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Highland Valley Copper

BORDER PHASE

Uralitic amphibole alteration after of ppx clinopyroxene (augite) & hornblende. Results in patchy, bleached pale green amphibole with includes remnants of augite. Hornblende alters to actinolitic amphibole & chlorite. Amphiboles are anhedral & irregular & commonly eroded. The clinopyroxene cores are rimmed with hornblende or a "late magmatic" hornblende formed at the expense of the pyroxene.[1]. Hornblende is stable in some sections while in others it retrogrades to actinolitic amphibole & chlorite. Another undetermined pale green mineral associated with these rocks is probably another amphibole.

Crude foliation evident in some sections.

- uralitic alteration
- commonly lacks titanite
- angular, closed interstitial qtz
- strong plag alt.
- cpx or trace remnants with Hb

CPX HB DIORITE, BI HB GD, BI - CPX (QZ) DIORITE

- crude foliation to massive

1. Kerr, Optical Mineralogy, (1959) p. 328

HIGHLAND PHASE - CHATAWAY VARIETY

- megacrysts (1-3 mm) of hb (green) + bi (brown)
- angular to subrounded open + closed interstitial qtz
- Bi - hb gd (ratio Bi:hb)
- relatively homogeneous
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HIGHLAND PHASE - GUICHON VARIETY

- CPx - Bi GD (hornfelsic?)
- HB QZ DIORITE

} heterogeneous rock types

- angular, closed & open interstitial qtz
- normally zoned plag
  - commonly albitic rims
  - Hb > Bi

- "mixed bag"
- green ^{pleo}Hb, poikilitic
- brown to reddish brown pleo Hb.

- alteration varies

-)

BETHLEHEM PHASE

- some oscillatory zoning of plag
- hb > bi
- local microperthitic texture

BETHSAIDA PHASE

Medium-grained, massive to weakly porphyritic, megacrysts of plagioclase (oligoclase) & quartz. Plagioclase displays sharp & narrow oscillatory zoning, normal zoning & excellent twinning. Commonly plagioclase is rimmed by ~~albite~~ unaltered albite. Alteration is variable & consists of sericite microflakes, "clay minerals" locally epidote & carbonate. Quartz occurs as weakly strained megacrysts up to 12 mm long & interstitially. K-spar is commonly micropertitic & interstitial. Ferromagnesian minerals tend to form clusters within the rock. Euhedral, hexagonal apatite occurs with titanite, opaque (magnetite?), hornblende & biotite. Biotite & hornblende are commonly poikilitic enclosing plagioclase, apatite & opaque dominantly. Some sections contain only biotite & no hornblende. Those lacking hornblende tend to have no or very minor amounts of titanite.

The mafic minerals are altered to various degrees. Hornblende is generally less altered & goes to actinolitic amphibole or has patches of chlorite within it & has an eroded outline. Biotite is partially to completely altered to chlorite mainly but with also epidote-clinozoisite & quartz. The biotite crystal forms remain despite extensive alteration.

Calcic cores are more severely altered than the more sodic rims.

- moderate to weak plag alteration
- massive
- no CPX
- qtz megacrysts
- rounded closed & open interstitial