were found intergrown with serpentine. The serpentine patches show beginning metamorphic overprint by talc and/or tremolite and host many fine-grained euhedral bright white cobaltite grains up to 80 µm in diameter, some of which contain submicroscopic inclusions of sperrylite. The sulphide blebs are disseminated throughout the clinopyroxenite (but not in the serpentine) and consist predominantly of chalcopyrite intergrown with pyrrhotite and blocky pentlandite. Late veinlets contain secondary pyrite.

Diopside (68%) fine- to medium-grained, anhedral, medium relief, almost colourless, in massive granoblastic masses, mottled by chlorite and titanite

Hornblende (trace) medium-grained, anhedral green pleochroic, intergrown with serpentine

Serpentine (28%) colourless, extremely fine-grained fibrous to micaceous masses, overprinted by tremolite and talc; grading from chrysotile to antigorite; with secondary magnetite

Tremolite/Diopside 2 (trace) fine-grained, colourless, euhedral crystals with medium high interference colours, overprinting serpentine

Chlorite (3%) fine-grained, grey green, anhedral, in pockets in clinopyroxene together with fine granular titanite and anhedral magnetite; also very fine-grained, almost colourless, anhedral, mottling clinopyroxene

Titanite (trace) very fine-grained, almost colourless, high relief grains in chlorite and clinopyroxene

Carbonate (trace) very fine-grained, anhedral, intergrown with sulphides in clinopyroxene

Magnetite (1%) fine-grained, subhedral to anhedral, spongy grains in clinopyroxene; coarser, anhedral, with titanite-altered exsolution lamellae interstitial to serpentine pseudomorphs; ii) very fine-grained, secondary, anhedral magnetite in serpentine

Pyrrhotite (trace) very fine-grained, anhedral, with flames of pentlandite; intergrown with chalcopyrite and fine-grained magnetite

Pentlandite (trace) very fine-grained, anhedral, blocky grains intergrown with pyrrhotite and chalcopyrite

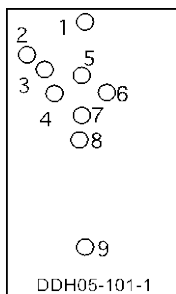
Chalcopyrite (trace) very fine-grained, anhedral, intergrown with pyrrhotite

Pyrite (trace) fine-grained, anhedral, in veins, rarely in small patches intergrown with serpentine.

Cobaltite (trace) very fine-grained (up to 80 µm), bright white-reflecting, euhedral isometric grains in serpentine patches

Sperrylite (trace) submicroscopic inclusion in cobaltite

Location and description of areas analyzed by electron microprobe



1) chalcopyrite intergrown with pyrrhotite, magnetite and anhedral pyrite in clinopyroxene

2) two white hexagonal cobaltite grains in serpentine with secondary magnetite

3) one white hexagonal cobaltite grain in serpentine with secondary magnetite and chalcopyrite

4) two white hexagonal cobaltite grains in serpentine with pyrite in vein

5) fine-grained cobaltite associated with magnetite and pentlandite in serpentine with secondary pyrite

6) cobaltite intergrown with magnetite, pyrrhotite and chalcopyrite in serpentine with talc

7) tremolite or talc overprinting serpentine with secondary magnetite

8) anhedral green hornblende intergrown with serpentine, overprinted by fine-grained colourless aggregates

9) chalcopyrite-pyrrhotite-pentlandite intergrown with carbonate in clinopyroxene

8) DDH05-101-5 Chlorite-carbonate-pyrrhotite vein in clinopyroxenite

Description: clinopyroxenite at the top of the section is being cut by a vein of semi-massive chlorite, intergrown with coarse carbonate, anhedral titanite and sulphides. The latter consist of dominantly medium-grained anhedral pyrrhotite intergrown with chalcopyrite, minor magnetite and pyrite. Very fine-grained cream-coloured euhedral cobaltite grains were discovered in coarse pyrrhotite. The sulphides have been mobilized into cracks of the clinopyroxene. The chlorite-carbonate assemblage contains minor olive biotite and is overprinted by parallel aligned elongate crystals of tremolite that nucleate around carbonate.

Diopside (22%) medium-grained anhedral, greenish- to brownish-tinged medium relief, semi-massive remnants, mottled by chlorite and titanite

Chlorite (38%) fine-grained, green- to straw-coloured pleochroic, semi-massive, infiltrating clinopyroxenite and intergrown with carbonate, titanite and sulphides.

