PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING, IGNACE AREA

Thin Section Petrography and Lithogeochemical Analysis of Core Samples from IG_BH01

APM-REP-01332-0375 January 2020

Nuclear Waste Management Organization

NUCLEAR WASTE MANAGEMENT ORGANIZATION
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R001	2022-12	Initial issue

1. INTRODUCTION

Lithogeochemistry and optical petrography provides important information about the composition, petrogenesis, alteration, and deformation of the host and accessory rock types of the Revell batholith. Whole rock (major element) and trace element analyses are performed on each sample, in addition to a detailed qualitative optical petrographic description. The goal of this work is to further understand and classify the host and accessory rock types of the batholith, to identify outlier or unusual rock types, and to better understand the types and locations of alteration throughout the rock mass

In general, whole rock geochemistry provides a breakdown of the major cations present in the sample (Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K, and P) which aid in rock classification and understanding the conditions of melting and/or the subsequent crystallization history of the batholith. Trace element geochemistry provides a breakdown of elements in the sample in concentrations less than 0.1 wt. %. Most commonly, these trace elements substitute for major elements (listed above) in the rock-forming minerals. Trace elements can help identify geological processes and combined with major elements, can identify the original tectonic setting of igneous rocks.

Qualitative optical petrography provides a detailed description of the minerals present in each sample, their form, interrelationship, and any deformation they may have undergone. Point-counting provides a relative amount of major minerals, allowing for classification of igneous rocks on a QAPF diagram. Additionally, the presence of accessory minerals and their relationship to the rock-forming minerals provide valuable information on post-cooling processes and fluid movement. The petrographic report and associated high-quality thin section photographs are an essential part of understanding the host and subordinate rock types present in the Revell batholith.

This report documents the results of Thin Section Petrography and Lithogeochemical Analysis of Core Samples from IG_BH01. This work was complete as part of Phase 2 Initial Borehole Drilling and Testing, Ignace Area. The analyses and reporting were completed by ACTLABS.

Results documented within this report are divided into two parts:

A) Thin Section Petrographic Analysis

B) Lithogeochemical Analysis

2. SCOPE OF LABORATORY WORK

The work associated with Phase 2 Geoscientific Preliminary Assessment, Lithogeochemical analysis of samples from IG_BH01 in Ignace was undertaken by Activations Laboratories, which is a mineral laboratory with ISO 17025:2017 accreditation.

All samples are prepared on arrival at Activation Laboratories in Thunder Bay using the following methodology: samples are crushed to 80% passing 2 mm, riffle split (250 g) and pulverized using a mild steel mill to 95% passing 105 µm. All samples are then analyzed for 60 major and trace elements using the techniques described below. Note that any analyses listed below with a 4 in their code are added to the 4Lithores suite to account for specific elements.

4Lithores

Crushed samples are fused with lithium metaborate/tetraborate and the resulting molten bead is digested in a weak nitric acid solution. The liquid is analyzed for major and trace elements using Inductively-Coupled Plasma Mass Spectroscopy (ICP-MS) and Inductively-Coupled Plasma Optical Emission Spectroscopy (ICP-OES). This analysis is intended for non-mineralized samples.

4B1

4B1 is used to obtain accurate levels of base metals (Cu, Pb, Zn, Ni, and Ag). A 4-acid (near-total) digestion is used, which is a combination of hydrofluoric, nitric, perchloric, and hydrochloric acids. The solution is analyzed with ICP-OES.

4B – INAA

4B-INAA is recommended for As, Sb, high W, and moderate levels of Cr. Instrumental Neutron Activation Analysis (INAA) is an analytical technique dependent on measuring gamma radiation induced in the sample by irradiation with neutrons. The source of neutrons is (usually) a nuclear reactor. Each element emits a unique signature of gamma radiation which can be measured and analyzed on a high-purity Ge detector.

QOP

A qualitative optical petrography report is completed for each sample. Thin-sections are prepared by ACTLABS and a petrographic analysis using transmitted and reflective light microscopy (including modal mineralogy, thin section description, and photomicrographs) is completed by a qualified person.

4F – F

This analysis is specifically to measure fluoride. Samples are fused with lithium metaborate/tetraborate in an induction furnace to release fluorite ions from the sample matric. An ion selective electrode (ISE, in this case fluoride-selective) is immersed in the solution to measure the fluoride-ion activity directly using an automated fluoride analyzer.

4F – B

This analysis is specifically to measure boron. Samples are irradiated with neutrons from a nuclear reactor and then measured for the Doppler broadened prompt gamma ray using a high purity Ge detector.

4F – C, S

This analysis is specifically to measure total carbon and sulphur. An accelerator material is added to the sample, and the inductive elements of the sample and accelerator couple with the high frequency field of the induction furnace, causing the sample to combust. During combustion, sulphur- and carbon-bearing elements are reduced, releasing sulphur and carbon, which bond with oxygen to form SO_2, CO, and CO_2 (majority CO_2). Sulphur and carbon dioxide are measured by infrared spectroscopy.

4F – Cl

This analysis is specifically to measure chlorine. Samples are irradiated with neutrons from a nuclear reactor and then measured for the Doppler broadened prompt gamma ray using a high purity Ge detector.

4F – Hg

This analysis is specifically to measure mercury. Samples are digested with aqua regia (a mixture of nitric and hydrochloric acids) and the resulting solution is oxidized to the stable divalent form. Solution is transported into an absorption cell and the cell is placed in the light path of an Atomic Absorption Spectrophotometer. The maximum amount absorbed (peak height) is directly proportional to the concentration of mercury atoms in the light path. Measurement is performed using a cold vapour flow injection mercury system (FIMS).

1B1

To analyze the platinum group elements (PGE), fire-assay and INAA are used. Samples are fire assayed using a nickel sulphide (NiS) procedure. The nickel sulphide button is dissolved in concentrated HCl and the resulting residue is collected. The residue undergoes INAA to measure the PGE and gold.

5S – I, Re

This analysis is for short-lived isotopes and is used to measure iodine and rhenium. Samples are sent to the source of irradiation and then back to the lab for analysis and are counted sequentially based on the analyte(s) of interest.

1. Thin Section Petrographic Analysis

Petrographic Report
on Polished Thin Sections
(work order: A19-14907)

Reviewed By:
Dr. Mahdi Ghobadi

Date:

January, 2020

EXECUTIVE SUMMARY

The present "Petrographic Descriptions" provides the following information for each sample:

(i) the petrographic rock classification;
(ii) a brief microstructural description;
(iii) a table with the modal percentage and average grain size for each mineral; and (iv) a detailed description of the minerals in decreasing order of abundance.

Samples were cut and prepared as ~20 × 40 mm polished thin sections.

The petrographic classification follows the recommendations of Gillespie and Styles (1999).
The microstructural terminology used in this report follows the recommendations and definitions of Vernon (2004), Passchier and Trouw (2005), and Ramdohr (1980). Some of the petrographic and microstructural terms are defined in the glossary.

METHODS EMPLOYED

Polished thin sections (PTS) were examined using a petrographic microscope, under both **transmitted** and **reflected** light. Both techniques use the properties of polarized light as it travels through, or reflects off of, the mineral sample, respectively.

Within transmitted light petrography, one can look at a sample in either '**plane polarized light**' (ppl), or '**crossed polars**' (xp). Plane polarized light is when the light coming through the microscope is traveling in only one direction. This state most closely resembles what the naked eye would see, just magnified. Some minerals show a slight difference in colour as the microscope stage is rotated under ppl, and this is called '**pleochroism**'. It happens because the light travels faster along one of the three axial planes in the mineral compared to another. Some minerals show a high degree of pleochroism (such as amphiboles), while others are not pleochroic at all.

When a second polarizer is inserted into the light path at a right angle to the first polarizer, the incoming light is now polarized in two directions. This other polarizer is called the '**analyzer**', and this state is called 'crossed polars' (or 'xp' for short). The colours that we now see down the microscope are the result of the refraction of two light paths coming through the mineral, and the interaction or 'interference' between them. One light ray comes through the mineral faster than the other, and that is why the colours are called '**interference colours**'. They are only seen under a petrographic microscope, and in many cases provide diagnostic information to identify minerals. When there is a large difference between the speeds of the two light rays coming out of the mineral, we can say that there is a high degree of '**birefringence**', and therefore higher '**orders**' of interference colours will result. This is particularly true for minerals such as carbonates that display anomalously high orders of interference colours, almost resembling a rainbow.

Opaque minerals such as sulfides and oxides appear black in transmitted light, and are identified instead under '**reflected light**'. This is achieved using the same petrographic microscope, in reflected mode, where the light is now shining on the sample, instead of through it. A mineral is said to be highly '**reflective**' if it appears light white or light yellow. A good example of this reflectance is arsenopyrite (white) and pyrite (light butter yellow). Other sulfides are distinguished mainly by their reflectance, from brassy yellow (chalcopyrite), to a golden yellow colour (native gold). Pentlandite has a slightly more pinkish reflectance. Oxides such as hematite and magnetite have a light grey reflectance. Silicates are usually dark grey under reflected light and only the crystal shapes and maybe cleavage traces are visible.

Specific tests are performed using both optical techniques with high powered objectives (2.5x, 5x, 10x, 20x, 50x, and 100x), and specialized petrographic accessories to identify all mineral phases present to the best of the ability of the petrographer. Note that the oculars (eyepieces) also apply a magnification of 10x, therefore the total magnification is the objective magnification multiplied by 10. Images displaying most of the pertinent mineral phases and overall textures are captured using a digital camera mounted on top of the microscope. Scale bars are included in each image, and this scale is calibrated to a micrometer prior to analysis.

PETROGRAPHY DESCRIPTION

LG 001

Rock Type: Tonalite

Microstructural features: Anhedral and medium-grained crystals of plagioclase, quartz, biotite, and alkali feldspar define a relatively homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase	**52**	**–**	**54**	Anhedral to subhedral crystals of plagioclase are randomly oriented and immersed within a medium-grained aggregate of alkali feldspar, quartz, and subordinate biotite. The plagioclase crystals are fresh to weakly altered by very fine-grained dispersions of white mica and calcite. In most cases the crystals show Albite twinnings, and in some cases show subhedral growth zoning.	**0.1–1**
quartz	**38**	**–**	**40**	Quartz crystals are anhedral, inequigranular, and inclusion-free. The quartz, in association with sparse crystals of alkali feldspar, occupy the interstices between the plagioclase crystals.	**0.2–1**
alkali feldspar	**5.5**	**–**	**6**	Alkali feldspar is medium-grained and forms irregular clusters dispersed within the granular microstructure. The alkali feldspar is fresh and shows Albite-Pericline twinnings.	**0.1–1**
biotite	**3**	**–**	**4**	Anhedral to subhedral lamellae of biotite are randomly oriented and define an isotropic microstructure. The biotite is subtly altered by very fine- to fine-grained crystal of epidote.	**0.1–0.8**
white mica	**0.2**	**–**	**0.5**	White mica flakes are very fine-grained and partially replaced the core of some of the plagioclase crystals, and are associated with the epidote within the interstitial positions around the white mica.	**up to 0.5**
epidote		**tr**		Epidote forms anhedral crystals, which are spatially associated with the biotite lamellae. In some cases, the epidote is intergrown with white mica and partially replaced the biotite.	**up to 0.5**
zircon		**tr**		Zircon is very fine-grained and very rare, and it is dispersed within the biotite lamellae.	**up to 0.01**
pyrite		**tr**		Pyrite is fine-grained and its rare crystals are dispersed within the quartz interstices.	**up to 0.1**

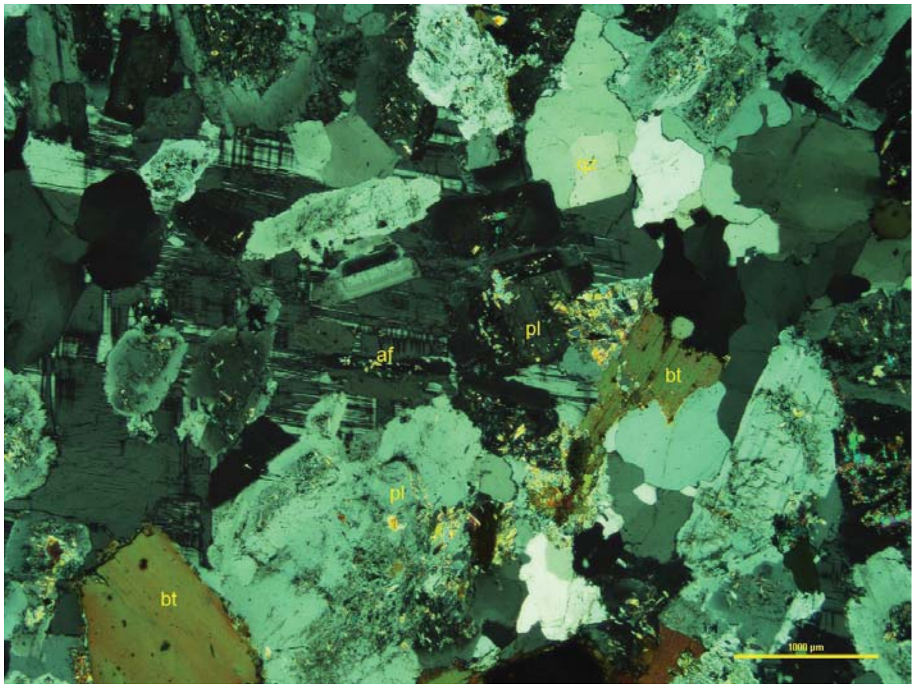


Figure 1Anhedral crystals of plagioclase (pl) are intergrown with anhedral crystals of quartz (qz), biotite (bt) and interstitial crystals of alkali feldspar (af), Crossed Nicols transmitted light.

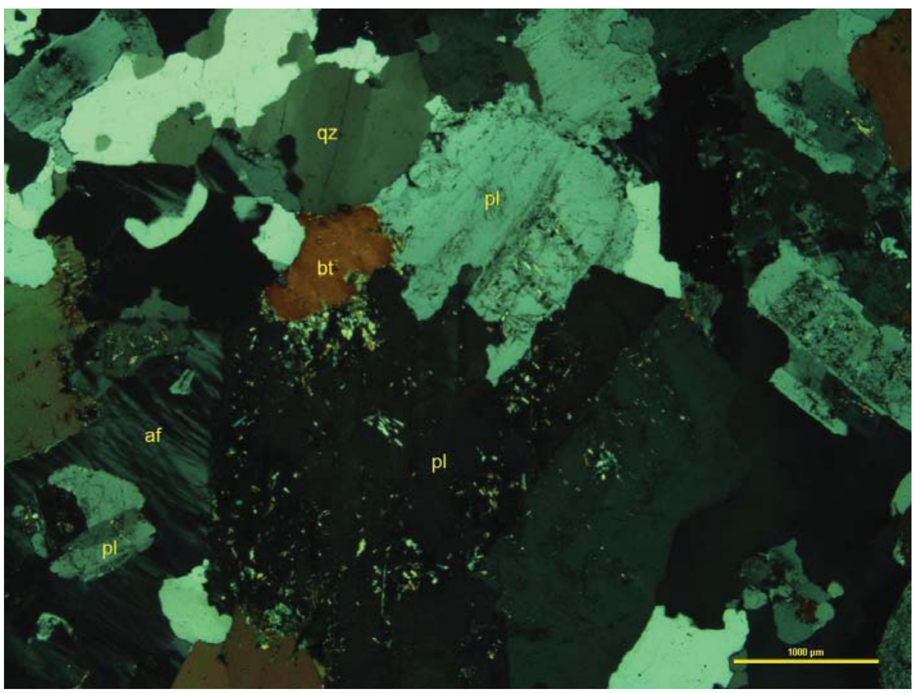


Figure 2 The plagioclase crystals (pl) are weakly altered by very fine-grained flakes of white mica. Crossed Nicols transmitted light.

LG 002

Rock Type: Tonalite

Medium-grained and randomly oriented crystals of plagioclase, quartz, alkali feldspar and biotite define a relatively homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase	**56**	–	**58**	Plagioclase forms anhedral to subhedral crystals, which are weakly altered by very fine-grained dispersions of white mica defining subhedral shapes within mostly anhedral crystals.	**0.5–2**
quartz	**32**	–	**34**	Quartz forms sub-rounded polycrystalline domains (up to 5 mm in diameter), which I interpret as quartz phenocrystals, and medium-grained anhedral crystals occupying the interstitial positions between the plagioclase and the quartz phenocrystalline aggregates.	**0.5–2**
alkali feldspar	**4.5**	–	**5**	Alkali feldspar forms anhedral to interlobate crystals, which are intergrown with the quartz and mostly occupy the interstices between the plagioclase and the phenocrystalline quartz aggregates. The alkali feldspar is homogeneously dispersed within the granular microstructure and it is fresh. Most of the crystals show Albite-Pericline twinnings.	**0.5–2.5**
biotite	**6**	–	**8**	Biotite occurs as randomly oriented and homogeneously dispersed lamellae showing anhedral to subhedral shapes. The biotite is subtly to weakly altered by epidote and iron oxides.	**0.4–1**
epidote		**tr**		Epidote is anhedral and it is spatially associated with the biotite lamellae, which in some cases weakly alters.	**up to 0.2**
iron oxides		**tr**		The iron oxides form rare rims around some of the biotite crystals.	**up to 0.01**
zircon		**tr**		Is very fine-grained and it is dispersed within the biotite lamellae.	**up to 0.01**
pyrite		**tr**		Pyrite is fine-grained and its rare crystals are dispersed within the quartz interstices.	**up to 0.1**

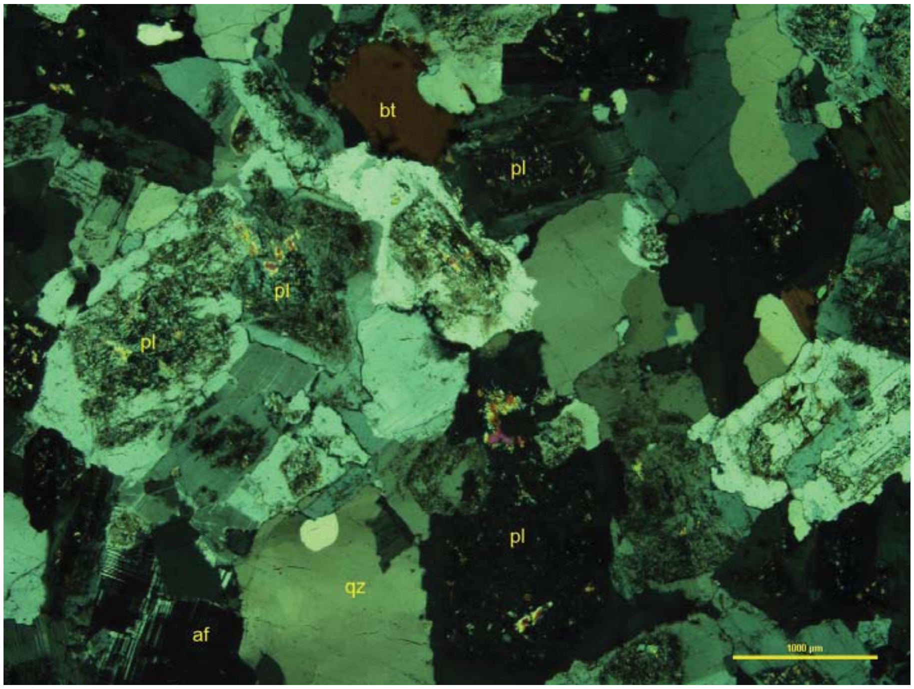


Figure 3 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), alkali feldspar (af) and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

LG 003

Rock Type: *Domain A* *Granodiorite*
Domain B *Alkali feldspar-quartz pegmatitic infill*

This polished thin section is subdivided into two different domains: a granular aggregate (Domain A) of plagioclase, quartz, alkali feldspar and biotite shows an irregular boundary with a coarse-grained infill of alkali feldspar and quartz (Domain B).

Mineral	*Modal %*				Size range (mm)
Domain A (~50% of PTS)					
plagioclase	**25**	–	**27**	Within Domain A, the plagioclase prevails over the other minerals, and forms anhedral to subhedral crystals intergrown with the quartz, and the subordinate alkali feldspar. Some of the plagioclase crystals are weakly altered by very fine- to fine-grained flakes of white mica and very rare patches of calcite.	**0.5–3.5**
quartz	**14**	–	**16**	Anhedral crystals of quartz show interlobate boundaries with the plagioclase and the alkali feldspar.	**0.5–4**
alkali feldspar	**6**	–	**8**	Fine-grained anhedral crystals of alkali feldspar occupy the interstices between the plagioclase and are distinguished by their typical Albite-Pericline twinnings. The alkali feldspar is transparent and fresh and i interpret it as a primary magmatic mineral.	**0.3–2.5**
biotite→chlorite	**4**	–	**5**	Inequigranular lamellae of biotite are randomly oriented and define an isotropic microstructure. Some of the biotite lamellae are moderately to strongly altered by chlorite.	**0.2–2**
opaque minerals		**tr**			
zircon		**tr**		Zircon crystals are very fine-grained and enclosed within the biotite lamellae	**up to 0.01**
Domain B (~50% of PTS)					
alkali feldspar	**27**	–	**29**	Alkali feldspar forms coarse-grained euhedral crystals showing straight boundaries with the quartz. In most cases, the alkali feldspar hosts fine-grained perthitic blebs. Similarly with the host rock, I interpret the alkali feldspar as a primary magmatic mineral.	**up to 22**
quartz	**21**	–	**22**	Quartz is medium- to coarse-grained within the coarse-grained Domain, which I interpret as an infill domain. The grain size of the quartz is inequigranular, and some of the crystals are recrystallized into smaller interlobate crystals near to contact with the host rock and the alkali feldspar.	**up to 22**

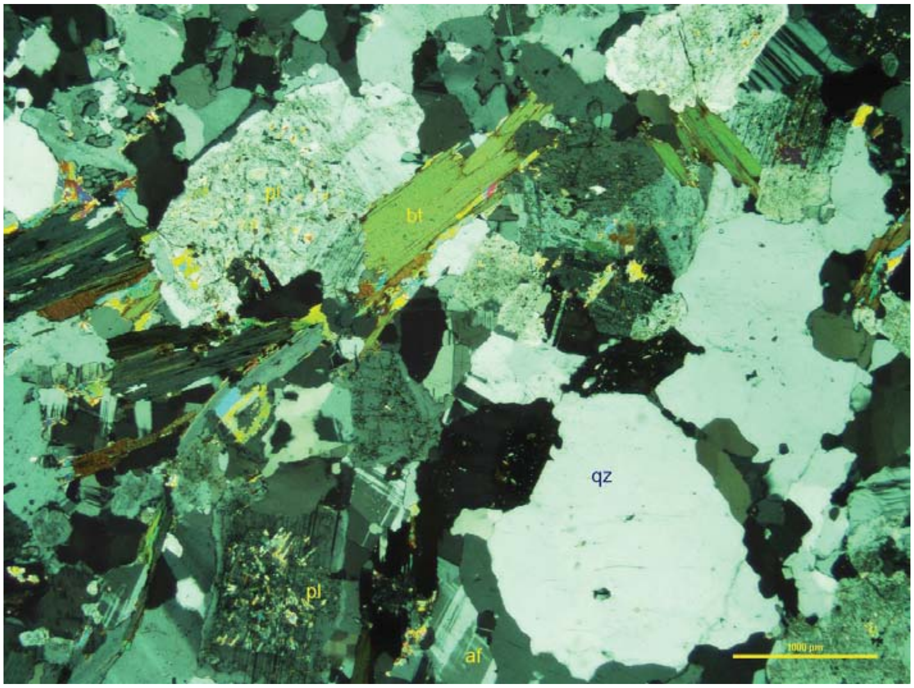


Figure 5 Domain A: Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

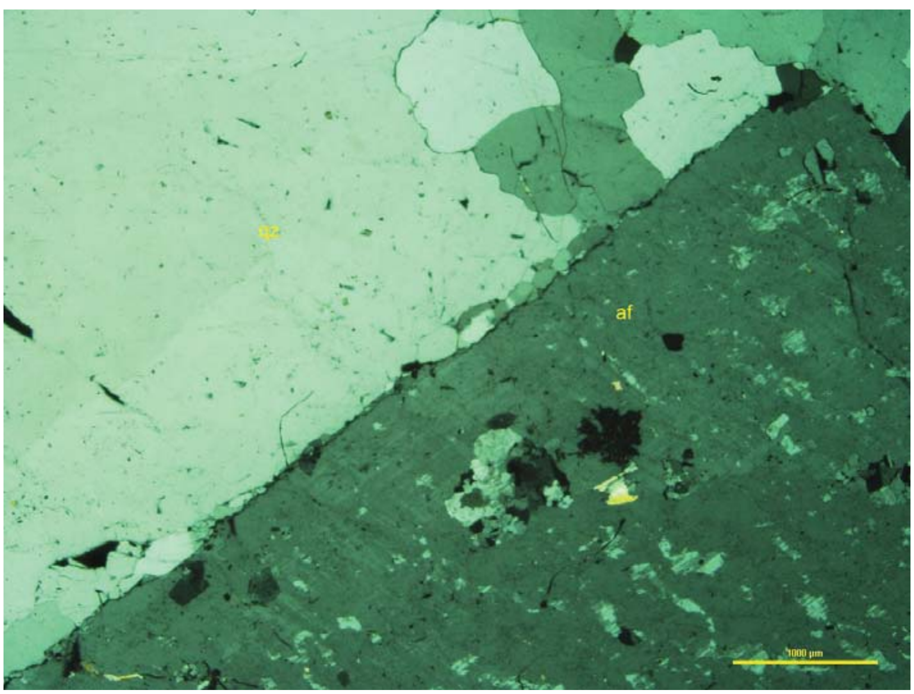


Figure 4 Domain B: Coarse grained crystals of quartz (qz) and alkali feldspar (af) show straight boundaries. Crossed polarizers transmitted light.

LG 004

Rock Type: Granodiorite

Medium-grained anhedral crystals of quartz, plagioclase, alkali feldspar and biotite define a relatively homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**64**	–	**66**	Inequigranular anhedral crystals of quartz prevail over the plagioclase in this granular microstructure. The quartz crystals show interlobate boundaries and are inclusion-free.	**0.3–2.5**
plagioclase→white mica+epidote	**22**	–	**22**	Plagioclase forms anhedral to subhedral crystals immersed within the quartz. The plagioclase shows Albite twinnings, and some of the crystals are weakly altered by very fine-grained aggregates of white mica and subordinate epidote. Some of the alteration products define subhedral to euhedral shapes within the plagioclase, thus indicating that the growth zoning occurred during the magmatic growth of the plagioclase, and that the core of the crystals are richer in anorthite.	**0.5–3.5**
alkali feldspar	**10**	–	**12**	Alkali feldspar forms anhedral crystals forming irregular clusters dispersed within the quartz-rich interstitial positions between the plagioclase. The alkali feldspar is distinguished by its Albite-Pericline twinnings, and by its yellow stain colour on the billet (see image of the billet).	**0.3–2.5**
biotite→chlorite	**2**	–	**4**	Biotite lamellae are randomly oriented within the quartz and in some cases are weakly altered by chlorite.	**0.2–2**
zircon		**tr**		Very fine-grained crystals of zircon are enclosed within the biotite lamellae	**up to 0.01**

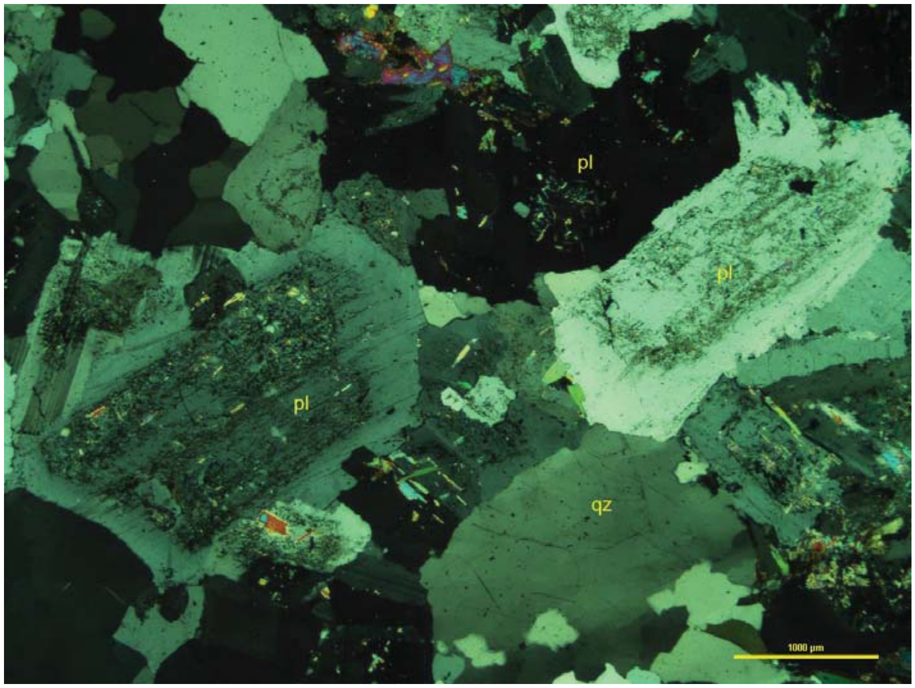


Figure 6 Subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), and define a granular microstructure. Crossed polarizers transmitted light. Crossed polarizers transmitted light.

LG 005

Rock Type: Tonalite

Medium-grained anhedral crystals of quartz, plagioclase, alkali feldspar, and biotite define a relatively homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				*Size range (mm)*
quartz	**70**	–	**72**	Quartz prevails over the plagioclase, alkali feldspar and biotite, and forms medium-grained anhedral to interlobate crystals.	**0.5–3**
plagioclase→white mica+epidote	**20**	–	**22**	Plagioclase occurs as medium-grained anhedral to subhedral crystals dispersed and randomly oriented within the prevailing quartz. The core of the plagioclase crystals are weakly to moderately altered by very fine- to fine-grained flakes of white mica and rare epidote.	**0.3–2.5**
alkali feldspar	**7**	–	**9**	Alkali feldspar forms anhedral and interstitial crystals subordinate to the quartz and the plagioclase. The alkali feldspar is fresh, inclusion-free, therefore I interpret it as a primary magmatic mineral.	**up to 2; rare up to 5 long**
biotite	**1**	–	**2**	Medium-grained anhedral crystals of biotite are randomly oriented within the quartzofeldspathic aggregate. The biotite crystals host very fine-grained crystals of zircon, which generate the typical pleochroic haloes in the biotite host.	**up to 1.5**
zircon		**tr**		Rare and very fine-grained crystals of zircon are dispersed within the biotite lamellae.	**up to 0.01**

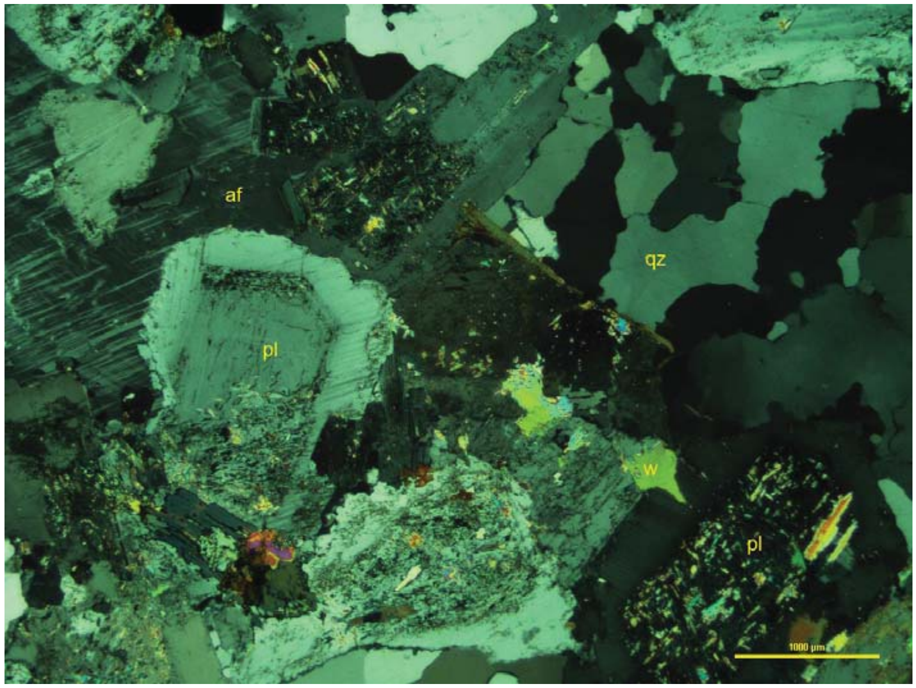


Figure 7 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), alkali feldspar (af) and in some cases show euhedral growth zoning within their crystal core, white mica (w). Crossed polarizers transmitted light.

LG 006

Rock Type: Tonalite

Medium-grained anhedral crystals of quartz, plagioclase, alkali feldspar, and biotite define a relatively homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→white mica+epidote(?)	**48**	**–**	**50**	Plagioclase forms anhedral to subhedral crystals, which are randomly oriented and contribute to the homogeneous and isotropic granular microstructure. Some of the crystals are subtly to weakly altered by very fine-grained flakes of white mica and very fine-grained unresolved material (epidote?). Th alteration products within the plagioclase are concentrated within the subhedral to euhedral crystal core. Some crystals show euhedral growth zoning, and some of the crystals show Albite twinnings.	**0.3–3**
quartz	**42**	**–**	**44**	Inequigranular crystals of quartz show anhedral to interlobate shapes and occupy the interstitial spaces between the plagioclase. The quartz is intergrown with anhedral crystals o alkali feldspar and subordinate lamellae of biotite.	**0.1–2**
alkali feldspar	**7**	**–**	**9**	Alkali feldspar is heterogeneously dispersed, and forms irregular crystal clusters within this polished thin section (see distribution of the alkali feldspar in the stained billet). The alkali feldspar crystals are inequigranular, and anhedral. They are distinguished by their typical Albite-Pericline twinnings, and are fresh.	**0.3–2.5**
biotite	**1**	**–**	**1.2**	Biotite forms anhedral to subhedral lamellae, which are randomly oriented within the granular microstructure. The biotite hosts very fine-grained inclusions of zircon, and are fresh.	**0.8–3**
epidote		**tr**			**up to 0.04**
zircon		**tr**			**up to 0.01**

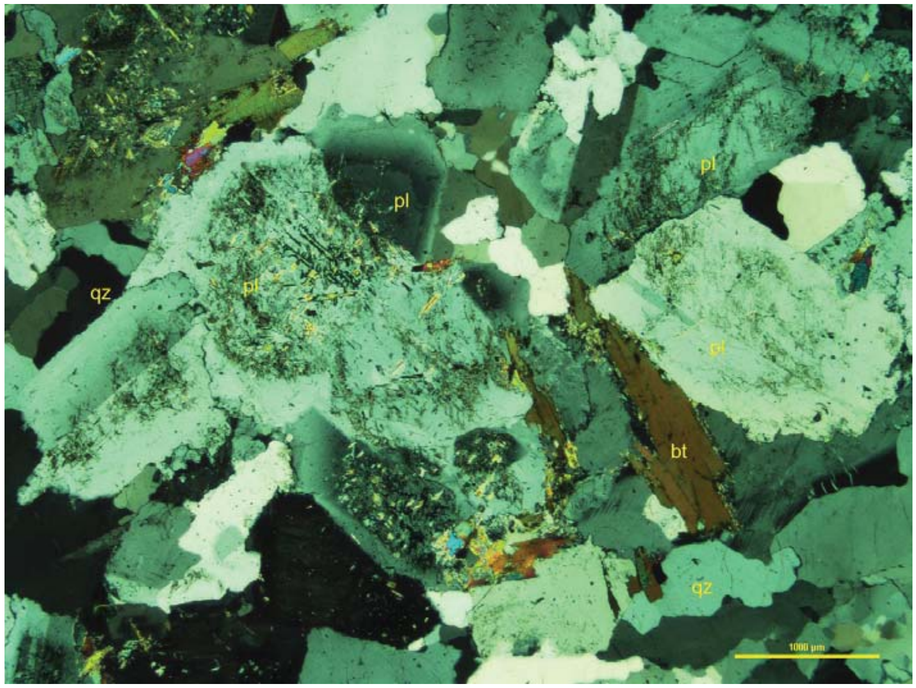


Figure 8 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with anhedral crystals of quartz (qz), and randomly oriented lamellae of biotite (bt). Crossed Nicols transmitted light.

