DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2012/66

Characterisation of the Nickel Sulphide Mineralisation between Graah Fjord and Bernstoff Isfjord, South-East Greenland

South-East Greenland Mineral Endowment Task Project, SEGMENT 2009-2014

John Owen

With an introduction by Jochen Kolb

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND
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John Owen
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Introduction

In 2010, the Geological Survey of Denmark and Greenland and the Centre for Exploration Targeting, University of Western Australia agreed on scientific collaboration on projects in Greenland and mineral systems for Ni and Au mineralisation. In the following, two students and one professional geologist from Australia took part in the South-East Greenland Mineral Endowment Task expedition, SEGMENT 2011, in order to establish research collaboration and starting two Bachelor of Science in Geology projects. A South-East Greenland expedition in 2009 discovered Ni-sulphide mineralisation in several locations, which were studied by the two students at more detail. Already in this early stage Greenland Minerals and Energy Ltd. became interested and explored for Ni in the area. At the same time, the Centre for Exploration Targeting established a research project ”Experimental determination of metal sources and transport mechanisms in the deep lithosphere”, in which the research in South-East Greenland was embedded. This multi-scale integrated study is designed to integrate experimental work with tests through the measurement of rock samples collected from key localities where the deep lithosphere is exposed, i.e. South-East Greenland. This project is designed to unravel the complex transport and concentration mechanisms of siderophile-chalcophile elements such as Ni in the deep lithosphere. This volume contains the Bachelor of Science in Geology Thesis by John Owen, who at present has started a PhD project following up his findings from 2011 and who will be joining the SEGMENT 2012 and SEGMENT 2013 expeditions.

John mapped the Ni-sulphide occurrences that are hosted in mafic bands from aerial photographs and in the field. His principal topic was to characterize the petrology and geochemistry of host rocks and mineralisation. He was able to show that the mafic bands consist of metamorphosed gabbroic rocks, which were intruded by ultramafic rocks (peridotites and minor pyroxenites) from (1) an undepleted deep mantle source and (2) a depleted shallow mantle source in the deep crust. Importantly, the Ni-sulphide mineralisation is associated with the latter type of ultramafic rocks. Petrological and geochemical evidence suggest that the Ni mineral system involved interaction of the ultramafic melt with a volatile, incompatible element, S, Cu and Ni bearing fluid in the upper mantle rather than being related to a typical orthomagmatic system.

CHARACTERISATION OF THE NICKEL SULPHIDE MINERALISATION BETWEEN GRAAH FJORD AND BERNSTORFF ISFJORD, SOUTH-EAST GREENLAND

John Owen

Submitted in partial fulfilment for the
Bachelor of Science in Geology (Honours)
School of Earth and Environment
University of Western Australia

October, 2011

DECLARATION

The research presented in this thesis was undertaken by the author and remains original unless otherwise acknowledged.

Abstract

Laterally extensive mafic bands, hosting Ni-Cu sulphide mineralisation can be found throughout the orthogneiss which dominates the relatively unexplored region between Graah Fjord and Bernstorff Isfjord in South-East Greenland. The mafic bands are volatile-rich and are dominantly gabbroic in composition but they do show large variation, ranging from gabbros to pyroxene hornblende norites. The mafic bands display some similarities with the mafic complex of the Ivrea-Verbano Zone (IVZ) in Italy which is thought to represent lower crustal material. Amphibole-bearing ultramafic bodies can be found locally within the mafic bands. The ultramafic rocks are dominantly peridotites with a smaller volume of pegmatitic pyroxenites. It seems most likely that the mafic bands of this study represent lower crustal material intruded by mantle-sourced ultramafic magmas.

The ultramafic rocks can be subdivided into two generations based on their trace-element geochemistry. One generation was most likely sourced from a deep, relatively undepleted mantle source, while the other was sourced from a depleted shallow mantle source. The shallow sourced ultramafic rocks host the majority of the mineralisation and display evidence for having interacted with a volatile, incompatible element, S, Cu and Ni bearing fluid. This fluid is interpreted as a key factor in the formation of the mineralisation.

All of the rocks comprising the mafic bands show enrichment of incompatible elements with Nb depleted relative to K and La. This is interpreted as evidence that all of the lithotypes in the mafic bands have interacted with a second, incompatible element bearing, Nb depleted fluid.

The mineralisation in the study area most likely does not represent a typical orthomagmatic Ni sulphide system, which are usually controlled by processes at the site of emplacement including interaction with crustal material. Rather, this mineralisation is controlled by mantle fluid processes. Work is ongoing for the determination of the economic viability of this mineralisation.

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Acknowledgements

I would first sincerely like to thank my supervisors from the CET and GEUS; Marco Fiorentini, Nicolas Thebaud, Jochen Kolb and Bo Møller Stensgaard. They have provided an amazing opportunity and have been very supportive and helpful throughout the year. Thanks to Max Nykjær Strunck for his patience and help getting the 3D photogrammetry working. Thank you to Alfons Berger and Jørgen Kystol for familiarising me with the electron microprobe and the SEM in Copenhagen. I would also like to thank all the members of the 2011 SEGMENT expedition to South-East Greenland, particularly Per Kalvig for his help in the field and for showing us the ropes and Michael Nielsen for his help with cutting all of our samples. Finally, I would like to thank Steve Rennick for being a great colleague and friend over the course of the year.

1. Introduction

1.1. Problem Identification

During the field work investigation carried out in the Summer of 2009, the Geological Survey of Denmark and Greenland (GEUS) identified rusty horizons in bands of mafic to ultramafic rocks in South-East Greenland (Stensgaard *et al.* 2010), in the North Atlantic Craton (NAC). These bands extend laterally for tens of kilometres and can be up to tens of metres wide. The bands locally contain disseminated to blebby sulphide mineralisation, including pentlandite and chalcopyrite. This mineralised occurrence could represent an orthomagmatic sulphide system. The bands have been thought previously to be mostly composed of supracrustal rocks but have never been mapped in detail. Furthermore, rock samples from the area have never been looked at in detail. Therefore, this Honours project aims to document and characterise the mineralised occurrences hosted in the mafic bands. Existing samples and data collected in previous years are used in addition to samples and data collected during the fieldwork carried out as part of this project.

1.2. Aims and Objectives

As the first detailed study of the mafic bands, this project aims to document the salient petrographic and geochemical features that characterise the sulphide mineralisation. The primary aim is to identify, describe and compare different styles of mineralisation. The data collected will be used to:

- Characterise the mineralised and mineralisation associated lithologies;
- Characterise the sulphide mineralisation;
- Provide evidence of the crustal level of formation of the mineralisation;
- Provide evidence of the style of the mineralising system;

- Formulate a basic model of ore formation;
- Constrain the extent of the mineralisation;
- Make a basic assessment of the economic potential of the mineralisation.

This project is part of a collaborative effort between GEUS and the Centre for Exploration Targeting (CET) at the University of Western Australia (UWA). This project is also part of The South-East Greenland Mineral Endowment Task (SEGMENT), a joint project between GEUS and the Greenland Bureau of Minerals and Petroleum (BMP) aimed at facilitating and encouraging mineral exploration in South-East Greenland.

1.3. Field Campaign

1.3.1. Preparation

GEUS had an expedition to the NAC in South-East Greenland in the summer of 2011. This expedition was composed of several teams, each carrying out different work for SEGMENT. The fieldwork for this Honours project, together with the fieldwork for Steve Rennick's Honours Project, was completed as one of the expedition teams. Steve Rennick was another UWA Honours student conducting a complimentary but differently focused project in the same field area.

In preparation for the expedition, it was necessary to be present in Copenhagen from the 17th of May to attend organisational workshops and short training courses. GEUS provided training in the use of first aid and emergency equipment, the use of motorboats and survival suits for work in the fjords which dominate the field area, the use of the GanFeld fieldwork documentation PDA system and the use of firearms and tripwire alarm systems for protection from polar bears. In addition, 3D aerial photogrammetry and analysis of existing samples was carried out using the facilities at GEUS in Copenhagen during this preparation period.

1.3.2. Location

The study area is located approximately 275km south from the township of Tasiilaq along the coast of South-East Greenland (**Figure 1.**). The field area consisted of the fjord walls of Graah fjord, Jættefjorden and Kangerdlikajik as well as nunataks (exposed rock within the inland ice) around Storbjørn glacier and Jomfruen glacier. It was planned for the expedition members to sail to the field area from Kulusuk but very bad sea-ice prevented the ship from reaching the harbour in Kulusuk or in Tasiilaq. Instead, the ship sailed south to the field area while the expedition members waited in Tasiilaq. The expedition members were then flown to the base ship in Air Greenland helicopters: a Bell 212 and a Eurocopter AS350.

1.3.3. Conditions

The field season in Greenland went from the 9th of July to the 12th of August. The 38m expedition ship MV Fox was used as a base camp for the work, holding fuel, food and other supplies and equipment. The base camp remained in southern Skjoldungen fjord and was contacted by RACAL radio and satellite phone. In addition, an Air Greenland Eurocopter AS350 helicopter supported the expedition. Our team used three field camps, one each in Graah fjord, Jættefjorden and Kangerdlikajik. The helicopter assisted with camp shifts and was also used to provide supply drops roughly every five days.

The field area was dominated by 500m-3000m-wide fjords, which cut very steep mountains up to 2km in height. A Zodiac motorboat with a 4hp outboard motor was used for transport within the fjords. There were some places along the walls of the fjords where it was possible to moor the boat and go ashore. At some of these locations, it was possible to hike up the wall for some distance but the work was still very much restricted to only the very lowest portion of the fjord walls. A few days of the fieldwork were spent on doing helicopter reconnaissance work. During helicopter reconnaissance, the team was accompanied by the helicopter for the day, which was used to reach otherwise inaccessible locations, such as mountaintops around the fjords and nunataks.