Biotite (trace) fine-grained olive-green anhedral inclusions in carbonate

Tremolite (4%) fine-grained elongate bladed parallel crystals overprinting chlorite and carbonate

Titanite (6%) fine- to medium-grained, almost colourless, high relief, poikilitic, anhedral grains in chlorite and carbonate

Carbonate (18%) very fine-grained, anhedral, intergrown with sulphides in clinopyroxene

Magnetite (trace) fine-grained, subhedral to anhedral, spongy grains in clinopyroxene; coarser, anhedral with titanite-altered exsolution lamellae interstitial to serpentine pseudomorphs; ii) very fine-grained, secondary, anhedral magnetite in serpentine

Pyrrhotite (11%) very fine-grained, anhedral grains with flames of pentlandite; intergrown with chalcopyrite and fine-grained magnetite

Chalcopyrite (1%) fine-grained, anhedral, intergrown with pyrrhotite; in cracks and veins

Pyrite (trace) fine-grained, anhedral, in veins; euhedral to subhedral crystals intergrown with chalcopyrite-pyrrhotite

Cobaltite (trace) very fine-grained, trapezoidal, cream-coloured grains in pyrrhotite

Location and description of areas analyzed by electron microprobe

1 ○	1) pyrite-chalcopyrite-pyrrhotite filling veinlets in clinopyroxene
2 ○	2) magnetite aggregates intergrown with pyrrhotite-chalcopyrite and chlorite-carbonate
3 ○	3) three tiny cobaltite inclusions on grain boundary in pyrrhotite
4 ○	4) pyrite porphyroblasts in pyrrhotite-chalcopyrite intergrown with coarse titanite, chlorite and carbonate
5 ○	5) tremolite overprinting chlorite-carbonate with pyrrhotite-chalcopyrite, intergrown with titanite
6 ○	6) olive biotite and tremolite blades in carbonate; pyrrhotite intergrown with chlorite

DDH05-101-5

9) DDH05-102-7 Clinopyroxenite with altered magnetite

Description: massive clinopyroxenite with minor interstitial green hornblende, brown biotite, altered magnetite, and sulphide droplets. A few patches contain olive-green biotite (\pm carbonate) that is overprinting green chlorite and titanite. Magnetite is more or less strongly altered and partially replaced by titanite, secondary pyrrhotite or pyrite \pm chalcopyrite. Sulphide blebs and droplets consisting of pyrrhotite-chalcopyrite and flame pentlandite occur in and on grain boundaries of clinopyroxene.

Diopside (94%) medium-grained anhedral, greenish- to brownish-tinged, medium relief, massive, with minor interstitial amphibole, magnetite and biotite

Chlorite (trace) fine-grained, green pleochroic, almost completely overprinted by green biotite

Biotite₂ (2%) fine-grained, olive-green anhedral, replacing chlorite intergrown with carbonate

Hornblende (1%) fine-grained, anhedral, olive-green pleochroic, interstitial to clinopyroxene

Biotite 1 (trace) rare, brown, subhedral, intergrown with hornblende interstitial to clinopyroxene

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in chlorite/biotite and clinopyroxene, also replacing and rimming altered magnetite

Calcite (trace) fine-grained, anhedral, intergrown with chlorite/biotite

Magnetite (2%) fine- to medium-grained, anhedral grains with dissolved exsolution lamellae; partially replaced by titanite, secondary pyrrhotite or pyrite \pm chalcopyrite, interstitial to clinopyroxene and intergrown with biotite

Pyrrhotite (1%) very fine-grained, anhedral, as droplets and blebby grains in clinopyroxene; with flames of pentlandite; intergrown with chalcopyrite

Pentlandite (trace) very fine-grained flames in pyrrhotite

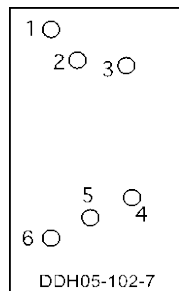
Chalcopyrite (trace) fine-grained, anhedral, intergrown with pyrrhotite; also mobilized into cracks of clinopyroxene

Pyrite (1%) fine-grained, subhedral, intergrown with chalcopyrite, replacing magnetite

Sphalerite (trace) very fine-grained, inclusions in chalcopyrite

unknown (Pd,Pt)₅(Sb,As)₃ or Ungavaite? (trace) submicroscopic grain attached to pyrrhotite

Location and description of areas analyzed by electron microprobe



1) altered magnetite intergrown with clinopyroxene, green biotite, pyrrhotite-pentlandite and pyrite-chalcopyrite

2) pyrrhotite-pentlandite-chalcopyrite with trace sphalerite(?) interstitial to clinopyroxene with minor chlorite

3) biotite 1 intergrown with hornblende and chlorite interstitial to clinopyroxene with sulphide (pyrrhotite-chalcopyrite) droplets

4) green biotite overprinting chlorite patch with fine-grained titanite and anhedral carbonate, clinopyroxene

5) pyrrhotite and titanite replacing altered magnetite, interstitial to clinopyroxene

6) pyrite-chalcopyrite intergrown with secondary magnetite in green biotite-chlorite patch

10) DDH05-102-12 Clinopyroxenite with net-textured pyrrhotite

Description: massive clinopyroxenite with minor interstitial chlorite (formerly phlogopite) and pale green hornblende rimmed by colourless tremolite, which also forms euhedral aggregates in the center of the section. The clinopyroxene is impregnated with abundant blebby to net-textured pyrrhotite, intergrown with trace chalcopyrite, pentlandite, pyrite and sphalerite. Any pre-existing magnetite has been completely replaced by titanite.