LG 007

Rock Type: Tonalite

Medium-grained anhedral crystals of quartz, plagioclase, alkali feldspar, and biotite define a relatively homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→white mica+epidote(?)	**46**	–	**48**	Plagioclase occurs as medium-grained anhedral to subhedral crystals, which are randomly oriented and define the isotropic granular microstructure. The plagioclase crystals are surrounded by a fresh and inclusion-free rim, which is probably albitic, and surrounds a subhedral to euhedral core altered by fine-grained white mica and very fine-grained unresolved aggregate of probable epidote.	**0.3–2.2**
quartz	**41**	–	**43**	Inequigranular crystals of quartz show anhedral to interlobate shape and occupy the interstitial positions between the plagioclase and the subordinate biotite. The quartz is intergrown with subordinate to rare crystals of alkali feldspar. In some cases, the quartz crystals at the contact with the alkali feldspar form myrmekitic intergrowths with the alkali feldspar.	**0.2–2**
biotite	**7**	–	**8**	Biotite is medium-grained and its subhedral to anhedral lamellae are randomly oriented within the granular microstructure. The biotite is fresh and hosts rare and very fine-grained inclusions of zircon.	**0.3–1.2**
alkali feldspar	**4**	–	**5**	Alkali feldspar is subordinate to the plagioclase, quartz, and biotite and forms irregular patches of anhedral to interstitial crystals. The alkali feldspar is fresh, and it shows Albite-Pericline twinnings.	**up to 1**
epidote		**tr**		Very fine- to fine-grained dipersions of epidote are associated with the white mica flakes within the plagioclase core, and in some cases form irregular clusters of fine-grained crystals within the plagioclase and near the biotite.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite.	**up to 0.01**
pyrite		**tr**		Very rare crystals of pyrite are intergrown with the epidote.	**up to 0.2**

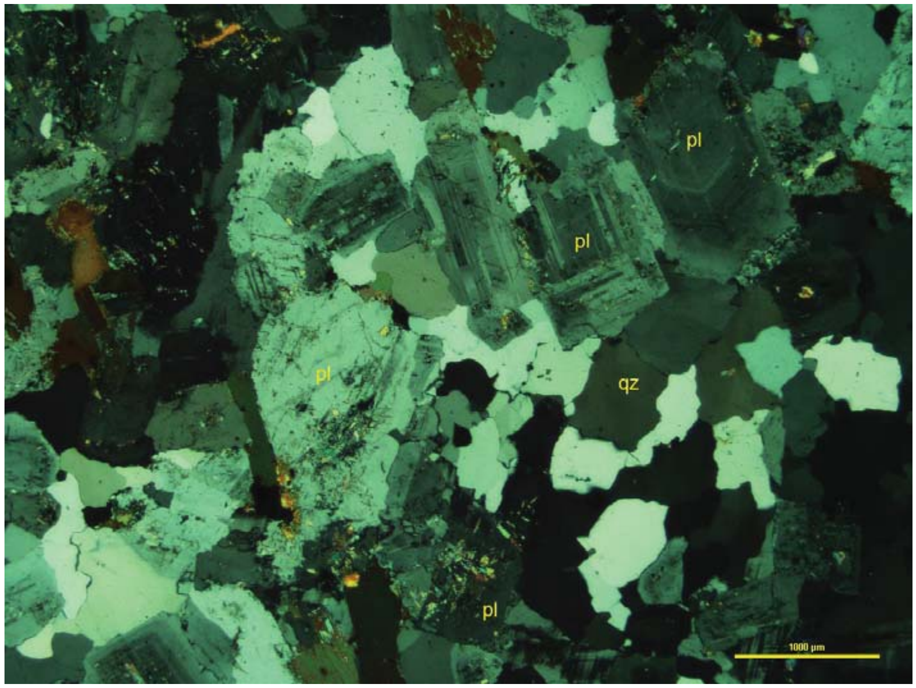


Figure 9 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), alkali feldspar (af) and in some cases show euhedral growth zoning within their crystal core. Crossed polarizers transmitted light.

LG 008

Rock Type: Tonalite & leucocratic felsitic rock

This polished thin section is made up of two main domains. A medium-grained granular aggregate of plagioclase, quartz, and biotite, is crosscut by an irregular infill domain of plagioclase, alkali feldspar, quartz and white mica.

Mineral	*Modal %*				Size range (mm)
Domain A *(~75% of PTS)*					
Tonalite					
plagioclase→epidote	**56**	**–**	**58**	Within the tonalite, the plagioclase is medium-grained anhedral, and its densely packed crystals define a granular isotropic microstructure. The plagioclase shows Albite twinnings, and it is overprinted by fine-grained anhedral crystals of epidote.	**up to 1**
quartz	**12**	**–**	**13**	Quartz forms fine- to medium-grained interstitial crystals intergrown with the prevailing plagioclase and the anhedral lamellae of biotite.	**0.1–2**
biotite→epidote	**3**	**–**	**5**	Biotite is fine- to medium-grained and its anhedral to subhedral lamellae are randomly oriented within the plagioclase-rich granular microstructure. The biotite is mostly fresh, in some cases it is subtly to weakly altered by epidote.	**0.2–0.6**
alkali feldspar→white mica	**1**	**–**	**2**	The alkali feldspar is subordinate and medium-grained in the tonalite. The alkali feldspar is fresh and in some cases it shows Albite-Pericline twinnings.	**0.5–2**
epidote	**1**	**–**	**2**	Epidote forms anhedral crystals overprinting the plagioclase in the tonalite, and to a lesser extent the biotite.	**up to 0.2**
pyrite		**tr**		Very rare crystals of pyrite are spatially associated with the biotite.	**up to 0.1**
Domain B *(~25% of PTS)*					
Leucocratic felsitic rock					
plagioclase→epidote	**15**	**–**	**16**	Within the leucocratic domain, the plagioclase is medium-grained anhedral, and prevails over the heterogeneously dispersed alkali feldspar, the subordinate and fine-grained crystals of quartz, and the anhedral lamellae of white mica.	**up to 3**
alkali feldspar→white mica	**9**	**–**	**10**	Alkali feldspar occurs in the leucocratic domain, and in this domain it is heterogeneously dispersed as medium-grained anhedral crystals. Some of the alkali feldspar crystals are overprinted by medium-grained anhedral lamellae of white mica.	**0.5–2**
quartz	**1**	**–**	**2**	Within the leucocratic domain, the quartz is subordinate to the feldspar and forms fine-grained interstitial crystals.	**0.1–0.2**
white mica		**tr**		White mica only occurs in the leucocratic domain, where it is spatially associated with the alkali feldspar. In some cases, the anhedral lamellae overprinted the medium-grained anhedral crystals of alkali feldspar.	**up to 2**

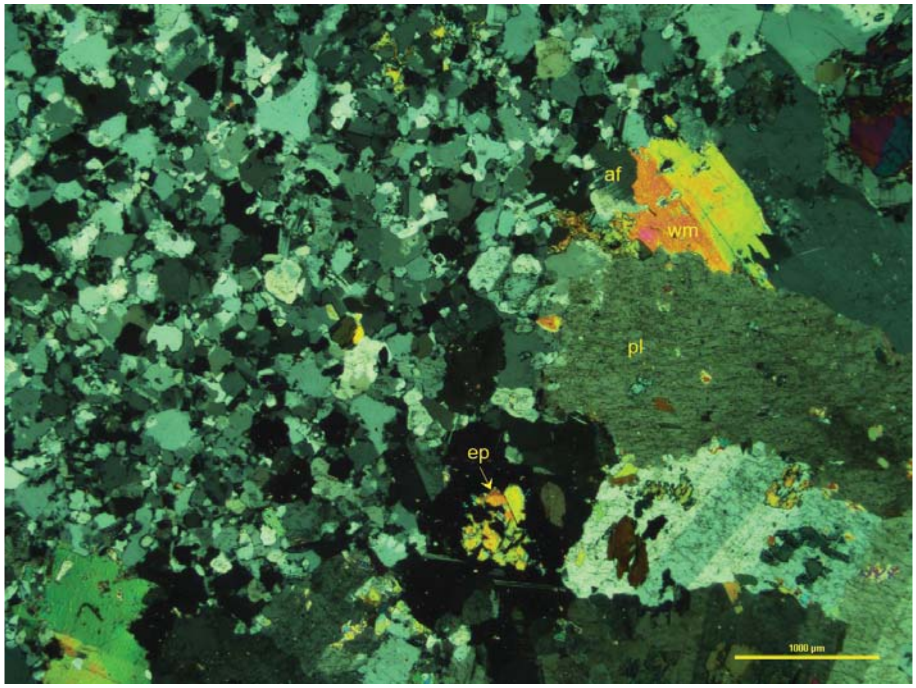


Figure 10 A fine-grained aggregate of plagioclase and quartz (Domain A) occurs in the left of this photomicrograph and is associated with a probable infill domain (on the right, Domain B in the petrographic description), which is made up of medium-grained plagioclase (pl) and subordinate white mica (wm). Crossed polarizers transmitted light.

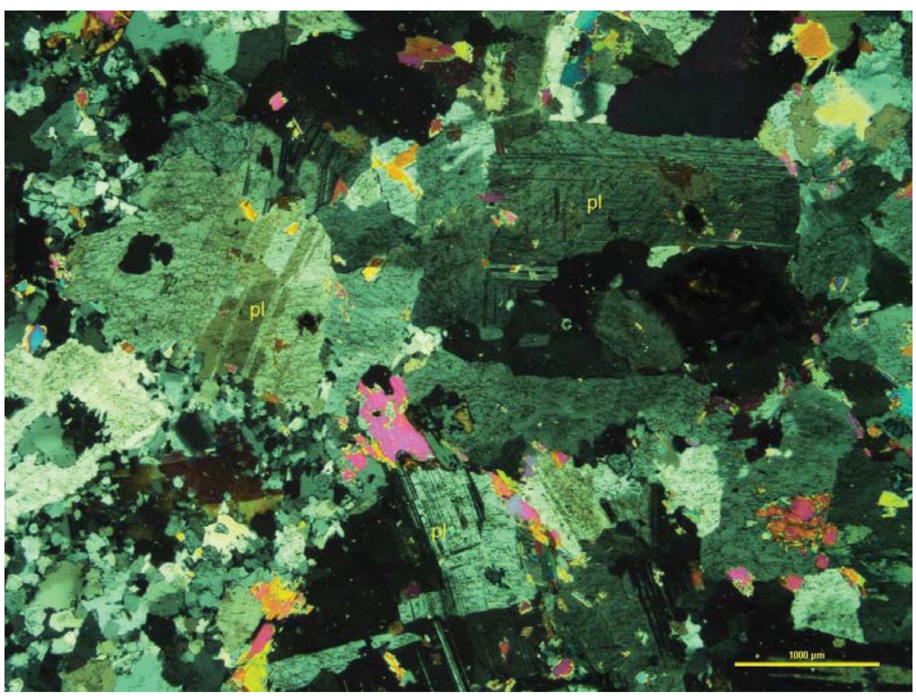


Figure 11 Domain B mostly consists of medium-grained plagioclase (pl) and subordinate white mica (wm) and show irregular boundaries with the finer-grained hosting rock. Crossed polarizers transmitted light.

LG 009

Rock Type: Tonalite

Medium-grained anhedral to subhedral crystals of plagioclase, fine- to medium-grained interstitial crystals of quartz, and subordinate lamellae of biotite define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase	**61**	–	**63**	Plagioclase forms anhedral to subhedral crystals, which are randomly oriented and define a granular isotropic microstructure. The plagioclase crystals are made up of a weakly altered subhedral core, and a fresh and inclusion-free albitic rim. The core hosts very fine- to fine-grained crystals of epidote and flakes of white mica. In some cases, the plagioclase shows Albite twinnings.	**0.5–2.3**
quartz	**28**	–	**30**	Quartz forms fine- to medium-grained interstitial crystals showing interlobate crystal boundaries.	**0.1–0.9**
biotite	**8**	–	**10**	Anhedral lamellae of biotite are randomly oriented and intergrown with the quartz within the interstices between the prevailing plagioclase crystals.	**up to 1**
epidote	**1**	–	**1.2**	Fine-grained crystals of anhedral epidote overprinted the core of some of the plagioclase crystals and are spatially associated with the biotite crystals.	**up to 0.2**
white mica		**tr**		Rare and fine-grained lamellae of white mica overprinted some of the biotite crystals, and in these instances, the boundary between the white mica and the biotite are populated by very fine- to fine-grained crystals of titanite.	**up to 0.2**
alkali feldspar		**tr**		Alkali feldspar is rare and its anhedral crystals are distinguished by their typical Albite-Pericline twinnings	**up to 0.5**
titanite		**tr**		Rare and fine-grained crystals of titanite are spatially associated with the biotite and the boundaries between the biotite and the rare lamellae of white mica.	**up to 0.1**
chalcopyrite				Irregular clusters of fine-grained chalcopyrite occur within the quartz and are spatially associated with the fine-grained crystals of epidote.	**up to 0.1**
pyrite				Pyrite is very rare and subordinate to the chalcopyrite within the rare sulphide clusters associated with the epidote.	**up to 0.1**

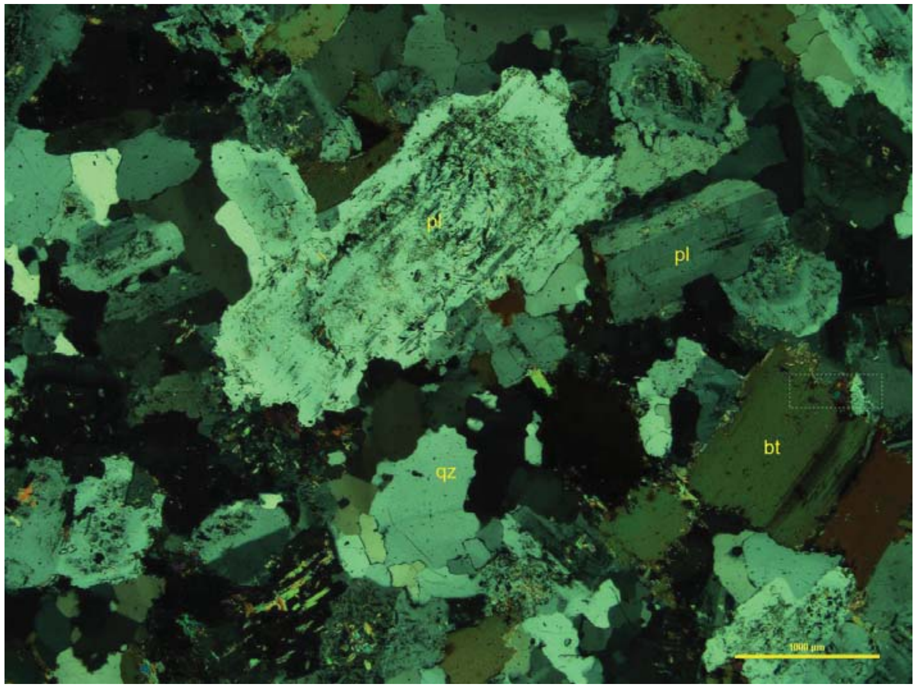


Figure 12 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

LG 010

Rock Type: Tonalite

Subhedral crystals of plagioclase and subordinate lamellae of biotite are randomly oriented within an inequigranular aggregate of quartz defining a medium-grained granular and isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**50**	–	**52**	Quartz prevails over the feldspar as anhedral and interlobate crystal aggregates. The quartz is inclusion-free and in some cases shows a moderate undulose extinction.	**0.3–3.5**
plagioclase→white mica+epidote	**35**	–	**37**	Plagioclase is dispersed within the prevailing quartz as anhedral to subhedral crystals. The plagioclase crystals consist of a weakly altered subhedral core, and a fresh albitic rim. The core hosts very fine- to fine-grained alteration products of white mica and epidote.	**0.3–3**
biotite	**7**	–	**9**	Biotite lamellae are homogeneously dispersed within the inequigranular aggregate of quartz, and contribute to the isotropic microstructure.	**up to 1.5**
alkali feldspar	**5**	–	**7**	Alkali feldspar is medium-grained anhedral, and its crystals occupy the interstitial positions between the quartz and plagioclase. The alkali feldspar is distinguished by its Albite-Pericline twinnings under crossed Nicols transmitted light, and show a yellow colour in the stained billet.	**up to 2**
epidote	**1.5**	–	**2**	Anhedral crystals of epidote overprinted the core of the plagioclase and are dispersed within the quartz and the biotite.	**up to 0.8 long**
chalcopyrite		**tr**		very rare crystals of chalcopyrite are intergrown within some of the biotite crystals.	**up to 0.1**
zircon		**tr**		Zircon is dispersed within the biotite as very fine-grained inclusions.	**up to 0.01**

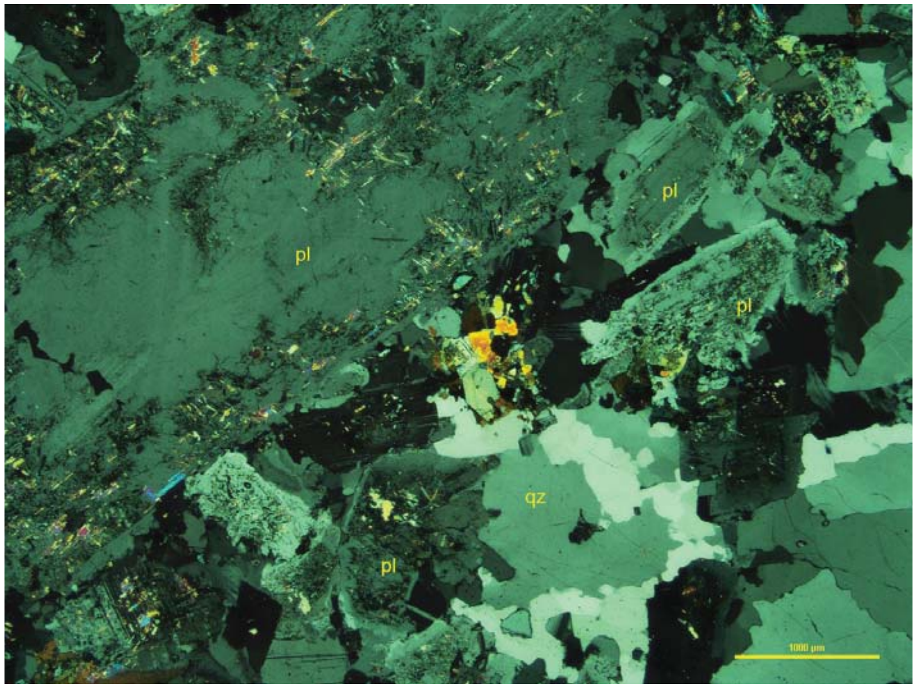


Figure 13 Subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz). Crossed polarizers transmitted light.

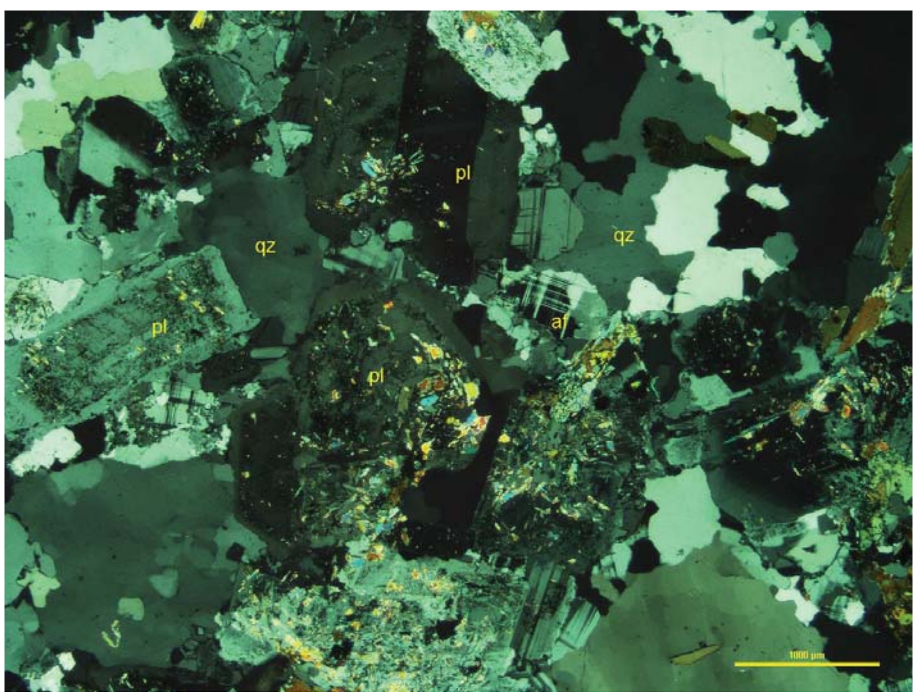


Figure 14 Subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), and alkali feldspar (af). Crossed polarizers transmitted light.

LG 011

Rock Type: White mica-altered granitoid(?) & quartz-white mica-pyrite schist & quartz filling(?)

This polished thin section is made up of three domains: In the lower part (Domain A), coarse-grained subhedral crystals of plagioclase and anhedral crystals of quartz are associated with subordinate white mica and rare opaque minerals in a granular isotropic microstructure. Domain B forms a ~10 mm thick sub-tabular and schistose domain of fine-grained quartz, white mica and pyrite, which defines sharp boundaries between the granular quartzofeldspathic rock and a ~quartz-rich Domain C.

Mineral	*Modal %*				Size range (mm)
Domain A: (~45% of PTS)					
granitoid(?)					
plagioclase→white mica-carbonate	**22**	**–**	**24**	Plagioclase forms subhedral crystals, which are randomly oriented and weakly to moderately altered by fine-grained flakes of white mica and subordinate patches of carbonate.	**up to 4**
quartz	**18**	**–**	**18**	Quartz occurs as medium- to coarse-grained anhedral to interstitial crystals occupying the interstices between the plagioclase. Some crystals are up to 6 mm across, and the coarser crystals show a moderate undulose extinction.	**up to 3.5 rare up to 6**
white mica	**4**	**–**	**5**	Fine- to medium-grained flakes and lamellae of white mica weakly to moderately altered the plagioclase.	**up to 0.8 long**
alkali feldspar	**0.2**	**–**	**0.3**	Alkali feldspar is rare and forms anhedral medium-grained crystals dispersed within the quartz.	**up to 0.5**
Domain B: (~20% of PTS)					
schist					
quartz	**14**	**–**	**15**	Quartz prevails over the white mica and the pyrite within this sub-tabular and schistose domain. The quartz is inequigranular and occurs as fine-grained polygonal to interlobate crystal aggregate near the boundaries of the domain associated with the pyrite, and as medium-grained (up to 1.5 mm long) preferentially iso-oriented crystals within the median part of the domain.	**up to 2.2 long**
white mica	**3**	**–**	**4**	White mica forms fine- to medium-grained lamellae, which are concentrated along the boundaries of the domain, and show a preferred dimensional orientation defining a schistosity parallel to the boundaries. In some cases, the white mica are curved and are randomly oriented, thus indicating that their crystallization occurred during and immediately after the deformation event.	**up to 1.5 long**
pyrite	**2**	**–**	**3**	Pyrite forms inequigranular subhedral to euhedral crystals defining irregular clusters oriented parallel to the schistosity.	**up to 0.5**

pyrrhotite	**0.2**	**–**	**0.3**	Anhedral crystals of pyrrhotite are dispersed within the mica	**up to 0.6**
Domain C: (~35% of PTS)					
quartz filling					
quartz	**34**	**–**	**35**	Quartz forms a medium-grained quasi-monominerlic domain, which I tentatively interpret as a filling domain/vein associated with the deformation of the schistose domain. Within the monomineralic domain, the quartz occurs as anhedral crystals up to 1.5 mm across.	**up to 1.5**
pyrrhotite→iron oxides	**0.2**	**–**	**0.3**	Anhedral crystals of pyrrhotite are dispersed within the quartz, and are weakly altered by iron oxides.	**up to 0.6**

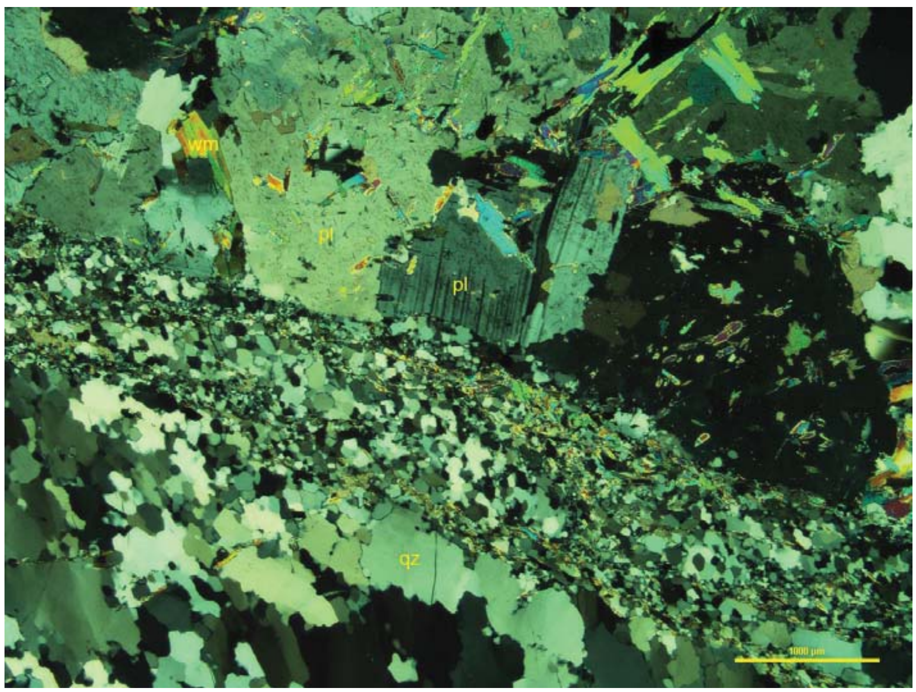


Figure 15 A fine-grained and schistose domain of quartz and white mice (wm) divides a medium-grained domain dominated by plagioclase (pl) and an inequigranular (filling?) domain of quartz (qz). Crossed polarizers transmitted light.

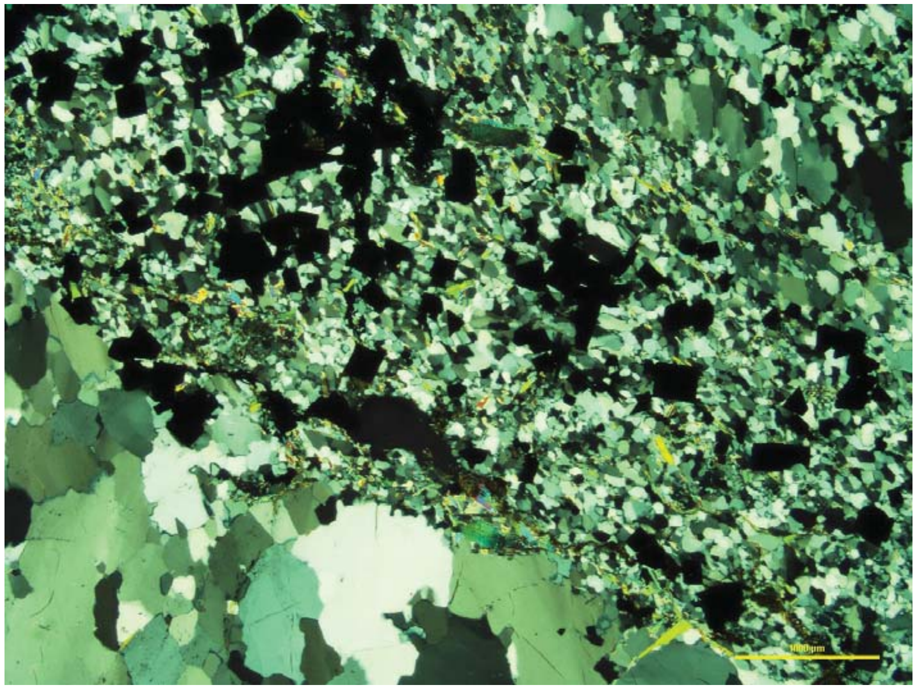


Figure 16 Within the fine-grained aggregate of quartz, idioblastic crystals of pyrite (opaque) are dispersed together with fine-grained white mica. Crossed polarizers transmitted light.

LG 012

Rock Type: White mica altered granitoid

Subhedral crystals of moderately altered plagioclase are immersed within an inequigranular aggregate of quartz and defines a granular isotropic microstructure similar to the granitoid rock in Sample 11.

Mineral	*Modal %*				Size range (mm)
quartz	**55**	–	**57**	Quartz forms inequigranular crystals defining sub-rounded to irregularly shaped domains, which I interpret as being re-crystallized magmatic crystals. Some of the domains are up to 10 mm long, and the quartz crystals are up to 1.8 mm across. Some of the quartz crystals show a moderate undulose extinction.	**0.1–1.8**
plagioclase→white mica	**33**	–	**35**	Anhedral to subhedral crystals of plagioclase are randomly oriented within an inequigranular quartz aggregate. The plagioclase crystals are moderately altered by very fine- to fine-grained flakes of white mica, and in some cases show Albite twinnings.	**0.3–3**
white mica	**10**	–	**15**	Most of the white mica overprinted the plagioclase crystals, and in some cases are up to 0.6 mm long.	**up to 0.6 long**
pyrrhotite		**tr**		Anhedral crystals of pyrrhotite are spatially associated with the white mica clusters dispersed within the quartz.	**up to 0.4**
biotite		**tr**		Very fine to fine-grained flakes of biotite are hosted in some of the plagioclase crystals, and in rare cases are dispersed within the quartz and are up to 1.8 mm long.	**up to 0.1, rare up to 1.8 long**

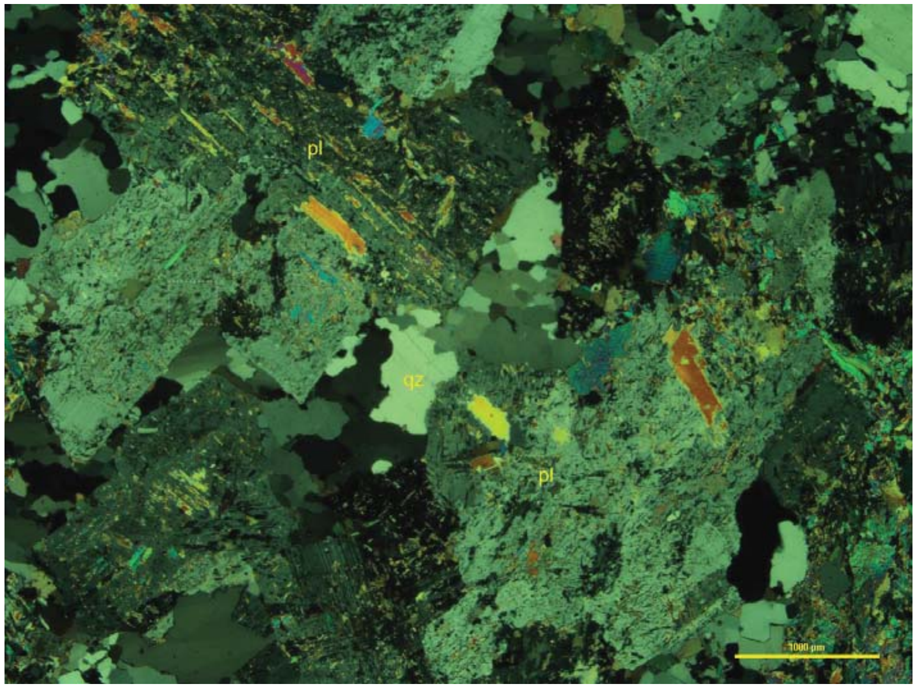


Figure 17 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), and are weakly altered by white mica. Crossed polarizers transmitted light.

LG 013

Rock Type: Graphite-bearing quartz-plagioclase-white mica schist

Most of this polished thin section is made up of an inequigranular domain of quartz surrounded by sub-parallel domains of plagioclase, quartz, white mica, and graphite, which define a weak spaced schistosity.

Mineral	*Modal %*				Size range (mm)
quartz	**82**	–	**84**	Quartz is concentrated within the central part of this polished thin section and forms a monomineralic microlithon of inequigranular crystals. The quartz crystals show anhedral shape and are preferentially iso-oriented.	**up to 3.5, rare up to 8 long**
plagioclase→white mica+carbonate	**15**	–	**17**	Anhedral crystals of plagioclase are concentrated within irregular and sub-parallel domains wrapping the monomineralic quartz domain. The plagioclase crystals are weakly altered by very fine- to fine-grained flakes of white mica and carbonate, are randomly oriented, and are in reciprocal contact within the plagioclase-rich domains. Most of the plagioclase crystals show Albite twinnings.	**up to 2**
white mica	**0.5**	–	**1**	Within the graphite-bearing cleavage domains, medium-grained lamellae of white mica are deformed, folded, preferentially iso-oriented, and define a subtle schistosity.	**up to 0.6 long**
pyrite	**0.2**	–	**0.4**	Fine-grained fillings of pyrite wrap the plagioclase domains and define a spaced schistosity. The pyrite fillings probably reactivated the interstices between the quartz-rich and the quartzofeldspathic domains. Rare crystals of pyrite (up to 0.2 mm across) are spatially associated with the irregular fillings.	**up to 0.2**
sphalerite	**0.2**	–	**0.3**	Anhedral crystals of sphalerite form very rare clusters, which are elongated parallel to the schistosity along the boundary between the quartz and the plagioclase-rich domains.	**up to 1.5 long**
pyrrhotite		**tr**		rare and anhedral crystals of pyrrhotite are spatially associated with the white mica in the plagioclase-bearing domains of this rock.	**up to 0.2**

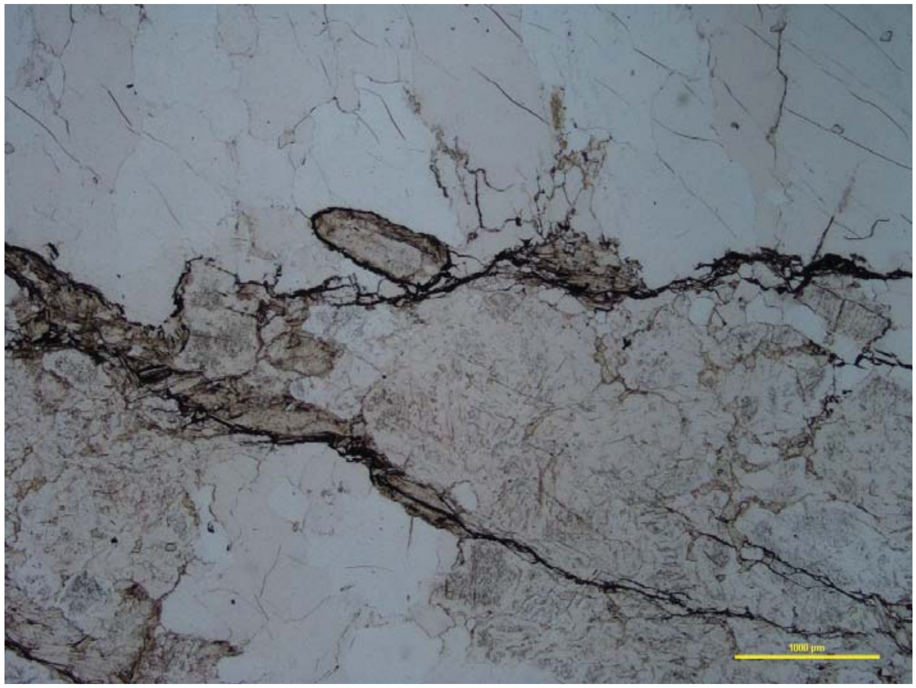


Figure 18 Thin cleavage domains of graphite (opaque) define the schistosity within an interlobate aggregate of quartz and a microlithon of plagioclase-quartz-white mica (see Photomicrograph 13b for details). Plane polarized transmitted light.