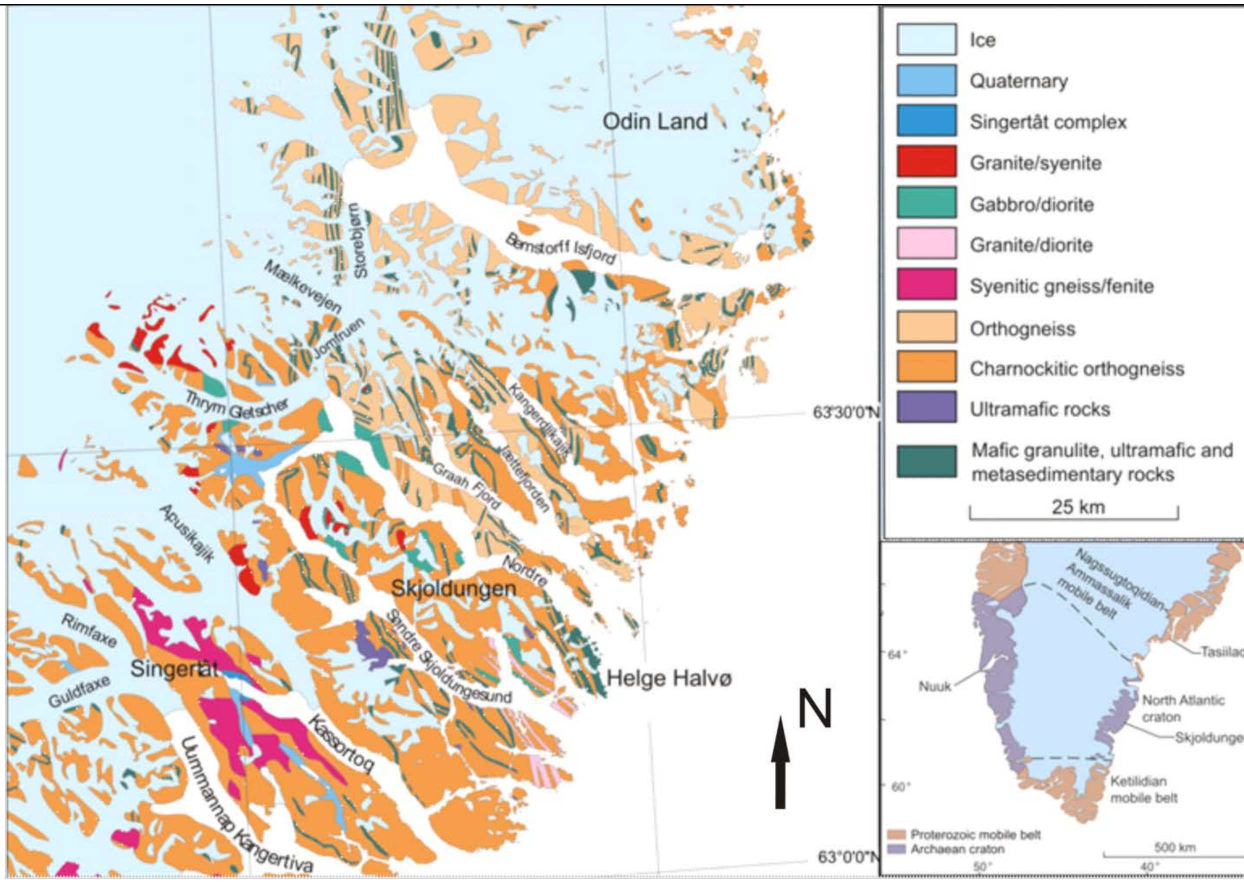


Figure 1. Geological map of the area around Skjoldungen island in South-East Greenland. Image modified from Kolb *et al.* (in review).

1.4. Research Methods

1.4.1. 3D Photogrammetry

All of the teams on the expedition needed helicopter support because of the terrain in the field area. Therefore, for the coordination of the helicopter support it was necessary to be familiar with the field area and to have planned campsites and work locations. In preparation for the fieldwork, digital stereoscopic viewing of triangulated orthogonal and oblique aerial photographs was used in the GEUS laboratory in Copenhagen. The oblique photographs needed to be triangulated before use.

The 3D photogrammetry was carried out using the software SOCET SET. The main monitor used for the 3D photogrammetry was the Planar SD2420W StereoMirror but some work was also done using the Planar SA2311W monitor. The SD2420W uses two monitors, glasses with one lens polarised perpendicular to the other and a StereoMirror. When wearing the glasses, the StereoMirror caused one eye to see the display on one screen and the other eye to see the other screen, allowing for stereoscopic 3D viewing. The SA2311W monitor ran at 120Hz alternating between the two different images. The glasses for the SA2311W were synced with the monitor and also flickered at 120Hz; alternating between blacking out the left lens and the right lens. The effect was for each eye to see one of the two images at 60Hz, allowing for stereoscopic 3D viewing with no perceivable flickering.

In 2009, a series of oblique aerial photographs of the fjord walls were collected from an AS-350 helicopter. 846 of these photographs were selected to be triangulated for 3D photogrammetry. Accordingly, the selected photographs needed to be oriented relative to each other in long strings, and then oriented in real space. The software that was used for the triangulation, SOCET SET, has a function for automatically creating tie-points between adjacent photographs to determine the photographs relative orientations. However, the focal length of the camera used to take the photographs was too long, resulting in photographs with a poor spatial accuracy. Furthermore, the photographs were not taken with consistent overlap and orientation, and the flight paths of the helicopter were not straight.

Therefore, tie-points had to be created manually for most of the photographs; by selecting common points on adjacent photographs, it was possible to ‘stitch’ long sequences of photographs together into strings. The tie-points created an initial estimate of the relative orientations of the photographs in a given string. From the initial estimations provided by the tie-points, iterative calculations were carried out using the program BINGO to refine the relative orientations of the photographs. Once the relative orientations of all the photographs in a given string had been refined, it was necessary to orient the string of photographs in real space. This was carried out by creating a minimum of three control points linking points on the photograph string with points in real space. A series of already triangulated 1:150 000 orthogonal aerial photographs was available over the South-East of Greenland. Because these photographs had already been triangulated, they were used to create the control points for the oblique photographs. Many of the oblique photographs in the strings contained coastline. Therefore, additional points were placed along the coast to further refine the orientation of the photographs, using the software to set these points to be a horizontal plane. This method permitted the definition of the photographs' phi, kappa, omega, y and z values to be carried out in batches, which constrained the rotational orientation, spatial location and scale of the photographs. The average scale of the selected oblique photographs determined from all the triangulation points was 1:49 000. The nature of oblique photographs is that the scale varies, in this case, being smallest at the top and largest at the bottom.

The 3D photogrammetry was crucial in planning the fieldwork in such a high relief environment. It was used to select areas of particular interest for the fieldwork and to localise associated possible camp sites. In addition, the photogrammetry software SOCET SET was linked with ArcGIS to allow the creation of 3D features from the aerial photographs. This permitted quantitative structural analysis to be carried out using the photographs as well as detailed mapping of lithological contacts, faults and dykes.

1.4.2. Fieldwork

Fieldwork was focused on documentation of the style of mineralisation and the contact relationships of the associated lithologies. The mafic bands were visited wherever it was possible to reach them.

Mineralisation occurrences and the surrounding lithologies were extensively sampled. In total, 296 samples were collected during the fieldwork, which were each allocated a unique GEUS number.

The GanFeld PDA system was used to document the fieldwork. GanFeld is a software add-on for ArcPad created by the Geological Survey of Canada (GSC) and modified by GEUS. This was used on an HP iPAQ 214 PDA linked with a GlobalSat wireless GPS. Wherever fieldwork was carried out a locality was created in ArcPad with coordinates from the GPS. Using Ganfeld, lithologies were added to the localities and all measurements and samples taken were recorded as belonging to a specific lithology. This permitted all observations, samples, photographs and measurements to be immediately entered and spatially located in a GIS program. In addition, the PDA was used to display GIS layers such as existing geological maps and topographic contours with a point indicating the current location.

1.4.3. Microscopy

Samples from the field area that were representative of the ultramafic and mafic units were selected for study. Viewing of thin sections in a light microscope was used to identify and describe eleven of the rock samples. In addition, images in transmitted and reflected light were collected of these samples. Furthermore, back-scattered electron (BSE) images were collected of one of the existing samples using a Scanning Electron Microscope (SEM), focusing on sulphide and oxide textures and relationships. All this work was carried out at GEUS in Copenhagen prior to the fieldwork.

1.4.4. Whole-Rock Geochemical Analysis

61 of the samples had been sent to AcmeLabs in Canada for geochemical analysis. 0.2g splits of the samples were analysed for major oxides, nickel and scandium by ICP-ES following lithium metaborate/tetraborate fusion and dilute nitric acid digestion. Rare earth and refractory elements were determined from 0.2g splits by ICP-MS following lithium metaborate/tetraborate fusion and nitric acid

digestion. Precious and base metals were determined from a 0.5g split by ICP-MS following Aqua Regia digestion. In addition total carbon and sulphur were determined by the Leco furnace method and loss on ignition was determined by weight difference after ignition at 1000°C. Detection limits can be found in **Table 1**.

Table 1. Detection limits for the suite of elements analysed by AcmeLabs in Canada.