Diopside (87%) medium-grained, anhedral, greenish- to brownish-tinged, medium relief, massive, with minor interstitial amphibole, magnetite and biotite

Chlorite (1%) fine-grained to medium-grained, pale green pleochroic, probably replacing primary phlogopite

Hornblende (1%) fine-grained, anhedral, olive-green pleochroic, interstitial to clinopyroxene, rimmed by tremolite

Tremolite (3%) colourless rims on hornblende and medium-grained euhedral crystals in aggregates in clinopyroxene

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in chlorite and clinopyroxene

Carbonate (trace) fine-grained, anhedral, intergrown with clinopyroxene and sulphides

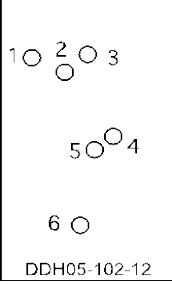
Pyrrhotite (9%) fine- to medium-grained, anhedral, as droplets and blebby grains in clinopyroxene and as coarser net-textured masses surrounding clinopyroxene in top left portion of section; with flames of pentlandite?; intergrown with chalcopyrite

Pentlandite (trace) very fine-grained, bright cream flames and specks in pyrrhotite

Chalcopyrite (trace) fine-grained, anhedral, tarnished tan, intergrown with pyrrhotite; also mobilized into cracks of clinopyroxene

Pyrite (trace) fine-grained, subhedral, intergrown with pyrrhotite

Location and description of areas analyzed by electron microprobe

	<p>1) net-textured pyrrhotite with creamy pentlandite and tan tarnished chalcopyrite surrounding clinopyroxene</p> <p>2) very fine-grained creamy white specks (pentlandite) in pyrrhotite surrounding clinopyroxene</p> <p>3) tan-tarnished chalcopyrite in pyrrhotite with creamy white specks and flames</p> <p>4) slightly altered pyrrhotite with creamy white specks (1 µm or less) intergrown with chlorite and tremolite</p> <p>5) green hornblende rimmed by tremolite intergrown with clinopyroxene and pyrrhotite</p> <p>6) medium phlogopite-chlorite intergrown with clinopyroxene, titanite, and pyrrhotite-chalcopyrite</p>
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11) DDH06-149-2 Clinopyroxenite with serpentinite patches

Description: granoblastic clinopyroxenite with minor interstitial green chlorite and fine-grained magnetite and very fine-grained chalcopyrite inclusions is intergrown with several large serpentinite patches, some of which still contain remnants of olivine and rare phlogopite, as well as abundant secondary magnetite and very fine-grained white sperrylite. Trace chalcopyrite occurs in chlorite or tremolite or serpentine on grain boundaries of clinopyroxene. A bornite-chalcopyrite-sphalerite droplet was discovered in serpentine as well as abundant very fine-grained sperrylite. Primary anhedral magnetite in serpentine is overgrown by secondary magnetite. Very fine-grained acicular tremolite or antigorite occurs on grain boundaries of clinopyroxene and coarser euhedral tremolite and/or cummingtonite overprints serpentine.

Diopside (66%) medium-grained anhedral, greenish- to brownish-tinged, medium relief, massive with minor interstitial amphibole, magnetite and biotite

Chlorite (1%) fine-grained to medium-grained, pale green pleochroic, interstitial to clinopyroxene and on grain boundaries

Tremolite (trace) very fine-grained colourless acicular aggregates rimming clinopyroxene; coarser, euhedral to subhedral overprinting serpentine

Olivine (4%) medium-grained, colourless, anhedral remnants with opaque fingerprint-like exsolutions on parallel "cleavage" planes; in serpentine

Phlogopite (trace) fine-grained subhedral pale brown micaceous grains in serpentine

Serpentine (26%) colourless, extremely fine-grained fibrous to micaceous masses, veined by secondary magnetite (chrysotile grading into antigorite)

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in chlorite and clinopyroxene

Carbonate (trace) rare, anhedral, interstitial to clinopyroxene

Magnetite (3%) i) fine-grained, subhedral to anhedral grains in clinopyroxenite; ii) abundant, very fine-grained trails in serpentine and fuzzy overgrowth on primary magnetite

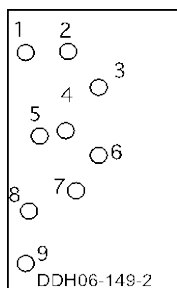
Chalcopyrite (trace) very fine-grained, anhedral, golden reflectance, specks in clinopyroxene; more abundant as intergrowths with chlorite on grain boundaries of clinopyroxene

Pyrite (trace) fine-grained, subhedral, intergrown with secondary magnetite \pm chalcopyrite in serpentine

Siegenite (trace) very fine-grained ($\leq 60 \mu\text{m}$), euhedral to subhedral, bright white, smooth grains in serpentine