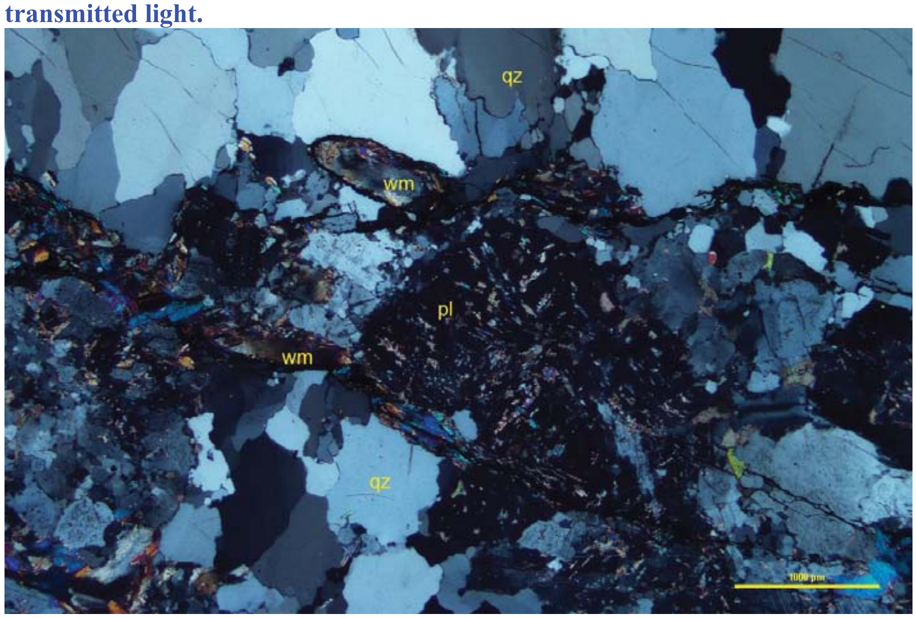


Figure 19 Same area as shown in Photomicrograph 13a—An irregular domain of plagioclase (pl), quartz and white mica (wm) is surrounded by thin cleavage domains of graphite and define the schistosity within an interlobate aggregate of quartz (qz). Crossed polarizers transmitted light.

LG 014

Rock Type: Altered microdiorite(?)

Anhedral to interstitial crystals of plagioclase, anhedral to subhedral crystals of tremolite/actinolite, and anhedral crystals of chlorite, epidote and alkali feldspar define a fine-grained granular and isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase	**41**	–	**42**	Plagioclase forms inequigranular anhedral to interstitial crystals intergrown with the slightly subordinate crystals of amphibole and chlorite. In some of the crystals Albite twinnings are detected, and most of the plagioclase crystals are fresh.	**up to 0.6**
tremolite/actinolite	**24**	–	**25**	Tremolite/actinolite form fine- to medium-grained anhedral to sub-prismatic crystals, which are randomly oriented and are spatially associated with the chlorite. The absence of pleochroism and the low extinction angle (comprised between 15° and 20°) suggests that the amphibole is a tremolite.	**up to 0.8 long**
chlorite	**22**	–	**24**	Anhedral crystals and flakes of chlorite are homogeneously dispersed, randomly oriented, and are intergrown with the plagioclase and the amphibole. Subordinate epidote overprinted the chlorite, which probably replaced primary biotite.	**up to 0.5**
epidote	**6**	–	**7**	Anhedral crystals of epidote are randomly oriented and are spatially associated with the chlorite crystals, and are dispersed within the plagioclase.	**up to 0.8 long**
alkali feldspar	**2**	–	**3**	Alkali feldspar is fine- to medium-grained and it is intergrown with the plagioclase. The alkali feldspar is homogeneously dispersed within the polished thin section, and I tentatively interpret it as a primary mineral. The distribution of the alkali feldspar can be observed on in the image of the billet, in which the alkali feldspar is yellow.	**up to 0.5**
quartz	**1.5**	–	**2**	Fine-grained crystal aggregates of quartz are heterogeneously dispersed within the granular microstructure.	**up to 0.1**
carbonate	**1**	–	**1.5**	Anhedral to interstitial crystals of carbonate are intergrown with the plagioclase and the ferromagnesian minerals.	**up to 0.25**
titanite	**1**	–	**1.5**	Titanite is very fine- to fine-grained and it is dispersed within the chlorite crystals.	**up to 0.05**
magnetite(?)		**tr**		Opaque minerals are subhedral and are dispersed within the plagioclase and the rare quartz.	**up to 0.2**

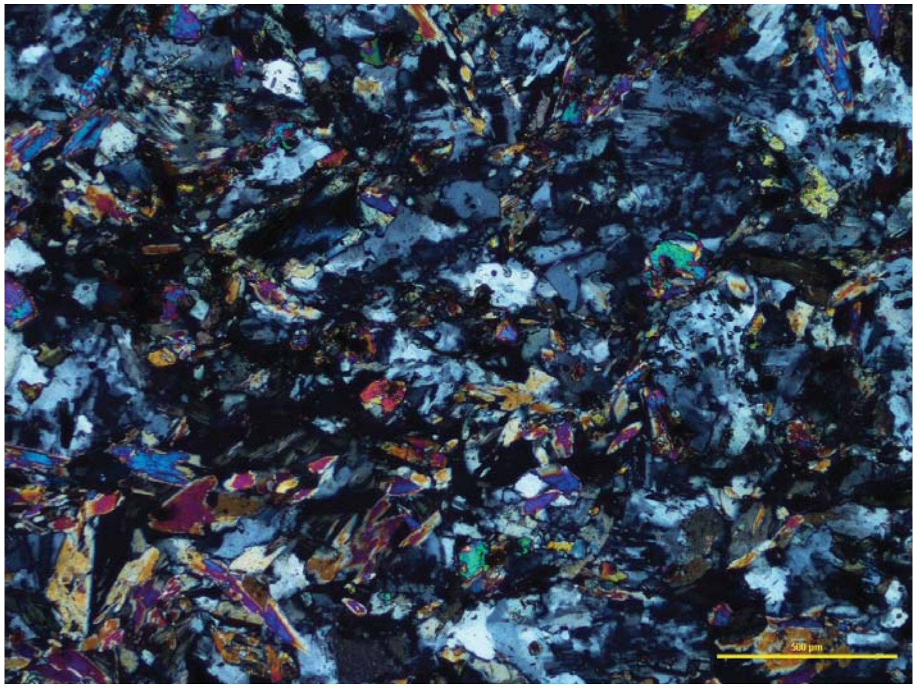


Figure 20 Anhedral crystals of plagioclase, tremolite, chlorite, epidote, define a fine-grained granular microstructure. Crossed polarizers transmitted light.

LG 015

Rock Type: Tonalite

Medium-grained aggregates of anhedral quartz, subhedral crystals of plagioclase, biotite, and interstitial alkali feldspar define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**59**	–	**61**	Quartz is inequigranular anhedral and tend to form irregular monimineralic domains, in which its crystals show interlobate crystal boundaries. The quartz aggregate hosts sparse and randomly oriented crystals of plagioclase, subordinate alkali feldspar and randomly oriented lamellae of biotite, all of which define a medium-grained, granular, and isotropic microstructure.	**0.3–3.5**
plagioclase→epidote+ white mica	**30**	–	**32**	Plagioclase forms medium-grained subhedral crystals, which are randomly oriented and are weakly altered by very fine- to fine-grained crystals of probable epidote and subordinate flakes of white mica.	**0.3–3**
biotite	**5**	–	**6**	Biotite forms fine- to medium-grained randomly oriented lamellae, which are fresh to weakly altered by epidote and titanite, and host very fine-grained inclusions of zircon.	**0.2–1.8**
alkali feldspar	**4**	–	**5**	Alkali feldspar is subordinate to the quartz and the plagioclase, and tends to form interstitial crystals between the quartz and the plagioclase crystals. The alkali feldspar is fresh and shows Albite-Pericline twinnings, thus indicating it is a primary magmatic mineral.	**0.2–3.5**
white mica		**tr**		Rare lamellae of white mica are dispersed within the plagioclase, and within the granular microstructure. The white mica lamellae are randomly oriented and rarely overprinted the biotite lamellae.	**up to 0.2**
epidote		**tr**		Very fine- to fine-grained anhedral crystals of probable epidote overprinted the plagioclase and are dispersed within the quartz and the biotite as fine-grained anhedral crystals.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are enclosed within the biotite, in which they generate pleochroic haloes.	**up to 0.01**

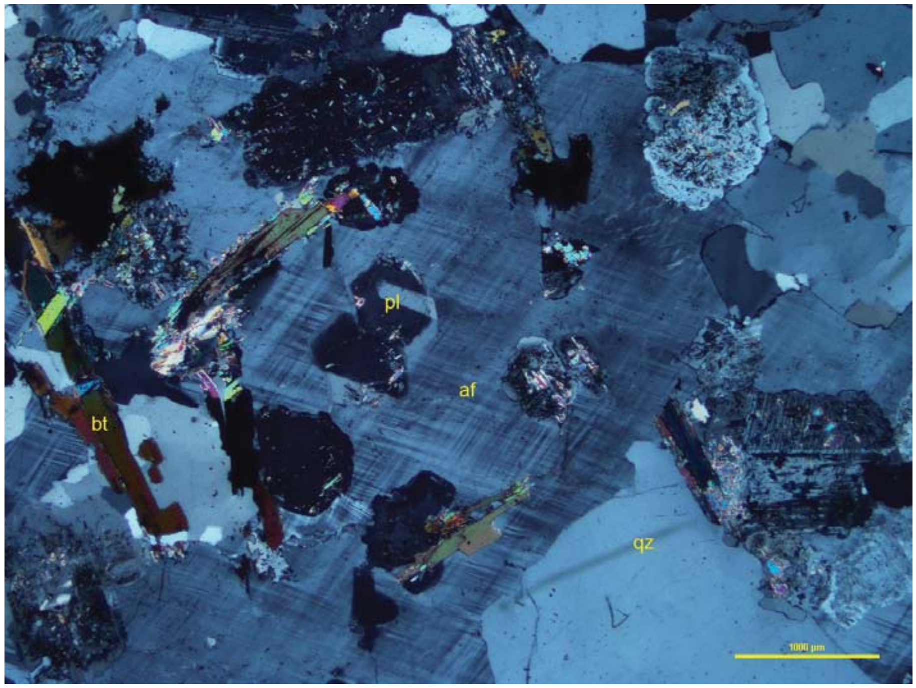


Figure 21 Subhedral crystals of plagioclase (pl) are immersed within interstitial to poikilitic crystals of alkali feldspar (af). Crossed polarizers transmitted light.

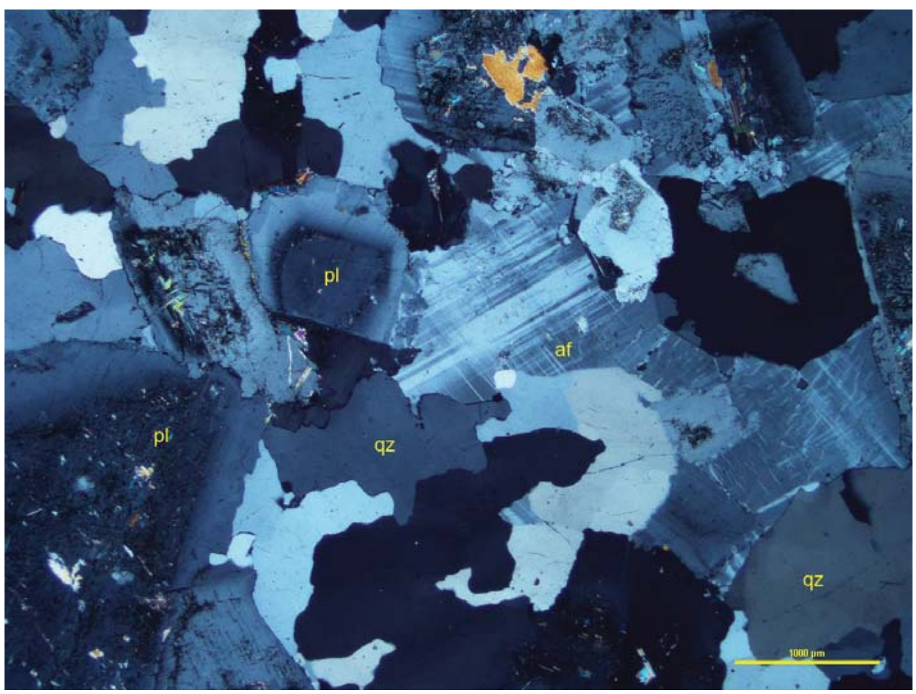


Figure 22 Subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz) and alkali feldspar (af). Crossed polarizers transmitted light.

LG 016

Rock Type: Leucocratic felsitic rock

This heterogeneous polished thin section consists of medium- to coarse-grained anhedral crystals of alkali feldspar and fine- to medium-grained crystals of quartz and plagioclase. Randomly oriented lamellae of biotite are dispersed within the fine-grained aggregate of quartz and plagioclase.

Mineral	*Modal %*				Size range (mm)
alkali feldspar	**68**	–	**70**	Alkali feldspar is inequigranular and the distribution of the coarse-grained anhedral crystals defines the compositional heterogeneity in this polished thin section. The distribution and the grain size of the alkali feldspar can be observed in the stained billet, in which the alkali feldspar is yellow. The alkali feldspar crystals are perthitic and in some cases show Albite-Pericline twinnings. The alkali feldspar is fresh and I interpret it as a primary magmatic mineral.	**0.1–7, rare up to 10 long**
quartz	**20**	–	**22**	Quartz is mostly fine-grained and it forms fine-grained aggregates of interlobate crystals intergrown with anhedral crystals of alkali feldspar and plagioclase.	**up to 2.5**
plagioclase→epidote(?)	**10**	–	**12**	Plagioclase is subordinate to the alkali feldspar and the quartz. It is mostly fine- to medium-grained and it is distinguished by its typical Albite twinnings. The plagioclase is subtly to weakly altered by very fine-grained dispersions of probable epidote.	**up to 1**
biotite→white mica+epidote	**0.5**	–	**0.7**	Fine- to medium-grained lamellae and flakes of biotite are randomly oriented within the fine-grained quartzofeldspathic aggregate. Some of the lamellae are weakly altered by white mica and epidote.	**up to 1**

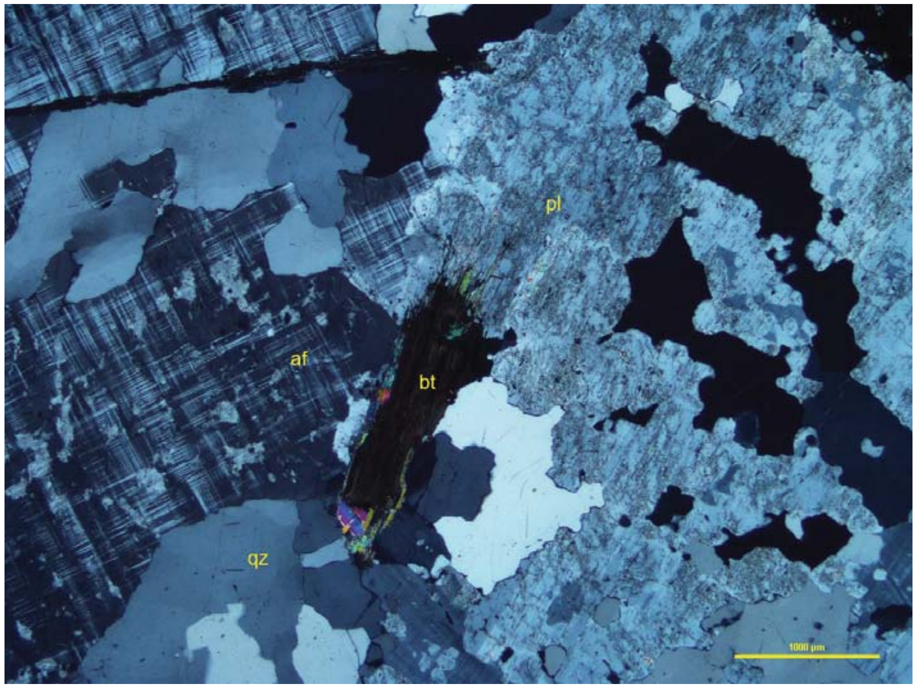


Figure 23 Anhedral crystals of alkali feldspar (af), are intergrown with anhedral crystals of plagioclase (pl) and interstitial crystals of quartz (qz). Crossed polarizers transmitted light.

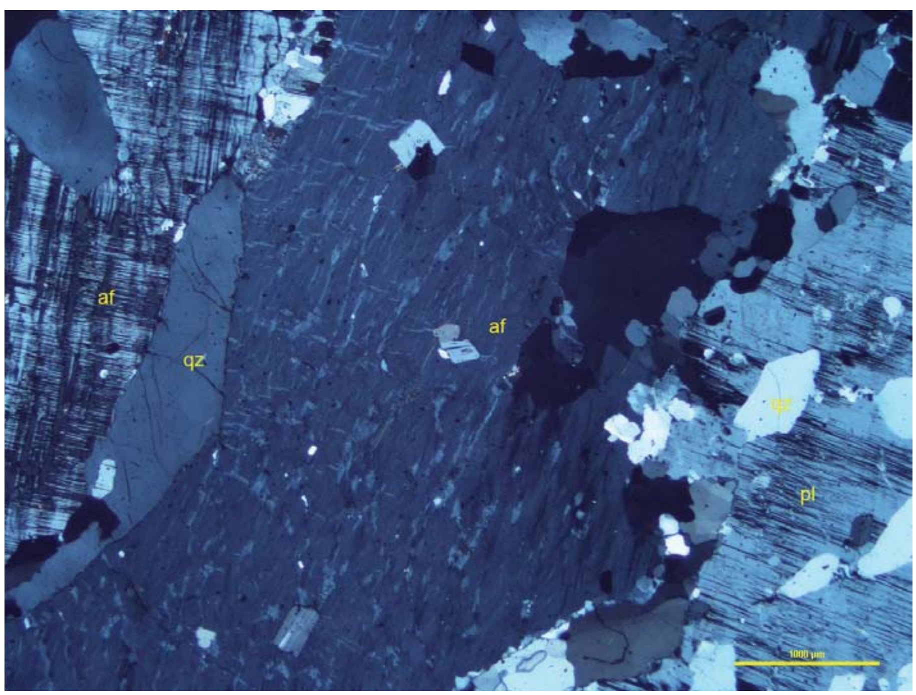


Figure 24 Anhedral crystals of alkali feldspar (af), are intergrown with anhedral crystals of plagioclase (pl) and subordinate crystals of quartz (qz). Crossed polarizers transmitted light.

LG 017

Rock Type: Leucocratic felsitic rock

This polished thin section is compositionally similar to Sample LG016. The inequigranular anhedral crystals of quartz, plagioclase and alkali feldspar clusters in the upper right part of the polished thin section (see upper left of the stained billet, in which the alkali feldspar is yellow).

Mineral	*Modal %*				Size range (mm)
quartz	**44**	–	**46**	Quartz is medium-grained anhedral and it is homogeneously dispersed within this granular microstructure.	**up to 2**
plagioclase→epidote(?)	**37**	–	**39**	Plagioclase forms anhedral to subhedral crystals, which only in some cases show a sub-prismatic shape with crystals up to 2.3 mm long. The randomly oriented crystals of plagioclase contribute to the isotropic microstructure.	**up to 2.3**
alkali feldspar	**16**	–	**17**	Alkali feldspar is inequigranular anhedral and it is concentrated within the upper right part of this plished thin section. Its crystals are relatively fresh, show interlobate boundaries at the contact with the quartz and the plagioclase, and in some cases show Albite-Pericline twinnings. I interpret the alkali feldspar as a magmatic mineral.	**up to 1.5**
biotite	**1**	–	**1.2**	Subhedral lamellae of biotite are homogeneously dispersed within the granular microstructure and are spatially associated with subordinate fine-grained and anhedral crystals of epidote.	**up to 0.5**
epidote		**tr**		Anhedral crystals of epidote are spatially associated with the subhedral crystals of biotite. Very fine-grained crystals may be dispersed within the plagioclase.	**up to 0.2**
pyrite		**tr**		Rare subhedral crystals of pyrite are dispersed and intergrown with the quartz crystals.	**up to 0.2**
pyrrhotite→iron oxides		**tr**		Rare crystals of pyrrhotite are weakly to moderately altered and are dispersed within the quartzofeldspathic aggregate.	**up to 0.1**

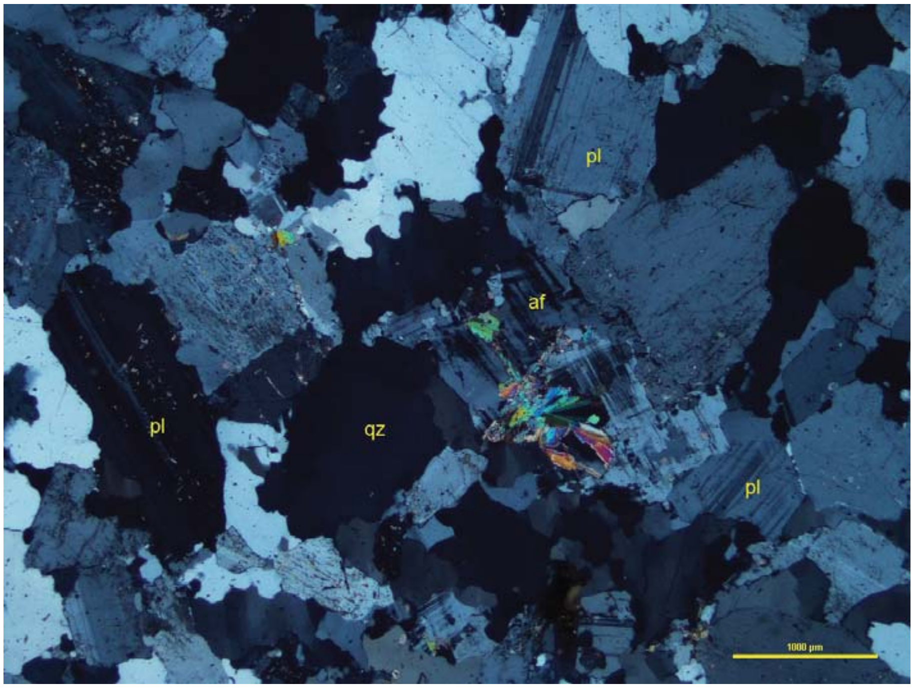


Figure 25 Anhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), alkali feldspar (af) and define a granular isotropic microstructure. Crossed polarizers transmitted light.

LG 018

Rock Type: Microleucogranite

Inequigranular and anhedral crystals of quartz, alkali feldspar and plagioclase define a medium-grained granular microstructure, in which subordinate crystals of biotite are homogeneously dispersed.

Mineral	*Modal %*				Size range (mm)
quartz	**37**	**–**	**39**	Quartz forms inequigranular anhedral crystals showing interlobate crystal boundaries with the plagioclase and the alkali feldspar. Some of the medium-grained crystals show moderate undulose extinction.	**0.1–0.6**
alkali feldspar	**32**	**–**	**34**	Alkali feldspar occurs as fine- to medium-grained crystals, which tend to occupy the interstitial positions between the quartz and the plagioclase. The alkali feldspar crystals are fresh, inclusion-free and show Albite-Pericline twinnings.	**0.1–0.6**
plagioclase	**28**	**–**	**30**	Plagioclase forms anhedral crystals contributing to the homogeneous and isotropic granular microstructure. Some of the plagioclase crystals show Albite twinnings, and most of the crystals are fresh.	**0.1–0.8**
biotite	**1**	**–**	**2**	Fine- to medium-grained lamellae of biotite are subordinate to the quartzofeldspathic aggregate, and are randomly oriented within the granular microstructure. In rare cases, the biotite forms irregular clusters in association with subordinate anhedral crystals of epidote, opaque minerals and carbonate.	**0.1–0.4**
epidote		**tr**			**up to 0.2**
carbonate		**tr**			**up to 0.2**
opaque minerals		**tr**			**up to 0.2**

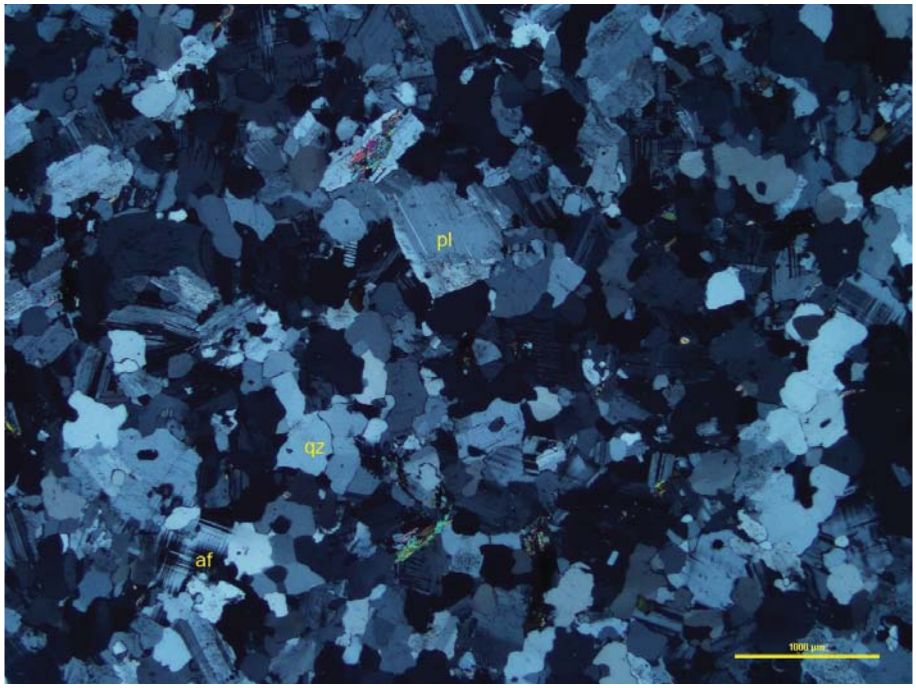


Figure 26 Anhedral crystals of quartz (qz), alkali feldspar (af) and plagioclase (pl) define a granular isotropic microstructure. Crossed polarizers transmitted light.

LG 019

Rock Type: Tonalite

Subhedral crystals of plagioclase are randomly oriented within an inequigranular aggregate of quartz. The quartzofeldspathic aggregate hosts subordinate lamellae of biotite and interstitial crystals of alkali feldspar, and define a medium-grained granular and isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**54**	**–**	**55**	Inequigranular and anhedral crystals of quartz occupy the interstices between the dispersed crystals of plagioclase. Some of the coarser crystals of quartz show undulose extinction.	**up to 2**
plagioclase→epidote± white mica	**32**	**–**	**34**	Plagioclase occurs as medium-grained anhedral to subhedral crystals, which are randomly oriented within the quartz aggregate. The plagioclase is weakly altered by very fine-grained crystals of epidote, white mica, and carbonate. The alteration products are concentrated within the subhedral crystal cores.	**up to 2**
biotite	**8**	**–**	**11**	Biotite forms inequigranular anhedral to subhedral lamellae, which are randomly oriented and contribute to the isotropic granular microstructure.	**up to 2**
alkali feldspar	**4**	**–**	**5**	Alkali feldspar is medium-grained anhedral and it is subordinate to the plagioclase and the quartz. The mostly interstitial crystals are heterogeneously dispersed within the granular microstructure, and can be observed in the image of the stained billet, in which the alkali feldspar is shown in yellow.	**up to 2**
epidote		**tr**		Very fine- to fine-grained dispersions of probable epidote weakly to moderately altered the core of the plagioclase. Fine-grained anhedral crystals are spatially associated to and overprinted some of the biotite crystals.	**up to 0.2**
zircon		**tr**		Very fine-grained crystals of zircon are hosted as inclusions within the biotite crystals.	**up to 0.01**

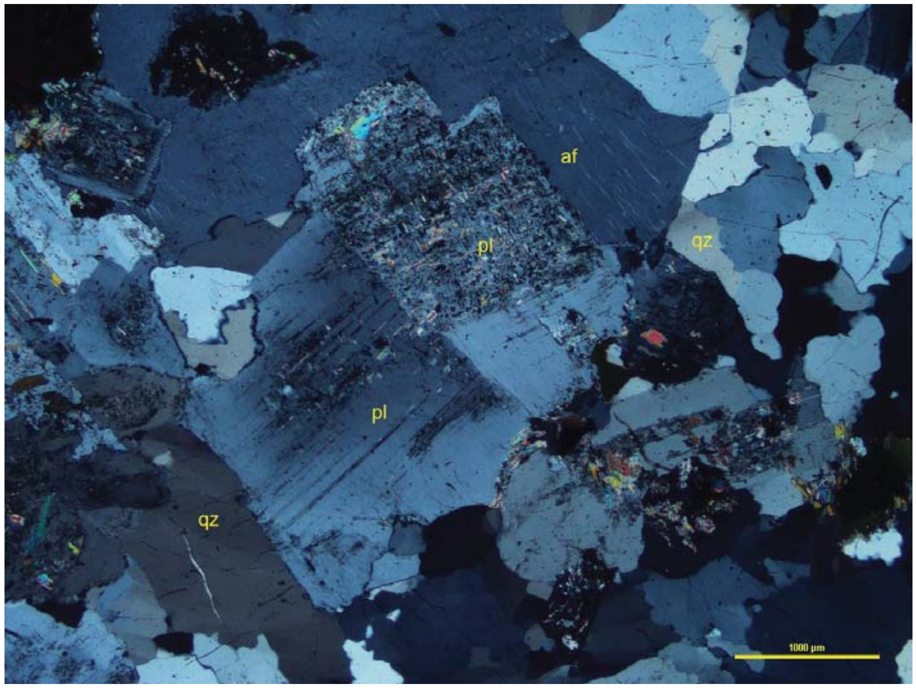


Figure 27 Subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz) and alkali feldspar (af). Crossed polarizers transmitted light.

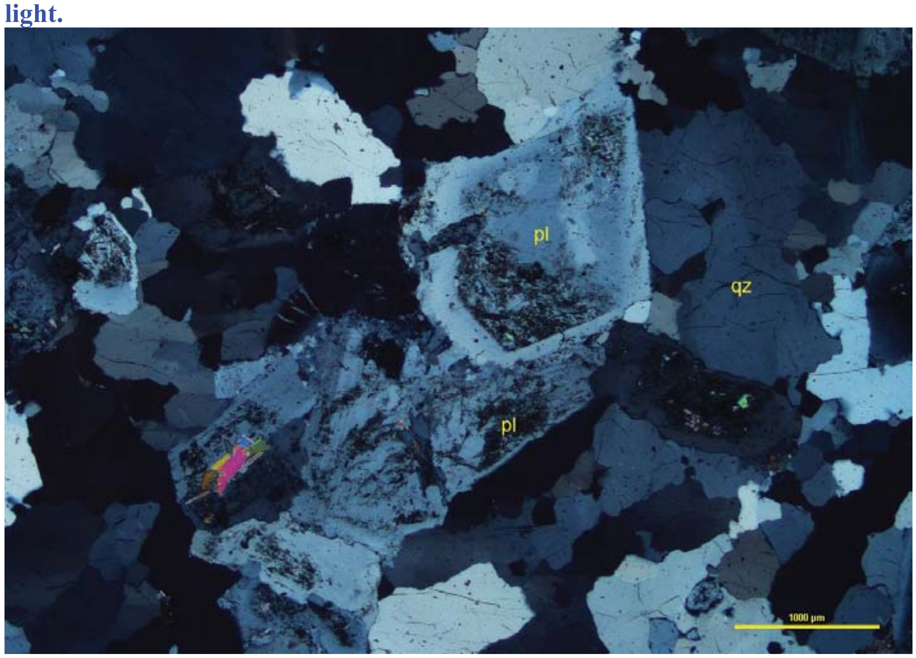


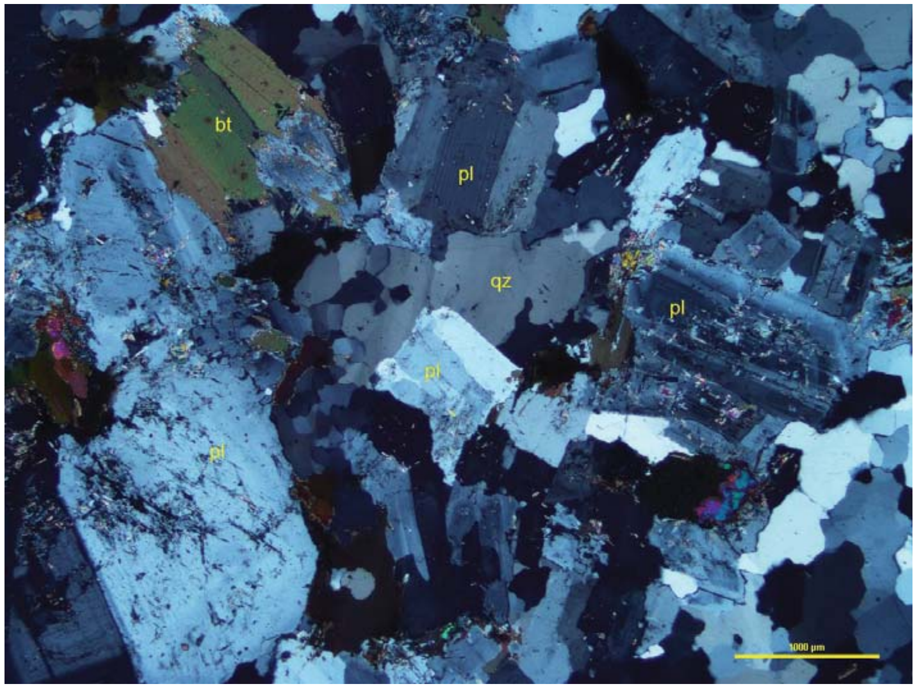
Figure 28 Subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), and define a granular isotropic microstructure. Crossed polarizers transmitted light.