Element	Detection Limit	Element	Detection Limit	Element	Detection Limit
SiO_2	0.01%	Rb	0.1 ppm	Tm	0.01 ppm
Al_2O_3	0.01%	Sn	1 ppm	Yb	0.05 ppm
Fe_2O_3	0.04%	Sr	0.5 ppm	Lu	0.01 ppm
MgO	0.01%	Ta	0.1 ppm	Mo	0.1 ppm
CaO	0.01%	Th	0.2 ppm	Cu	0.1 ppm
Na_2O	0.01%	U	0.1 ppm	Pb	0.1 ppm
K_2O	0.01%	V	8 ppm	Zn	1 ppm
TiO_2	0.01%	W	0.5 ppm	Ni	0.1 ppm
P_2O_5	0.01%	Zr	0.1 ppm		
MnO	0.01%	Y	0.1 ppm	As	0.5 ppm
Cr_2O_3	0.002%	La	0.1 ppm	Cd	0.1 ppm
Ni	20 ppm	Ce	0.1 ppm	Sb	0.1 ppm
Sc	1 ppm	Pr	0.02 ppm	Bi	0.1 ppm
		Nd	0.3 ppm	Ag	0.1 ppm
Ba	1 ppm	Sm	0.05 ppm	Au	0.5 ppb
Be	1 ppm	Eu	0.02 ppm	Hg	0.01 ppm
Co	0.2 ppm	Gd	0.05 ppm	Tl	0.1 ppm
Cs	0.1 ppm	Tb	0.01 ppm	Se	0.5 ppm
Ga	0.5 ppm	Dy	0.05 ppm	C	0.02%
Hf	0.1 ppm	Ho	0.02 ppm	S	0.02%
Nb	0.1 ppm	Er	0.03 ppm	LOI	0.1%

186 selected samples were sent to Activation Laboratories Ltd. in Canada for geochemical analysis. The samples were crushed, split and pulverized with mild steel. 186 samples were then analysed with a lithium metaborate/tetraborate fusion ICP Whole Rock and trace element ICP/MS package. Two samples were additionally analysed for gold, platinum and palladium by Fire assay-ICP/MS. Detection

limits can be found in **Table 2**. 18 of the 186 samples were rushed so that the results could be received before the completion of this project.

Table 2. Detection limits for the suite of elements analysed by Activation Laboratories Ltd. in Canada.

Element	Detection Limit	Element	Detection Limit	Element	Detection Limit
Al_2O_3	0.01%	Ga	1 ppm	Zn	30 ppm
CaO	0.01%	Ge	0.5 ppm	Zr	1 ppm
Fe_2O_3	0.01%	Hf	0.1 ppm	La	0.5 ppm
K_2O	0.01%	In	0.1 ppm	Ce	0.05 ppm
MgO	0.01%	Mo	2 ppm	Pr	0.01 ppm
MnO	0.001%	Nb	0.2 ppm	Nd	0.05 ppm
Na_2O	0.01%	Ni	20 ppm	Sm	0.01 ppm
P_2O_5	0.01%	Pb	5 ppm	Eu	0.005 ppm
SiO_2	0.01%	Rb	1 ppm	Gd	0.01 ppm
TiO_2	0.001%	Sb	0.2 ppm	Tb	0.01 ppm
LOI	0.01%	Sc	1 ppm	Dy	0.01 ppm
Ag	0.5 ppm	Sn	1 ppm	Ho	0.01 ppm
As	5 ppm	Sr	2 ppm	Er	0.01 ppm
Ba	3 ppm	Ta	0.01 ppm	Tm	0.005 ppm
Be	1 ppm	Th	0.05 ppm	Yb	0.01 ppm
Bi	0.1 ppm	Tl	0.05 ppm	Lu	0.002 ppm
Co	1 ppm	U	0.01 ppm		
Cr	20 ppm	V	5 ppm	Au	1-30000 ppb
Cs	0.1 Ppm	W	0.5 ppm	Pt	1-300000 ppb
Cu	10 ppm	Y	0.5 ppm	Pd	1-30000 ppb

The whole rock chemistry was used to create normal mid-ocean ridge basalt (N-MORB) normalised trace-element diagrams and C1 Chondrite normalised rare earth element (REE) diagrams.

1.4.5. Wavelength Dispersive Spectroscopy (WDS) Analysis

Six samples were carbon coated for Electron Microprobe Analysis (EMPA). The analysis was carried out using a JEOL JXA 8200 microprobe. The system had five Wavelength dispersive X-ray spectroscopy (WDS) detectors. 776 point analyses were carried out including 18 sections of 25 points and one of 30 points. The samples were analysed for eleven elements according to the specifications in **Table 3**. Core and rim compositions of olivine, pyroxene and amphibole were obtained. The sections were obtained from the core of olivine grains to the rims in contact with sulphides. The samples had not been sufficiently polished for EMPA resulting in a large number of bad analyses. The sample coating was not always perfect and charging effects were also a minor source of error.

Table 3. All analyses were carried out at 15kV accelerating voltage, on the elements' Kα peaks. TAP=Thallium Acid Phthalate, LiF= Lithium Fluoride, PET= Pentaerythritol, H= high sensitivity, J= high reflectivity

Element	Crystal	Peak counting time (s)
Si	TAP	10
Fe	LiF	10
K	PETJ	10
Ni	LiFH	30
Na	TAPH	10
Al	TAP	10
Mn	LiF	20
Ca	PETJ	20
Cr	LiFH	20
Mg	TAPH	10
Ti	PETJ	10

1.4.6. Energy Dispersive Spectroscopy (EDS) Analysis

One of the samples was carbon-coated for analysis in a Philips XL40 scanning electron microscope (SEM) at GEUS, Copenhagen. 112 EDS point analyses were carried out on sulphide and oxide minerals at 17kv and a working distance of 10.6 mm. An element map was also collected and was used to construct a composite image mapping the sulphide minerals.

2. Regional Geology

2.1. Geology

The Archaean North Atlantic craton (NAC) is located in southern Greenland, northwest Scotland and along the coast of Labrador in Canada. In South-East Greenland, the NAC is bordered by Paleoproterozoic mobile belts, the Ketilidian to the south and the Nagssugtoqidian to the north. The NAC in South-East Greenland is dominated by migmatitic orthogneisses with narrow bands of mafic granulite, meta-ultramafic and possible meta-sedimentary rocks (Kolb *et al.* in review). Also present in the NAC in South-East Greenland is a suite of late-tectonic alkaline intrusions, which make up the Skjoldungen Alkaline Province. The orthogneisses are dominated by an early tonalitic generation intruded by syn- to late-tectonic tonalite and granodiorite, which have in turn, been intruded by post-tectonic granitic to granodioritc sheets. The metamorphic grade of the region is predominantly granulite facies but retrogression to amphibolite facies is common (Stensgaard *et al.* 2010). The mineralisation occurrences that are the subject of this project are hosted in the bands of mafic, meta-ultramafic and possible meta-sedimentary rocks within the gneisses. These bands extend for tens of kilometres and are generally rusty on the surface.

2.2. Previous Work

The NAC in South-East Greenland has not been the subject of much detailed study. Scientific expeditions to the region began in the 1960s with researchers from British Universities moving along the coastal areas. The Geological Survey of Greenland completed reconnaissance geological mapping by boat for the 1:2 500 000 scale geological map of Greenland in the late 1960s and early 1970s. From 1977-1978 and again from 1981-1982 further reconnaissance mapping was carried out at the 1:500 000 scale, which was complemented by helicopter work carried out from 1986-1987. A four-week investigation was carried out in 2009 between Timmiarmut and Bernstorff Isfjord to prepare for future scientific projects (Kolb *et al.* in review). In addition, a few K-Ar, Rb-Sr, Pb-Pb and Sm-Nd dates have been determined for rocks in the surrounding area (Bridgwater 1970, 1971, Escher *et al.* 1986, Kalsbeek & Taylor 1993).

Up until recently, there has been little mineral exploration company activity within the project area and no detailed study of the mineralisation occurrences or of the associated lithologies has been carried out. The lateral extent of the anomalous sulphide mineralisation is uncertain because the bands containing the mineralisation occurrences have only been inspected in a few locations. This is partly due to the limited nature of the work carried out in the area and partly because most of the visible extent of the bands is on near-vertical faces rendering it inaccessible. In addition there are many locations where the bands are sufficiently weathered that anomalous sulphides may have been present but have weathered out. An accurate documentation of the mineralisation occurrences is a necessary first step in gaining an understanding of the mineralising system.

3. Results

This section will document the results from the 3D photogrammetry, the field observations, the petrography, the mineral chemistry and the whole-rock geochemistry. One of the main lithological units in the area shows variation from gabbros to pyroxene hornblende norites; this unit is referred to as a gabbroid to avoid unnecessary complication. Where no distinction is made between the peridotites and pyroxenites in the area the term ‘ultramafic rocks’ is used to refer to them as a group.

3.1. Aerial Photogrammetry

Previously triangulated orthogonal aerial photographs were used to map the mafic bands outcropping in the study area. This revolutionary mapping technique, linking SOCET SET (the stereo viewing software) with ArcGIS, permitted the mapping of the mafic bands in three dimensions and at a much greater level of detail than the existing geological maps (**Figure 2.**). This technique, which was essential in such a rugged and remote terrain, was used in order to identify areas of interest and understand the large scale geometry of the outcrops that would be visited in the field.