Millerite (trace) very fine-grained ($2\text{-}5 \mu\text{m}$), tiny anhedral, light yellow specks in serpentine

Location and description of areas analyzed by electron microprobe



1) bornite-chalcopyrite droplet and sphalerite with secondary magnetite and siegenite in serpentine

2) olivine remnant with magnetite on cleavage planes and surrounded by rusty brown stilpnomelane (Fe-rich phyllosilicate)? in serpentine

3) phlogopite intergrown with secondary magnetite in serpentine with tiny siegenite

4) acicular, fuzzy tremolite and/or chlorite/antigorite rimming clinopyroxene against serpentine with small siegenite and secondary magnetite

5) euhedral sperrylite in serpentine with antigorite aggregates at rim; secondary magnetite

6) siegenite intergrown with secondary magnetite interstitial to clinopyroxene with fuzzy antigorite on grain boundaries

7) anhedral chalcopyrite with siegenite, intergrown with green chlorite, interstitial to clinopyroxene

8) chalcopyrite intergrown with acicular antigorite or tremolite, with secondary magnetite and pyrite-chalcopyrite in clinopyroxene

9) tremolite patch overgrowing serpentine with secondary magnetite-pyrite-chalcopyrite

12) DDH06-161-3 Deformed pyrrhotite-amphibole-talc with molybdenite and PdSb(Te)

Description: strongly deformed assemblage consisting of semi-massive pyrrhotite intergrown with fibrous serpentine, amphibole (pale green Mg-hornblende remnants overgrown by tremolite), and talc; all replacing a primary ultramafic assemblage whose grain boundaries are still visible in some areas. Pyrrhotite contains medium-sized magnetite poikiloblasts and extremely fine-grained cream-coloured specks of Co-rich pentlandite and is intergrown with chalcopyrite, which contains very fine-grained rounded white inclusions of $\text{Pd}(\text{Sb},\text{Te})_2$, sudburyite [PdSb] and kinked banded molybdenite.

Mg-hornblende (4%) fine- to medium-grained, anhedral, pale green remnants overgrown by colourless tremolite

Talc (28%) fairly coarse, colourless, poikilitic intergrown with amphiboles

Tremolite (28%) fine-grained, colourless, bladed aggregates rimming hornblende remnants

Serpentine (2%) colourless, extremely fine-grained, fibrous, in veins and intergrown with pyrrhotite

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in chlorite and clinopyroxene

Magnetite (3%) fine-grained, subhedral to euhedral, poikilitic grains in pyrrhotite

Pyrrhotite (30%) semi-massive, intergrown with Mg-silicates, chalcopyrite and magnetite

Chalcopyrite (4%) fine-grained anhedral, yellow-reflecting, intergrown with pyrrhotite

Pentlandite (trace) extremely fine-grained, cream-coloured specks in pyrrhotite

Molybdenite (trace) fine-grained, light grey, strongly anisotropic, kinked ribbons and micaceous grains in chalcopyrite and gangue

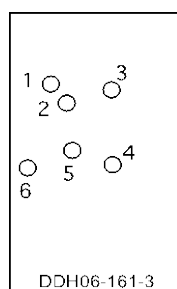
Sphalerite (trace) fine-grained, medium-grey inclusion in chalcopyrite

unknown [$\text{Pd},\text{Ni}(\text{Sb},\text{Te})_2$]* (trace) very fine-grained ($\leq 20 \mu\text{m}$) anhedral, smooth, rounded, bright white (isotropic) inclusions in chalcopyrite

Sudburyite [PdSb] (trace) very fine-grained ($7\mu\text{m}$), cream-coloured round inclusion in pyrrhotite

Sperrylite (trace) very fine-grained, white, anhedral inclusions in tremolite

Location and description of areas analyzed by electron microprobe



1) white PdSbTe in pyrrhotite with magnetite, chalcopyrite, molybdenite intergrown with talc/tremolite

2) two PdSbTe grains in pyrrhotite and round cream-coloured inclusion (sudburyite) in magnetite

3) kinked molybdenite band in pyrrhotite with chalcopyrite, magnetite, trace sphalerite and anhedral sperrylite in gangue

4) round sudburyite (cream, approximately $7 \mu\text{m}$ in diameter) in pyrrhotite with pentlandite speck and fibrous serpentine

5) molybdenite with chalcopyrite in gangue

6) fine-grained pentlandite specks in pyrrhotite with amphiboles (hornblende + tremolite)

* possibly a Sb-rich and Bi-free variant of testibiopalladite [$\text{Pd}(\text{Sb},\text{Bi})\text{Te}$]

13) DDH07-207-7 Amphibole-biotite clinopyroxenite with net-textured pyrrhotite

Description: granular clinopyroxene is intergrown with abundant coarse- to medium-grained, partly altered and deformed red-brown biotite and olive-green hornblende, which is overgrown by colourless euhedral tremolite and surrounded by net-textured sulphides (mostly pyrrhotite \pm chalcopyrite). The upper portion of the section contains more amphibole and pyrrhotite and less clinopyroxene. A round amygdale (approximately 4-5mm in diameter) in the center of the section is filled with phlogopite + talc + carbonate + pyrrhotite.