LG0 020

Rock Type: Tonalite

Medium-grained crystals of subhedral plagioclase, anhedral quartz, and randomly oriented lamellae of biotite define a homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→epidote-white mica	**55**	**–**	**57**	Plagioclase occurs as randomly oriented medium-grained crystals. Inclusion-free and fresh albite rims the euhedral to subhedral core of the crystals, which are weakly altered by very fine- to fine-grained dispersions of epidote and white mica. Some of the plagioclase crystals show Albite twinnings.	**0.3–1.8**
quartz	**33**	**–**	**35**	Quartz is inequigranular anhedral, and its interlobate crystals occupy the interstices between the prevailing plagioclase and the biotite.	**up to 1.5**
biotite→epidote	**10**	**–**	**12**	Biotite forms anhedral to subhedral lamellae, which are randomly oriented within the granular microstructure. Some of the biotite crystals are weakly altered by very fine- to fine-grained crystals of epidote, and hosts rare and very fine-grained crystals of zircon.	**up to 1.5**
epidote		**tr**		Epidote weakly altered the plagioclase core as very fine- to fine-grained dispersions associated with lesser white mica, and overprinted the biotite.	**up to 0.3**
carbonate		**tr**		Rare and anhedral crystals of carbonate are dispersed within the biotite and along the interstices between the biotite and the epidote.	**up to 0.3**
zircon		**tr**		Very fine-grained crystals of zircon are enclosed within the biotite crystals.	**up to 0.01**



Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), alkali feldspar (af) and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

LG0 021

Rock Type: Tonalite

Medium-grained crystals of subhedral plagioclase, anhedral quartz, and randomly oriented lamellae of biotite define a homogeneous and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→epidote-white mica	**45**	–	**47**	Plagioclase occurs as anhedral to subhedral crystals, which are randomly oriented and define a granular isotropic microstructure in association with subordinate quartz and biotite. The plagioclase crystals are fresh to subtly altered by very fine- to fine-grained dispersions of epidote and white mica.	**up to 1.5**
quartz	**41**	–	**42**	Inequigranular and anhedral crystals of quartz occupy the interstitial positions between the prevailing plagioclase and the biotite. The quartz crystals show interlobate grain boundaries, and some of the medium-grained crystals show undulose extinction.	**up to 1.8 long**
biotite→epidote-white mica-titanite	**12**	–	**13**	Biotite forms medium-grained and randomly oriented lamellae, which contribute to the isotropic granular microstructure. Some of the lamellae show irregular boundaries, which are intergrown with the plagioclase and indicate a disequilibrium of the biotite during the latest stages of the magmatic crystallization. Along these irregular boundaries, epidote and white mica occur.	**up to 0.8 long**
epidote		**tr**		Very fine- to fine-grained anhedral crystals of epidote subtly altered the plagioclase core and are dispersed along the biotite grain boundaries.	**up to 0.2**
titanite		**tr**		Very fine- to fine-grained crystals of titanite are spatially associated with the biotite crystals.	**up to 0.1**
white mica		**tr**		Very fine-grained flakes of white mica are subordinate to the epidote within the plagioclase's core and along the biotite boundaries.	**up to 0.05**
zircon		**tr**		Rare and very fine-grained crystals of zircon are hosted within the biotite.	**up to 0.01**

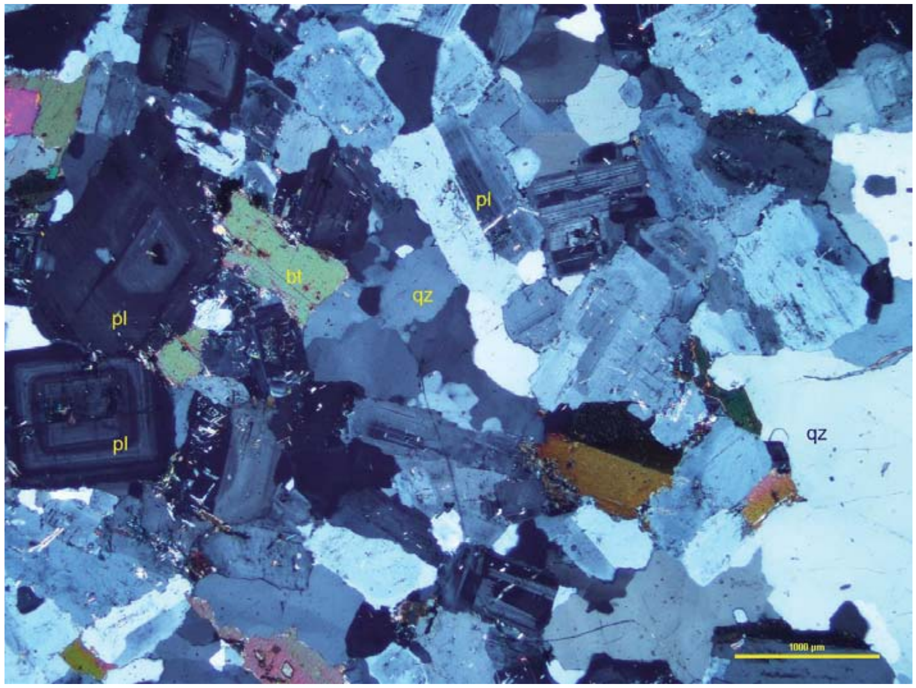


Figure 29 Anhedral to subhedral crystals of plagioclase (pl) show euhedral growth zoning, and are intergrown with interstitial crystals of quartz (qz), and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

LG0 022

Rock Type: Tonalite

Subhedral to euhedral crystals of plagioclase, interstitial aggregates of quartz and alkali feldspar, and randomly oriented lamellae of biotite define a medium-grained and isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→epidote-white mica	**41**	**–**	**43**	Plagioclase forms randomly oriented subhedral to euhedral crystals. The plagioclase crystals consist of an inclusion-free and fresh albite rim, which surrounds euhedral to subhedral core hosting very fine- to fine-grained dispersions of epidote and white mica. Some of the plagioclase crystals show Albite twinnings.	**up to 4**
quartz	**39**	**–**	**41**	Inequigranular and anhedral crystals of quartz occupy the interstitial positions between the randomly oriented crystals of plagioclase and biotite. The quartz crystals show reciprocal interlobate boundaries.	**0.2–2.2**
biotite→epidote	**10**	**–**	**12**	Inequigranular lamellae of biotite are randomly oriented and are homogeneously dispersed within the granular microstructure.	**up to 1.8**
alkali feldspar	**5**	**–**	**6**	Alkali feldspar is subhedral and its fine- to medium-grained crystals occupy interstitial spaces between the plagioclase, the quartz, and the biotite. The alkali feldspar is inclusion-free and shows Albite-Pericline twinnings, thus indicating it is a primary magmatic mineral, which was deformed during the latest stages of the magmatic crystallization.	**up to 0.5**
epidote		**tr**		Fine-grained anhedral crystals of epidote are spatially associated with and partially replaced the biotite.	**up to 0.2**
apatite		**tr**		Anhedral to subhedral crystals of apatite are dispersed witin the quartz and the biotite.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are hosted within the biotite, in which they generate the typical pleochroic halo.	**p to 0.01**

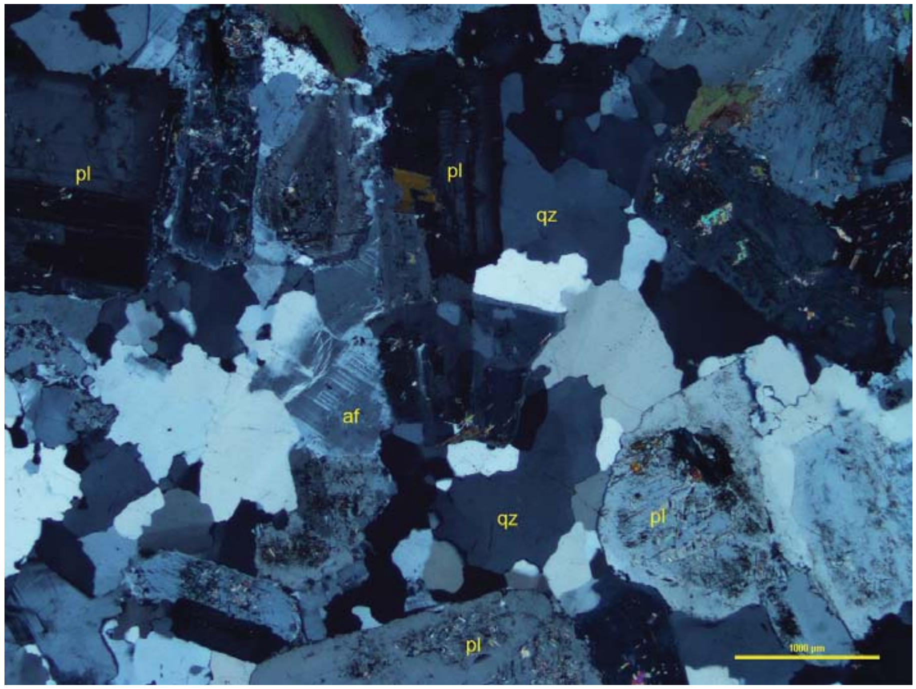


Figure 30 Anhedral to subhedral crystals of plagioclase (pl) are intergrown with interstitial crystals of quartz (qz), alkali feldspar (af) and randomly oriented lamellae of biotite. Crossed polarizers transmitted light.

LG0 023

Rock Type: Biotite schist

Preferentially iso-oriented lamellae of biotite and subordinate white mica are immersed within a fine-grained granoblastic aggregate of quartz and define a continuous schistosity wrapping sub-rounded porphyroclasts of plagioclase.

Mineral	*Modal %*				Size range (mm)
quartz	**75**	–	**77**	Quartz forms fine-grained granoblastic aggregates, which prevail over the preferentially iso-oriented lamellae of biotite and white mica.	**0.05–0.2**
biotite	**13**	–	**15**	Biotite is fine-grained and its lamellae are preferentially iso-oriented and define a continuous schistosity. The schistosity is sub-planar and in some cases wraps the albite porphyroclasts and the albite-bearing porphyroclastic lenses.	**0.05–0.3**
albite→epidote+white mica	**5**	–	**7**	Albite forms sub-rounded porphyroclasts (up to 1.5 mm in diameter), porphyroblastic lenticular aggregates, in which the albite crystals are intergrown with quartz, and it is dispersed as fine-grained xenoblastic crystals within the fine-grained granoblastic aggregate of quartz. The porphyroclasts are weakly to moderately altered by very fine-grained dispersions of probable epidote, and host fine-grained crystals of epidote and white mica.	**0.05–1.5**
white mica	**4**	–	**5**	White mica is subordinate to the biotite, and It is preferentially iso-oriented parallel to the schistosity.	**0.05–0.3**
carbonate	**1**	–	**2**	Fine-grained xenoblastic crystals of carbonate are dispersed within the granoblastic schistose microstructure.	**up to 0.5**
epidote	**0.5**	–	**1**	Epidote forms fine-grained xenoblastic crystals, which are spatially associated with the phyllosilicates, and overprint the albite crystals.	**up to 0.2**
iron oxides		**tr**		Fine-grained aggregates of iron oxides are intergrown with the epidote.	**up to 0.05**

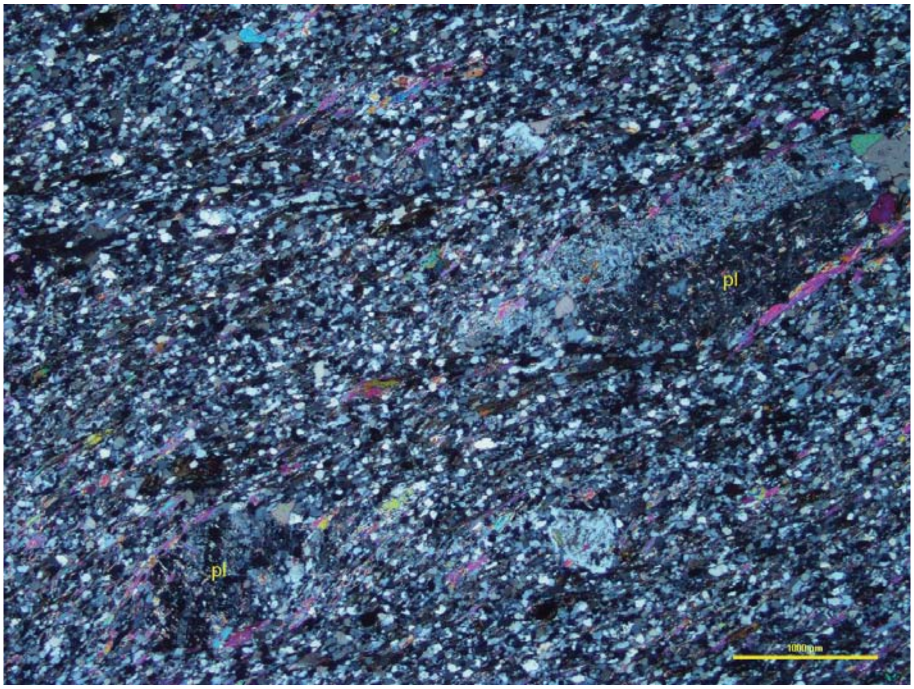


Figure 31 Xenoblastic porphyroclasts of plagioclase (pl) are wrapped by the schistosity defined by the iso-oriented lamellae of biotite, quartz, and white mica. Crossed polarizers transmitted light.

LG0 024

Rock Type: Orthoschist

Randomly oriented and subhedral crystals of plagioclase and weakly iso-oriented lamellae of biotite are immersed within a fine-grained granoblastic aggregate of quartz.

Mineral	*Modal %*				Size range (mm)
quartz	**71**	**–**	**73**	Fine-grained granoblastic aggregate of quartz are intergrown with subordinate biotite and host coarser-grained crystals of plagioclase.	**0.1–0.2**
plagioclase	**20**	**–**	**22**	Plagioclase forms inequigranular subhedral crystals showing Albite twinnings, and in some cases euhedral growth zoning. The euhedral growth zoning is a typical feature of magmatic plagioclase; therefore, I interpret the plagioclase crystals as magmatic relicts immersed within a metamorphosed and slightly deformed groundmass.	**0.2–1.8**
biotite	**7**	**–**	**9**	Fine-grained lamellae of biotite show a weak preferred dimensional orientation, which impart a weak schistosity to this orthoderivate rock.	**up to 0.2**
epidote		**tr**		Xenoblastic crystals of epidote are dispersed within the weakly schistose microstructure and are spatially associated with the biotite lamellae and clusters.	**up to 0.2**
white mica		**tr**		Rare lamellae of white mica are spatially associated with the biotite and show a weak preferred dimensional orientation.	**up to 0.3 long**

Figure 32 Subhedral crystals of plagioclase (pl) show euhedral growth zoning and are immersed within a weakly schistose matrix of quartz and biotite. Crossed polarizers transmitted light.

LG0 025

Rock Type: Orthoschist

Elongate sub-parallel clusters of biotite and subordinate epidote define a weak schistosity together with the preferred iso-orientation of fine-grained lamellae of biotite, which is immersed within a fine-grained granoblastic aggregate of quartz and plagioclase.

Mineral	*Modal %*				Size range (mm)
quartz	**54**	–	**56**	Quartz is fine-grained and defines the granoblastic aggregate intergrown with fine-grained plagioclase and biotite.	**up to 0.2**
plagioclase→epidote	**30**	–	**32**	Plagioclase forms fine-grained subhedral to anhedral crystals intergrown with the quartz in the granoblastic aggregate, and subhedral porphyroclasts (up to 4 mm across) immersed within the granoblastic aggregate of quartz, plagioclase, and biotite. Some of the medium-grained plagioclase crystals show a subhedral growth zoning, which indicate the magmatic origin of the crystals. Most of the plagioclase crystals show albite twinnings. Some of the coarse-grained porphyroclasts show Albite-Carlsbad twinnings.	**0.1–4**
biotite	**10**	–	**12**	Biotite occurs as fine-grained preferentially iso-oriented lamellae, which define the schistosity in this polished thin section. The schistosity is also defined by up to 2.3 mm long sub-parallel clusters of biotite and subordinate quartz.	**up to 0.2**
epidote	**4**	–	**5**	Fine-grained xenobastic crystals of epidote are dispersed within the granoblastic aggregate, in which they are spatially associated and, in some cases, overprinted the biotite lamellae. Very fine- to fine-grained crystals of epidote overprinted the plagioclase crystals.	**up to 0.1**
alkali feldspar	**0.1**	–	**0.2**	Alkali feldspar is rare and forms fine-grained anhedral crystals, which probably represent a mineral relict from a magmatic phase.	**up to 0.5**

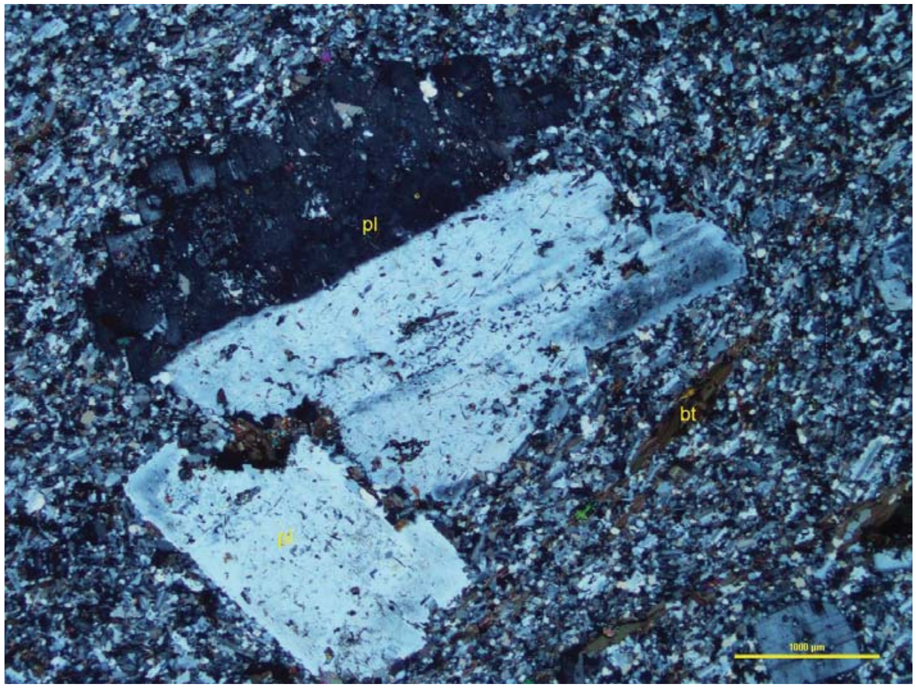


Figure 33 Subhedral crystals of plagioclase (pl) are immersed and rotated within a weakly schistose matrix of quartz, plagioclase, and biotite (bt). Crossed polarizers transmitted light.

LG0 026

Rock Type: Tonalite

Subhedral to euhedral crystals of plagioclase, interstitial crystal aggregate of quartz, and randomly oriented lamellae of biotite define an granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→epidote-white mica	**50**	–	**52**	Plagioclase forms subhedral to euhedral inequigranular crystals, which are randomly oriented and weakly altered by very fine- to fine-grained flakes of white mica. The plagioclase is made up of alteration-free albite rims surrounding weakly altered and subhedral cores, which in most cases show Albite twinnings, and in some cases show a subhedral growth zoning. The weakly altered cores host randomly oriented flakes of white mica.	**0.4–5**
quartz	**42**	–	**44**	Inequigranular crystal aggregates of quartz occupy the interstitial positions between the plagioclase and the biotite. The quartz shows interlobate crystal boundaries and is inclusion-free.	**0.1–2**
biotite	**4**	–	**6**	Anhedral to subhedral lamellae of biotite are randomly oriented and homogeneously dispersed and contribute to the isotropic nature of the granular microstructure.	**up to 4.5 long**
alkali feldspar	**2**	–	**2.5**	Anhedral crystals of alkali feldspar are homogeneously dispersed within the granular microstructure as interstitial crystals, which are distinguished by their low relief and low birefringence under crossed polarizers and by their yellow staining color in the billet.	**up to 0.5**
white mica	**0.2**	–	**0.5**	White mica is very fine- to fine-grained and mostly occurs as a randomly oriented alteration product after the plagioclase. Rare lamellae of white mica overprint some of the biotite lamellae.	**up to 0.2**
carbonate		**tr**		Fine-grained anhedral crystals of carbonate are spatially associated with the biotite.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite lamellae.	**up to 0.01**

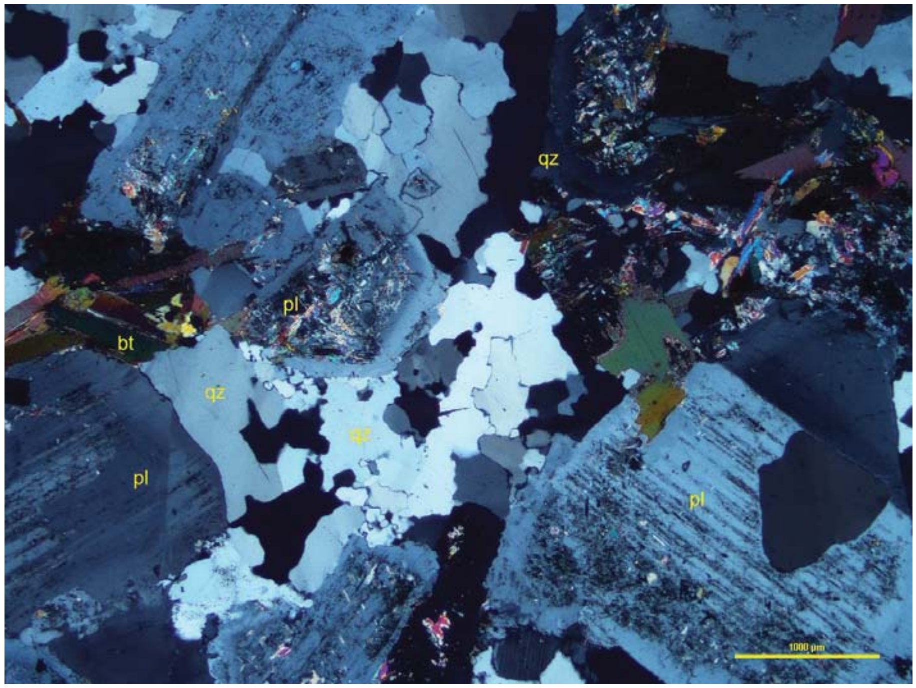


Figure 34 Subhedral crystals of plagioclase (pl) are immersed within an interstitial aggregate of quartz (qz), and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

LG0 027

Rock Type: Tonalite

Subhedral to euhedral crystals of plagioclase, interstitial crystal aggregate of quartz, randomly oriented lamellae of biotite, and subordinate interstitial crystals of alkali feldspar define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→epidote-white mica±calcite	**47**	–	**49**	Subhedral to euhedral crystals of plagioclase are randomly oriented, and together with the randomly oriented biotite, define an isotropic granular microstructure. The plagioclase crystals are weakly altered by very fine-grained dispersions of epidote and very fine- to fine-grained flakes of white mica. The alteration products are concentrated within subhedral crystal cores, which are surrounded by inclusion- and alteration-free albitic rims.	**up to 4**
quartz	**43**	–	**45**	Inequigranular crystal aggregates of quartz occupy the interstices between the plagioclase and the subordinate biotite. Most of the quartz crystals show interlobate grain boundaries.	**up to 3**
alkali feldspar	**5**	–	**6**	Inequigranular and anhedral to interstitial crystals of alkali feldspar are intergrown with the subhedral to euhedral crystals of plagioclase and the interstitial crystal aggregates of quartz. The alkali feldspar crystals are inclusion and alteration-free under crossed polarizers transmitted light and their distribution can be observed in the stained billet, in which the alkali feldspar is yellow.	**up to 3.5**
biotite	**2**	–	**3**	Biotite is homogeneously dispersed within the granular microstructure as fine- to medium-grained randomly oriented lamellae.	**up to 1.2**
white mica	**1**	–	**1.2**	Very fine- to fine-grained lamellae of white mica overprinted the plagioclase, and to a lesser extent some of the lamellae of biotite in contact with the plagioclase.	
epidote		**tr**		Rare anhedral crystals of epidote are spatially associated with the biotite and the white mica overprinting the plagioclase.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite lamellae.	**up to 0.01**

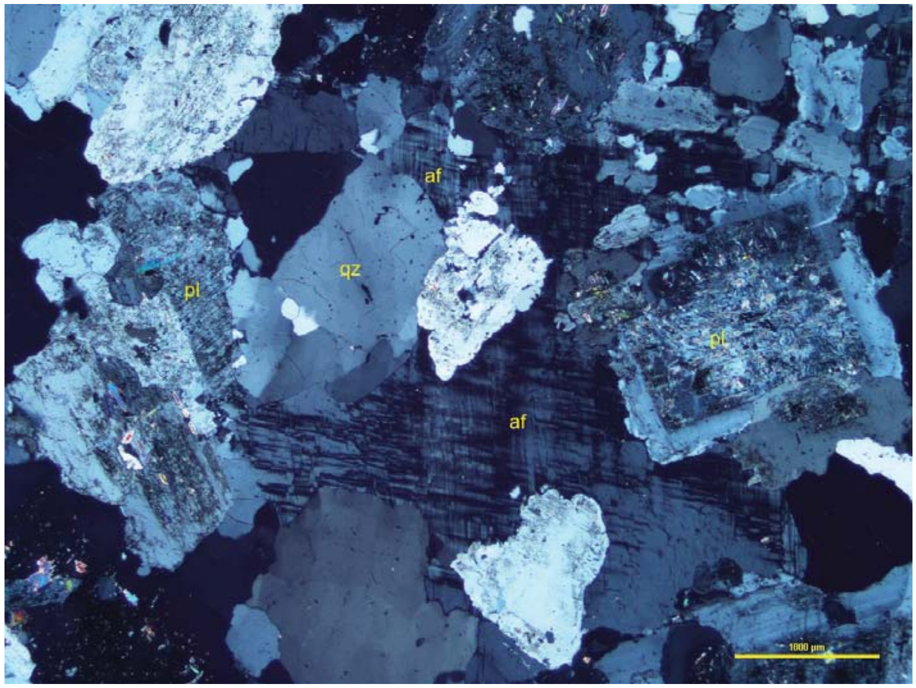


Figure 35 Subhedral crystals of plagioclase (pl) are immersed within an interstitial aggregate of quartz (qz), and alkali feldspar (af). Crossed polarizers transmitted light.

LG0 028

Rock Type: Epidote-biotite-altered microcrodioritic rock(?)

Anhedral and inequigranular crystals of plagioclase and randomly oriented crystals of biotite define a fine- to medium-grained anhedral granular microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase→epidote	**60**	**–**	**62**	Inequigranular and anhedral crystals of plagioclase host very fine- to fine-grained crystals of epidote. In rare cases, subhedral shapes, which suggests a magmatic origin and thus a dioritic composition of this rock. In rare cases, the plagioclase shows Albite twinnings.	**0.1–2**
biotite	**16**	**–**	**17**	Biotite is very fine- to fine-grained, and in most of its occurrences are randomly oriented. It is hard to interpret the origin of the biotite. There is no evidence of a magmatic origin, and there is no foliation indicating a metamorphic origin. I tentatively interpret the biotite as an alteration mineral overprinting and partially replacing the biotite of a dioritic rock. The abundance of epidote partially supports such hypothesis.	–
epidote	**10**	**–**	**15**	Inequigranular and mostly fine-grained anhedral crystals of epidote are dispersed within the plagioclase and in some cases form medium-grained crystals (up to 1 mm across). I interpret the relatively abundant epidote and biotite as an alteration assemblage within a dioritic rock.	**up to 1**
amphibole	**2**	**–**	**2.2**	An anhedral crystal of amphibole is partially overprinted by biotite and shows a distinct pleochroism with green tints. I interpret this mineral as a relict of a magmatic mineral, which is partially overprinted by the biotite crystallization.	**up to 4.5 long**
quartz	**5**	**–**	**7**	Fine-grained granoblastic aggregates of quartz are dispersed within the anhedral aggregate of plagioclase and biotite.	**up to 0.1**
pyrite		**tr**		Rare and subhedral crystals of pyrite are heterogeneously dispersed within the granular microstructure, and are spatially associated with the biotite crystals.	**up to 0.2**

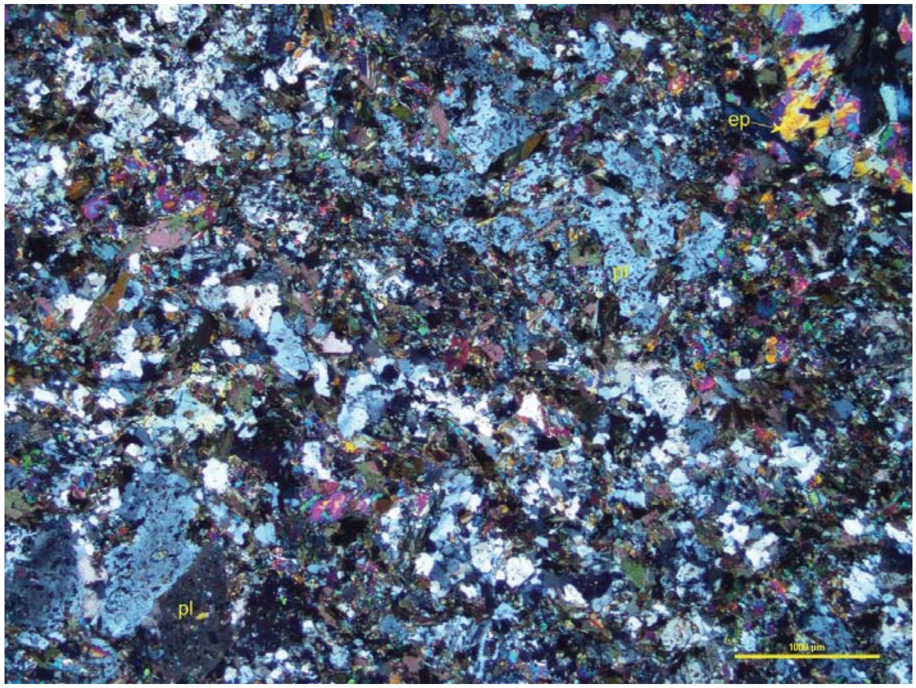


Figure 36 Anhedral and inequigranular crystals of plagioclase (pl), biotite, epidote (ep) and quartz define an anhedral granular microstructure. Crossed polarizers transmitted light.

LG0 029

Rock Type: White mica-epidote-altered tonalite

Anhedral to subhedral crystals of plagioclase, interstitial crystal aggregate of quartz, randomly oriented lamellae of biotite, and subordinate interstitial crystals of alkali feldspar define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**52**	–	**54**	Inequigranular crystals of quartz occupy the interstitial positions between the plagioclase and the biotite crystals. In rare cases, the quartz reaches 3 mm in diameter, and in most of its occurrences shows interlobate to curved crystal boundaries.	**up to 3**
plagioclase→white mica-epidote	**42**	–	**44**	Subhedral crystals of plagioclase are randomly oriented and are weakly altered by white mica and epidote. The fine-grained and randomly oriented flakes of white mica are concentrated within the subhedral crystal core of the plagioclase. The rims of the plagioclase are alteration-free and are made up of albite.	**up to 2.5**
alkali feldspar	**4**	–	**5**	Alkali feldspar is subordinate to the plagioclase and the quartz and forms fine- to medium-grained interstitial crystals. The alkali feldspar crystals are mostly fresh, and in some cases show Albite-Pericline twinnings and I interpret them as magmatic minerals.	**up to 2.2**
biotite→white mica-epidote	**0.5**	–	**1**	Biotite is rare, and its fine- to medium-grained lamellae are randomly oriented within the granular microstructure and are partially replaced by fine-grained white mica and epidote.	**up to 0.9**

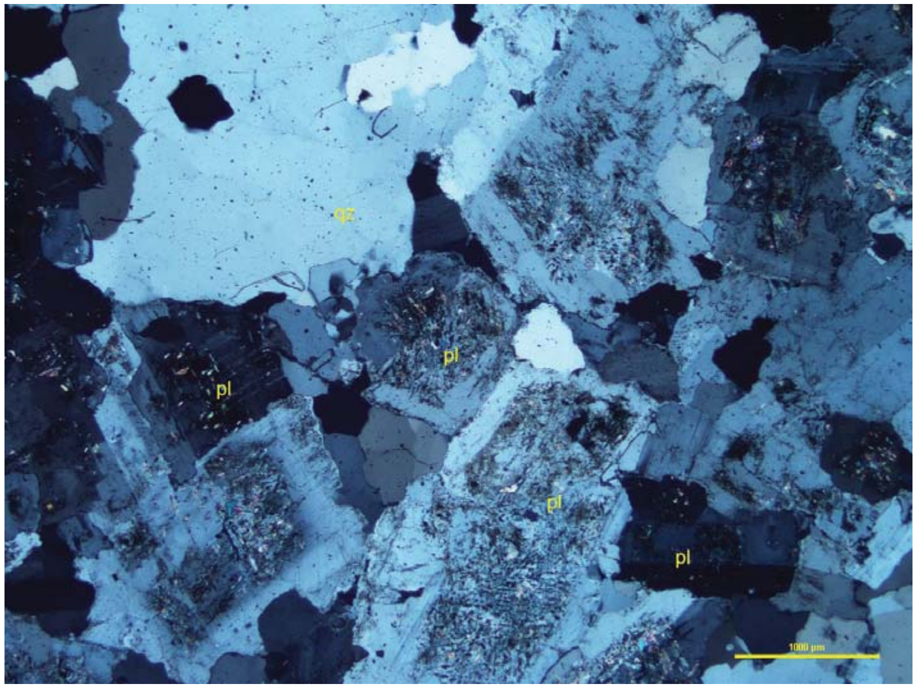


Figure 37 Subhedral crystals of plagioclase (pl) are immersed within an interstitial aggregate of quartz (qz). Crossed polarizers transmitted light.

LG0 030

Rock Type: Tonalite

Anhedral crystals of plagioclase are immersed within an interstitial aggregate of inequigranular anhedral crystals of quartz, which also hosts randomly oriented lamellae of biotite and subordinate interstitial crystals of alkali feldspar. The quartz, plagioclase, biotite, and alkali feldspar define an isotropic granular microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**51**	–	**53**	Inequigranular crystals of quartz form interstitial crystal aggregates, in which the crystals are interlobate. In some cases, the quartz crystals are up to 2.2 mm across, and show a moderate undulose extinction.	**0.3–2.2**
plagioclase→white mica+epidote	**38**	–	**40**	Plagioclase occurs as inequigranular anhedral crystals, which are randomly oriented and intergrown with the quartz and subordinate alkali feldspar. The plagioclase is made up of subhedral cores, which are weakly to moderately altered by white mica and epidote, and albite-rich rims. In some cases, the plagioclase crystals show Albite twinnings.	**0.5–3.5**
biotite	**6**	–	**8**	Biotite forms anhedral to subhedral lamellae, which are randomly oriented within the interstitial aggregate of quartz. The biotite crystals are mostly fresh and host very fine-grained crystals of zircon. Very fine- to fine-grained crystals of epidote occur along the edges of the biotite crystals and along the interstices between the biotite in reciprocal contact.	**up to 3 long**
alkali feldspar	**3**	–	**4**	Alkali feldspar is fine- to medium-grained, and occupies the interstitial positions between the plagioclase and the quartz crystals. The alkali feldspar shows Albite-pericline twinnings, and it is fresh, thus indicating that it is a magmatic mineral crystallized during the final stages of the magmatic crystallization. The distribution of the alkali feldspar can be observed in the image of the stained billet, in which the alkali feldspar is yellow.	**up to 0.5**
epidote		**tr**		Very fine-grained dispersions of epidote occur within the core of the plagioclase crystals. Fine-grained crystals of epidote are concentrated along the edges of the biotite crystals and along the interstices between the biotite in reciprocal contact.	**up to 0.1**
ilmenite		**tr**		Fine-grained lamellae of ilmenite are epitaxially intergrown with the biotite.	**up to 0.4 long**
apatite		**tr**		Very fine- to fine-grained and it is spatially associated with the biotite crystals.	**up to 0.05**
pyrite		**tr**		Very rare and very fine-grained crystals of pyrite are dispersed within the white mica-bearing replacement aggregates after plagioclase.	**up to 0.05**

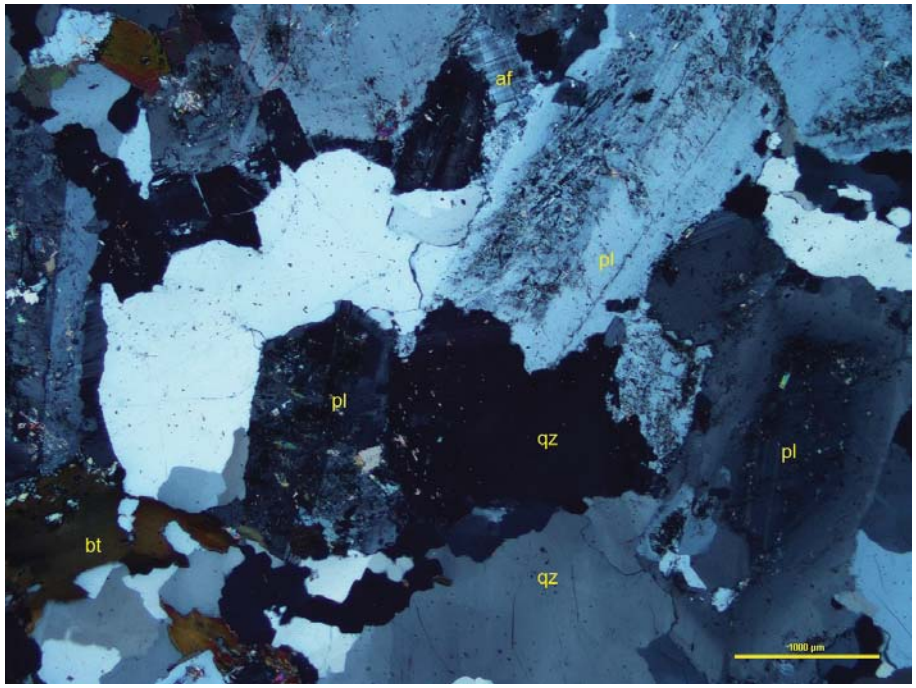


Figure 38 Subhedral crystals of plagioclase (pl) show euhedral growth zoning, and are immersed within an interstitial aggregate of quartz (qz), and randomly oriented lamellae of biotite (bt). Crossed polarizers transmitted light.

LG0 031

Rock Type: Biotite-calcite schist

Fine-grained lamellae of biotite and amphibole are preferentially iso-oriented and define a continuous schistosity. The biotite is associated with subordinate carbonate, quartz, and epidote.