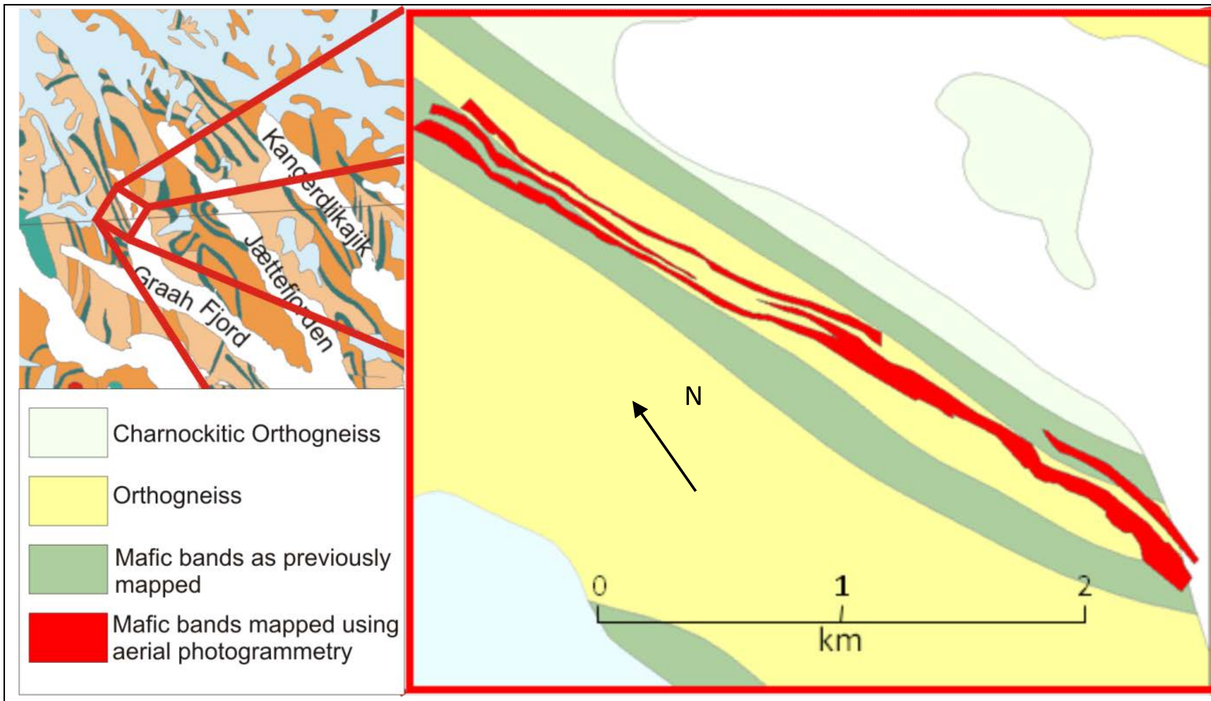


Figure 2. An expanded view of the existing geological map from the study area (on the left, cf. Figure 1) overlain by the mafic bands as mapped from the orthogonal aerial photogrammetry shown in red. The mapping carried out using the aerial photogrammetry shows a much greater level of detail and accuracy than the existing mapping. Image modified from Kolb *et al.*(in review).

The oblique photographs triangulated for this mapping technique revealed more detail than the orthogonal photographs but provided less coverage. Some possible fold structures were mapped in the western wall of Graah Fjord (**Figure 3.**).

Figure 3. Oblique aerial photograph of part of the western wall of Graah Fjord showing the mapping of the mafic bands in green. The blue lines show contacts between the gneiss and the mafic bands. Where overburden or the image resolution made the location of the bands unclear they were not mapped in green. This section corresponds to the southern 2km of the bands mapped out in **Figure 2.** The oblique aerial photographs allow for mapping to be carried out at a greater level of detail than the orthogonal photographs. The two yellow circles are roughly 1km apart and indicate mineralised localities that were visited in the field. The leftmost circle is the Lommen locality. The circle on the right is the second mineralised Graah fjord locality.

3.2. Field Relationships

The mafic bands extend along strike for up to 10s of kilometres within the orthogneiss. The mafic bands were visited at numerous localities in the field. The mafic bands are dominantly gabbroids and they generally parallel the regional foliation found in the surrounding orthogneiss. The contact between the orthogneiss and the mafic bands varies. At some locations there are intrusive contacts preserved indicating that the protolith of the gneiss intruded the rock which comprises the mafic bands, whereas at other locations the contact appears sheared.

Locally, ultramafic rocks can be found within the gabbroids along the mafic bands. The gabbroids are generally foliated parallel to the regional foliation but the ultramafic rocks generally do not show a foliation. Two dominant ultramafic lithologies have been identified in the region: a peridotite and a pyroxenite. The peridotite appears fine grained and is typically a pale grey-green in colour. There is generally a smaller volume of the pyroxenite, which is a darker blue-black and is locally much coarser (up to 1cm in grain size). The ultramafic rocks form irregularly shaped bodies within the mafic bands; there is no apparent pattern to their locations or forms. The peridotites appear intrusive in to the gabbroids and the pyroxenites appear intrusive in to the peridotites. Anomalous sulphide mineralisation has been identified at four locations: the Lommen mineralisation, the second Graah Fjord mineralisation, the third Graah Fjord mineralisation and the Jættefjorden mineralisation (**Figure 4.**).

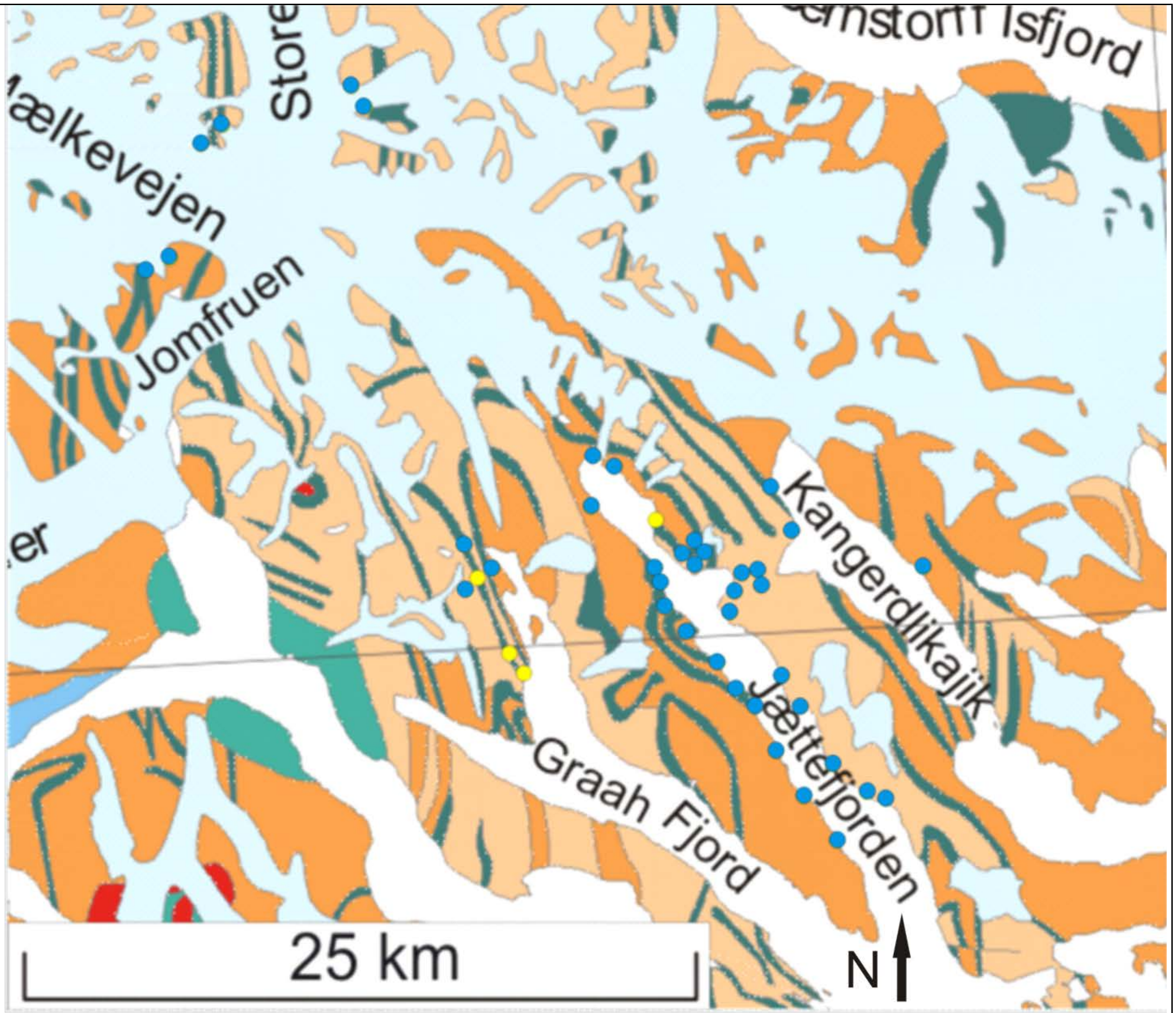


Figure 4. The existing geological map of the field area for this project overlain by yellow and blue markers indicating areas visited in the field. Yellow markers indicate areas at which anomalous sulphide mineralisation has been identified as part of this study. The southernmost yellow marker in Graah Fjord is the Lommen mineralisation. The yellow marker just North of the Lommen mineralisation is the second Graah Fjord mineralisation. The northernmost yellow marker in Graah Fjord is the third Graah Fjord mineralisation. The yellow marker in Jættefjorden is the Jættefjorden mineralisation. Image modified from Kolb *et al. (in review).*

At the Lommen locality the mafic band is approximately 60m thick. Close to the middle of the band there is an approximately 15m wide, irregular ultramafic body cross-cutting the foliation developed in the gabbroid (**Figure 5**.). The ultramafic body is largely peridotite and appears to be intrusive in to the gabbroids. Within the peridotite there is an intrusive pyroxenite showing clear chilled margin contacts with the peridotite. Sulphide mineralisation at this locality is dominantly hosted in peridotite closely associated with pyroxenite. There is also some elevated sulphide content hosted in a roughly 4m wide zone in the gabbroids near to the ultramafic rocks at this locality.

At the second mineralised locality in Graah Fjord, the ultramafic units do follow the regional foliation. The sulphide mineralisation is located in a 1m wide, foliation parallel pyroxenite band above a 2m wide peridotite band. The remainder of the mafic band at this locality is a gabbroid.