Diopside (48%) medium-grained anhedral, almost colourless, with oriented exsolutions of opaque flakes, medium relief, surrounded by pyrrhotite

Mg-hornblende (7%) fine- to medium-grained, euhedral to anhedral, pale olive-green to brown, overgrown by colourless tremolite

Tremolite (20%) fine- to medium-grained, colourless, euhedral, overgrowing hornblende and as rhomb-shaped to bladed crystals in top portion of section

Phlogopite (12%) medium- to coarse-grained, subhedral, kinked, pale brown pleochroic "books" intergrown with clinopyroxene, amphibole, pyrrhotite and partly altered by chlorite

Talc? (1%) fine-grained, anhedral, associated with secondary phlogopite and carbonate, filling amygdale

Chlorite (trace) fine-grained, anhedral, colourless with blue-violet interference colours; replacing phlogopite

Carbonate (trace) colourless, anhedral, interstitial to amphibole and in amygdale

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in amphibole and rimming magnetite-ilmenite

Magnetite (trace) fine-grained, anhedral remnants with ilmenite lamellae, both rimmed and replaced by titanite

Pyrrhotite (12%) anhedral, blebby to net-textured, surrounding clinopyroxene, amphibole, phlogopite

Chalcopyrite (trace) fine-grained, anhedral, yellow to orangy-brown tarnished, intergrown with pyrrhotite

Location and description of areas analyzed by electron microprobe

- | | |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 ○ | 1) euhedral tremolite with pyrrhotite-chalcopyrite in crack overprinting chlorite-altered phlogopite intergrown with pyrrhotite-chalcopyrite and trace titanite |
| ○ 2 | 2) pale green hornblende rimmed by clear tremolite(?) intergrown with phlogopite, clinopyroxene, pyrrhotite-chalcopyrite and trace titanite |
| ○ 3 | 3) coarse clinopyroxene and minor hornblende intergrown with pyrrhotite-chalcopyrite |
| 4 ○ | 4) fuzzy talc/serpentine and pale phlogopite with titanite and carbonate intergrown with pyrrhotite-chalcopyrite in round amygdale |
| 5 ○ | 5) euhedral green hornblende intergrown with anhedral clinopyroxene, brown phlogopite, and chalcopyrite-pyrrhotite |
| ○ 6 | 6) well-preserved magnetite with ilmenite-titanite lamellae intergrown with coarse phlogopite and granular clinopyroxene |

14) DDH07-207-11 Clinopyroxenite with pyrrhotite and chlorite

Description: massive to granular granoblastic clinopyroxene with trace olive-green hornblende, intergrown with blebby to net-textured pyrrhotite-magnetite-chalcopyrite and abundant green chlorite. Subhorizontal bands with euhedral tremolite aggregates intergrown with pyrrhotite-chalcopyrite-magnetite occur in the clinopyroxenite. Pyrrhotite is slightly altered, anhedral and intergrown with poikilitic magnetite, fine-grained chalcopyrite and contains rare trace flame pentlandite (rare). Anhedral pyrite is rare. Magnetite appears to be part of the sulphide assemblage rather than a primary phase in the clinopyroxenite. Chlorite appears to partly replace earlier biotite or phlogopite.

Diopside (58%) fine- to medium-grained, rounded to subhedral, slightly greenish grains in granoblastic masses or dissociated by chlorite

Mg-hornblende (trace) fine-grained, anhedral, olive-green remnants intergrown with clinopyroxene and as blebby inclusions in clinopyroxene

Tremolite (10%) fine- to medium-grained, colourless, euhedral, overgrowing hornblende and as bladed aggregates in subhorizontal bands

Chlorite (25%) fine-grained anhedral, green with brown interference colours, interstitial to clinopyroxene

Carbonate (trace) colourless, anhedral, interstitial to amphibole and in round amygdale

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in amphibole and rimming magnetite-ilmenite

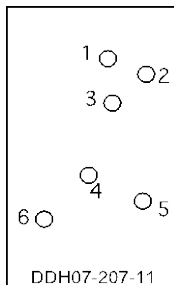
Magnetite (2%) fine-grained, anhedral to subhedral poikiloblasts in pyrrhotite

Pyrrhotite (5%) anhedral, blebby to net-textured, surrounding clinopyroxene, amphibole, phlogopite

Chalcopyrite (trace) fine-grained, anhedral, yellow to orangy-brown tarnished, intergrown with pyrrhotite

Pyrite (trace) rare subhedral to anhedral, cream-coloured inclusions in pyrrhotite