Mineral	*Modal %*				Size range (mm)
biotite	**65**	**–**	**67**	Biotite is fine-grained and its subidioblastic lamellae are preferentially iso-oriented and are relatively homogeneously dispersed within this polished thin section. The biotite and the amphibole define the continuous schistosity and in rare cases form irregular crystal clusters. The biotite hosts very fine-grained dispersions of zircon.	**up to 0.15**
calcite	**19**	**–**	**20**	Calcite forms xenoblastic and in some cases elongate crystals, which are intergrown with the biotite, the amphibole, and in some cases are elongate parallel to the schistosity.	**up to 0.2 long**
quartz	**8**	**–**	**10**	Quartz forms fine-grained interlobate crystal aggregates, which are dispersed within the interstitial positions between the biotite, carbonate and the amphibole.	**up to 0.1**
tremolite or cummingtonite	**3**	**–**	**4**	Amphibole is subidioblastic and its columnar crystals are preferentially iso-oriented parallel to the schistosity. The amphibole shows no pleochroism and extinction angles (c:Z) up to 16°. Some of the columnar crystals show twinnings parallel to the crystal length. I tentatively interpret this amphibole as cummingtonite or tremolite.	**up to 0.2 long**
epidote	**3**	**–**	**4**	Fine-grained xenoblastic crystals of epidote are spatially associated with and overprinted the biotite and the amphibole.	**up to 0.1**

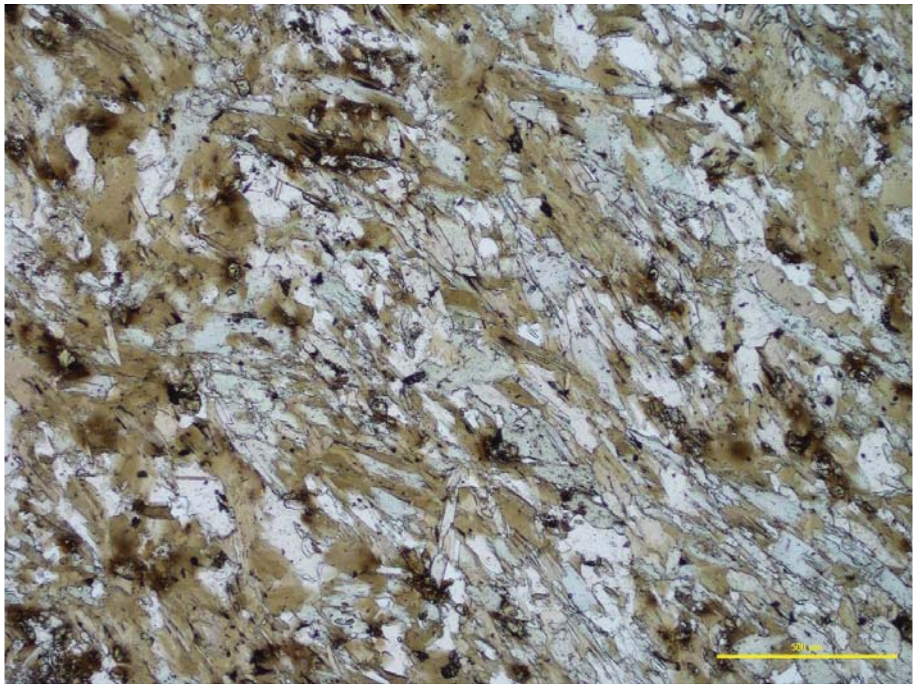


Figure 39 Fine-grained lamellae of biotite and amphibole are preferentially iso-oriented and define a continuous schistosity. Plane polarized transmitted light.

LG0 032

Rock Type: Tonalite

Medium-grained anhedral to subhedral crystals of plagioclase, and randomly oriented crystals of biotite are immersed within a medium-grained aggregate of quartz and define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**54**	–	**56**	Quartz is medium-grained anhedral and forms interlobate crystal aggregates hosting the feldspars and the biotite.	**up to 2**
plagioclase→white mica-epidote	**34**	–	**36**	Plagioclase forms subhedral to euhedral crystals, which are randomly oriented within the prevailing aggregate of quartz. In most cases, the plagioclase crystals show Albite twinnings and a euhedral growth zoning. The plagioclase crystals are weakly to moderately altered by randomly oriented flakes of fine-grained white mica and subordinate crystals of epidote.	**up to 2**
biotite→white mica-epidote	**7**	–	**9**	Biotite is medium-grained anhedral and its crystals are homogeneously dispersed and randomly oriented within the granular quartzofeldspathic microstructure.	**up to 1.5**
alkali feldspar	**3**	–	**5**	Alkali feldspar is subordinate to the quartz and the plagioclase, and forms anhedral and interstitial crystals (up to 2 mm across). The alkali feldspar crystals are fresh and show the typical Albite-Pericline twinnings. In the image of the stained billet, the alkali feldspar is shown in yellow.	**up to 2**
apatite		**tr**		Very fine- to fine-grained subhedral crystal of apatite are spatially associated and, in some cases, intergrown with the biotite.	**up to 0.05**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite.	**up to 0.01**

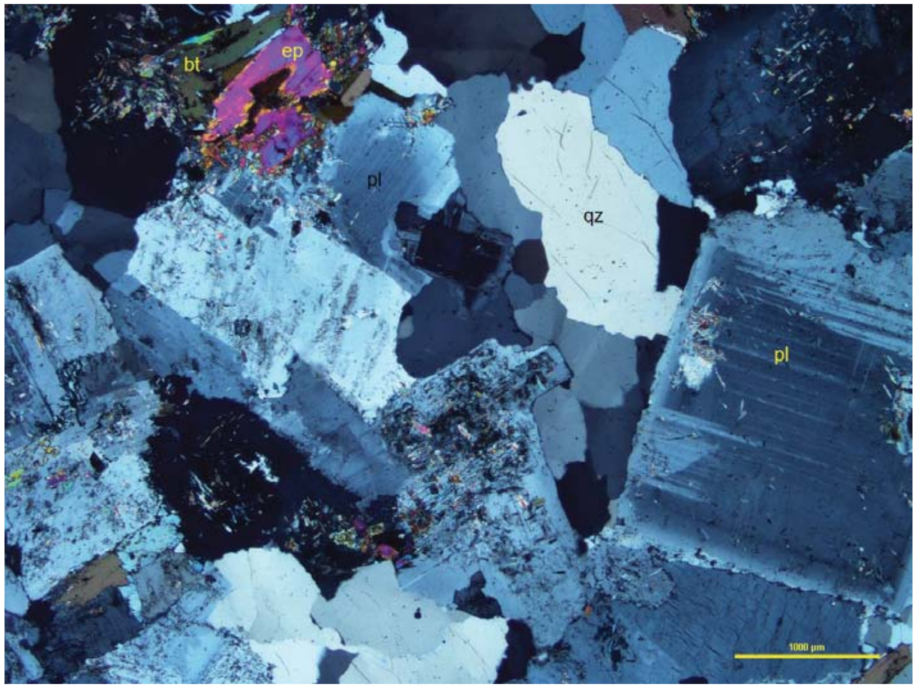


Figure 40 Subhedral to euhedral crystals of plagioclase (pl) are immersed within an interstitial aggregate of quartz (qz), and randomly oriented lamellae of biotite (bt), which are overprinted by epidote (ep). Crossed polarizers transmitted light.

LG0 033

Rock Type: Biotite orthoschist & meta-granitoid

This polished thin section is made up of two main domains. A fine-grained granoblastic domain, in which xenoblastic porphyroclasts of plagioclase are immersed within a matrix of quartz, plagioclase, and preferentially iso-oriented lamellae of biotite (Domain A), and a medium- to coarse-grained granular domain (B) made up of subhedral crystals of plagioclase, preferentially iso-oriented lamellae and clusters of biotite immersed within a medium-grained interstitial aggregate of quartz.

Mineral	*Modal %*				Size range (mm)
Domain A (~60% of PTS)					
quartz	**19**	**–**	**20**	Fine-grained polygonal to interlobate crystal aggregates of quartz prevail over the plagioclase and the biotite within the matrix. The inequigranular crystals of quartz are up to 0.1 mm across and form rare monomineralic domains, which are elongate parallel to the schistosity defined by the biotite.	**up to 0.1**
plagioclase	**12**	**–**	**13**	Plagioclase forms xenoblastic porphyroclasts oriented parallel to the schistosity, and are wrapped by the schistosity defined by the biotite.	**up to 1.5**
biotite	**5**	**–**	**6**	Fine-grained lamellae of biotite show a preferred dimensional orientation, which defines a sub-planar schistosity. The schistosity is sub-parallel to the irregular boundary between the schist and the foliated magmatic rock.	**up to 0.2 long**
white mica	**1.5**	**–**	**2**	White mica forms irregular and discontinuous cleavage domains surrounding the plagioclase porphyroclasts, and it overprinted the biotite. Fine-grained lamellae of white mica are associated with carbonate within lenticular domains oriented parallel to the schistosity.	**up to 0.5 long**
calcite	**1**	**–**	**2**	Xenoblastic and elongate crystals of carbonate tend to form lenticular domains oriented parallel to the schistosity.	**up to 0.2 long**
epidote	**0.2**	**–**	**0.5**	Epidote is spatially associated and intergrown with the biotite, as fine-grained anhedral crystals, and are dispersed within the granoblastic aggregate of quartz.	**up to 0.1**
Domain B (~40% of PTS): metagranitoid					
quartz	**20**	**–**	**21**	In Domain B, the quartz prevails over the feldspar and the biotite and shows interlobate to curved crystal boundaries, and in some cases show undulose extinction.	**up to 1.5 long**
plagioclase→white mica	**17**	**–**	**18**	Plagioclase forms medium-grained subhedral to euhedral crystals, which show a weak preferred orientation and are dispersed within the prevailing quartz. The plagioclase crystals are weakly to moderately altered by fine-grained flakes of white mica and very fine-grained epidote.	**up to 3 long**
biotite	**2**	**–**	**3**	Medium-grained lamellae of biotite are preferentially iso-oriented and define a spaced foliation in the granitoid.	**up to 2.5 long**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite crystals	**up to 0.01**

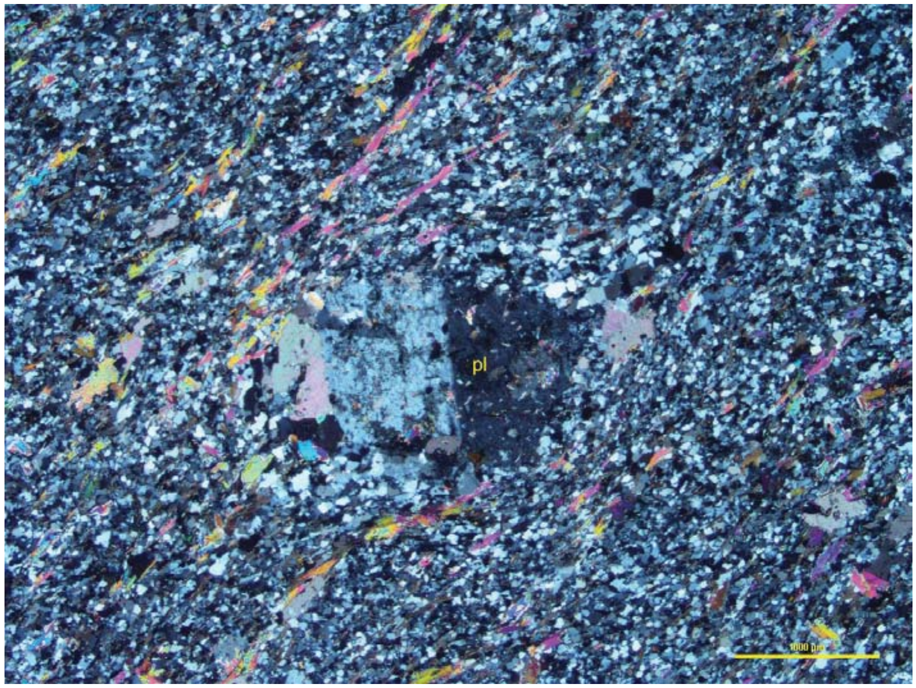


Figure 41 Domain A—Xenoblastic porphyroclasts of plagioclase (pl) are immersed within a matrix of quartz, plagioclase, and preferentially iso-oriented lamellae of biotite. Crossed polarizers transmitted light.

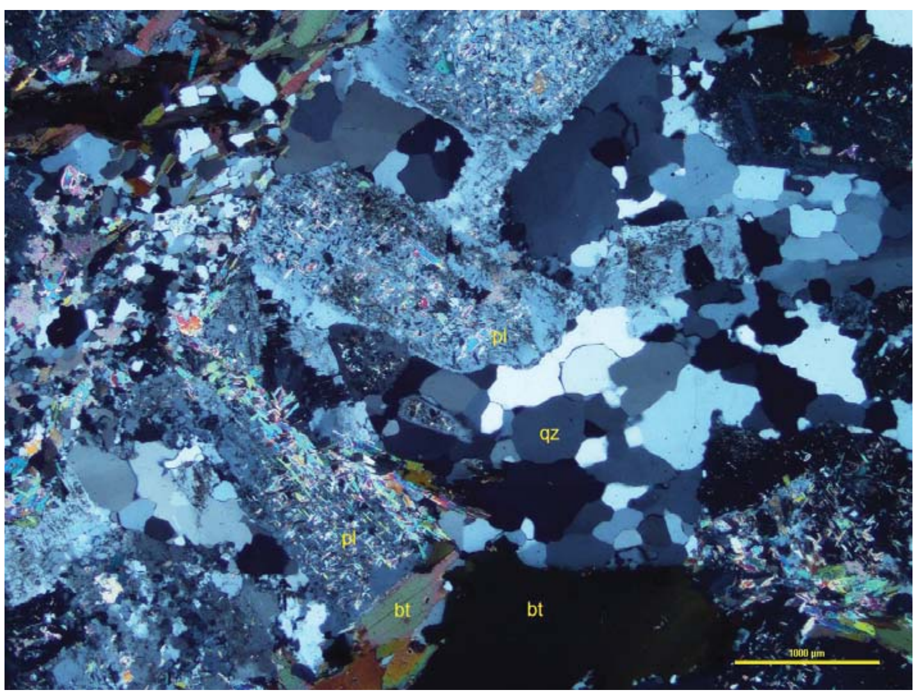


Figure 42 Domain B—Subhedral crystals of plagioclase, preferentially iso-oriented lamellae and clusters of biotite immersed within a medium-grained interstitial aggregate of quartz. Crossed polarizers transmitted light.

LG0 034

Rock Type: Biotite-amphibole-calcite granofels

Porphyroblasts of calcite and irregular clusters of biotite are associated with fine-grained crystals of amphibole and quartz. The weak iso-orientation of the biotite clusters defines a weakly schistose microstructure; however, the crystals within the clusters are randomly oriented.

Mineral	*Modal %*				Size range (mm)
biotite	**47**	–	**49**	Biotite forms fine-grained lamellae, which tend to form irregularly shaped to lenticular clusters dispersed within the amphibole-rich matrix. The preferred dimensional orientation of the clusters defines a weak schistosity.	**up to 0.2**
tremolite-actinolite	**45**	–	**46**	Fine-grained prisms of tremolite-actinolite are randomly oriented and form a felt-like matrix, in which the biotite clusters are dispersed. The amphibole is intergrown with subordinate and fine-grained quartz.	**up to 0.1**
calcite	**5**	–	**7**	Amoeboid and xenoblastic crystals of calcite overprinted the weakly foliated microstructure as medium-grained (up to 0.5 mm across) crystals. The calcite is distinguished by its extreme birefringence and high relief under the microscope, and by its brisk reaction to cold dilute (10%) HCl in the billet.	**up to 0.5**
quartz	**1**	–	**1.5**	Fine-grained and xenoblastic crystals of quartz are intergrown with the amphibole.	**up to 0.05**
iron oxides		**tr**		Xenoblastic to lamellar crystals of iron oxides are intergrown with the biotite crystals.	**up to 0.05**

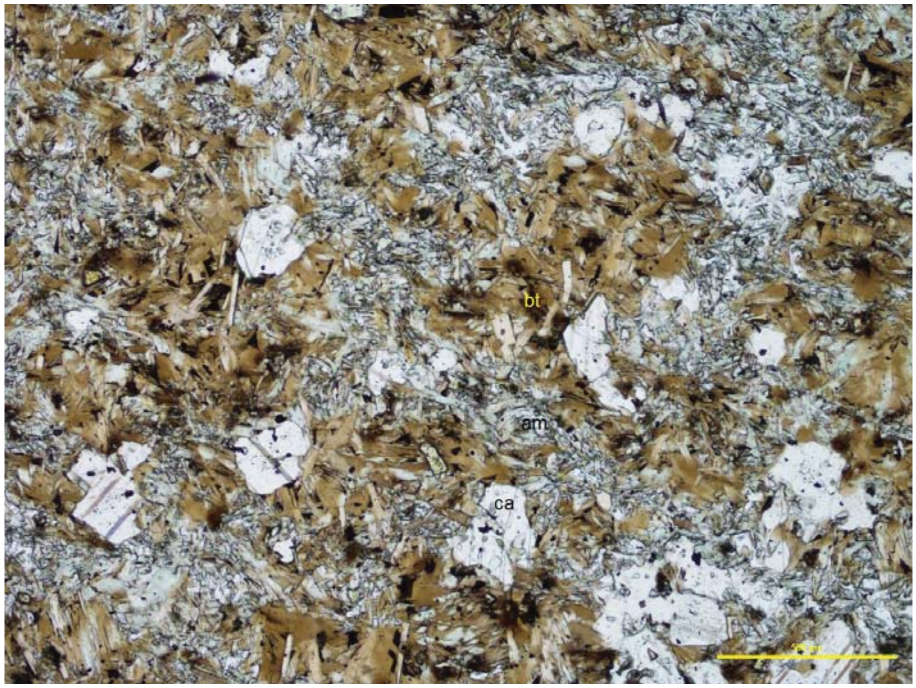


Figure 43 Porphyroblasts of calcite (ca) and irregular clusters of biotite (bt) are associated with fine-grained crystals of amphibole (am) and quartz. Crossed polarizers transmitted light.

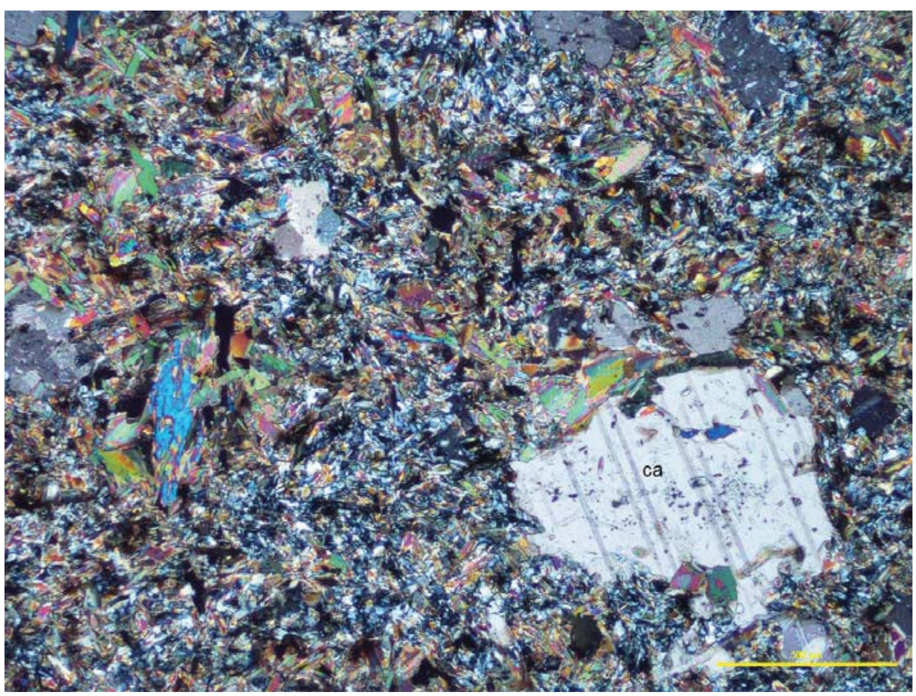


Figure 44 Xenoblastic crystals of calcite overprinted the weakly foliated microstructure defined by biotite, amphibole, and quartz. Crossed polarizers transmitted light.

LG0 035

Rock Type: Albite-amphibole-biotite granofels

Xenoblastic crystals of albite are intergrown with randomly oriented prisms of amphibole, xenoblastic crystals of biotite, and subordinate calcite and epidote, all of which define a heterogeneous isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
albite	**40**	–	**42**	Xenoblastic to interstitial crystals of albite are distinguished by their low birefringence (up to the first order grey), and low relief. They form fine- to medium-grained interstitial crystals, which are heterogeneously dispersed within the isotropic microstructure. The heterogeneously dispersed albite is more abundant in the upper part of this polished thin section, and in this part, it hosts very fine- to fine-grained dispersions of epidote, and fine-grained amphibole.	**up to 0.4**
tremolite-actinolite	**30**	–	**32**	Xenoblastic prisms of tremolite/actinolite are randomly oriented within this polished thin section. In some cases, the prisms host strongly pleochroic cores, which I interpret as the relict of hornblende-rich amphibole, which were partially replaced by a tremolitic to actinolitic amphibole during metamorphism. Most of the amphibole are weakly pleochroic showing green tints and in some cases, twinning developed along the length of the prisms. In the mid and lower part of the polished thin section, the albite forms interstitial crystals subordinate to the amphibole and the biotite.	**up to 0.6 long**
biotite	**15**	–	**20**	Biotite is fine-grained and the xenoblastic crystals are randomly oriented and intergrown with the amphibole.	**up to 0.2**
calcite	**5**	–	**7**	Xenoblastic crystals of calcite are heterogeneously dispersed within the isotropic microstructure. In some cases, the calcite is poikiloblastic and hosts very fine-grained crystals of epidote and amphibole.	**up to 0.3**
epidote	**4**	–	**5**	Fine-grained xenoblastic crystals of epidote are spatially associated and intergrown with the biotite, and to a lesser extent with the tremolite/actinolite.	**up to 0.15**
quartz	**2**	–	**4**	Rare quartz is tentatively interpreted to occur within the interstices between the amphibole, the biotite, and the epidote.	**up to 0.1**
[pyrite]→iron oxides	**1**	–	**2**	Iron oxides completely replaced subidioblastic crystals (up to 0.4 mm across, and in one case up to 1 mm), which retain a cubic shape. Because of the shape of the alteromorphs, I interpret the iron oxides as having replaced pyrite.	**up to 0.4, rare up to 1**

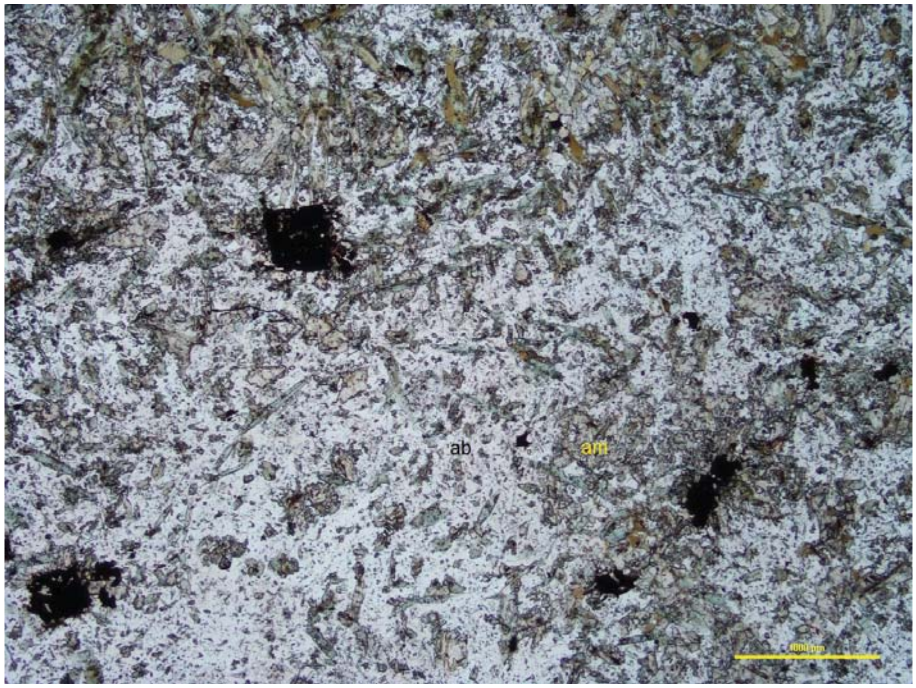


Figure 45 Xenoblastic crystals of albite are intergrown with randomly oriented prisms of amphibole. The alteromorphs of iron oxides (opaque) replaced cubic crystals of pyrite. Plane polarized transmitted light.

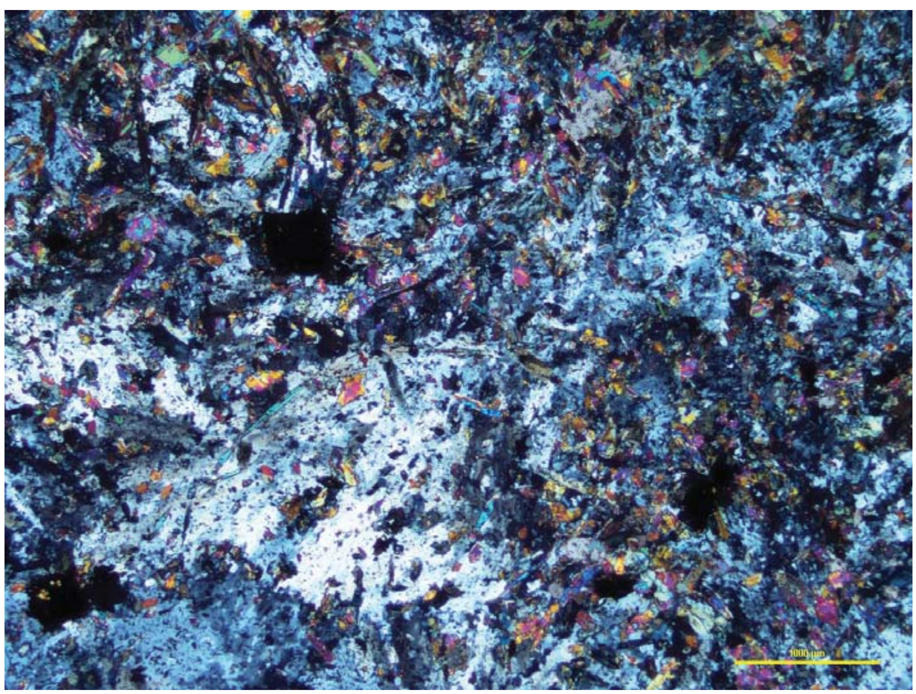


Figure 46 Same area as shown in Photomicrograph 35a. Under crossed polarizers, the epidote shows its high birefringence colours.

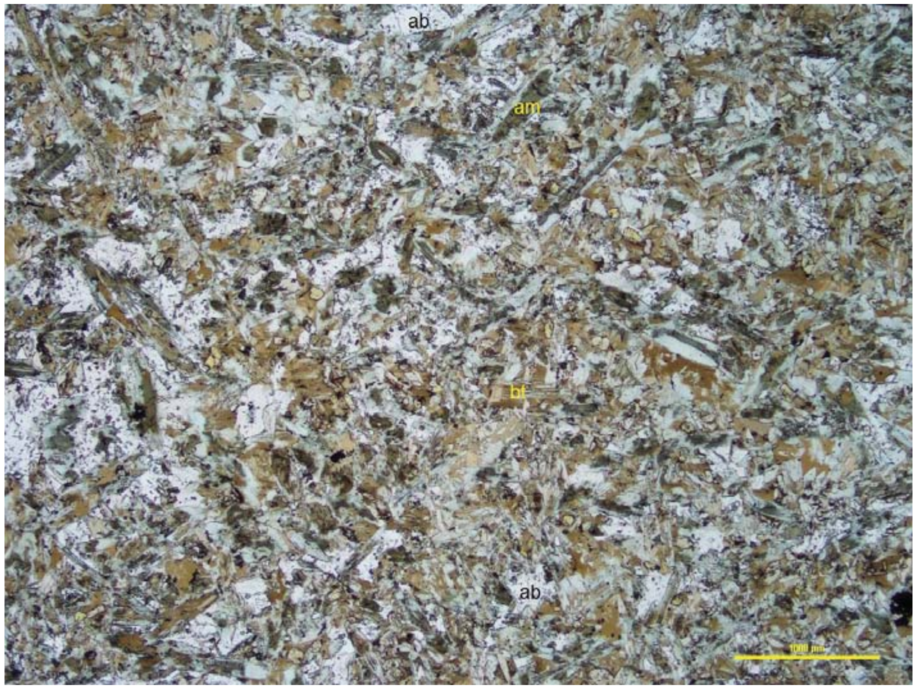


Figure 47 Xenoblastic crystals of albite (ab) are intergrown with randomly oriented prisms of amphibole (am), xenoblastic crystals of biotite (bt), and subordinate calcite and epidote, all of which define a heterogeneous isotropic microstructure. Plane polarized transmitted light.

LG0 036

Rock Type: Biotite-amphibole schist

Xenoblastic relicts of amphibole are immersed within a fine-grained aggregate of preferentially iso-oriented lamellae of biotite, which defines a weak schistosity. The biotite is intergrown, with subordinate crystals of amphibole, calcite, and quartz.

Mineral	*Modal %*				Size range (mm)
biotite→epidote	**50**	–	**52**	Fine-grained lamellae and flakes of biotite are weakly iso-oriented and define a continuous schistosity. The biotite tends to form slightly elongate crystal clusters, in which the biotite flakes and lamellae are randomly oriented. The biotite crystals host very fine- to fine-grained crystals of epidote and zircon.	**up to 0.3**
tremolite-actinolite	**45**	–	**47**	Xenoblastic prisms of tremolite/actinolite are weakly iso-oriented and are subordinate to the biotite in the weakly schistose microstructure. Medium-grained xenoblastic crystals of amphibole (up to 1.2 mm across) form porphyroblasts immersed within the schistosity and wrapped by the schistosity defined by the biotite. The subtle to weak pleochroism with green to yellow tints suggests that the amphibole is a tremolite or a Fe-poor actinolite.	**up to 0.25, rare up to 1.2**
titanite	**2**	–	**3**	Very fine- to fine-grained crystals of titanite are dispersed within the biotite	**up to 0.05**
albite	**1**	–	**2**	Fine-grained xenoblastic crystals of albite occupy the interstitial positions between the biotite and the amphibole.	
calcite	**0.5**	–	**1**	Calcite is rare and its fine- to medium-grained xenoblastic crystals are heterogeneously dispersed within the fine-grained aggregate of biotite and amphibole.	**up to 1 long**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite crystals.	**up to 0.01**

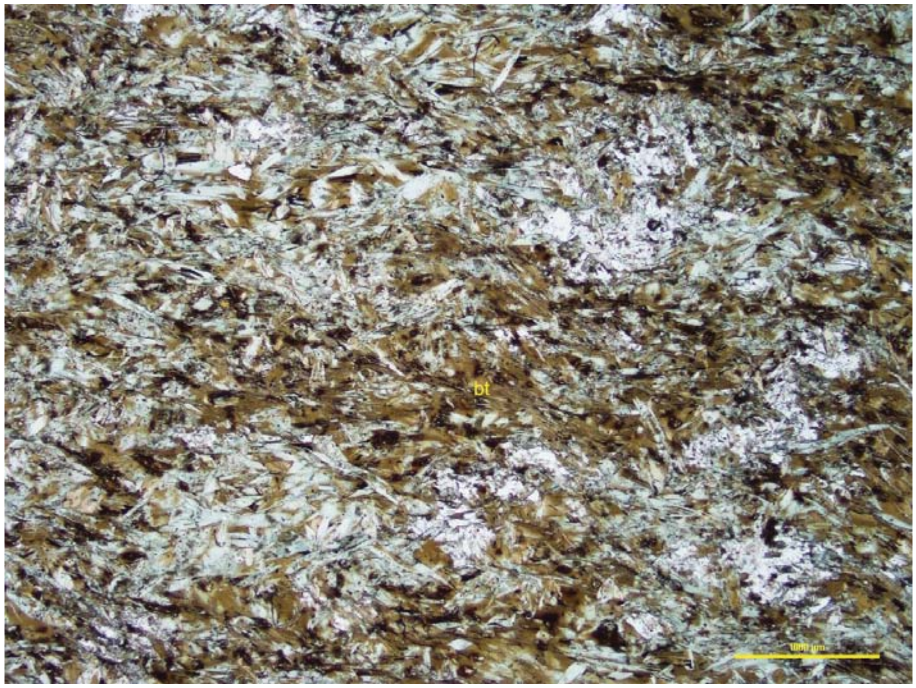


Figure 48 The biotite (bt) tends to form slightly elongate crystal clusters, in which the biotite flakes and lamellae are randomly oriented, and define a weak schistosity. Plane polarized transmitted light.

LG0 037

Rock Type: Tonalite

Subhedral to euhedral crystals of plagioclase and randomly oriented lamellae of biotite are immersed within anhedral crystal aggregates of quartz and define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**45**	–	**47**	Quartz is medium-grained, anhedral, and forms quasi-monomineralic aggregates occupying the interstices between the plagioclase and the biotite. The quartz crystals show interlobate grain boundaries, and in some cases show undulose extinction.	**0.2–2.5**
plagioclase→white mica+epidote	**40**	–	**42**	Plagioclase forms subhedral to euhedral crystals, which are randomly oriented and are weakly altered by very fine-grained dispersions of white mica and very fine-grained dispersions of epidote. Most of the crystals show a weakly altered core, and a fresh albitic rim. The plagioclase shows Albite and Albite-Carlsbad twinnings. Most of the plagioclase crystals show euhedral growth zoning.	**up to 3 long**
biotite→epidote	**10**	–		Biotite forms medium-grained lamellae, which are randomly oriented, and in some cases show evidence of deformation. The deformation occurred during the latest stages of the magmatic crystallization.	**up to 3 long**
alkali feldspar	**2**	–	**3**	Fine- to medium-grained anhedral to interstitial crystals of alkali feldspar occur within the interstices between the plagioclase and the quartz. The alkali feldspar is fresh and, in some cases, shows Albite-Pericline twinnings.	**up to 0.5**
epidote	**0.5**	–	**0.6**	Very fine- to fine-grained crystals of epidote are dispersed within the core of the plagioclase and the biotite. In some cases, the epidote forms fine-grained anhedral crystals overprinting the biotite.	**up to 0.2**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite.	**up to 0.01**

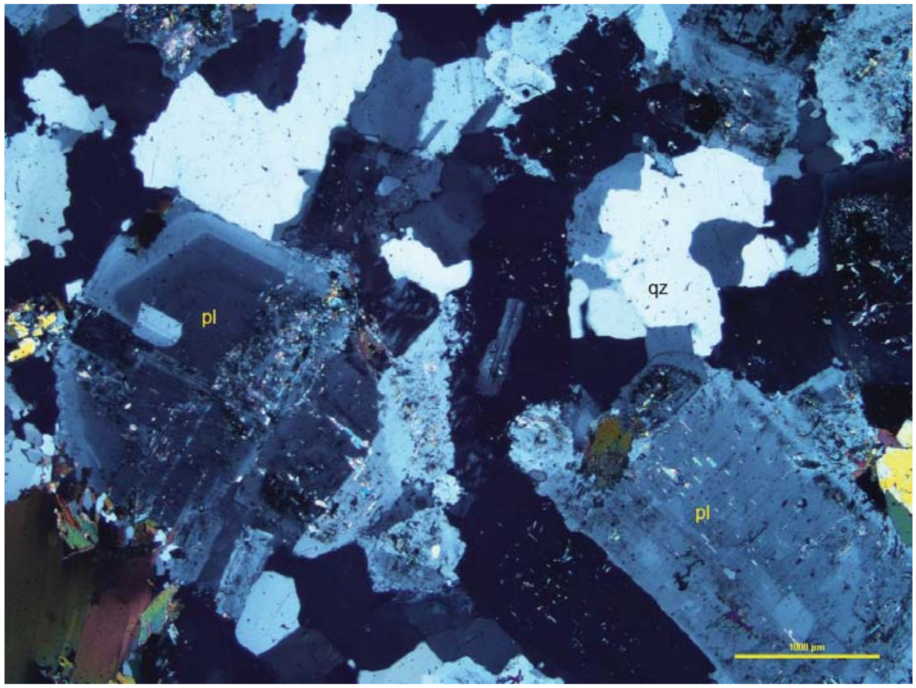


Figure 49 Subhedral to euhedral crystals of plagioclase (pl) and randomly oriented lamellae of biotite are immersed within anhedral crystal aggregates of quartz (qz). Crossed polarizers transmitted light.