The third mineralised locality in Graah Fjord consists of foliation parallel rusty zones in the gabbroid of the mafic band. The ultramafic rocks have been heavily altered at this locality. Due to this alteration, the ultramafic units were not recognised as ultramafic and no distinct contact between the mafic gabbroid and the altered ultramafic rock was identified in the field. However, petrographic work has shown that the mineralisation is largely contained within the altered ultramafic rock.

The mafic band at the mineralised locality in Jættefjorden is roughly 15m wide and has no ultramafic rocks. The locality is dominated by a gabbroid, which follows the regional foliation. The sulphide mineralisation is observed in two, foliation parallel, 0.5m wide zones. The sulphide mineralised zones typically have increased quartz content. An along strike extension of one of the mineralised zones can be found 20m away from the main outcrop in a smaller outcrop of the mafic band.

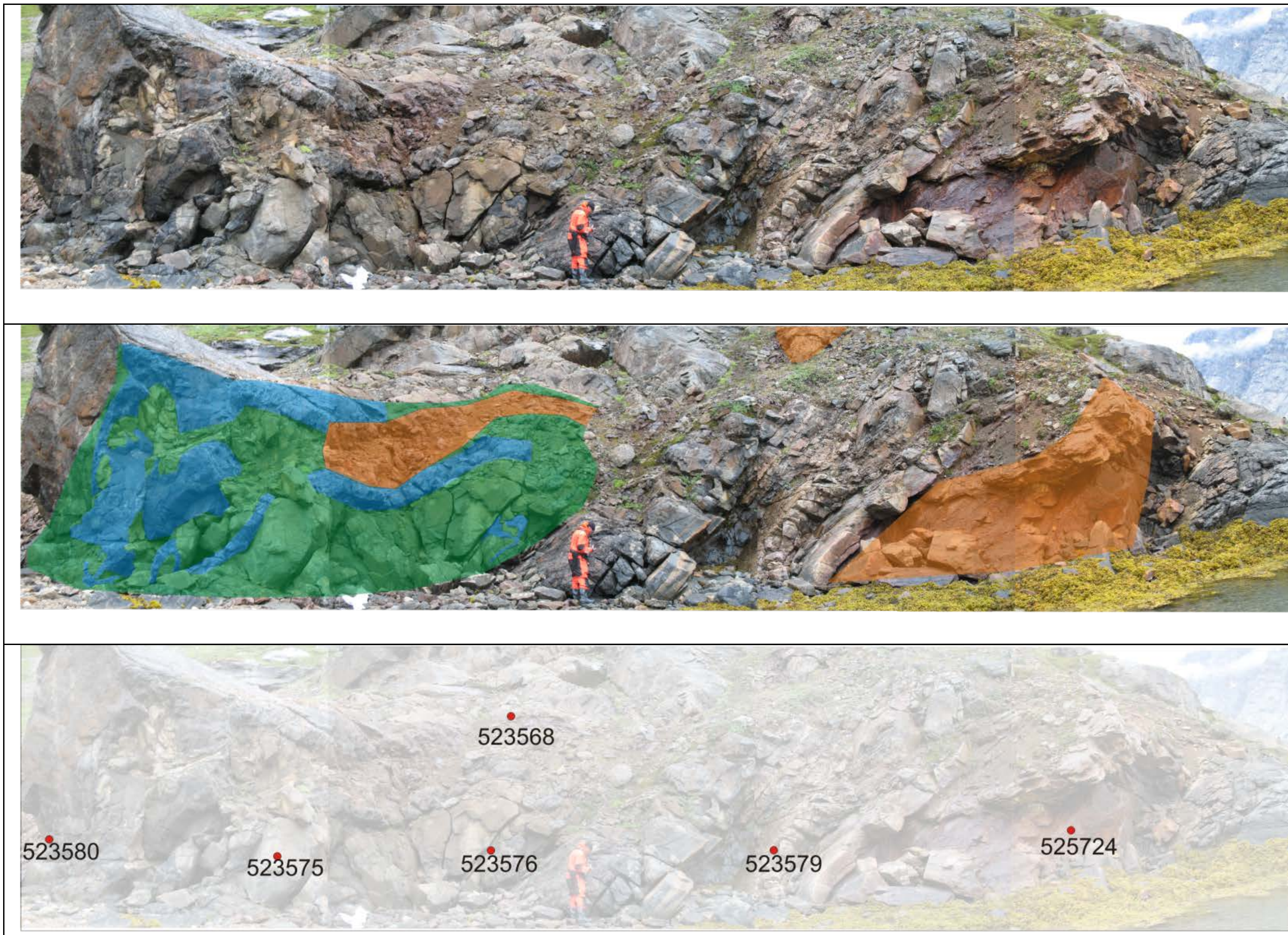


Figure 5. Outcrop photograph of the Lommen mineralised occurrence viewed to the North-West. Mineralised zones are highlighted in orange. The green areas are peridotite, the blue areas are pyroxenite and the remainder of the outcrop is gabbroid. The rightmost mineralised zone is hosted in gabbroid, whereas the other two are hosted in peridotite. The regional foliation can be observed just to the right of the centre of the photo. The peridotite and pyroxenite do not follow the regional foliation, whereas the gabbroid generally does. The bottom panel shows the location of some of the samples collected at this locality.

3.3. Petrography

Samples were selected from the four localities at which anomalous sulphide mineralisation had been identified in the field. Petrographic study of these samples was carried out with an aim to confirm the lithology, characterise the mineralogical assemblage and identify the style of mineralisation.

The gabbroids, peridotites and pyroxenites all show dominantly igneous cumulate textures. Major mineral modal abundances can be found in **Table 4.** Pseudomorphous serpentinisation of olivine is common but not complete in the olivine bearing rocks.

The gabbroids are fine grained cumulates, typically 0.5mm to 1mm in grainsize. They mainly comprise plagioclase, orthopyroxene, clinopyroxene, amphibole and minor biotite (**Figure 6.**). The amphibole generally appears replacing the pyroxenes, as does the biotite. Interstitial to the silicate minerals, there are Fe oxides and sulphides (magnetite, pyrrhotite, pyrite, minor chalcopyrite). Subhedral to euhedral apatite crystals can be found associated with the plagioclase. Some gabbroids show a higher sulphide content, with more significant quantities of chalcopyrite. In petrographic terms, aside from higher sulphide content, there is no consistent difference between the gabbroids with higher sulphide contents and those with lower sulphide contents (**Figure 7.**). It is worth noting that the samples with higher sulphide content are typically from gabbroids close to ultramafic rocks. One mineralised sample (sample 535307) from the Jættefjorden mineralisation does stand out, as there are no ultramafic rocks apparent at the Jættefjorden mineralisation. This sample is also different in that it contains a large quantity of recrystallised quartz with sutured boundaries and the sulphides show secondary textures. The sulphides in this sample frequently cross-cut the silicate minerals; skeletal grains of plagioclase or pyroxene, with the cracks filled in with sulphides are common.

The peridotites are generally fine grained cumulates, typically 0.5mm to 1mm in grainsize. The cumulate minerals are olivine, pyroxenes and amphibole with interstitial green spinel, pyrrhotite and magnetite with minor pyrite, chalcopyrite, pentlandite, hematite and wüstite (**Figure 8.**, **Figure 9.** and **Figure 10.**). Many samples contain a few larger (~2mm) grains of pyroxene with scattered inclusions of spinel and sulphides.

The pyroxenites grade between two main end-members. The first is a fine grained cumulate composed of pyroxenes and amphibole with minor biotite and quartz and interstitial magnetite, pyrrhotite and pyrite, and minor pentlandite and chalcopyrite (**Figure 11.**). The second end-member is much coarser grained (up to 5mm) and is composed exclusively of amphibole and/or biotite.

Table 4. Summary of modal abundances of the major minerals in the gabbroids, peridotites and pyroxenites. Pyroxenites (fg) refers to the fine grained end-member of the pyroxenites, whereas Pyroxenites (cg) refers to the coarse grained end-member.

	Plagioclase	Pyroxenes	Amphibole	Olivine	Biotite	Quartz	Oxides and Sulphides
Gabbroids	30-65	20-50	0-30		0-10	0-5	0-10
Peridotites		15-40	0-25	40-55			5-25
Pyroxenites (fg)		60-90	5-10	0-15	0-5	0-5	0-10
Pyroxenites (cg)			0-100		0-100		

Figure 6. Cross-Polarised (left in each panel) and Plain-Polarised (right in each panel) composite images collected from five thin sections of the unmineralised Gabbroids. **A:** 516120, **B:** 516122, **C:** 516123, **D:** 535304, **E:** 535314. **A, B** and **C** are from the Lommen mineralisation. **D** and **E** are from the Jættefjorden mineralisation. **C** and **D** show growth of amphibole at the expense of pyroxene.