Location and description of areas analyzed by electron microprobe



- 1) subhedral pyrite intergrown with pyrrhotite-magnetite-chalcopyrite in clinopyroxene with interstitial chlorite
- 2) euhedral pyrite in pyrrhotite, intergrown with magnetite and chlorite
- 3) euhedral tremolite intergrown with pyrrhotite-magnetite and clinopyroxene
- 4) blebby pyrite-pyrrhotite-chalcopyrite-magnetite in clinopyroxene
- 5) hornblende inclusions in clinopyroxene
- 6) medium-grained, euhedral magnetite with chalcopyrite-pyrrhotite inclusions in pyrrhotite-chalcopyrite in chlorite with titanite and clinopyroxene

15) DDH07-211-1 Clinopyroxenite with biotite and chalcopyrite-pentlandite-millerite

Description: massive, fine- to medium-grained clinopyroxenite containing pockets and interstices filled with pale olive-green biotite and chalcopyrite-pentlandite-millerite, which also occur in cracks and veinlets. Rare, fine-grained, red-brown biotite can still be found as inclusions in clinopyroxene. The green biotite patches are overprinted by ragged epidote \pm titanite. The sulphide assemblage also contains very fine-grained euhedral to partly resorbed cobaltite-gersdorffite, nickeline, galena and submicroscopic tucckite $[\text{Ni}_9\text{Sb}_2\text{S}_8]$.

Diopside (87%) fine- to medium-grained, subhedral to euhedral, almost colourless, medium relief grains in granoblastic masses

Biotite (9%) fine-grained, anhedral, olive-green remnants intergrown with clinopyroxene and as blebby inclusions in clinopyroxene

Epidote (1%) yellow-green, fine-grained, anhedral ragged aggregates overprinting biotite

Mg-Chlorite (1%) fine-grained, colourless (with grey interference colours), anhedral, intergrown with epidote and biotite

Carbonate (trace) colourless, anhedral, interstitial to chalcopyrite

Titanite (trace) fine-grained, almost colourless, high relief, anhedral grains in biotite

Chalcopyrite (1.5%) fine-grained, anhedral, yellow-reflecting, interstitial to chalcopyrite and in cracks

Pentlandite (0.5 %) fine-grained, subhedral, rounded, dark cream coloured grains in chalcopyrite

Millerite (trace) fine-grained, anhedral, bright pale yellow grains in chalcopyrite

Cobaltite (trace) very fine-grained, euhedral, white rhombs in chalcopyrite; also as partly resorbed, high relief remnants in chalcopyrite

Nickeline (trace) pale copper-coloured anhedral inclusions associated with gersdorffite

Gersdorffite (trace) subhedral to euhedral, off-white, isometric grains in gangue or in chalcopyrite; also as spongy, anhedral, light grey blebs and rims in and around chalcopyrite

Tucckite $[\text{Ni}_9\text{Sb}_2\text{S}_8]$ (trace) submicroscopic (4 μm) inclusion in chalcopyrite

Location and description of areas analyzed by electron microprobe

1) yellow epidote, chlorite, titanite in olive biotite intergranular to clinopyroxene, veined by chalcopyrite

2) abundant yellow-green epidote overprinting biotite-chlorite patch with clinopyroxene at rim

3) tiny bright cream speck in pentlandite in chalcopyrite with euhedral cobaltite at rim; in clinopyroxene

4) pentlandite in chalcopyrite rimmed by light grey spongy gersdorffite intergrown with titanite in biotite-chlorite patch

5) euhedral, off-white gersdorffite in clinopyroxene with chalcopyrite-pentlandite-millerite

6) carbonate intergrown with chalcopyrite, interstitial to clinopyroxene

7) cobaltite remnants and millerite intergrown with pentlandite and gersdorffite in chalcopyrite

8) nickeline in gersdorffite with cobaltite remnants in chalcopyrite near crack

9) nickeline intergrown with euhedral pyrite aggregate and pentlandite

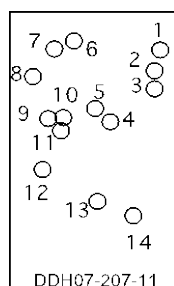
10) white gersdorffite in chalcopyrite, adjacent to crack

11) rounded pentlandite and gersdorffite intergrown with ? in chalcopyrite

12) millerite rimming chalcopyrite intergrown with white Co-gersdorffite in biotite patch

13) white, euhedral cobaltite at rim of chalcopyrite with pentlandite inclusions

14) nickeline rimmed by cobaltite in chalcopyrite with pentlandite at rim



16) DDH07-211-4 Hornblendite with biotite and pyrrhotite

Description: massive, coarse-grained, brown hornblende (Mg-hastingsite) shows intense green alkali-rich rims along cracks and in contact with sulphides (pyrrhotite-pyrite). It is intergrown with subhedral magnetite±ilmenite, remnant primary red-brown biotite, medium-grained apatite, titanite and pockets filled with secondary olive biotite and chlorite. Magnetite is being replaced by pyrrhotite ± pyrite ± carbonate, ilmenite is being replaced by titanite. Pyrrhotite-chalcopyrite droplets occur in coarse hornblende. Chalcopyrite with trace sphalerite is found in cracks and veins. A 1.8 mm thick vein filled by pyrite and trace chalcopyrite-pyrrhotite runs along the upper left side of the section.