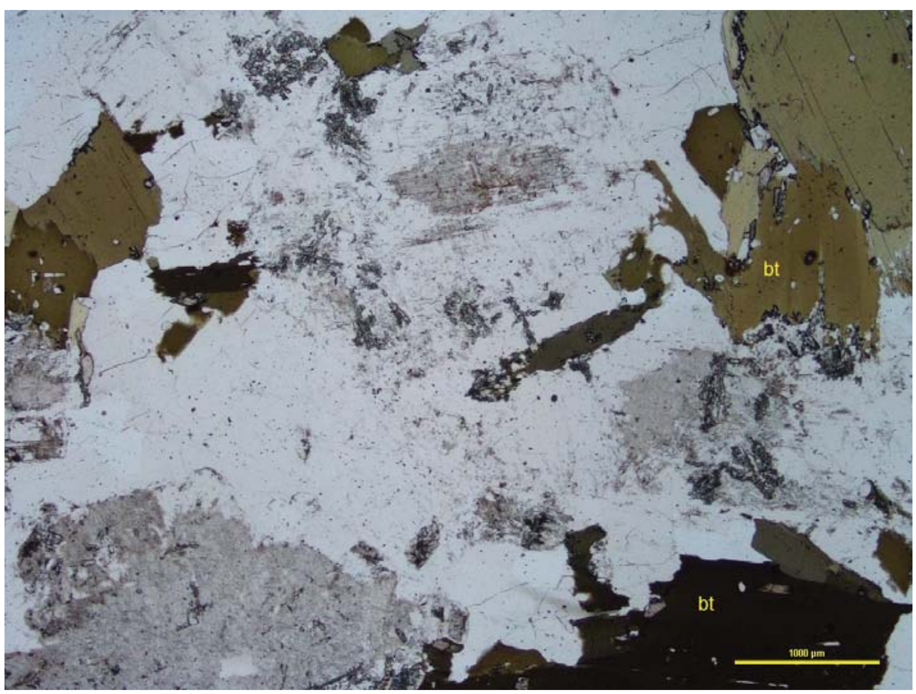


Figure 50 The biotite (bt) crystals are randomly oriented and contribute to the isotropic nature of the granular microstructure. Plane polarized transmitted light.

LG0 038

Rock Type: Plagioclase-amphibole-biotite granofels

Xenoblastic and randomly oriented crystals of plagioclase, amphibole, and biotite define a granular and isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
plagioclase (albite)	**52**	–	**53**	Medium-grained xenoblastic and poikiloblastic crystals of plagioclase are fresh to subtly altered by very fine-grained dispersions of epidote(?) and amphibole.	**0.2–0.5**
tremolite/actinolite (and cummingtonite?)	**43**	–	**45**	The prismatic to xenoblastic crystals of amphibole are randomly oriented and homogeneously dispersed within this polished thin section. The amphibole is made up of pleochroic core, and non-pleochroic rims. The pleochroic core shows green tints and extinction angle up to 15°, thus indicating an actinolitic composition. I tentatively interpret the non-pleochroic rim as tremolitic. Some of the amphibole crystals are overprinted by fine-grained crystals of biotite. Some of the non-pleochroic crystals shown polysynthetic twinnings, and I suspect the occurrence of some cummingtonite. The occurrence of cummingtonite would need to be determined by SEM-EDS analysis.	**up to 1.5 long**
biotite	**2**	–	**3**	Biotite is spatially associated with and overprinted the amphibole, and forms randomly oriented flakes and lamellae.	**up to 0.2**
epidote	**1**	–	**2**	Xenoblastic crystals of epidote are dispersed within the plagioclase as very fine-grained crystals, and within the ferromagnesian minerals form very fine- to fine-grained crystals.	**up to 0.15**
titanite		**tr**		Xenoblastic crystals of titanite overprint some of the amphibole crystals.	**up to 0.1**
pyrite		**tr**		Rare and fine-grained crystals of pyrite form irregular clusters, which are spatially associated with the amphibole and the biotite.	**up to 0.2**

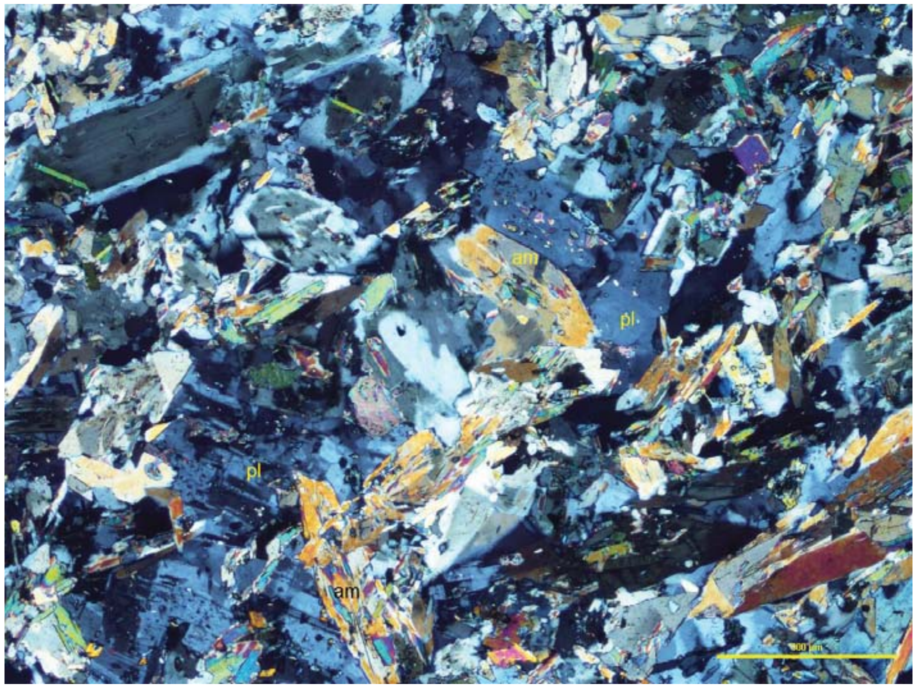


Figure 51 Xenoblastic and randomly oriented crystals of plagioclase (pl), amphibole (am), and biotite define a granular and isotropic microstructure. Crossed Nicols transmitted light.

LG0 039

Rock Type: Tonalite

Subhedral crystals of plagioclase, subordinate biotite, and interstitial alkali feldspar are immersed within an inequigranular aggregate of anhedral quartz and define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**48**	–	**50**	Quartz forms anhedral inequigranular crystal aggregates occupying the interstices between the plagioclase and the biotite. The quartz shows interlobate grain boundaries, and in some cases, it shows undulose extinction.	**0.2–3**
plagioclase→white mica+epidote	**42**	–	**44**	Plagioclase is subhedral to euhedral and its crystals are randomly oriented and homogeneously dispersed within the slightly more abundant quartz. The plagioclase crystals consist of euhedral cores, which are weakly altered by white mica and epidote, the plagioclase's cores show euhedral growth zoning, and are surrounded by homogeneous and fresh albite-rich rims.	**0.3–4**
biotite	**6**	–	**7**	Biotite forms medium-grained lamellae, which are randomly oriented within the quartz. The biotite crystals show straight boundaries in contact with the quartz and irregular to finely interlobate grain boundaries in contact with the plagioclase and the alkali feldspar.	**up to 2.5**
alkali feldspar	**2**	–	**2.5**	Interstitial crystals of alkali feldspar are fresh and show Albite-Pericline twinnings, thus indicating their magmatic origin. In some cases, the alkali feldspar hosts subhedral crystals of plagioclase.	**up to 3**
epidote	**0.2**	–	**0.3**	Epidote crystals are very fine-grained and heterogeneously dispersed within the plagioclase's cores. Anhedral crystals of epidote overprinted some of the biotite crystals.	**up to 0.2**
zircon		**tr**		Very fine-grained inclusions of zircon are dispersed within the biotite crystals.	**up to 0.01**

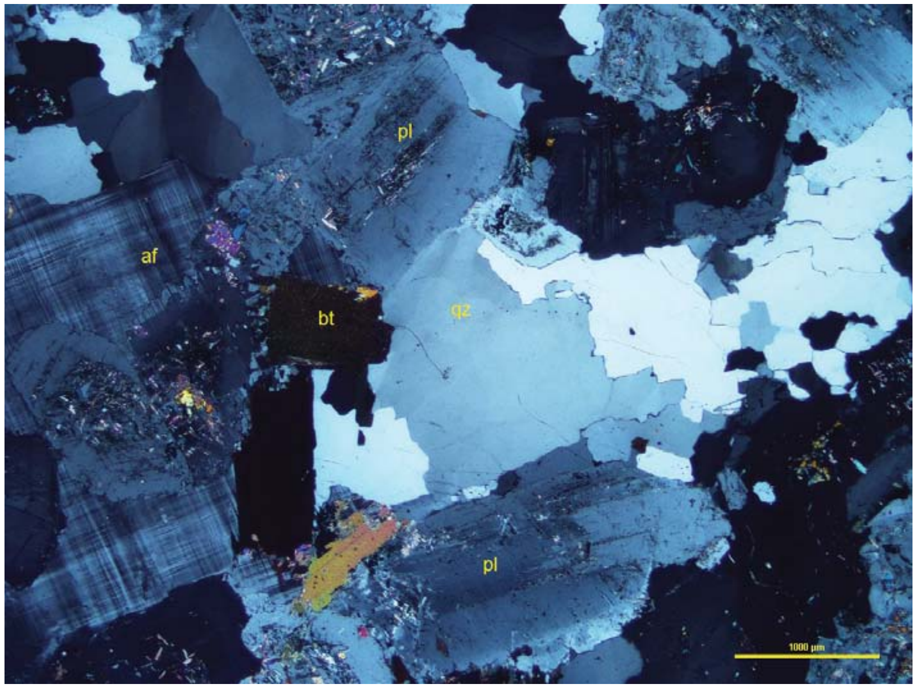


Figure 52 Subhedral crystals of plagioclase (pl), anhedral crystals of quartz (qz), randomly oriented crystals of biotite (bt), and interstitial crystals of alkali feldspar (af) define a granular isotropic microstructure. Crossed Nicols transmitted light.

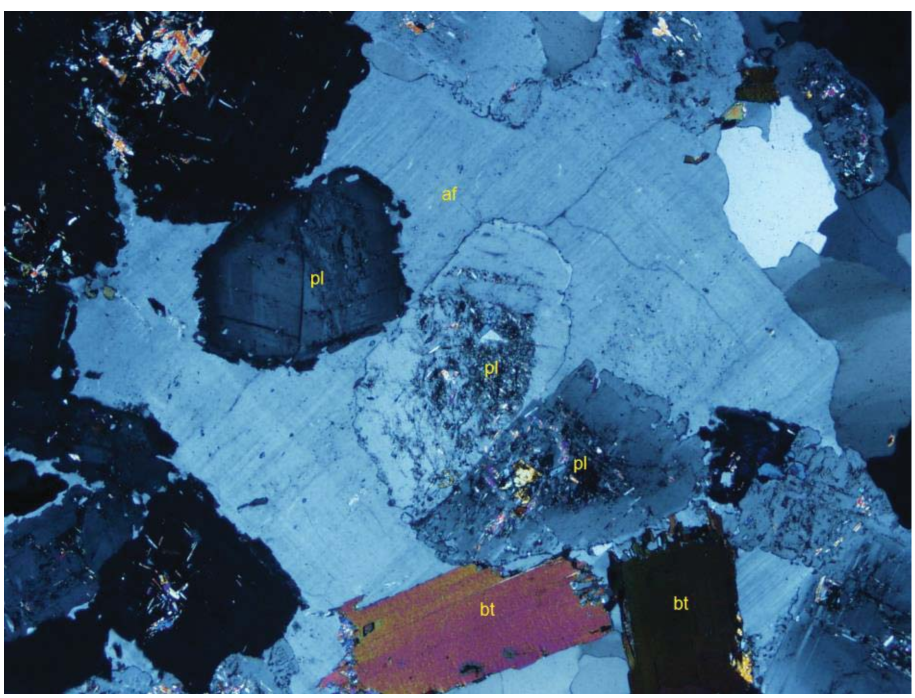


Figure 53 The alkali feldspar crystals (af) are fresh, and hosts subhedral inclusions of plagioclase (pl), which in some cases show euhedral growth zoning. Crossed Nicols transmitted light. Same scale as above.

LG0 040

Rock Type: Tonalite

Subhedral crystals of plagioclase, subordinate biotite, and interstitial alkali feldspar are immersed within an inequigranular aggregate of anhedral quartz and define a granular isotropic microstructure.

Mineral	*Modal %*				Size range (mm)
quartz	**48**	–	**50**	Inequigranular crystals of quartz form monomineralic aggregates hosting the homogeneously dispersed crystals of plagioclase and biotite.	**0.2–2.4**
plagioclase→white mica+epidote	**40**	–	**42**	Subhedral to euhedral crystals of plagioclase are randomly oriented within the inequigranular aggregate of quartz. The plagioclase crystals are made up of subhedral cores, which are weakly altered by very fine-grained dispersions of epidote, and fresh rims of albite. The plagioclase cores show euhedral growth zoning.	**up to 3 long**
biotite	**8**	–	**9**	Medium-grained subhedral lamellae of biotite are randomly oriented within the inequigranular quartz. In some cases, the biotite shows corroded and irregular grain boundaries at the contact with the quartz and plagioclase.	**up to 3 long**
alkali feldspar	**2**	–	**2.5**	Medium-grained crystals of alkali feldspar occupy the interstices between the plagioclase, quartz and biotite. In some cases, the alkali feldspar hosts subhedral inclusions of plagioclase. The crystals are fresh and show Albite-Pericline twinnings. Similarly, to the other samples of tonalite, I interpret the alkali feldspar as a magmatic mineral crystallized during the last stages of the magmatic crystallization.	**up to 1.5**
epidote	**0.3**	–	**0.5**	Epidote is very fine- to fine-grained and together with the very fine- to fine-grained flakes of white mica weakly altered the plagioclase core. Fine-grained anhedral crystals of epidote overprinted the biotite crystals.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite.	**up to 0.01**

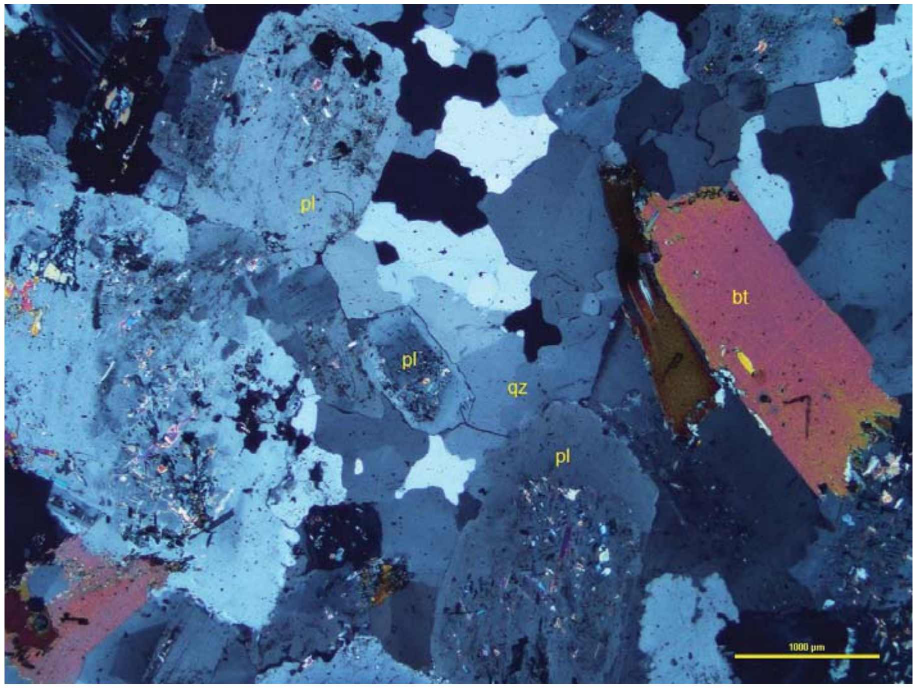


Figure 54 Subhedral crystals of plagioclase (pl), randomly oriented crystals of biotite (bt) are immersed within an inequigranular aggregate of anhedral quartz (qz) and define a granular isotropic microstructure. Crossed Nicols transmitted light.

LG0 041

Rock Type: Tonalite(?) and foliated granitoid and alkali feldspar-quartz-biotite filling domain

This heterogeneous polished thin section is made up of an alkali feldspar-quartz-biotite filling domain dividing a granular and isotropic microstructure defined by quartz, plagioclase, biotite and alkali feldspar, and an inequigranular granoblastic domain of quartz, plagioclase, alkali feldspar, and preferentially iso-oriented lamellae of biotite.

Mineral	Modal %				Size range (mm)
Domain A *(~25% of PTS)*					
tonalite(?)					
quartz	**12**	–	**13**	Quartz is anhedral and forms an inequigranular monomineralic aggregate hosting plagioclase, biotite, and subordinate alkali feldspar.	**up to 2.5**
plagioclase→white mica+epidote	**10**	–	**11**	Plagioclase forms subhedral crystals, which are randomly oriented and homogeneously dispersed within the tonalite. The plagioclase crystals are made up of euhedral cores surrounded by homogeneous and fresh albite-rich rims. The crystal cores are weakly altered by white mica and epidote, and show euhedral growth zoning.	**up to 3 long**
biotite	**2**	–	**2.5**	Randomly oriented lamellae of biotite impart to the tonalite a granular isotropic microstructure.	**up to 2.5 long**
alkali feldspar	**0.5**	–	**0.7**	Medium-grained interstitial crystals of alkali feldspar are fresh and show Albite-Pericline twinnings.	**up to 1.5**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite.	**up to 0.01**
Domain B *(~55% of PTS)*					
foliated grainitoid(?)					
quartz	**27**	–	**28**	Within the foliated domain, the anhedral crystals of quartz prevail over the feldspars and the biotite, and in some cases form irregularly shaped monomineralic and polygonal domains, which are oriented parallel to the foliation defined by the biotite.	**up to 0.5**
plagioclase→white mica+epidote	**20**	–	**21**	Within the granoblastic and foliated domain, anhedral crystals of plagioclase are subordinate to and intergrown with the quartz and less abundant alkali feldspar. The plagioclase is distinguished from the fresh quartz and alkali feldspar by being subtly to weakly altered by very fine-grained dispersions of epidote and flakes of white mica. In some of the crystals,	**up to 0.6**

				the altered core show a subhedral to euhedral shape, thus suggesting that the plagioclase is magmatic.	
biotite	**4**	**–**	**6**	Fine to medium-grained lamellae of biotite are relatively homogeneously dispersed within the granitoid, and are preferentially iso-oriented. I tentatively interpret the foliation defined by the biotite as a late-magmatic foliation as suggested by the homogeneous distribution of the biotite lamellae.	**up to 0.7 long**
alkali feldspar	**2.5**	**–**	**3**	Interstitial crystals of alkali feldspar are fresh and show Albite-Pericline twinnings. I interpret the alkali feldspar as crystallized during the late magmatic stage.	–
epidote		**tr**		Anhedral crystals of epidote are dispersed within the plagioclase and are spatially associated with the biotite.	**up to 0.4**
Domain C (~20% of PTS)					
alkali feldspar-quartz-biotite filling domain					
alkali feldspar	**11**	**–**	**11**	Coarse-grained anhedral to poikilitic crystals of alkali feldspar prevail over the quartz and the biotite in this irregularly shaped filling domain.	**up to 11 long**
quartz	**7**	**–**	**8**	Anhedral crystals of quartz occur as inclusions within the alkali feldspar and form medium-grained interlobate crystal aggregates, in which subordinate lamellae of biotite are dispersed.	**up to 2**
biotite	**1**	**–**	**1.5**	Thin lamellae (up to 2.5 mm long) of biotite show a high aspect ratio (up to 25 to 1), thus suggesting that the biotite crystallized within a melt-bearing crystal mush. The biotite lamellae are randomly oriented within this filling domain, and this indicates that the filling crystallized after the end of the deformation responsible of the granitoid foliation.	**up to 2.5 long**

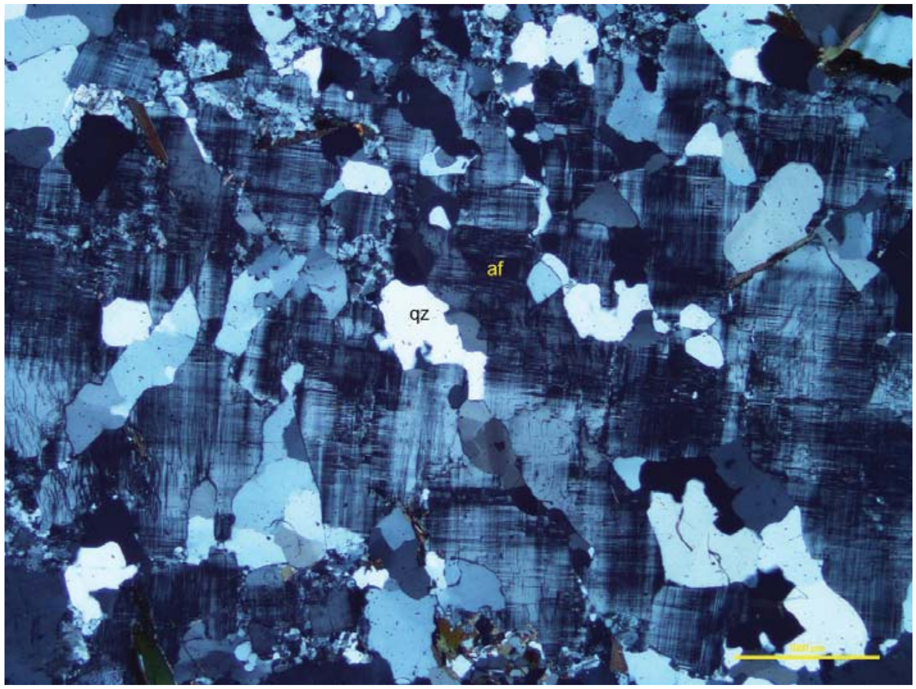


Figure 55 Within the irregularly shaped filling domain, a fresh and poikilitic crystal of alkali feldspar (af) hosts anhedral inclusions of quartz (qz). Crossed Nicols transmitted light.

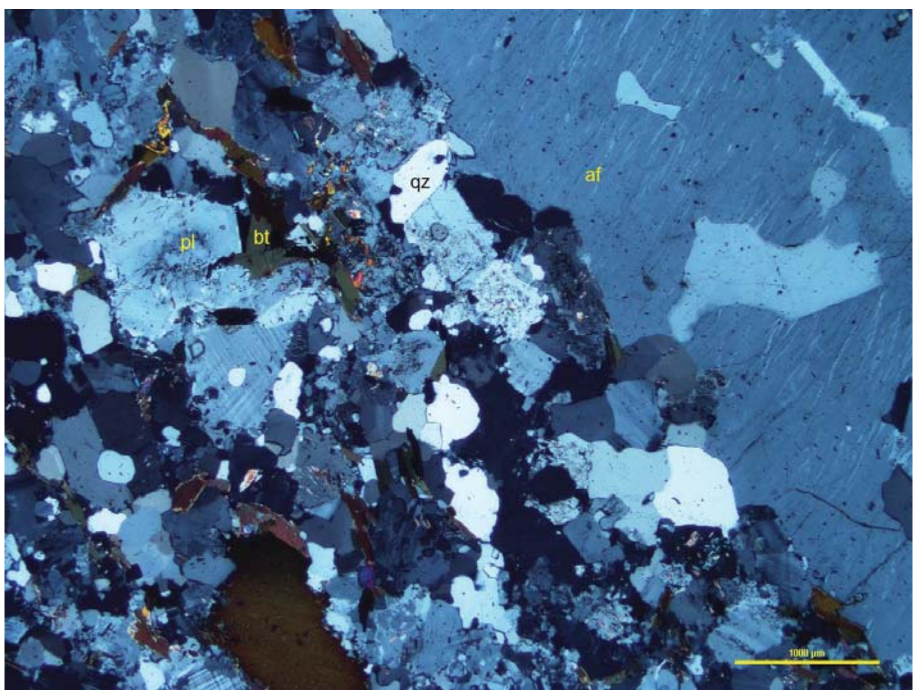


Figure 56 Near the alkali feldspar-rich filling domain (af in the upper right of this photomicrograph) quartz (qz), plagioclase (pl), alkali feldspar, and preferentially iso-oriented lamellae of biotite (bt) define a weak foliation. Crossed Nicols transmitted light.

LG0 042

Rock Type: Amphibole-biotite granofels

Fine-grained xenoblastic crystals of amphibole, biotite, and subordinate calcite, albite, and titanite define a relatively homogeneous granoblastic and isotropic microstructure.

Mineral	Modal %				Size range (mm)
tremolite/actinolite	**58**	–	**60**	The amphibole forms randomly oriented xenoblastic to subidioblastic crystals. The amphibole crystals show a subtle to weak pleochroism with yellow to pale green tints, which together with the extinction angles up to 18° suggest that the amphibole is tremolite. Most of the amphibole crystals host very fine-grained crystals of carbonate (calcite?). Rare xenoblastic crystals (up to 1.2 mm long) are probable epitaxial replacement of another amphibole or pyroxene.	**0.1–0.5; rare up to 1.2 mm**
biotite	**35**	–	**37**	Biotite is fine-grained and its lamellae are randomly oriented within the granoblastic microstructure.	**0.1–0.3**
chlorite	**3**	–	**5**	Chlorite is fine- to medium-grained and its lamellae are probably replacing some of the biotite lamellae.	**0.1–0.4**
calcite	**1**	–	**2**	Calcite forms medium-grained xenoblastic crystals and it occurs as fine-grained interstitial crystals intergrown with the amphibole. Very fine-grained crystals of calcite weakly to moderately altered the amphibole.	**0.05–0.3**
titanite	**0.1**	–	**0.2**	Very fine-grained crystals of titanite are heterogeneously dispersed within the biotite and the amphibole.	**up to 0.05**
albite		**tr**		Rare and interstitial crystals of albite are distinguished by their low birefringence, and in some cases by their anhedral growth zoning.	**up to 0.2**
magnetite		**tr**		Rare and fine-grained crystals of magnetite are spatially associated with the biotite and the amphibole.	**up to 0.1**
zircon		**tr**		Very fine-grained crystals of zircon are dispersed within the biotite lamellae.	**up to 0.01**

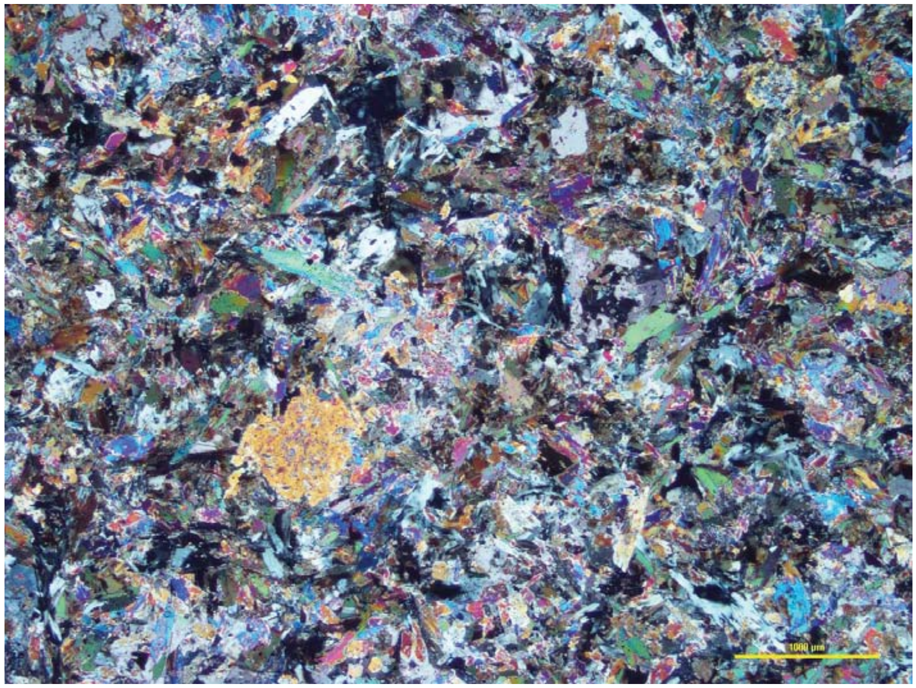


Figure 57 Xenoblastic crystals of amphibole, biotite, and subordinate calcite, and albite define a granoblastic and isotropic microstructure. Crossed Nicols transmitted light.

LG0 043

Rock Type: Alkali feldspar-chlorite-calcite-actinolite altered rock or granofels

Anhedral crystals of alkali feldspar, calcite, chlorite and actinolite are heterogeneously dispersed and define a fine-grained anhedral and slightly brecciated microstructure (crackle breccia), which is filled in by irregular veinlets of calcite.

Mineral	Modal %				Size range (mm)
alkali feldspar	**34**	–	**37**	Alkali feldspar is anhedral and inequigranular. It is more abundant within the lower part of this polished thin section. Its distribution can be observed in the image of the stained billet, in which the alkali feldspar is yellow.	**0.05–0.2**
chlorite	**32**	–	**34**	Fine-grained anhedral flakes and lamellae of chlorite are intergrown with the amphibole and the calcite, and are finely intergrown with the heterogeneously dispersed crystals of alkali feldspar.	**0.02–0.2**
calcite	**20**	–	**22**	Anhedral and inequigranular crystals of calcite are heterogeneously dispersed within the polished thin section, and occur within irregular veinlets and filling domains, in which the calcite forms interlobate crystals up to 0.7 mm across	**0.05–0.7**
amphibole (actinolite?)	**10**	–	**12**	Elongate anhedral prisms of amphibole are randomly oriented and show a weak pleochroism with green tints. The pleochroism and low angle of extinction (up to 15°) indicate that the amphibole is actinolite.	**up to 0.5 long**
hematite	**1**	–	**2**	Irregular crystal clusters of fine-grained hematite are heterogeneously dispersed within this polished thin section.	**up to 0.2**
iron oxides	**1**	–	**2**	Iron oxides occur within the irregular fractures generated during the brecciation.	

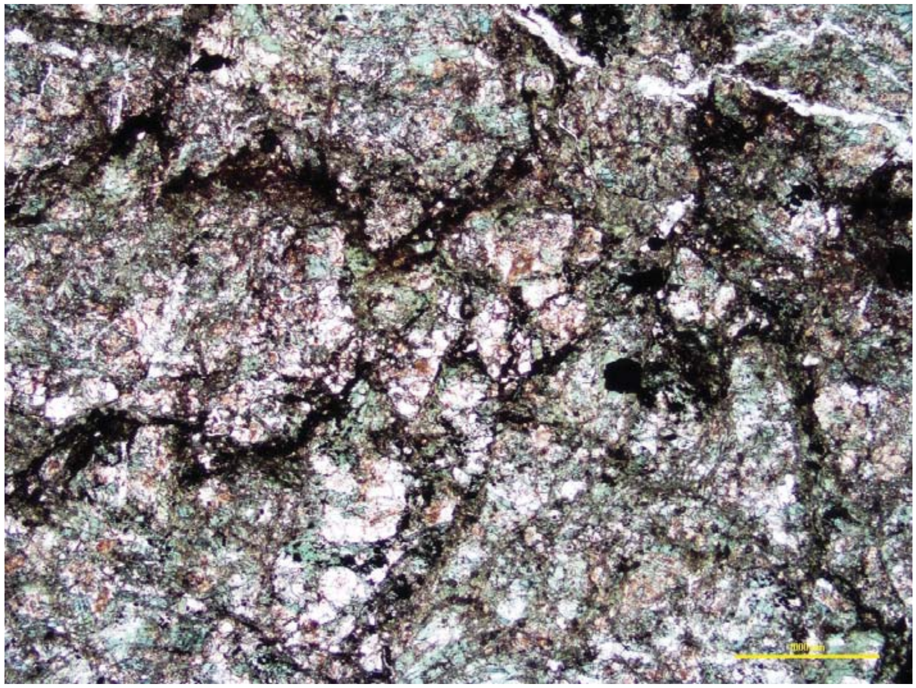


Figure 58 The fine-grained anhedral mineral aggregate is brecciated (crackle breccia), and it is filled in by irregular veinlets of iron oxides (opaque) and calcite (white). Plane polarized transmitted light.

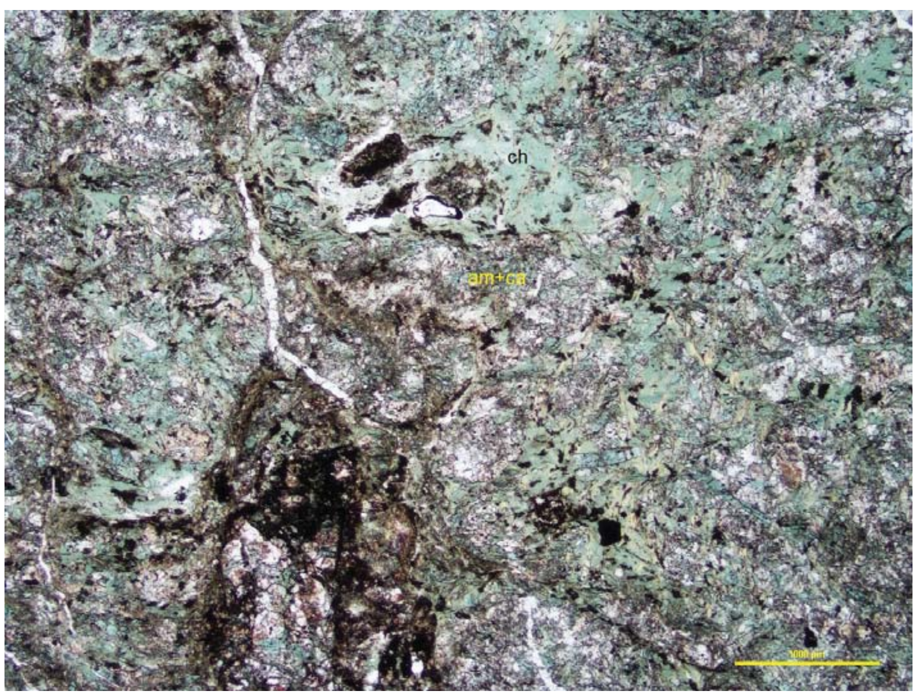


Figure 59 Irregular clusters of chlorite (ch) are intergrown with the amphibole and the calcite (am+ca). Plane polarized transmitted light.

LG0 044

Rock Type: Tonalite

Medium-grained subhedral crystals of plagioclase and biotite are immersed within interstitial and medium-grained aggregates of quartz, and define a granular and isotropic microstructure.

Mineral	Modal %				Size range (mm)
quartz	**48**	–	**50**	Inequigranular and anhedral crystals of quartz form monomineralic aggregates in which randomly oriented crystals of plagioclase, biotite, and alkali feldspar are immersed. Most of the quartz crystals show interlobate grain boundaries, and in some cases, the quartz crystals show undulose extinction.	**0.25–2.5**
plagioclase→white mica+epidote	**42**	–	**43**	Plagioclase forms inequigranular anhedral crystals, which are randomly oriented within the slightly more abundant quartz. The plagioclase crystals are weakly to moderately altered by white mica and epidote. Some of the crystals are surrounded by an albite-rich rim. In some cases, the plagioclase crystals show Albite twinnings.	**up to 2.5, rare up to 4 long**
biotite	**8**	–	**10**	Biotite forms medium- to coarse-grained lamellae, which are randomly oriented and contribute to the isotropy of this granular microstructure.	**up to 4 long**
alkali feldspar	**0.2**	–	**0.5**	Fine- to medium-grained interstitial crystals of alkali feldspar are fresh and are distinguished by the lack of dispersions/alteration products and the occurrence of Albite-Pericline twinnings. The dispersion of alkali feldspar can be observed on the stained billet, in which the alkali feldspar is yellow.	**up to 0.5**
epidote		**tr**		Very fine- to fine-grained anhedral crystals of epidote are dispersed within the plagioclase in association with very fine-grained flakes of white mica, and are spatially associated with the biotite.	**up to 0.2**
magnetite		**tr**		Very rare crystals of magnetite are dispersed within the quartz, and in some cases are surrounded by a thin rim of titanite.	**up to 0.2**

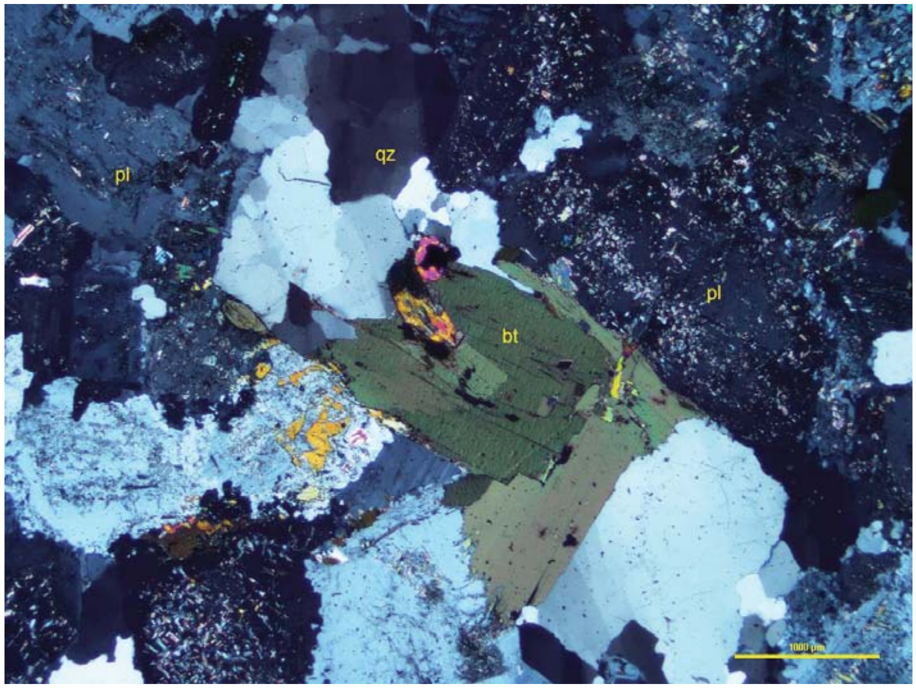


Figure 60 Inequigranular anhedral crystals of plagioclase (pl) are randomly oriented within the slightly more abundant quartz (qz) and subordinate crystals of biotite (bt). Crossed Nicols transmitted light.