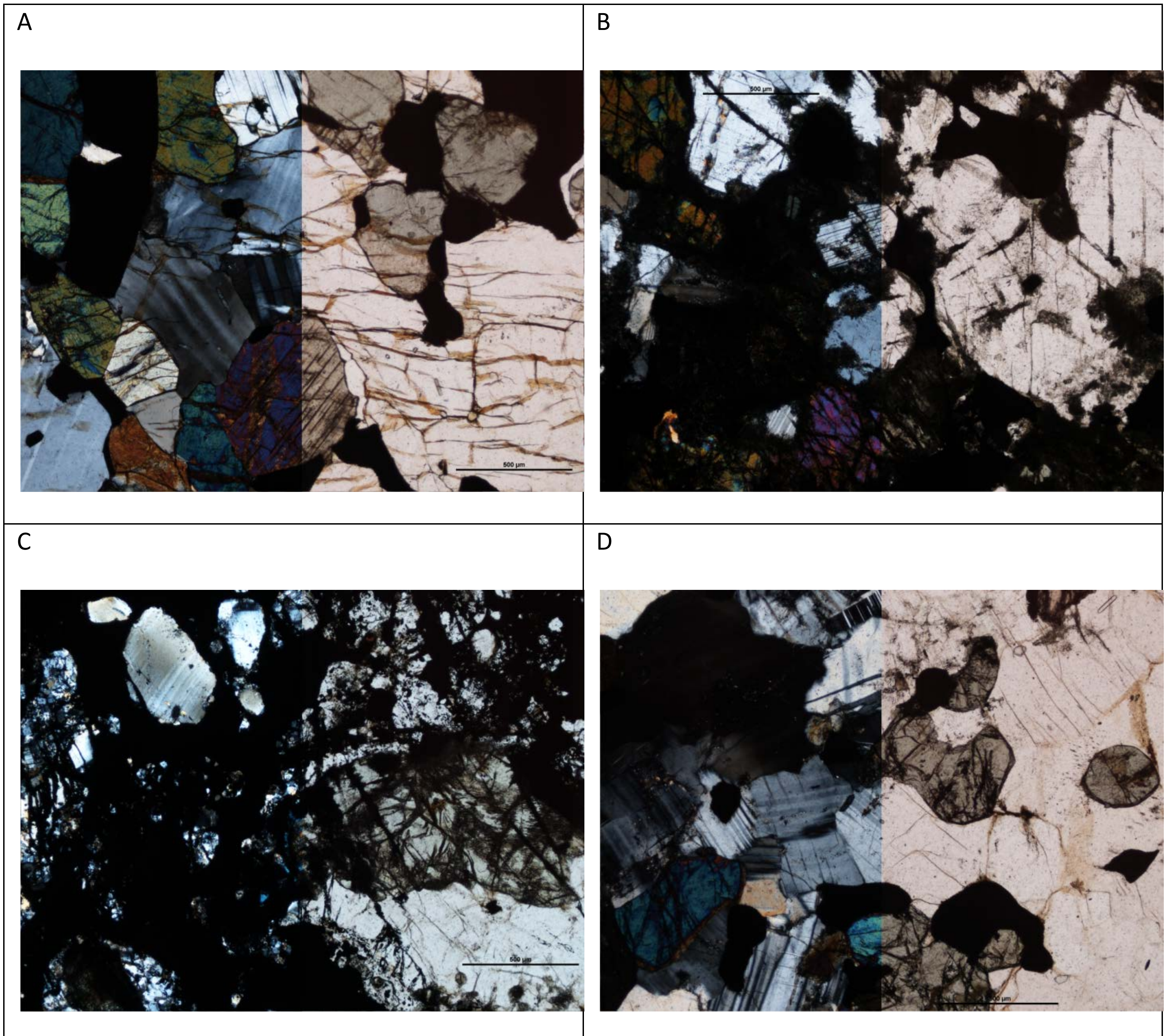


Figure 7. Cross-Polarised (left in each panel) and Plain-Polarised (right in each panel) composite images collected from four thin sections of the mineralised Gabbroids. **A:** 525717, **B:** 535302, **C:** 535307, **D:** 535709. **A** is from the Lommen mineralisation. **B** and **C** are from the Jættefjorden mineralisation. **D** is from the second Graah Fjord mineralisation. **C** shows recrystallised quartz with sutured contacts and veining of sulphides through a skeletal amphibole grain.

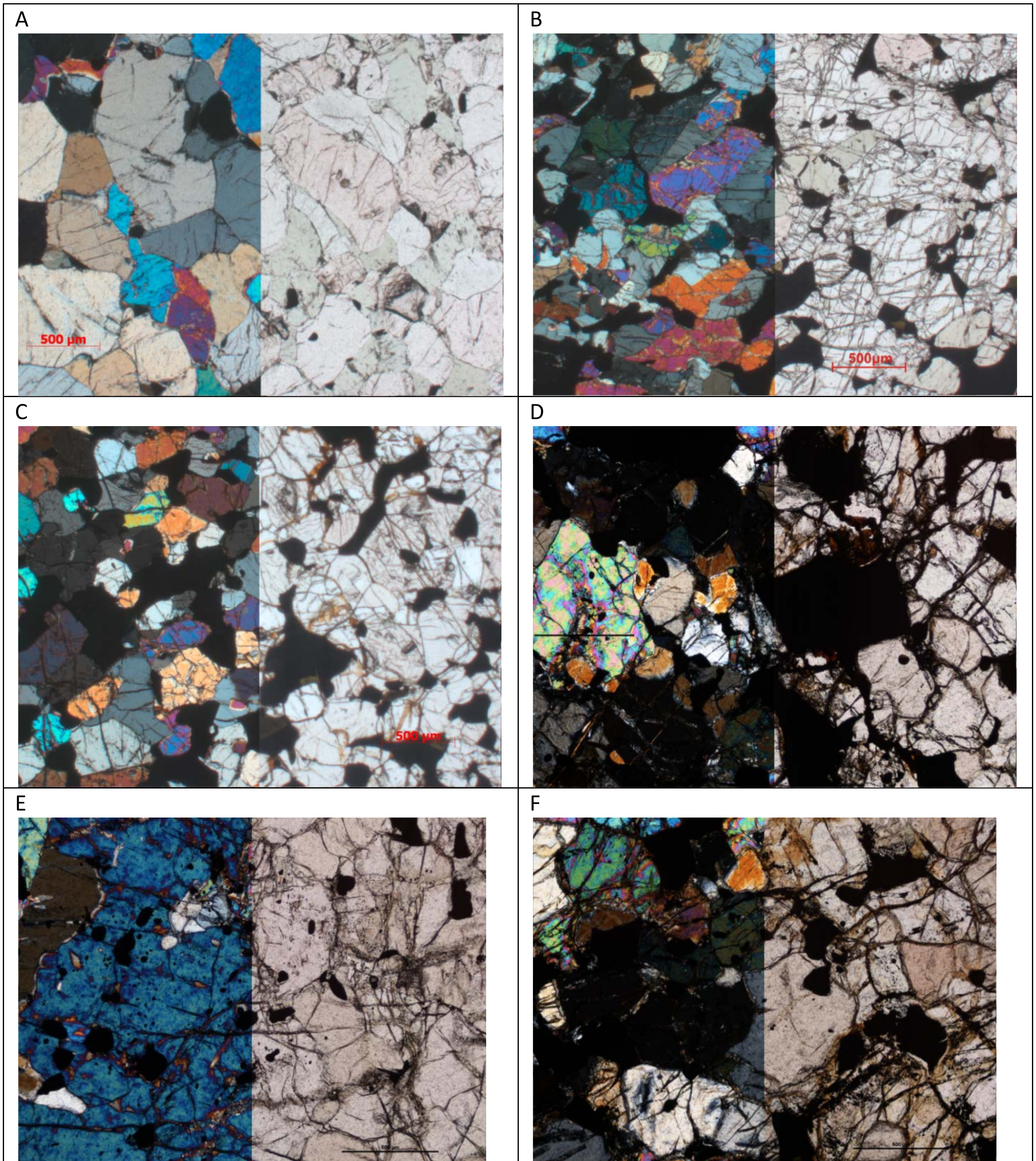


Figure 8. Cross-Polarised (left in each panel) and Plain-Polarised (right in each panel) composite images collected from six thin sections of the peridotites from the Lommen mineralisation. **A:** 516121, **B:** 516137, **C:** 516138, **D:** 523568, **E:** 523575, **F:** 523583. **E** shows a poikilitic pyroxene grain.

A B

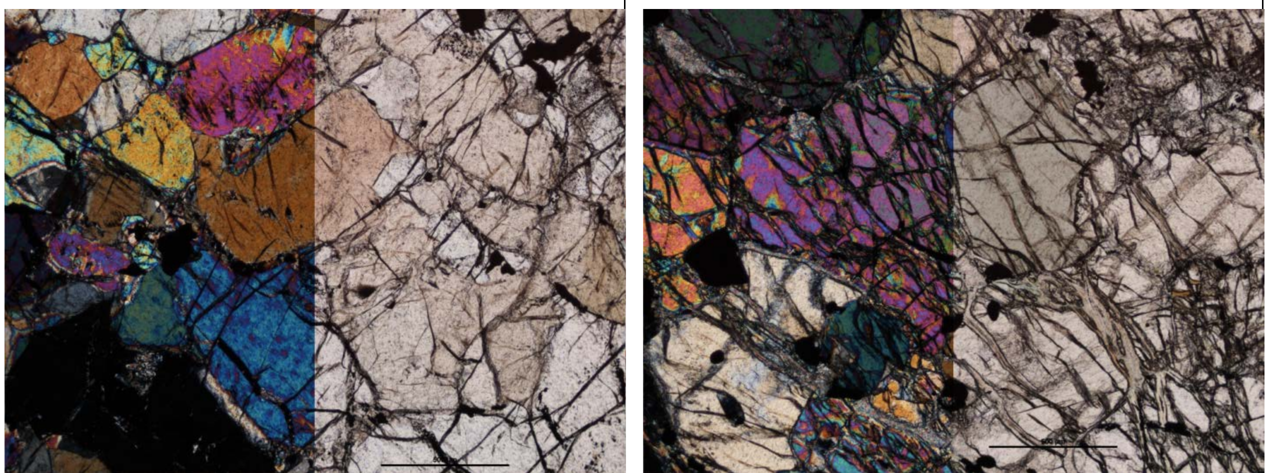


Figure 9. Cross-Polarised (left in each panel) and Plain-Polarised (right in each panel) composite images collected from two thin sections of the peridotites from the second Graah Fjord mineralisation. **A:** 535706, **B:** 535708.