Mg-hastingsite (90%) massive, coarse, anhedral olive brown pleochroic, intense green in contact with sulphides and near cracks

Biotite 1 (1%) red-brown, medium-grained anhedral, slightly altered, deformed, intergrown with hornblende

Biotite 2 (1%) fine-grained, anhedral, olive-green rosettes in pockets interstitial to hornblende

Chlorite (trace) fine-grained, green (with purple interference colours), in rosettes intergrown with biotite 2; coarser intergrown with chalcopyrite and carbonate, filling veinlet

Carbonate (trace) colourless, anhedral, intergrown with chalcopyrite and chlorite in vein

Titanite (2%) medium-grained, almost colourless, high relief, euhedral to anhedral grains in biotite 2 and very fine-grained, granular, replacing ilmenite and rimming magnetite

Apatite (trace) colourless, medium-grained, subhedral grains associated with titanite in biotite 2 patches, abundant elongate inclusions parallel c-axis

Magnetite (1%) fine- to medium-grained, subhedral, blocky grains partially replaced by pyrrhotite-pyrite in hornblende

Ilmenite (trace) fine-grained, anhedral, intergrown with magnetite, marginally replaced by titanite

Chalcopyrite (trace) fine-grained, anhedral, yellow-reflecting, in cracks and veinlets in hornblende

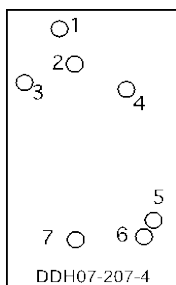
Sphalerite (trace) very fine-grained, anhedral, red-brown, translucent, associated with chalcopyrite in veinlet

Pyrrhotite (trace) fine-grained, anhedral, pinkish-cream, intergrown with magnetite and pyrite

Pyrite (5%) massive, blocky, in vein with fine-grained, chalcopyrite and pyrrhotite inclusions

Location and description of areas analyzed by electron microprobe

1) medium-grained apatite intergrown with hornblende, titanite and chlorite-biotite patch; chalcopyrite in hornblende



2) biotite2-titanite pseudomorph with minor pyrrhotite-chalcopyrite in primary biotite

3) pyrite vein with chalcopyrite-pyrrhotite inclusion adjacent to coarse hornblende and pyrrhotite-pyrite with carbonate inclusion adjacent to intense green hornblende

4) coarse primary biotite with tiny titanite inclusion bordering on hornblende and secondary biotite patch

5) chalcopyrite (with sphalerite star) and pyrrhotite intergrown with chlorite, biotite and titanite in veinlet

6) sphalerite attached to pyrite and chalcopyrite in hornblende with pyrrhotite droplet

7) pyrrhotite and secondary pyrite replacing magnetite; titanite replacing ilmenite surrounded by intense green hornblende, intergrown with carbonate and titanite in normal hornblende

17) DDH07-211-107**Hornblende clinopyroxenite with biotite vein**

Description: massive to granular clinopyroxene is intergrown with olive-brown oikocrystic hornblende and infused with droplets and blebs of pyrrhotite±chalcopyrite. The assemblage is veined by several subvertical carbonate-sulphide veinlets. The sulphides in the vein are pyrrhotite-chalcopyrite-sphalerite. A late sub-horizontal vein filled with fine-grained olive-green biotite cuts both the primary assemblage and off-sets the carbonate-sulphide veinlets. Magnetite in the clinopyroxenite is more or less altered and in the process of being replaced by titanite and pyrrhotite. The hornblende shows intense green streaks where alkali-bearing fluids and veinlets have gone through.

Clinopyroxene (72%) fine-grained, granular to massive, anhedral, intergrown with oikocrystic hornblende, magnetite and sulphide blebs

Hornblende (13%) coarse, anhedral, oikocrystic, olive brown pleochroic, intense green in contact with carbonate-sulphide veinlets

Biotite (7%) fine-grained, anhedral, olive-green, filling late vein and interstices in hornblende-clinopyroxenite

Chlorite (trace) fine-grained, green (with deep violet interference colours), in pockets associated with biotite vein and intergrown with altered magnetite and associated with carbonate veins

Carbonate (1%) colourless, anhedral, intergrown with chalcopyrite and pyrrhotite in subvertical veinlets

Titanite (trace) medium-grained, almost colourless, high relief, anhedral, replacing ilmenite-magnetite

Unknown mineral (siderite?) (trace) fine-grained, granular, high relief, orange, translucent grains in chlorite

Magnetite (1%) fine- to medium-grained, subhedral, blocky grains partially replaced by pyrrhotite, titanite

Ilmenite (trace) fine-grained, anhedral, intergrown with magnetite, partly replaced by titanite