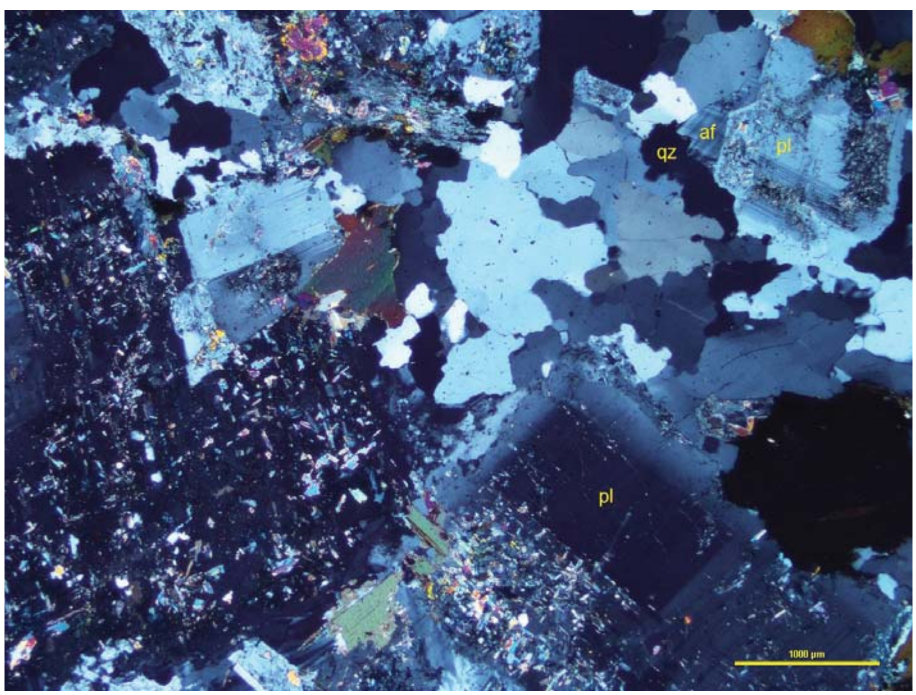


Figure 61 Some of the plagioclase crystals show euhedral growth zoning (pl). Rare crystals of alkali feldspar (af) occur within the interstices between the plagioclase and the quartz (qz). Crossed Nicols transmitted light.

LG0 045

Rock Type: Amphibole-plagioclase-biotite granofels (metamicro-diorite?)

Fine-grained xenoblastic crystals of amphibole are intergrown with subordinate crystals of plagioclase, biotite and calcite, and define a granoblastic isotropic microstructure.

Mineral	Modal %				Size range (mm)
tremolite/actinolite	**87**	–	**89**	Fine-grained xenoblastic crystals of amphibole are randomly oriented and intergrown with the xenoblastic crystals of plagioclase. Most of the crystals of amphibole show a subtle to weak pleochroism with pale green to pale yellow tints. Some of the amphibole crystals host xenoblastic cores, showing a strong dark green to brown pleochroism, therefore I interpret the tremolite-actinolite amphibole as having overprinted a hornblende or alkaline amphibole. The nature of the two amphiboles would need to be determined by electron optic analysis.	**0.1–0.4**
plagioclase (albite)	**10**	–	**12**	Xenoblastic crystals of plagioclase are intergrown with the amphibole and in some cases form interstitial crystals between the subidioblastic crystals of amphibole. Most of the plagioclase crystals host very fine- to fine-grained crystals of amphibole, therefore it is likely that the plagioclase recrystallized during the post-magmatic stage. Because of the occurrence of plagioclase and the abundance of amphibole, the host rock was probably a microdioritic rock. In rare cases, Albite twinnings occur within the plagioclase crystals.	**up to 0.5**
calcite	**1**	–	**1.5**	Rare and heterogeneously dispersed crystals of calcite.	**0.03–0.3**
biotite	**0.5**	–	**0.6**	Fine-grained flakes of biotite are intergrown and probably overprinted the more abundant amphibole.	**up to 0.1**
pyrite(?)→iron oxides	**0.05**	–	**0.1**	Euhedral crystals of probable cubic sulphide (pyrite?) are completely replaced by iron oxides and are spatially associated with the amphibole crystals.	**up to 0.5 long**

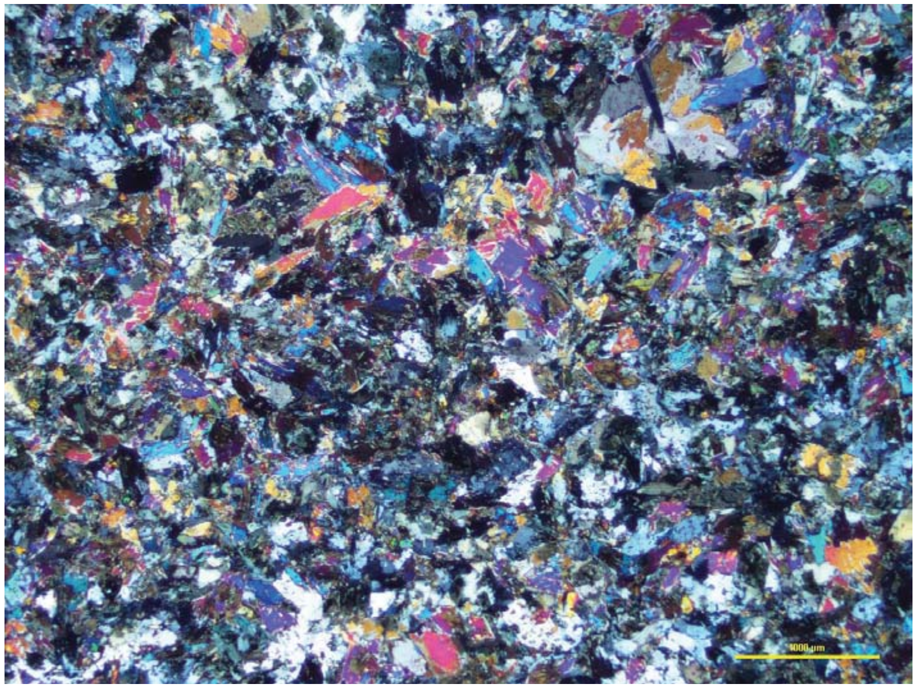


Figure 62 Fine-grained xenoblastic crystals of amphibole dominate the composition of this polished thin section and with subordinate crystals of plagioclase, biotite and calcite define a granoblastic isotropic microstructure. Crossed Nicols transmitted light.

2. Lithogeochemical Analysis

Quality Analysis ... **Actlabs** *Innovative Technologies*

Report No.: **A19-14907-Rev**
Report Date: **16-Mar-20**
Date Submitted: **04-Nov-19**
Your Reference:

Nuclear Waste Mgmt.Org.
22 St Clair St East
Toronto Ontario M4T2S3
Canada

ATTN: Andrew Parmenter

CERTIFICATE OF ANALYSIS

45 Core samples were submitted for analysis.

The following analytical package(s) were requested:		Testing Date:
4B-INAA(4B)	QOP INAAGEO (INAA)	2019-12-03 14:50:50
4LITHORES + 4B1 (11+)	QOP WRA/ QOP WRA 4B2/QOP Total (/Major/Trace Elements Fusion ICPOES/ICPMS/Total Digestion ICPOES)	2019-11-26 15:56:17

REPORT **A19-14907-Rev**

This report may be reproduced without our consent. If only selected portions of the report are reproduced, permission must be obtained. If no instructions were given at time of sample submittal regarding excess material, it will be discarded within 90 days of this report. Our liability is limited solely to the analytical cost of these analyses. Test results are representative only of material submitted for analysis.

Notes:

Values which exceed the upper limit should be assayed for most accurate values.

We recommend using option 4B1 for accurate levels of the base metals Cu, Pb, Zn, Ni and Ag. Option 4B-INAA for As, Sb, high W >100ppm, Cr >1000ppm and Sn >50ppm by Code 5D. Values for these elements provided by Fusion ICP/MS, are order of magnitude only and are provided for general information. Mineralized samples should have the Quant option selected or request assays for values which exceed the range of option 4B1. Total includes all elements in % oxide to the left of total. Zr is now being reported from FUS-ICP instead of FUS-MS.

CERTIFIED BY:

Emmanuel Eseme , Ph.D.
Quality Control Coordinator

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Analyte Symbol	Au	As	Br	Cr	Cs	Co	Ce	Eu	Hf	Ir	La	Lu	Mo	Nd	Rb	Sb	Se	Sm	Ta	Th	Tb	U	W
Unit Symbol	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	2	0.5	0.5	5	1	1	3	0.2	1	5	0.5	0.05	5	5	20	0.2	3	0.1	0.5	0.2	0.5	0.5	1
Method Code	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA
LG001	< 2	< 0.5	< 0.5	< 5	< 1	3	26	0.2	4	< 5	13.5	< 0.05	< 5	< 5	50	< 0.2	< 3	1.4	< 0.5	3.6	< 0.5	< 0.5	< 1
LG002	< 2	< 0.5	< 0.5	< 5	< 1	5	23	0.3	3	< 5	12.1	< 0.05	< 5	< 5	< 20	0.4	< 3	1.3	< 0.5	3.5	< 0.5	0.7	< 1
LG003	< 2	< 0.5	< 0.5	< 5	< 1	1	25	< 0.2	3	< 5	15.6	< 0.05	< 5	8	100	< 0.2	< 3	1.2	< 0.5	4.5	< 0.5	0.9	< 1
LG004	6	0.9	< 0.5	< 5	3	< 1	35	< 0.2	3	< 5	21.4	< 0.05	< 5	9	80	< 0.2	< 3	1.5	< 0.5	9.2	< 0.5	0.9	< 1
LG005	< 2	0.6	< 0.5	< 5	< 1	< 1	52	< 0.2	2	< 5	29.5	< 0.05	< 5	10	50	< 0.2	< 3	1.5	< 0.5	6.9	< 0.5	2.6	< 1
LG006	< 2	3.1	< 0.5	< 5	1	2	62	< 0.2	3	< 5	39.0	< 0.05	< 5	14	50	< 0.2	< 3	2.0	< 0.5	9.7	< 0.5	< 0.5	< 1
LG007	4	2.0	< 0.5	8	< 1	7	33	< 0.2	3	< 5	17.9	< 0.05	< 5	6	50	< 0.2	< 3	1.7	< 0.5	3.7	< 0.5	< 0.5	< 1
LG008	< 2	1.0	< 0.5	< 5	2	2	26	< 0.2	4	< 5	15.4	< 0.05	< 5	6	70	< 0.2	< 3	1.1	< 0.5	3.8	< 0.5	1.9	< 1
LG009	< 2	2.3	< 0.5	< 5	4	7	28	< 0.2	4	< 5	16.6	< 0.05	< 5	< 5	< 20	< 0.2	< 3	1.5	< 0.5	3.6	< 0.5	< 0.5	< 1
LG010	< 2	0.8	< 0.5	< 5	1	< 1	90	0.6	4	< 5	53.9	< 0.05	< 5	20	100	< 0.2	< 3	2.7	< 0.5	13.0	< 0.5	1.1	< 1
LG011	< 2	0.9	< 0.5	< 5	< 1	1	43	< 0.2	2	< 5	24.5	< 0.05	< 5	14	20	< 0.2	< 3	1.4	< 0.5	7.2	< 0.5	0.9	< 1
LG012	< 2	0.9	< 0.5	7	3	2	52	< 0.2	3	< 5	31.0	< 0.05	< 5	11	100	< 0.2	< 3	1.5	< 0.5	7.6	< 0.5	3.0	< 1
LG013	< 2	< 0.5	< 0.5	< 5	2	2	36	< 0.2	2	< 5	23.0	< 0.05	< 5	10	80	< 0.2	< 3	1.2	< 0.5	6.0	< 0.5	2.2	< 1
LG014	< 2	< 0.5	< 0.5	258	< 1	35	180	2.6	3	< 5	85.8	< 0.05	< 5	62	< 20	< 0.2	< 3	11.1	< 0.5	13.5	< 0.5	2.4	< 1
LG015	< 2	< 0.5	< 0.5	< 5	2	< 1	53	< 0.2	3	< 5	31.3	< 0.05	< 5	12	70	< 0.2	< 3	1.6	< 0.5	7.9	< 0.5	2.4	< 1
LG016	< 2	< 0.5	< 0.5	< 5	3	< 1	19	< 0.2	3	< 5	9.4	< 0.05	< 5	8	120	< 0.2	< 3	1.3	< 0.5	5.6	< 0.5	4.7	< 1
LG017	< 2	< 0.5	< 0.5	< 5	< 1	< 1	13	< 0.2	2	< 5	6.1	0.07	6	< 5	160	< 0.2	< 3	1.3	< 0.5	4.9	< 0.5	8.4	< 1
LG018	< 2	< 0.5	< 0.5	< 5	4	< 1	17	< 0.2	4	< 5	5.7	0.15	8	< 5	200	< 0.2	< 3	1.7	1.1	5.5	< 0.5	14.8	< 1
LG019	< 2	1.4	< 0.5	< 5	3	< 1	67	0.3	3	< 5	40.3	< 0.05	< 5	10	100	0.3	< 3	1.7	< 0.5	7.1	< 0.5	3.6	< 1
LG020	< 2	< 0.5	< 0.5	< 5	< 1	9	21	< 0.2	4	< 5	11.0	< 0.05	< 5	< 5	< 20	< 0.2	< 3	1.4	< 0.5	1.8	< 0.5	< 0.5	< 1
LG021	< 2	< 0.5	< 0.5	< 5	1	8	19	< 0.2	4	< 5	11.1	< 0.05	< 5	8	< 20	< 0.2	< 3	1.3	< 0.5	2.3	< 0.5	< 0.5	< 1
LG022	< 2	0.7	4.4	< 5	< 1	5	66	0.3	5	< 5	41.0	< 0.05	< 5	19	40	< 0.2	< 3	1.7	< 0.5	8.1	< 0.5	1.6	< 1
LG023	< 2	0.8	< 0.5	10	3	8	39	0.4	4	< 5	22.5	< 0.05	< 5	12	60	< 0.2	< 3	2.3	< 0.5	4.5	< 0.5	0.7	< 1
LG024	< 2	< 0.5	< 0.5	7	4	2	32	0.5	4	< 5	18.6	< 0.05	< 5	12	< 20	< 0.2	< 3	1.7	< 0.5	3.9	< 0.5	< 0.5	< 1
LG025	< 2	< 0.5	< 0.5	15	< 1	8	34	0.5	3	< 5	21.4	< 0.05	< 5	12	< 20	< 0.2	< 3	1.9	< 0.5	4.3	< 0.5	0.7	< 1
LG026	< 2	< 0.5	< 0.5	< 5	1	3	76	0.5	3	< 5	47.5	< 0.05	< 5	17	30	< 0.2	< 3	2.1	< 0.5	9.6	< 0.5	1.7	< 1
LG027	< 2	< 0.5	< 0.5	< 5	< 1	< 1	16	< 0.2	3	< 5	9.4	< 0.05	< 5	< 5	< 20	0.2	< 3	0.9	< 0.5	3.1	< 0.5	1.9	< 1
LG028	< 2	0.7	< 0.5	168	3	34	97	2.4	4	< 5	48.0	< 0.05	< 5	35	40	< 0.2	< 3	8.6	< 0.5	7.1	< 0.5	0.9	< 1
LG029	< 2	< 0.5	< 0.5	< 5	< 1	< 1	20	< 0.2	2	< 5	10.0	< 0.05	< 5	< 5	40	0.3	< 3	1.4	< 0.5	4.7	< 0.5	0.9	< 1
LG030	< 2	2.1	< 0.5	< 5	2	2	56	0.4	4	< 5	36.8	< 0.05	< 5	12	< 20	< 0.2	< 3	1.7	< 0.5	6.8	< 0.5	< 0.5	< 1
LG031	< 2	2.5	< 0.5	898	15	48	42	0.7	2	< 5	19.5	< 0.05	< 5	16	190	< 0.2	< 3	3.0	< 0.5	2.9	< 0.5	< 0.5	< 1
LG032	< 2	1.0	< 0.5	11	1	3	85	0.6	5	< 5	52.9	< 0.05	< 5	17	100	< 0.2	< 3	2.3	< 0.5	9.1	< 0.5	1.7	< 1
LG033	< 2	0.7	< 0.5	13	3	3	44	0.5	4	< 5	25.2	< 0.05	< 5	9	< 20	< 0.2	< 3	2.5	< 0.5	5.2	< 0.5	< 0.5	< 1
LG034	4	< 0.5	< 0.5	893	5	46	45	0.7	2	< 5	21.2	< 0.05	< 5	18	130	< 0.2	< 3	4.1	< 0.5	2.7	< 0.5	0.8	< 1
LG035	< 2	< 0.5	< 0.5	455	3	38	55	1.1	2	< 5	29.6	< 0.05	< 5	24	60	0.3	< 3	5.1	< 0.5	3.4	< 0.5	< 0.5	< 1
LG036	< 2	< 0.5	< 0.5	959	5	48	44	0.8	1	< 5	19.5	< 0.05	< 5	15	170	< 0.2	< 3	4.0	< 0.5	3.6	< 0.5	< 0.5	< 1
LG037	< 2	< 0.5	18.4	13	< 1	3	41	0.3	4	< 5	26.1	< 0.05	< 5	9	20	< 0.2	< 3	1.7	< 0.5	5.1	< 0.5	< 0.5	< 1
LG038	< 2	< 0.5	< 0.5	399	2	37	129	2.0	3	< 5	63.0	< 0.05	< 5	53	50	< 0.2	< 3	10.6	< 0.5	8.5	< 0.5	1.5	< 1
LG039	< 2	< 0.5	< 0.5	8	< 1	6	36	0.4	4	< 5	21.8	< 0.05	< 5	8	30	< 0.2	< 3	1.5	< 0.5	5.3	< 0.5	3.2	< 1
LG040	< 2	< 0.5	< 0.5	9	< 1	7	41	0.4	4	< 5	22.7	< 0.05	< 5	7	30	< 0.2	< 3	1.8	< 0.5	5.2	< 0.5	< 0.5	< 1
LG041	< 2	< 0.5	< 0.5	8	< 1	< 1	37	0.3	3	< 5	20.7	< 0.05	< 5	9	50	< 0.2	< 3	1.8	< 0.5	5.7	< 0.5	0.8	< 1
LG042	< 2	1.5	< 0.5	1170	13	54	106	1.9	2	< 5	46.3	< 0.05	< 5	49	110	< 0.2	< 3	9.3	< 0.5	5.5	< 0.5	2.3	< 1
LG043	< 2	1.9	4.1	443	< 1	41	97	1.0	< 1	< 5	46.9	< 0.05	< 5	34	30	< 0.2	< 3	6.9	< 0.5	3.0	< 0.5	< 0.5	< 1
LG044	< 2	< 0.5	< 0.5	18	< 1	4	62	0.7	4	< 5	36.8	< 0.05	< 5	15	110	< 0.2	< 3	2.4	< 0.5	8.1	< 0.5	< 0.5	< 1
LG045	< 2	< 0.5	< 0.5	905	6	47	54	0.9	2	< 5	26.8	< 0.05	< 5	16	< 20	< 0.2	< 3	5.4	< 0.5	4.0	< 0.5	1.1	< 1

Analyte Symbol	Yb	Mass	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	Total	Sc	Be	V	Cr	Co	Ga	Ge	As	Rb	Sr
Unit Symbol	ppm	g	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	0.2		0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	1	1	5	20	1	1	0.5	5	1	2
Method Code	INAA	INAA	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP
LG001	< 0.2	30.9	70.18	15.35	2.69	0.040	0.62	2.60	4.72	2.37	0.268	0.06	99.39	3	1	27	< 20	5	20	0.8	< 5	60	297
LG002	0.4	30.0	71.00	15.84	2.69	0.037	0.59	2.60	4.75	2.26	0.269	0.07	100.8	4	1	26	< 20	4	21	0.8	< 5	55	312
LG003	< 0.2	29.4	68.70	15.07	2.34	0.028	0.50	1.25	3.89	5.55	0.204	0.05	98.64	2	< 1	17	< 20	4	18	0.9	< 5	93	206
LG004	< 0.2	28.7	75.67	12.53	1.61	0.027	0.23	1.62	4.11	2.29	0.098	0.04	98.61	2	2	< 5	< 20	1	17	1.1	< 5	71	161
LG005	< 0.2	31.9	75.89	13.46	2.04	0.032	0.29	1.85	4.24	2.13	0.142	0.02	100.6	1	2	7	< 20	< 1	16	< 0.5	< 5	64	187
LG006	< 0.2	28.7	74.16	13.30	2.12	0.031	0.37	2.06	4.23	1.95	0.158	0.03	98.89	2	1	7	< 20	2	18	0.8	< 5	62	197
LG007	< 0.2	29.4	69.39	15.20	3.29	0.046	0.78	3.07	4.44	1.94	0.336	0.10	99.00	5	2	32	< 20	2	22	< 0.5	< 5	52	356
LG008	0.4	29.7	67.04	17.28	2.85	0.040	0.60	2.56	5.43	3.15	0.269	0.04	100.7	3	2	25	< 20	4	23	0.8	< 5	102	253
LG009	< 0.2	27.8	68.81	16.03	3.31	0.042	0.70	3.25	5.04	1.49	0.328	0.10	99.64	4	2	29	< 20	6	23	0.8	< 5	63	357
LG010	< 0.2	28.6	69.37	15.63	2.33	0.030	0.38	2.09	4.42	3.74	0.175	0.06	98.71	2	< 1	12	< 20	2	19	1.0	< 5	82	243
LG011	< 0.2	29.6	78.11	11.05	2.19	0.025	0.22	1.52	3.50	1.90	0.110	0.02	99.58	1	1	< 5	< 20	2	14	0.9	< 5	56	160
LG012	< 0.2	29.3	74.13	12.63	1.84	0.027	0.26	1.84	4.05	2.09	0.124	0.03	98.93	1	1	6	< 20	2	18	0.9	< 5	70	223
LG013	< 0.2	30.2	81.66	8.74	1.56	0.020	0.18	1.26	2.71	1.44	0.092	0.03	99.19	1	< 1	7	< 20	2	13	1.0	< 5	47	114
LG014	1.3	29.3	52.38	14.85	7.75	0.140	8.51	8.04	4.07	0.89	0.672	0.49	100.5	17	3	140	310	26	17	< 0.5	< 5	28	1429
LG015	< 0.2	30.8	75.04	13.03	2.13	0.030	0.33	1.99	4.15	2.07	0.140	0.03	99.35	2	1	7	< 20	2	18	0.9	< 5	70	189
LG016	< 0.2	30.8	75.50	13.49	0.95	0.014	0.08	0.69	3.36	5.71	0.036	0.01	100.0	< 1	1	< 5	< 20	1	19	1.2	< 5	135	98
LG017	0.6	30.2	76.51	13.16	1.04	0.020	0.06	0.75	3.97	4.81	0.039	< 0.01	100.7	< 1	2	6	< 20	< 1	20	< 0.5	< 5	121	66
LG018	1.4	31.6	73.94	13.51	0.94	0.087	0.05	0.43	4.12	5.20	0.030	0.02	98.52	3	1	< 5	< 20	< 1	25	2.0	< 5	179	15
LG019	< 0.2	31.5	73.92	13.37	2.05	0.027	0.33	2.12	4.24	2.03	0.165	0.04	98.67	2	1	9	< 20	2	18	1.0	< 5	66	205
LG020	0.2	33.1	68.39	15.97	3.41	0.038	0.84	3.72	4.80	1.25	0.384	0.09	99.41	5	1	37	< 20	6	21	0.7	< 5	44	411
LG021	0.4	34.6	69.44	15.57	3.41	0.038	0.88	3.69	4.84	1.30	0.372	0.10	100.1	5	1	41	< 20	7	22	0.7	< 5	47	403
LG022	< 0.2	33.9	73.89	13.05	2.34	0.028	0.45	2.45	4.10	1.67	0.223	0.06	98.60	2	1	14	< 20	3	18	0.8	< 5	54	228
LG023	0.5	29.9	69.79	15.07	3.30	0.039	0.81	3.14	4.32	2.06	0.447	0.12	100.7	4	1	31	< 20	6	20	0.8	< 5	60	273
LG024	< 0.2	31.4	71.63	15.47	2.57	0.031	0.61	3.22	4.42	1.60	0.293	0.08	100.2	3	1	23	< 20	4	20	0.8	< 5	40	249
LG025	< 0.2	31.2	70.20	15.15	3.10	0.038	0.89	3.34	4.49	1.76	0.330	0.09	99.75	4	1	33	20	6	21	0.9	< 5	48	259
LG026	< 0.2	30.7	75.11	13.35	2.59	0.034	0.48	2.36	4.01	1.92	0.240	0.08	100.6	2	2	16	< 20	< 1	16	< 0.5	< 5	55	224
LG027	0.3	30.4	74.60	13.68	1.41	0.025	0.29	1.94	4.66	1.96	0.110	0.05	99.14	1	2	11	< 20	< 1	18	< 0.5	< 5	53	167
LG028	1.5	31.3	54.05	14.02	8.69	0.117	6.60	7.64	2.87	2.68	0.978	0.38	99.99	19	2	168	190	34	19	1.2	< 5	68	936
LG029	< 0.2	30.5	74.00	14.19	1.29	0.023	0.22	1.91	4.71	2.28	0.088	0.03	99.20	2	1	9	< 20	1	19	1.0	< 5	49	168
LG030	< 0.2	28.9	73.29	13.73	3.09	0.038	0.67	2.76	3.96	1.72	0.317	0.09	100.2	2	1	24	< 20	5	18	0.7	< 5	56	242
LG031	1.1	22.8	47.18	10.22	9.22	0.156	10.98	9.14	0.17	5.38	0.557	0.17	99.81	30	1	193	1040	47	12	1.6	< 5	145	138
LG032	< 0.2	27.1	72.67	13.38	3.33	0.039	0.71	2.65	3.91	1.76	0.320	0.08	99.24	2	1	24	< 20	5	19	0.9	< 5	59	236
LG033	0.5	29.8	70.34	14.61	3.31	0.039	0.82	3.06	4.59	1.65	0.443	0.12	100.2	4	2	34	< 20	6	21	0.9	< 5	49	265
LG034	1.1	28.6	47.66	10.63	9.64	0.168	12.04	9.53	0.89	4.00	0.577	0.16	99.74	33	1	203	1110	49	14	1.6	< 5	113	206
LG035	1.3	29.3	49.87	13.68	9.93	0.154	8.53	9.96	2.91	1.87	0.732	0.22	100.4	27	1	227	590	42	17	1.6	< 5	51	653
LG036	0.9	26.0	46.08	11.07	10.94	0.175	13.09	8.62	1.13	3.58	0.582	0.17	98.12	35	1	206	1270	54	17	1.5	< 5	101	200
LG037	< 0.2	27.2	70.24	14.09	3.49	0.043	0.86	3.07	4.17	1.67	0.337	0.10	98.49	3	1	29	< 20	6	19	0.8	< 5	51	258
LG038	1.2	25.2	49.84	13.30	8.05	0.127	10.93	9.37	2.87	2.22	0.649	0.48	98.89	21	2	139	520	41	17	1.2	< 5	52	1137
LG039	0.3	29.9	70.03	13.47	3.15	0.042	0.69	2.68	4.10	1.80	0.299	0.07	100.3	2	1	23	< 20	5	19	1.0	< 5	59	225
LG040	< 0.2	30.7	70.83	13.81	3.56	0.044	0.86	2.93	4.04	1.68	0.335	0.10	98.52	3	1	29	< 20	6	18	0.7	< 5	50	250
LG041	< 0.2	29.8	74.68	13.46	2.49	0.039	0.45	2.18	4.10	2.32	0.201	0.06	100.2	2	1	26	< 20	< 1	17	< 0.5	< 5	59	194
LG042	1.0	25.5	43.91	9.20	9.43	0.169	16.82	9.47	0.64	3.49	0.636	0.37	98.66	26	2	139	1460	58	13	1.4	< 5	94	266
LG043	1.0	24.6	41.51	9.69	9.45	0.152	9.12	14.39	1.69	2.41	0.627	0.32	99.90	26	3	179	550	42	12	1.2	< 5	71	241
LG044	0.3	25.1	72.51	13.07	3.67	0.050	0.95	2.80	3.63	1.66	0.377	0.12	99.38	3	2	29	< 20	3	19	< 0.5	< 5	50	242
LG045	1.2	29.0	49.10	11.13	9.76	0.164	11.03	10.47	2.71	1.53	0.607	0.19	99.87	33	2	223	1040	46	13	1.4	< 5	43	529

Analyte Symbol	Y	Zr	Nb	Mo	In	Sn	Sb	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	0.5	1	0.2	2	0.1	1	0.2	0.1	2	0.05	0.05	0.01	0.05	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.002
Method Code	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
LG001	4.3	95	2.0	< 2	< 0.1	1	< 0.2	1.6	556	13.7	24.6	2.61	9.10	1.61	0.486	1.18	0.16	0.81	0.16	0.44	0.062	0.42	0.064
LG002	4.3	100	2.1	< 2	< 0.1	1	< 0.2	1.4	513	12.0	23.1	2.27	8.10	1.48	0.452	1.12	0.16	0.83	0.15	0.40	0.062	0.40	0.061
LG003	3.6	60	2.5	< 2	< 0.1	1	< 0.2	1.0	1606	15.5	26.4	2.54	8.88	1.28	0.344	1.02	0.14	0.72	0.13	0.34	0.047	0.31	0.047
LG004	3.6	58	3.3	< 2	< 0.1	1	< 0.2	2.3	405	22.8	39.7	3.72	12.1	1.74	0.455	1.09	0.13	0.62	0.11	0.35	0.050	0.33	0.049
LG005	3.3	84	3.8	< 2	< 0.1	1	< 0.2	1.6	424	30.3	50.7	4.49	13.3	1.70	0.546	0.99	0.12	0.60	0.11	0.30	0.050	0.34	0.052
LG006	3.5	83	3.6	< 2	< 0.1	1	< 0.2	1.2	403	40.5	67.6	6.13	19.1	2.17	0.553	1.31	0.16	0.74	0.12	0.32	0.045	0.30	0.049
LG007	4.4	126	2.0	< 2	< 0.1	1	< 0.2	1.2	583	18.5	33.3	3.22	11.5	1.93	0.610	1.40	0.18	0.90	0.16	0.42	0.057	0.36	0.054
LG008	4.1	114	3.9	< 2	< 0.1	1	< 0.2	2.5	582	15.8	27.7	2.74	9.19	1.42	0.425	0.92	0.14	0.72	0.13	0.42	0.065	0.46	0.073
LG009	4.9	127	5.8	< 2	< 0.1	1	< 0.2	2.9	441	16.8	30.1	3.04	10.7	1.87	0.525	1.27	0.17	0.93	0.17	0.48	0.073	0.53	0.074
LG010	3.5	82	3.3	< 2	< 0.1	1	< 0.2	1.0	988	55.5	91.5	8.43	25.6	2.97	0.677	1.62	0.16	0.71	0.12	0.35	0.051	0.31	0.046
LG011	3.3	56	2.5	< 2	< 0.1	1	< 0.2	1.5	390	25.6	42.7	3.99	12.5	1.54	0.422	0.99	0.12	0.59	0.11	0.31	0.048	0.32	0.048
LG012	3.4	71	3.1	< 2	< 0.1	1	< 0.2	2.2	434	30.6	51.4	4.67	14.5	1.70	0.393	1.00	0.13	0.62	0.11	0.32	0.045	0.35	0.055
LG013	2.5	49	2.1	< 2	< 0.1	1	< 0.2	1.4	339	21.9	36.9	3.32	10.7	1.26	0.265	0.79	0.09	0.45	0.08	0.23	0.030	0.22	0.038
LG014	18.9	204	6.2	2	< 0.1	1	< 0.2	1.3	216	82.9	168	18.9	69.9	11.7	3.22	7.96	0.88	4.06	0.64	1.65	0.197	1.32	0.216
LG015	3.5	77	3.7	< 2	< 0.1	1	< 0.2	1.8	392	32.6	55.4	4.95	15.4	1.85	0.521	1.02	0.13	0.63	0.11	0.31	0.047	0.32	0.052
LG016	3.9	25	2.5	< 2	< 0.1	< 1	< 0.2	2.3	1434	9.12	17.5	1.85	6.75	1.43	0.380	1.19	0.17	0.75	0.13	0.33	0.053	0.34	0.046
LG017	7.9	36	3.0	< 2	< 0.1	< 1	< 0.2	1.1	185	5.24	11.3	1.21	4.10	1.28	0.201	1.49	0.24	1.44	0.26	0.80	0.112	0.77	0.120
LG018	18.8	32	5.8	< 2	< 0.1	1	< 0.2	2.5	50	5.70	12.6	1.50	5.40	1.95	0.048	2.57	0.50	3.06	0.56	1.56	0.217	1.53	0.193
LG019	3.6	83	3.0	< 2	< 0.1	1	< 0.2	1.9	377	41.1	67.9	6.00	18.2	1.97	0.521	0.99	0.13	0.69	0.11	0.32	0.050	0.33	0.054
LG020	4.0	132	2.1	< 2	< 0.1	< 1	< 0.2	0.8	447	10.7	19.0	2.06	7.75	1.54	0.604	1.22	0.15	0.84	0.14	0.37	0.054	0.34	0.055
LG021	4.2	138	2.3	< 2	< 0.1	1	< 0.2	0.9	467	10.8	19.4	2.03	7.40	1.36	0.555	1.17	0.16	0.78	0.15	0.42	0.063	0.44	0.076
LG022	3.0	143	3.3	< 2	< 0.1	1	< 0.2	1.2	423	41.1	67.5	6.09	18.0	1.83	0.604	0.97	0.11	0.54	0.10	0.29	0.042	0.28	0.045
LG023	5.6	150	5.3	< 2	< 0.1	1	< 0.2	2.3	466	21.8	40.7	4.24	15.2	2.53	0.773	1.86	0.24	1.19	0.21	0.57	0.072	0.43	0.069
LG024	3.6	127	3.8	< 2	< 0.1	1	< 0.2	4.5	363	18.0	32.1	3.22	11.4	1.88	0.563	1.45	0.17	0.78	0.13	0.33	0.045	0.26	0.042
LG025	4.4	129	3.9	< 2	< 0.1	1	< 0.2	1.2	436	21.7	38.6	3.80	13.8	2.21	0.620	1.61	0.19	0.87	0.15	0.40	0.051	0.33	0.051
LG026	3.0	158	3.5	< 2	< 0.1	1	< 0.2	1.4	528	48.3	78.7	6.95	21.0	2.37	0.670	1.22	0.12	0.59	0.09	0.28	0.039	0.24	0.039
LG027	4.5	81	2.4	< 2	< 0.1	< 1	< 0.2	1.2	410	9.07	15.7	1.53	4.90	0.99	0.528	0.83	0.13	0.75	0.16	0.42	0.058	0.36	0.048
LG028	20.8	157	4.9	< 2	0.1	1	< 0.2	2.8	951	47.4	105	12.7	52.6	9.85	2.47	6.96	0.93	4.36	0.80	2.02	0.278	1.83	0.276
LG029	4.5	62	2.3	< 2	< 0.1	1	< 0.2	1.1	446	9.52	17.9	1.93	7.19	1.70	0.380	1.51	0.20	0.93	0.15	0.36	0.050	0.30	0.049
LG030	3.1	153	4.0	< 2	< 0.1	1	< 0.2	1.8	403	38.4	64.2	5.79	17.5	1.99	0.599	1.15	0.12	0.58	0.10	0.33	0.049	0.34	0.052
LG031	9.4	67	2.2	< 2	< 0.1	1	< 0.2	13.0	648	18.4	37.6	4.31	16.4	3.05	0.748	2.29	0.31	1.70	0.35	1.07	0.166	1.14	0.191
LG032	3.2	165	4.2	< 2	< 0.1	1	< 0.2	1.8	447	51.8	85.7	7.61	23.6	2.38	0.623	1.15	0.11	0.59	0.10	0.30	0.046	0.31	0.050
LG033	6.0	153	6.3	< 2	< 0.1	1	< 0.2	2.6	414	26.4	47.4	4.77	16.6	2.64	0.741	2.06	0.28	1.34	0.21	0.57	0.076	0.51	0.074
LG034	12.4	68	2.5	< 2	< 0.1	1	< 0.2	4.8	656	22.1	45.7	5.67	23.6	4.48	1.14	3.49	0.47	2.54	0.47	1.32	0.188	1.26	0.195
LG035	16.4	87	3.5	< 2	< 0.1	1	0.2	2.8	406	31.9	60.1	7.33	29.8	5.50	1.55	4.20	0.59	3.06	0.59	1.70	0.239	1.54	0.238
LG036	12.0	69	2.7	< 2	< 0.1	1	< 0.2	5.4	591	22.1	46.6	5.65	23.6	4.47	1.23	3.47	0.45	2.50	0.47	1.32	0.183	1.16	0.179
LG037	3.2	170	4.3	< 2	< 0.1	1	< 0.2	1.3	431	26.8	44.8	4.22	13.6	1.71	0.649	1.11	0.13	0.59	0.11	0.30	0.045	0.30	0.049
LG038	17.8	154	6.4	< 2	< 0.1	1	< 0.2	3.2	870	70.1	149	17.4	68.7	11.7	3.01	8.03	0.89	4.02	0.65	1.68	0.226	1.33	0.191
LG039	4.5	145	4.7	< 2	< 0.1	1	< 0.2	1.3	387	24.0	40.4	3.82	12.3	1.87	0.592	1.30	0.17	0.83	0.14	0.42	0.065	0.45	0.068
LG040	3.9	185	4.4	< 2	< 0.1	1	< 0.2	1.5	403	25.0	43.2	4.10	13.9	1.87	0.592	1.30	0.16	0.76	0.14	0.37	0.054	0.34	0.061
LG041	3.6	135	3.6	< 2	< 0.1	1	< 0.2	1.3	710	22.6	39.4	3.68	12.1	1.73	0.577	1.41	0.17	0.73	0.13	0.34	0.046	0.33	0.043
LG042	14.6	118	9.3	< 2	< 0.1	1	< 0.2	13.7	622	49.6	112	13.7	56.5	9.76	2.53	6.69	0.74	3.28	0.53	1.32	0.171	1.02	0.156
LG043	14.7	68	12.5	< 2	< 0.1	< 1	< 0.2	0.5	254	50.3	104	10.8	43.5	7.63	1.67	4.85	0.66	3.09	0.52	1.36	0.187	1.20	0.182
LG044	3.5	202	4.4	< 2	< 0.1	1	< 0.2	1.2	434	33.0	55.2	4.98	17.0	1.99	0.673	1.24	0.13	0.63	0.11	0.31	0.046	0.26	0.044
LG045	13.7	74	2.7	< 2	< 0.1	1	< 0.2	4.9	344	25.0	52.5	6.46	26.9	5.29	1.38	4.01	0.53	2.61	0.50	1.41	0.212	1.34	0.203