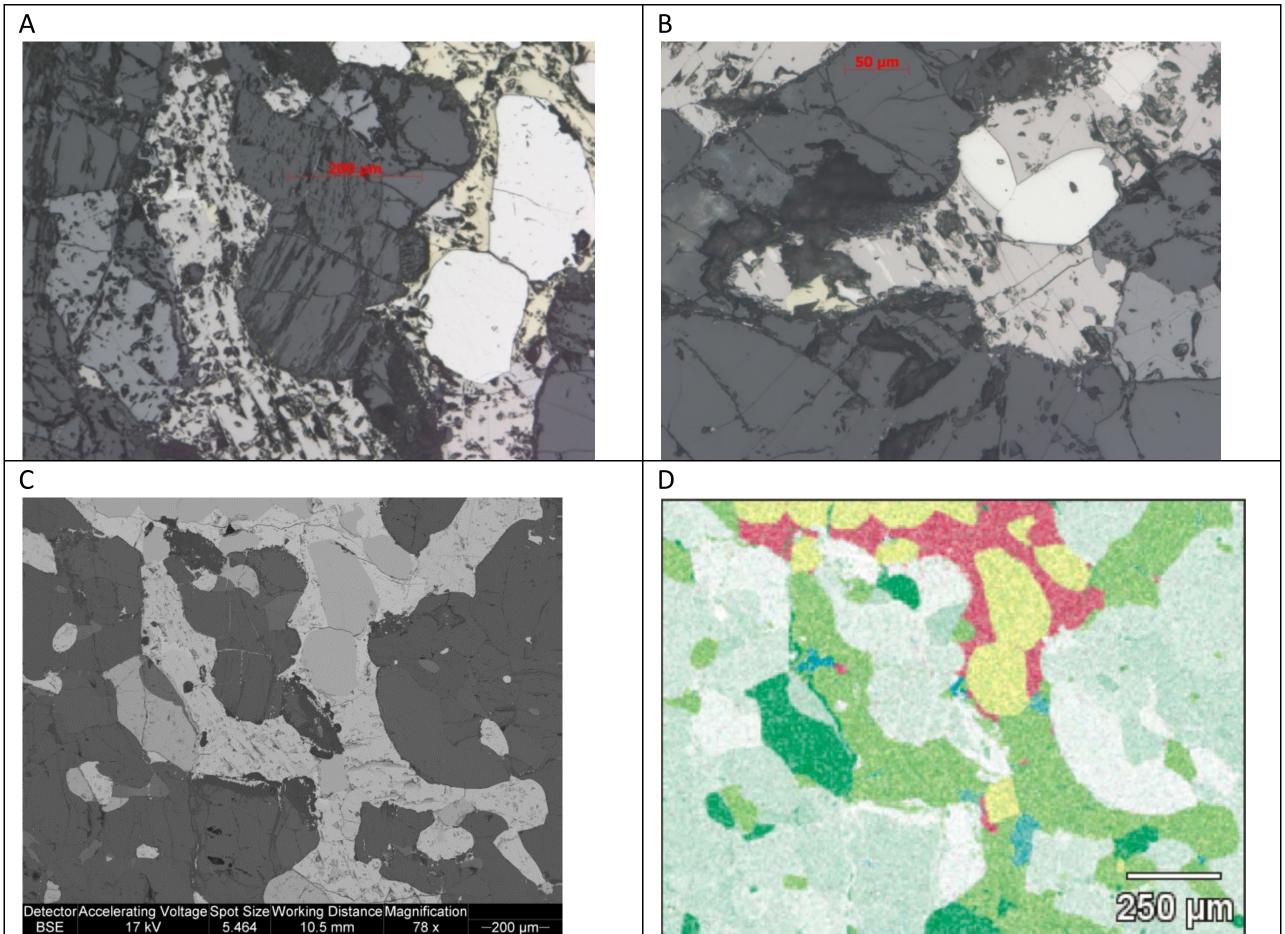
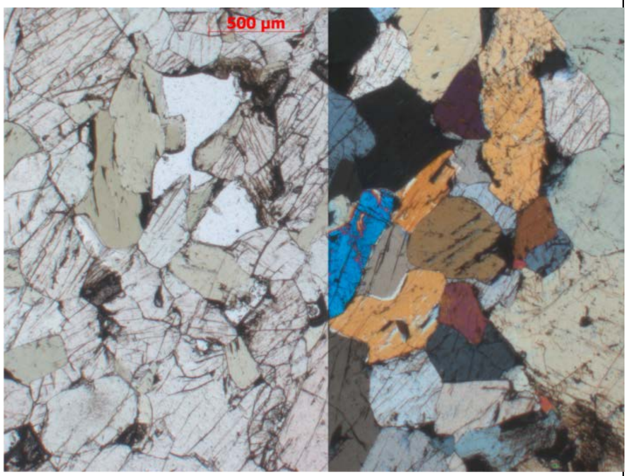
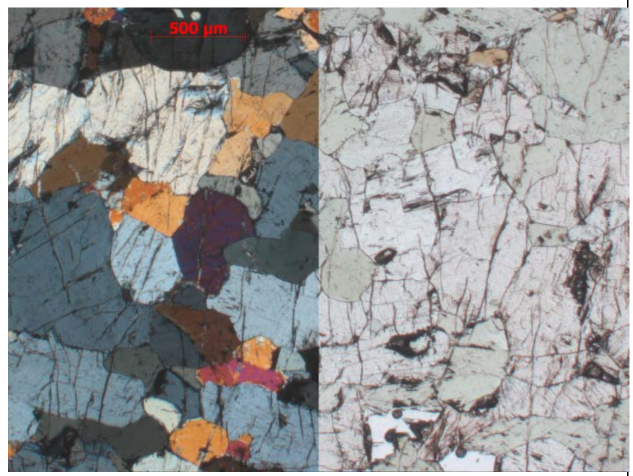


Figure 10. Images of peridotite interstitial minerals from sample 516137, Lommen mineralisation. All images show the sulphides and oxides to have a primary, igneous interstitial texture. **A:** reflected, plain polarised light images showing Pyrrhotite, Pyrite, Magnetite, Chalcopyrite and Pentlandite. **B:** reflected, plain polarised light image. Exsolution textures can be seen with Pentlandite exsolving from Pyrrhotite. **C:** Back-Scattered Electron image showing the same site as **A**. Due to similarities in density it is difficult to distinguish between Pyrite and Magnetite and also to distinguish between Chalcopyrite and Pentlandite. **D:** Composite image constructed from EDS element maps of Fe, S, Cu and Ni over the area of **C**. The dark green mineral is Magnetite as it contains no sulphur. The different ratios of Fe:S in Pyrrhotite and Pyrite allow them to be distinguished. Pyrite is the lime green mineral while Pyrrhotite is the intermediate green. Cu plotting in pink identifies the Chalcopyrite and Ni plotting in blue identifies the Pentlandite.

A



B



C

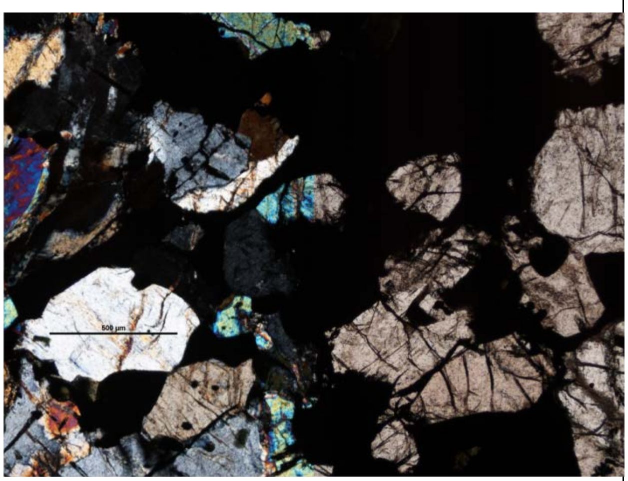


Figure 11. Cross-Polarised (right in **A,** left in **B** and **C**) and Plain-Polarised (left in **A,** right in **B** and **C**) composite images collected from three thin sections of the pyroxenites. **A:** 516124, **B:** 516125, **C:** 535707. **A** and **B** are from the Lommen mineralisation. **C** is from the second Graah Fjord mineralisation.

3.4. Mineral chemistry

Representative average mineral compositions determined by WDS analysis are listed in **Table 5**, whereas those determined by EDS analysis are listed in **Table 6.** Compositions of olivine, orthopyroxene and clinopyroxene are in the ranges of Fo about 84-89, En about 83-85 and Di about 87-93 respectively. The composition of the green spinels fall within the ranges $Mg_{0.5\text{-}0.7}Fe^{2+}{}_{0.3\text{-}0.5}(Al_{0.65\text{-}0.9}Cr_{0.05\text{-}0.25}Fe^{3+}{}_{0.05\text{-}0.1})_2O_4$, thus placing them in a solid solution between spinel and chromite. The composition of the green spinels calculated from the EDS analysis results does fall within the range of compositions calculated from the WDS results. The amphibole is pargasite with a minor Ti content (0.6-1.3 wt% TiO_2), making it slightly kaersutitic. No consistent zonation was discernible in any mineral phases.

Table 5. Mineral chemistry in wt% determined by WDS analysis from five peridotite samples.