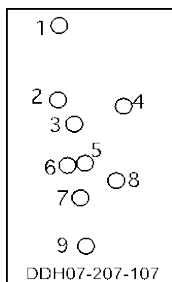
Chalcopyrite (1%) fine-grained, anhedral, yellow-reflecting, intergrown with pyrrhotite in droplets; more abundant in carbonate veinlets

Sphalerite (trace) very fine-grained, anhedral, red-brown, translucent, associated with chalcopyrite in veinlet

Pyrrhotite (5%) fine-grained, anhedral, pinkish-cream, round blebs in clinopyroxene, hornblende; anhedral, replacing magnetite

Pyrite (trace) rare, fine-grained cubes and aggregates in pyrrhotite

Marcasite (trace) fine-grained white flames in altered pyrrhotite

Location and description of areas analyzed by electron microprobe

1) tiny white anhedral pyrrhotite specks associated with titanite-chlorite-altered magnetite in hornblende

2) anhedral pyrrhotite ± pyrite in clinopyroxene adjacent to biotite vein

3) tiny white anhedral specks in crack in clinopyroxene with pyrrhotite inclusions

4) pyrrhotite-chalcopyrite-sphalerite with tiny pyrite grains in carbonate vein through hornblende-clinopyroxene-biotite

5) pyrrhotite intergrown with and replacing magnetite, surrounded by chlorite with orange unknown mineral

6) magnetite remnants and marcasite flames in pyrrhotite in hornblende + clinopyroxene

7) fine-grained secondary pyrite in crack in pyrrhotite, with chalcopyrite and magnetite in hornblende, clinopyroxene

8) pyrrhotite-chalcopyrite-sphalerite in calcite veinlet

9) orange unknown mineral (titanite or siderite?) in chlorite adjacent to carbonate and hornblende

18) DDH07-211-108**Hornblende clinopyroxenite**

Description: massive to granular clinopyroxene is intergrown with olive-brown oikocrystic hornblende and infused with pyrite-chalcopyrite-pentlandite-pyrrhotite, which penetrate into cracks and interstices. The assemblage is altered by green chlorite that gradually replaces hornblende and in some cases also clinopyroxene. The clinopyroxene pseudomorphs are overprinted by fine-grained tremolite aggregates. Remnants of magnetite-ilmenite are being replaced by titanite and chlorite. Fine-grained titanite occurs throughout chlorite patches. The sulphides consist predominantly of chalcopyrite with anhedral, partially resorbed pyrite aggregates, minor anhedral pyrrhotite and rounded pentlandite inclusions. Rare sphalerite occurs as inclusion in chalcopyrite. Pyrrhotite is veined by flame-like marcasite (alteration).

Clinopyroxene (65%) fine-grained, granular to massive, anhedral, intergrown with oikocrystic hornblende, and veined by sulphides

Hornblende (7%) coarse, anhedral, oikocrystic, olive-brown pleochroic, intense green in contact with carbonate-sulphide veinlets

Chlorite (15%) fine-grained, green (with deep violet interference colours), in pockets associated with biotite and intergrown with altered magnetite and associated with carbonate veins

Titanite (trace) fine-grained, anhedral, replacing ilmenite-magnetite; fine-grained euhedral grains in chlorite alteration

Magnetite (trace) fine-grained, anhedral, blocky remnants, pitted due to chlorite replacing exsolution lamellae

Ilmenite (trace) fine-grained, anhedral, intergrown with magnetite, partly replaced by anhedral titanite

Chalcopyrite (10%) fine- to medium-grained, anhedral, yellow-reflecting, infusing silicate assemblage, intergrown with pyrite, pyrrhotite, pentlandite

Sphalerite (trace) very fine-grained, anhedral, red-brown, translucent, associated with chalcopyrite in veinlet

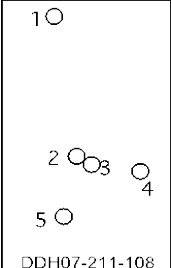
Pyrrhotite (0.5%) fine-grained, anhedral, pinkish-cream, round blebs in clinopyroxene

Pentlandite (0.5%) fine-grained, rounded, cream-coloured inclusion in chalcopyrite

Pyrite (2%) fine-grained, creamy white, anhedral aggregates in chalcopyrite

Marcasite (trace) fine-grained white flames in altered pyrrhotite

Location and description of areas analyzed by electron microprobe

	<p>1) chalcopyrite-pyrite-pentlandite in chlorite patch, interstitial to clinopyroxene</p> <p>2) pyrite and chalcopyrite intergrown with anhedral pentlandite, coarse pyrrhotite with marcasite flames</p> <p>3) hornblende replaced by chlorite and titanite</p> <p>4) pyrite, pyrrhotite ± pentlandite in chalcopyrite</p> <p>5) clinopyroxene pseudomorphs overprinted by tremolite-actinolite in chlorite patch replacing hornblende</p>
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