Analyte Symbol	Hf	Ta	W	Tl	Bi	Th	U	Ni	Cu	Zn	Cd	S	Ag	Pb	LOI
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%
Lower Limit	0.1	0.01	0.5	0.05	0.1	0.05	0.01	1	1	1	0.5	0.001	0.3	3	
Method Code	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	GRAV
LG001	2.6	0.30	< 0.5	0.36	< 0.1	3.41	0.61	4	31	54	< 0.5	0.005	< 0.3	8	0.48
LG002	2.7	0.25	< 0.5	0.34	< 0.1	3.28	1.15	3	17	53	< 0.5	0.002	0.4	6	0.71
LG003	1.7	0.46	0.6	0.51	< 0.1	3.96	1.65	2	46	47	< 0.5	0.004	0.4	19	1.06
LG004	2.0	0.88	< 0.5	0.42	0.2	8.34	1.66	2	13	38	< 0.5	0.001	< 0.3	8	0.39
LG005	2.3	0.52	< 0.5	0.28	0.1	6.80	2.63	1	10	44	< 0.5	0.002	0.4	8	0.46
LG006	2.6	0.64	< 0.5	0.39	< 0.1	9.04	0.98	2	8	47	< 0.5	0.002	< 0.3	6	0.47
LG007	3.5	0.22	< 0.5	< 0.05	< 0.1	3.53	0.68	3	37	61	< 0.5	0.003	0.3	4	0.40
LG008	3.3	0.72	< 0.5	0.55	< 0.1	3.43	1.67	2	8	66	< 0.5	0.003	0.5	8	1.46
LG009	3.7	1.16	< 0.5	0.44	< 0.1	3.40	0.93	3	18	72	< 0.5	0.004	0.4	5	0.54
LG010	2.5	0.43	< 0.5	0.42	< 0.1	11.9	1.66	2	7	49	< 0.5	0.003	< 0.3	11	0.48
LG011	1.7	0.44	1.2	0.35	0.4	6.50	1.42	2	8	33	< 0.5	0.312	0.4	7	0.93
LG012	2.2	0.72	0.7	0.42	< 0.1	7.44	2.18	1	6	40	< 0.5	0.047	< 0.3	6	1.92
LG013	1.6	0.50	2.9	0.26	0.2	5.23	1.89	1	6	85	< 0.5	0.225	< 0.3	6	1.48
LG014	4.6	0.28	10.1	0.15	0.2	11.4	2.59	171	12	86	< 0.5	0.006	0.4	12	2.72
LG015	2.4	0.62	< 0.5	0.43	0.2	7.60	2.43	2	20	44	< 0.5	0.003	< 0.3	8	0.41
LG016	1.9	0.75	< 0.5	0.72	< 0.1	4.86	4.12	2	3	11	< 0.5	0.009	< 0.3	20	0.17
LG017	2.3	0.40	< 0.5	0.54	< 0.1	3.75	8.83	1	6	14	< 0.5	0.030	< 0.3	18	0.31
LG018	3.3	1.21	2.5	0.96	0.1	4.53	14.6	< 1	5	15	< 0.5	0.006	< 0.3	16	0.19
LG019	2.5	0.55	< 0.5	0.39	0.2	6.94	3.35	2	18	42	< 0.5	0.003	0.4	7	0.38
LG020	3.3	0.20	< 0.5	0.28	< 0.1	1.81	0.68	3	10	60	< 0.5	0.003	< 0.3	3	0.50
LG021	3.3	0.21	< 0.5	0.29	< 0.1	2.00	1.25	4	7	61	< 0.5	0.003	< 0.3	4	0.40
LG022	3.9	0.58	< 0.5	0.34	< 0.1	7.10	1.85	2	6	47	< 0.5	0.003	0.4	5	0.34
LG023	3.9	0.60	< 0.5	0.38	< 0.1	4.95	1.28	6	4	61	< 0.5	0.002	0.4	7	1.61
LG024	3.4	0.45	< 0.5	0.26	< 0.1	3.63	1.05	3	10	54	< 0.5	0.003	< 0.3	4	0.24
LG025	3.4	0.48	< 0.5	0.29	< 0.1	4.55	1.15	8	17	56	< 0.5	0.004	0.4	5	0.34
LG026	3.8	0.36	< 0.5	0.37	< 0.1	9.53	1.30	3	9	49	< 0.5	0.004	0.3	6	0.42
LG027	3.1	0.44	< 0.5	0.28	< 0.1	2.77	1.32	2	8	25	< 0.5	0.003	< 0.3	9	0.43
LG028	4.6	0.34	< 0.5	0.46	< 0.1	7.07	2.04	143	74	86	< 0.5	0.095	0.3	8	1.97
LG029	2.3	0.36	< 0.5	0.26	< 0.1	5.19	1.49	3	7	23	< 0.5	0.003	< 0.3	10	0.46
LG030	3.9	0.70	< 0.5	0.34	< 0.1	7.44	1.51	4	12	58	< 0.5	0.005	0.4	5	0.52
LG031	1.9	0.14	< 0.5	0.94	< 0.1	2.85	0.75	213	2	84	< 0.5	0.003	< 0.3	< 3	6.64
LG032	4.3	0.57	< 0.5	0.37	< 0.1	9.08	1.62	5	12	62	< 0.5	0.004	0.3	7	0.39
LG033	4.0	0.68	0.9	0.30	< 0.1	5.74	1.32	6	8	65	< 0.5	0.006	0.3	7	1.24
LG034	1.9	0.14	< 0.5	0.77	0.1	2.84	0.75	229	3	84	< 0.5	0.003	< 0.3	< 3	4.44
LG035	2.4	0.19	0.5	0.32	0.2	3.59	1.17	127	8	75	< 0.5	0.005	< 0.3	19	2.54
LG036	2.0	0.14	< 0.5	0.70	< 0.1	3.01	0.80	258	4	121	< 0.5	0.003	< 0.3	< 3	2.70
LG037	4.2	0.41	< 0.5	0.32	< 0.1	5.37	0.99	175	20	118	< 0.5	0.006	0.3	8	0.42
LG038	3.8	0.30	0.6	0.34	0.1	9.39	2.22	306	60	68	< 0.5	0.071	0.3	8	2.43
LG039	3.8	0.82	< 0.5	0.35	< 0.1	6.09	2.14	7	11	58	< 0.5	0.003	0.3	9	0.38
LG040	4.7	0.52	< 0.5	0.31	0.1	5.73	1.55	7	18	69	< 0.5	0.005	< 0.3	5	0.33
LG041	3.5	0.38	< 0.5	0.29	< 0.1	5.88	1.32	4	6	46	< 0.5	0.003	0.4	7	0.24
LG042	3.2	0.39	0.6	0.56	0.2	6.03	1.75	419	16	87	< 0.5	0.006	0.3	< 3	4.54
LG043	1.8	0.51	1.2	0.32	< 0.1	2.90	0.77	81	22	91	< 0.5	0.003	< 0.3	< 3	10.54
LG044	4.9	0.32	< 0.5	0.13	< 0.1	6.86	0.83	6	7	68	< 0.5	0.003	0.3	3	0.54
LG045	2.1	0.15	0.5	0.26	0.1	3.26	0.94	185	8	69	< 0.5	0.005	< 0.3	4	3.17

Analyte Symbol	Au	As	Br	Ce	Cr	Cs	Co	Ce	Eu	Hf	Ir	La	Lu	Mo	Nd	Rb	Sb	Se	Sm	Ta	Th	Tb	U
Unit Symbol	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	2	0.5	0.5	3	5	1	1	3	0.2	1	5	0.5	0.05	5	5	20	0.2	3	0.1	0.5	0.2	0.5	0.5
Method Code	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA
NIST 694 Meas																							
NIST 694 Cert																							
DNC-1 Meas																							
DNC-1 Cert																							
GBW 07113 Meas																							
GBW 07113 Cert																							
SDC-1 Meas																							
SDC-1 Cert																							
TDB-1 Meas																							
TDB-1 Cert																							
W-2a Meas																							
W-2a Cert																							
DTS-2b Meas																							
DTS-2b Cert																							
SY-4 Meas																							
SY-4 Cert																							
Oreas 72a (4 Acid Digest) Meas																							
Oreas 72a (4 Acid Digest) Cert																							
BIR-1a Meas																							
BIR-1a Cert																							
ZW-C Meas																							
ZW-C Cert																							
OREAS 101b (Fusion) Meas																							
OREAS 101b (Fusion) Cert																							
OREAS 101b (4 Acid) Meas																							
OREAS 101b (4 Acid) Cert																							
OREAS 98 (4 Acid) Meas																							
OREAS 98 (4 Acid) Cert																							
NCS DC86318 Meas																							
NCS DC86318 Cert																							
SARM 3 Meas																							
SARM 3 Cert																							
DNC-1a Meas																							
DNC-1a Cert																							
OREAS 13b (4-Acid) Meas																							
OREAS 13b (4-Acid) Cert																							
USZ 42-2006 Meas																							
USZ 42-2006 Cert																							
OREAS 904 (4 ACID) Meas																							
OREAS 904 (4 ACID) Cert																							

Analyte Symbol	Au	As	Br	Ce	Cr	Cs	Co	Ce	Eu	Hf	Ir	La	Lu	Mo	Nd	Rb	Sb	Se	Sm	Ta	Th	Tb	U
Unit Symbol	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	2	0.5	0.5	3	5	1	1	3	0.2	1	5	0.5	0.05	5	5	20	0.2	3	0.1	0.5	0.2	0.5	0.5
Method Code	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA
OREAS 45d (4-Acid) Meas																							
OREAS 45d (4-Acid) Cert																							
REE-1 Meas																							
REE-1 Cert																							
OREAS 96 (4 Acid) Meas																							
OREAS 96 (4 Acid) Cert																							
OREAS 923 (4 Acid) Meas																							
OREAS 923 (4 Acid) Cert																							
OREAS 621 (4 Acid) Meas																							
OREAS 621 (4 Acid) Cert																							
OREAS 621 (4 Acid) Meas																							
OREAS 621 (4 Acid) Cert																							
OREAS 522 (4 Acid) Meas																							
OREAS 522 (4 Acid) Cert																							
DMMAS 122b Meas	685	1510		36	133		43	36				17.6					6.6		2.6				10.6
DMMAS 122b Cert	715	1540		33.0	136		40.2	33.0				16.5					6.41		2.71				11.6
LG007 Orig																							
LG007 Dup																							
LG014 Orig																							
LG014 Dup																							
LG015 Orig																							
LG015 Dup																							
LG024 Orig																							
LG024 Dup																							
LG032 Orig	< 2	0.6	< 0.5	84	13	2	3	84	0.7	5	< 5	53.5	< 0.05	< 5	19	100	< 0.2	< 3	2.2	< 0.5	9.6	< 0.5	2.0
LG032 Dup	< 2	1.5	< 0.5	85	10	1	4	85	0.5	6	< 5	52.4	< 0.05	< 5	15	100	< 0.2	< 3	2.3	< 0.5	8.6	< 0.5	1.4
LG035 Orig																							
LG035 Dup																							
LG044 Orig																							
LG044 Dup																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank	< 2	< 0.5	< 0.5	< 3	< 5	< 1	< 1	< 3	< 0.2	< 1	< 5	< 0.5	< 0.05	< 5	< 5	< 20	< 0.2	< 3	< 0.1	< 0.5	< 0.2	< 0.5	< 0.5
Method Blank																							

Analyte Symbol	W	Yb	Mass	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	Total	Sc	Be	V	V	Cr	Co	Ni	Cu	Zn
Unit Symbol	ppm	ppm	g	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	1	0.2		0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	1	1	5	5	20	1	20	10	30
Method Code	INAA	INAA	INAA	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
NIST 694 Meas				11.09	1.89	0.73	0.010	0.34	42.77	0.87	0.55	0.120	30.19					1673					
NIST 694 Cert				11.2	1.80	0.790	0.0116	0.330	43.6	0.860	0.510	0.110	30.2					1740					
DNC-1 Meas				47.36	18.11	9.63	0.150	10.02	11.52	1.93	0.22	0.480	0.07		31			152					
DNC-1 Cert				47.15	18.34	9.97	0.150	10.13	11.49	1.890	0.234	0.480	0.070		31			148					
GBW 07113 Meas				69.70	13.06	3.18	0.140	0.14	0.59	2.49	5.41	0.290	0.05		5	4		< 5					
GBW 07113 Cert				72.8	13.0	3.21	0.140	0.160	0.590	2.57	5.43	0.300	0.0500		5.00	4.00		5.00					
SDC-1 Meas																							
SDC-1 Cert																							
TDB-1 Meas																	467		250		100	320	150
TDB-1 Cert																	471		251		92	323	155
W-2a Meas				52.31	15.66	10.72	0.170	6.24	11.00	2.21	0.61	1.080	0.13		35	1	267	274	90	41	70	110	70
W-2a Cert				52.4	15.4	10.7	0.163	6.37	10.9	2.14	0.626	1.06	0.140		36.0	1.30	262	262	92.0	43.0	70.0	110	80.0
DTS-2b Meas																	22		> 10000	130	3730		
DTS-2b Cert																	22.0		15500	120	3780		
SY-4 Meas				49.40	19.91	6.22	0.110	0.49	8.13	6.82	1.64	0.290	0.13		1	3		6					100
SY-4 Cert				49.9	20.69	6.21	0.108	0.54	8.05	7.10	1.66	0.287	0.131		1.1	2.6		8.0					93
Oreas 72a (4 Acid Digest) Meas																							
Oreas 72a (4 Acid Digest) Cert																							
BIR-1a Meas				47.81	15.73	11.20	0.170	9.50	13.56	1.81	0.02	0.960	0.03		43	< 1	331	337	370	49	180	120	70
BIR-1a Cert				47.96	15.50	11.30	0.175	9.700	13.30	1.82	0.030	0.96	0.021		44	0.58	310	310	370	52	170	125	70
ZW-C Meas																			60				990
ZW-C Cert																			56.0				1050.000
OREAS 101b (Fusion) Meas																	76			43		420	
OREAS 101b (Fusion) Cert																	80			47		420	
OREAS 101b (4 Acid) Meas																							
OREAS 101b (4 Acid) Cert																							
OREAS 98 (4 Acid) Meas																							
OREAS 98 (4 Acid) Cert																							
NCS DC86318 Meas																							
NCS DC86318 Cert																							
SARM 3 Meas																							
SARM 3 Cert																							
DNC-1a Meas																							
DNC-1a Cert																							
OREAS 13b (4-Acid) Meas																							
OREAS 13b (4-Acid) Cert																							
USZ 42-2006 Meas																	129				< 20	30	460
USZ 42-2006 Cert																	115.00				13.18	27.37	469
OREAS 904 (4																							

Analyte Symbol	W	Yb	Mass	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	Total	Sc	Be	V	V	Cr	Co	Ni	Cu	Zn
Unit Symbol	ppm	ppm	g	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	1	0.2		0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	1	1	5	5	20	1	20	10	30
Method Code	INAA	INAA	INAA	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
ACID) Meas																							
OREAS 904 (4 ACID) Cert																							
OREAS 45d (4-Acid) Meas																							
OREAS 45d (4-Acid) Cert																							
REE-1 Meas																			300			80	
REE-1 Cert																			277			79.7	
OREAS 96 (4 Acid) Meas																							
OREAS 96 (4 Acid) Cert																							
OREAS 923 (4 Acid) Meas																							
OREAS 923 (4 Acid) Cert																							
OREAS 621 (4 Acid) Meas																							
OREAS 621 (4 Acid) Cert																							
OREAS 621 (4 Acid) Meas																							
OREAS 621 (4 Acid) Cert																							
OREAS 522 (4 Acid) Meas																							
OREAS 522 (4 Acid) Cert																							
DMMAS 122b Meas																							
DMMAS 122b Cert																							
LG007 Orig				69.95	15.15	3.30	0.046	0.78	3.08	4.47	1.94	0.335	0.10	99.55	5	1	31	31	< 20	2	< 20	40	50
LG007 Dup				68.83	15.26	3.28	0.046	0.78	3.05	4.41	1.94	0.336	0.11	98.44	5	2	33	32	< 20	2	< 20	40	60
LG014 Orig																							
LG014 Dup																							
LG015 Orig				75.33	13.06	2.14	0.030	0.33	1.99	4.15	2.07	0.140	0.04	99.69	2	1	6	7	< 20	2	< 20	< 10	40
LG015 Dup				74.75	12.99	2.13	0.030	0.33	1.99	4.16	2.07	0.140	0.03	99.02	2	1	6	6	< 20	2	< 20	< 10	40
LG024 Orig																							
LG024 Dup																							
LG032 Orig	< 1	< 0.2	26.2	73.01	13.02	3.28	0.039	0.70	2.62	3.81	1.73	0.317	0.07	98.99	2	1	23	24	< 20	5	< 20	10	60
LG032 Dup	< 1	< 0.2	28.1	72.34	13.74	3.39	0.040	0.72	2.67	4.00	1.79	0.323	0.09	99.49	2	1	24	24	< 20	5	< 20	10	70
LG035 Orig																							
LG035 Dup																							
LG044 Orig				72.99	13.03	3.67	0.050	0.95	2.83	3.64	1.65	0.376	0.11	99.84	3	2	30	29	< 20	3	< 20	< 10	70
LG044 Dup				72.02	13.10	3.67	0.050	0.95	2.78	3.62	1.67	0.377	0.13	98.92	3	2	29	28	< 20	3	< 20	< 10	70
Method Blank				< 0.01	< 0.01	< 0.01	0.003	< 0.01	< 0.01	< 0.01	< 0.01	< 0.001	< 0.01		< 1	< 1	< 5	< 5	< 20	< 1	< 20	< 10	< 30
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							

Analyte Symbol	W	Yb	Mass	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	Total	Sc	Be	V	V	Cr	Co	Ni	Cu	Zn
Unit Symbol	ppm	ppm	g	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	1	0.2		0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	1	1	5	5	20	1	20	10	30
Method Code	INAA	INAA	INAA	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
Method Blank	< 1	< 0.2	30.0																				
Method Blank				0.01	< 0.01	< 0.01	0.003	< 0.01	< 0.01	< 0.01	< 0.01	< 0.001	0.01		< 1	< 1		< 5					

Analyte Symbol	Ga	Ge	As	Rb	Sr	Sr	Y	Y	Zr	Nb	Mo	In	Sn	Sb	Cs	Ba	Ba	La	Ce	Pr	Nd	Sm	Eu
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	1	0.5	5	1	2	2	0.5	1	1	0.2	2	0.1	1	0.2	0.1	3	2	0.05	0.05	0.01	0.05	0.01	0.005
Method Code	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
NIST 694 Meas																							
NIST 694 Cert																							
DNC-1 Meas						142		16	34								109						
DNC-1 Cert						144.0		18.0	38								118						
GBW 07113 Meas						42		44	385								493						
GBW 07113 Cert						43.0		43.0	403								506						
SDC-1 Meas																							
SDC-1 Cert																							
TDB-1 Meas							33.8											16.5	38.6		23.3		2.00
TDB-1 Cert							36											17	41		23		2.1
W-2a Meas	17	1.4	< 5	19	192	198		19	86	7.7	< 2			0.7		165	174	10.6	22.6		12.6	3.20	
W-2a Cert	17.0	1.00	1.20	21.0	190	190		24.0	94.0	7.90	0.600			0.790		182	182	10.0	23.0		13.0	3.30	
DTS-2b Meas																							
DTS-2b Cert																							
SY-4 Meas	36			55	1240	1197	123	112	545	13.4					1.5	356	341	62.0	129	15.2	59.6	13.1	2.05
SY-4 Cert	35			55.0	1191	1191	119	119	517	13					1.5	340	340	58	122	15.0	57	12.7	2.00
Oreas 72a (4 Acid Digest) Meas																							
Oreas 72a (4 Acid Digest) Cert																							
BIR-1a Meas	15				108	109	14.8	13	14					0.5			11	0.60	1.90		2.30	1.10	0.530
BIR-1a Cert	16				110	110	16	16	18					0.58			6	0.63	1.9		2.5	1.1	0.55
ZW-C Meas	97			> 1000						209			> 1000	4.5	260			30.3	104	9.50	25.0	6.90	
ZW-C Cert	99			8500						198			1300.000	4.2	260			30.0	97	9.5	25.0	6.6	
OREAS 101b (Fusion) Meas							174				20							783	1350	122	371	48.0	7.85
OREAS 101b (Fusion) Cert							178				21							789	1331	127	378	48	7.77
OREAS 101b (4 Acid) Meas																							
OREAS 101b (4 Acid) Cert																							
OREAS 98 (4 Acid) Meas																							
OREAS 98 (4 Acid) Cert																							
NCS DC86318 Meas				391			> 10000								10.9			1980	422	728	> 2000	> 1000	19.2
NCS DC86318 Cert				369.42			17008								10.28			1960	430	740	3430	1720	18.91
SARM 3 Meas										> 1000													
SARM 3 Cert										978													
DNC-1a Meas																							
DNC-1a Cert																							
OREAS 13b (4-Acid) Meas																							
OREAS 13b (4-Acid) Cert																							
USZ 42-2006 Meas				61	5340		172			34.0	36					322		> 2000	> 3000	> 1000	> 2000	531	91.0
USZ 42-2006 Cert				67.12	4900.00		167			31.00	34.40					307		21100	27600	2300	6500	539	87.22
OREAS 904 (4																							

Analyte Symbol	Ga	Ge	As	Rb	Sr	Sr	Y	Y	Zr	Nb	Mo	In	Sn	Sb	Cs	Ba	Ba	La	Ce	Pr	Nd	Sm	Eu
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	1	0.5	5	1	2	2	0.5	1	1	0.2	2	0.1	1	0.2	0.1	3	2	0.05	0.05	0.01	0.05	0.01	0.005
Method Code	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
ACID) Meas																							
OREAS 904 (4 ACID) Cert																							
OREAS 45d (4-Acid) Meas																							
OREAS 45d (4-Acid) Cert																							
REE-1 Meas			122												1.1	106		1740	> 3000		1490		24.9
REE-1 Cert			124												1.07	100.1		1661	3960		1456		23.5
OREAS 96 (4 Acid) Meas																							
OREAS 96 (4 Acid) Cert																							
OREAS 923 (4 Acid) Meas																							
OREAS 923 (4 Acid) Cert																							
OREAS 621 (4 Acid) Meas																							
OREAS 621 (4 Acid) Cert																							
OREAS 621 (4 Acid) Meas																							
OREAS 621 (4 Acid) Cert																							
OREAS 522 (4 Acid) Meas																							
OREAS 522 (4 Acid) Cert																							
DMMAS 122b Meas																							
DMMAS 122b Cert																							
LG007 Orig	22	0.5	< 5	51	369	355	4.3	3	127	1.9	< 2	< 0.1	1	< 0.2	1.2	596	585	19.0	34.4	3.33	11.6	2.02	0.586
LG007 Dup	22	< 0.5	< 5	53	363	357	4.4	5	126	2.2	< 2	< 0.1	1	< 0.2	1.2	601	581	18.0	32.3	3.11	11.4	1.84	0.633
LG014 Orig																							
LG014 Dup																							
LG015 Orig	18	0.9	< 5	70	185	190	3.5	4	78	3.8	< 2	< 0.1	1	< 0.2	1.8	409	392	32.7	55.6	4.99	15.3	1.79	0.517
LG015 Dup	18	1.0	< 5	70	186	188	3.5	4	76	3.5	< 2	< 0.1	1	< 0.2	1.9	411	392	32.5	55.2	4.92	15.5	1.91	0.525
LG024 Orig																							
LG024 Dup																							
LG032 Orig	18	0.9	< 5	58	228	228	3.1	3	162	4.0	< 2	< 0.1	1	< 0.2	1.8	464	436	52.1	85.7	7.56	23.8	2.37	0.632
LG032 Dup	19	0.8	< 5	60	238	243	3.2	3	168	4.3	< 2	< 0.1	1	< 0.2	1.9	475	459	51.5	85.7	7.65	23.4	2.39	0.613
LG035 Orig																							
LG035 Dup																							
LG044 Orig	19	< 0.5	< 5	50	243	241	3.4	3	198	4.4	< 2	< 0.1	1	< 0.2	1.2	441	433	33.2	54.9	5.11	17.3	2.08	0.724
LG044 Dup	18	< 0.5	< 5	50	244	243	3.5	4	205	4.3	< 2	< 0.1	1	< 0.2	1.2	438	435	32.8	55.5	4.84	16.7	1.91	0.622
Method Blank	< 1	< 0.5	< 5	< 1	< 2	< 2	< 0.5	< 1	2	< 0.2	< 2	< 0.1	< 1	< 0.2	< 0.1	< 3	< 2	< 0.05	< 0.05	< 0.01	< 0.05	< 0.01	< 0.005
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							
Method Blank																							

Analyte Symbol	Ga	Ge	As	Rb	Sr	Sr	Y	Y	Zr	Nb	Mo	In	Sn	Sb	Cs	Ba	Ba	La	Ce	Pr	Nd	Sm	Eu
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	1	0.5	5	1	2	2	0.5	1	1	0.2	2	0.1	1	0.2	0.1	3	2	0.05	0.05	0.01	0.05	0.01	0.005
Method Code	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
Method Blank						< 2		< 1	1								< 2						

Analyte Symbol	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Tl	Bi	Th	U	Ni	Cu	Zn	Cd	S	Ag	Pb
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.002	0.1	0.01	0.5	0.05	0.1	0.05	0.01	1	1	1	0.5	0.001	0.3	3
Method Code	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
NIST 694 Meas																						
NIST 694 Cert																						
DNC-1 Meas																						
DNC-1 Cert																						
GBW 07113 Meas																						
GBW 07113 Cert																						
SDC-1 Meas																35	30	101				16
SDC-1 Cert																38.0	30.000	103.00				25.00
TDB-1 Meas							3.20							2.60								
TDB-1 Cert							3.4							2.7								
W-2a Meas		0.65	3.70	0.73			2.00	0.300	2.5	0.47	< 0.5	0.07	< 0.1	2.30	0.51							
W-2a Cert		0.630	3.60	0.760			2.10	0.330	2.60	0.500	0.300	0.200	0.0300	2.40	0.530							
DTS-2b Meas																						
DTS-2b Cert																						
SY-4 Meas	14.2		19.0	4.37	14.7	2.32	15.6	2.22	10.4	0.80				1.30	0.90							
SY-4 Cert	14.0		18.2	4.3	14.2	2.3	14.8	2.1	10.6	0.9				1.4	0.8							
Oreas 72a (4 Acid Digest) Meas																6200	315			1.53		
Oreas 72a (4 Acid Digest) Cert																6930.000	316			1.74		
BIR-1a Meas							1.60															
BIR-1a Cert							1.7															
ZW-C Meas	4.70									85.8	329	33.7			19.5							
ZW-C Cert	4.70									82	320	34			20.0							
OREAS 101b (Fusion) Meas		5.34	31.1	6.18	18.6	2.67	17.5	2.60						35.3	388							
OREAS 101b (Fusion) Cert		5.37	32.1	6.34	18.7	2.66	17.6	2.58						37.1	396							
OREAS 101b (4 Acid) Meas																9	434					20
OREAS 101b (4 Acid) Cert																8.2	412					23
OREAS 98 (4 Acid) Meas																	> 10000	1280		13.5	44.3	325
OREAS 98 (4 Acid) Cert																	148000.0	1360		15.5	45.1	345
NCS DC86318 Meas	> 1000	489	> 1000	593	> 1000	267	> 1000	254						67.0								
NCS DC86318 Cert	2095	470	3220	560	1750	270	1840	260.0						67.0								
SARM 3 Meas																						
SARM 3 Cert																						
DNC-1a Meas																234	92	58				< 3
DNC-1a Cert																247	100	70				6.3
OREAS 13b (4-Acid) Meas																2080	2360	121		1.07	1.0	
OREAS 13b (4-Acid) Cert																2247.0000	2327.0000	133		1.2	0.86	
USZ 42-2006 Meas							17.1							971								
USZ 42-2006 Cert							17.85							946								
OREAS 904 (4 ACID) Meas																45	6530	27		0.059	1.0	7
OREAS 904 (4																40.1	6120	26.3		0.0630	0.551	10.6

Analyte Symbol	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Tl	Bi	Th	U	Ni	Cu	Zn	Cd	S	Ag	Pb
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.002	0.1	0.01	0.5	0.05	0.1	0.05	0.01	1	1	1	0.5	0.001	0.3	3
Method Code	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
ACID) Cert																						
OREAS 45d (4-Acid) Meas																239	386	43		0.043		15
OREAS 45d (4-Acid) Cert																231.0	371	45.7		0.049		21.8
REE-1 Meas	447		903	215	711				491													
REE-1 Cert	433		847	208	701				479													
OREAS 96 (4 Acid) Meas																	> 10000	445		3.85	11.3	95
OREAS 96 (4 Acid) Cert																	39300	457		4.19	11.5	101
OREAS 923 (4 Acid) Meas																38	4760	347	< 0.5	0.678	2.0	82
OREAS 923 (4 Acid) Cert																35.8	4230	345	0.420	0.691	1.60	83.0
OREAS 621 (4 Acid) Meas																29	3980	> 10000	292	4.45	68.6	> 5000
OREAS 621 (4 Acid) Cert																26.2	3630	52200	284	4.48	69.0	13600
OREAS 621 (4 Acid) Meas																27	3820	> 10000	283	4.23	67.3	> 5000
OREAS 621 (4 Acid) Cert																26.2	3630	52200	284	4.48	69.0	13600
OREAS 522 (4 Acid) Meas																63	8680	31		2.13	1.5	8
OREAS 522 (4 Acid) Cert																70.0	9160	30.2		2.50	1.31	12.5
DMMAS 122b Meas																						
DMMAS 122b Cert																						
LG007 Orig	1.43	0.18	0.95	0.17	0.43	0.060	0.36	0.052	3.6	0.24	< 0.5	0.14	0.1	3.58	0.67							
LG007 Dup	1.38	0.17	0.85	0.16	0.40	0.054	0.36	0.056	3.3	0.19	< 0.5	< 0.05	< 0.1	3.47	0.69							
LG014 Orig																170	12	86	< 0.5	0.006	0.4	12
LG014 Dup																172	12	85	< 0.5	0.005	0.3	13
LG015 Orig	1.00	0.13	0.60	0.11	0.32	0.049	0.33	0.052	2.5	0.64	< 0.5	0.41	0.2	7.62	2.43							
LG015 Dup	1.04	0.12	0.66	0.11	0.31	0.046	0.32	0.052	2.3	0.60	< 0.5	0.45	0.2	7.57	2.44							
LG024 Orig																3	11	54	< 0.5	0.003	0.4	4
LG024 Dup																3	9	55	< 0.5	0.003	< 0.3	4
LG032 Orig	1.16	0.11	0.60	0.10	0.29	0.045	0.32	0.050	4.3	0.56	< 0.5	0.39	< 0.1	9.05	1.62							
LG032 Dup	1.14	0.12	0.58	0.10	0.31	0.046	0.30	0.050	4.3	0.58	< 0.5	0.35	< 0.1	9.11	1.62							
LG035 Orig																128	8	74	< 0.5	0.005	< 0.3	19
LG035 Dup																126	7	76	< 0.5	0.005	< 0.3	20
LG044 Orig	1.15	0.12	0.62	0.11	0.33	0.049	0.28	0.047	5.0	0.34	< 0.5	0.18	< 0.1	6.95	0.84							
LG044 Dup	1.33	0.14	0.64	0.11	0.30	0.044	0.25	0.041	4.8	0.31	< 0.5	0.08	< 0.1	6.76	0.83							
Method Blank	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.005	< 0.01	< 0.002	< 0.1	< 0.01	< 0.5	< 0.05	< 0.1	< 0.05	< 0.01							
Method Blank																< 1	< 1	< 1	< 0.5	< 0.001	< 0.3	< 3
Method Blank																< 1	< 1	< 1	< 0.5	0.001	< 0.3	< 3
Method Blank																< 1	< 1	< 1	< 0.5	< 0.001	< 0.3	< 3
Method Blank																< 1	< 1	< 1	< 0.5	< 0.001	< 0.3	< 3
Method Blank																< 1	< 1	< 1	< 0.5	< 0.001	< 0.3	< 3
Method Blank																						
Method Blank																						