Diopside								
Sample	516121	σ	516127	σ	516137	σ	516138	σ
n	16		2		2		25	
SiO_2	53.46	0.42	50.52	0.13	51.64	0.11	51.33	0.29
FeO	3.28	0.41	4.19	0.05	4.68	0.04	4.93	0.79
K_2O	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
NiO	0.06	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Na_2O	0.30	0.05	0.28	0.02	0.23	0.00	0.27	0.03
Al_2O_3	1.42	0.16	4.42	0.07	3.05	0.08	3.34	0.12
MnO	0.11	0.03	0.16	0.01	0.10	0.00	0.12	0.03
CaO	24.15	0.28	23.84	0.20	23.68	0.18	23.25	1.56
Cr_2O_3	0.39	0.08	0.14	0.04	0.28	0.02	0.26	0.03
MgO	16.78	0.28	14.91	0.17	15.74	0.09	15.74	0.84
TiO_2	0.07	0.02	0.38	0.03	0.34	0.02	0.36	0.03
Total	100.03	0.58	98.85	0.00	99.75	0.33	99.60	0.43
Enstatite								
Sample	516121	σ	516127	σ	516137	σ	516138	σ
n	50		29		96		45	
SiO_2	55.79	0.60	54.17	0.73	54.76	0.60	54.85	0.46
FeO	9.90	1.51	10.60	0.42	11.53	0.50	11.56	0.28
K_2O	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01
NiO	0.09	0.03	0.04	0.02	0.01	0.01	0.01	0.01
Na_2O	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Al_2O_3	1.17	0.22	3.31	0.75	2.49	0.29	2.51	0.21
MnO	0.25	0.06	0.37	0.04	0.28	0.04	0.27	0.04
CaO	0.41	0.09	0.37	0.10	0.40	0.09	0.35	0.09
Cr_2O_3	0.20	0.10	0.07	0.03	0.14	0.03	0.15	0.05
MgO	32.52	0.91	30.96	0.46	30.82	0.46	31.12	0.36
TiO_2	0.04	0.02	0.07	0.03	0.05	0.03	0.08	0.03
Total	100.38	0.74	99.98	0.48	100.50	0.72	100.92	0.45

Table 5. Continued. Mineral chemistry in wt% determined by WDS analysis from five peridotite samples.

Pargasite										
Sample	516121	σ	516127	σ	516137	σ	516138	σ		
n	30		21		97		21			
SiO_2	44.90	0.61	42.34	0.27	42.65	0.33	42.28	0.26		
FeO	5.94	1.52	6.65	0.28	6.99	0.22	6.98	0.18		
K_2O	1.07	0.15	0.74	0.06	0.64	0.16	1.38	0.04		
NiO	0.13	0.04	0.06	0.02	0.02	0.02	0.01	0.01		
Na_2O	2.06	0.18	2.60	0.06	2.80	0.13	2.33	0.05		
Al_2O_3	10.65	0.34	13.95	0.43	13.74	0.19	13.81	0.16		
MnO	0.08	0.03	0.10	0.03	0.08	0.03	0.07	0.04		
CaO	12.32	0.22	12.38	0.10	12.24	0.12	12.37	0.08		
Cr_2O_3	1.13	0.27	0.25	0.03	0.52	0.06	0.50	0.03		
MgO	17.84	0.86	16.39	0.19	16.56	0.16	16.43	0.09		
TiO_2	0.63	0.13	1.28	0.08	1.03	0.09	1.26	0.05		
Total	96.76	0.50	96.74	0.34	97.27	0.46	97.45	0.31		
Olivine										
Sample	516121	σ	516127	σ	516137	σ	516138	σ	516148	σ
n	19		17		106		10		40	
SiO_2	39.89	0.50	39.82	0.32	39.70	0.36	38.97	1.81	40.34	0.41
FeO	12.10	0.25	14.15	0.51	15.74	0.39	15.97	0.36	11.01	0.32
K_2O	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
NiO	0.41	0.05	0.20	0.03	0.04	0.03	0.04	0.02	0.39	0.02
Na_2O	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01
Al_2O_3	0.01	0.01	0.02	0.02	0.02	0.02	0.08	0.10	0.02	0.02
MnO	0.17	0.03	0.34	0.03	0.25	0.04	0.24	0.05	0.16	0.03
CaO	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cr_2O_3	0.02	0.04	0.01	0.02	0.01	0.02	0.03	0.02	0.03	0.05
MgO	48.10	0.38	45.98	0.45	45.09	0.49	45.64	1.20	48.64	0.46
TiO_2	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Total	100.73	0.63	100.56	0.87	100.88	0.59	100.98	0.95	100.62	0.61

Table 5. Continued. Mineral chemistry in wt% determined by WDS analysis from five peridotite samples.

Green Spinel								
Sample	516127	σ	516137	σ	516138	σ	516148	σ
n	17		15		2		12	
SiO_2	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.01
FeO	17.76	1.09	22.17	1.45	23.03	0.83	27.13	0.38
K_2O	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01
NiO	0.29	0.04	0.02	0.02	0.02	0.01	0.18	0.02
Na_2O	0.01	0.01	0.07	0.01	0.07	0.03	0.03	0.02
Al_2O_3	59.53	0.74	50.85	1.33	48.15	2.91	36.96	0.47
MnO	0.26	0.05	0.22	0.04	0.24	0.02	0.30	0.03
CaO	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01
Cr_2O_3	3.93	0.27	11.96	0.93	14.30	3.12	23.59	0.37
MgO	18.04	0.50	14.16	0.73	13.18	0.61	11.50	0.27
TiO_2	0.02	0.02	0.03	0.03	0.02	0.01	0.11	0.02
Total	99.88	0.71	99.50	0.49	99.02	0.44	99.82	0.81

Table 6. Mineral chemistry in wt% determined by EDS analysis from sample 516137.

	Chalcopyrite		*Pentlandite*		*Pyrrhotite*		*Pyrite*	
	n=18	σ	n=14	σ	n=26	σ	n=17	σ
O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mg	0.00	0.00	0.05	0.06	0.01	0.03	0.00	0.00
Si	0.06	0.07	0.09	0.06	0.05	0.06	0.02	0.04
S	36.37	0.19	36.67	2.13	40.71	0.23	54.72	0.12
Cl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ca	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe	30.43	0.17	31.57	2.04	59.16	0.41	45.22	0.19
Ni	0.00	0.00	31.61	5.04	0.07	0.19	0.00	0.00
Cu	33.13	0.33	0.00	0.00	0.00	0.00	0.00	0.00
As	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10

	Wüstite		*Magnetite*		*Hematite*		*Spinel*	
	n=3	σ	n=9	σ	n=8	σ	n=3	σ
O	20.28	0.76	23.11	1.28	32.70	0.34	32.77	0.79
Mg	0.20	0.15	0.72	0.15	0.18	0.20	8.88	0.80
Al	0.05	0.08	1.20	0.28	0.08	0.06	27.06	2.80
Si	0.21	0.19	0.10	0.08	0.33	0.20	0.00	0.00
S	0.10	0.07	0.00	0.00	0.07	0.10	0.00	0.00
Cl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ca	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00
Cr	0.49	0.00	5.86	0.48	0.00	0.00	12.69	2.79
Mn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe	78.67	2.60	69.01	4.49	66.56	0.94	18.60	2.43
Ni	0.00	0.00	0.00	0.00	0.07	0.18	0.00	0.00
Cu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
As	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Whole-rock geochemistry

The gabbroids, peridotites and pyroxenites display MgO ranges between 1-13 wt%, 26-39 wt% and 20-37 wt% respectively (**Table 7.**). The gabbroids can very easily be distinguished from the ultramafic peridotites and pyroxenites with major element abundances but the peridotites and pyroxenites show considerable overlap (**Figure 12.**).

Table 7. Representative whole-rock chemistry from 6 samples. The three samples on the left are samples with a small sulphide content, whereas the three on the right are considered to have anomalous volumes of sulphides. Samples 525724, 523575, 523576 and 516137 are from the Lommen mineralisation locality. Sample 535302 is from the Jættefjorden mineralisation site, whereas sample 535707 is from the second Graah fjord mineralisation locality.

Sample		525724	523575	523576	535302	516137	535707
Lithology		gabbroid	peridotite	pyroxenite	gabbroid	peridotite	pyroxenite
SiO_2	(wt %)	47.94	42.96	47.41	47.06	39.66	38.56
Al_2O_3	(wt %)	12.21	2.88	6.74	11.52	3.48	5.03
Fe_2O_3	(wt %)	17.60	12.72	13.15	24.10	23.63	26.39
MnO	(wt %)	0.18	0.19	0.19	0.28	0.19	0.18
MgO	(wt %)	12.81	38.79	21.15	3.82	27.44	22.06
CaO	(wt %)	5.90	1.91	8.30	8.69	2.74	4.87
Na_2O	(wt %)	1.75	0.31	0.87	1.77	0.21	0.23
K_2O	(wt %)	0.25	0.09	1.69	0.24	0.05	0.06
TiO_2	(wt %)	0.66	0.11	1.46	0.67	0.18	0.20
P_2O_5	(wt %)	0.04	0.02	0.02	0.19	0.01	0.02
Total	(wt %)	99.35	99.99	100.98	98.35	97.58	97.60
Cr	(ppm)	990	7280	3030	220	4650	4500
Ni	(ppm)	270	2010	720	420	1700	2090
Cu	(ppm)	410	< 10	< 10	1110	2030	650

N-MORB normalised trace-element diagrams show three distinct populations in the available geochemical dataset (**Figure 13.**). The gabbroids form one population, the unmineralised ultramafic rocks form the second and the mineralised ultramafic rocks form the third. It is worth noting that the peridotites cannot be systematically distinguished from the pyroxenites based on their trace-element chemistry.

The gabbroid population has flat compatible and intermediate element normalised trends, plotting just below N-MORB concentrations. It shows enrichment of incompatible elements and displays positive anomalies in Ba, K and Sr. The gabbroid population also shows negative anomalies in Nb and Ti. Copper (and to a lesser extent nickel) shows either a negative or positive anomaly dependent on whether the sample is mineralised, showing a positive anomaly if mineralised.

The unmineralised ultramafic population shows a slightly negatively sloping trend in the intermediate to compatible elements at levels marginally depleted relative to N-MORB concentrations. This negative trend indicates fractionation of the heavy rare earth elements (HREEs). The unmineralised population shows some limited enrichment of incompatible elements along with negative anomalies in Nb and Ti. The unmineralised ultramafic rocks show a negative Sr anomaly rather than the positive anomaly observed in the gabbroids. They also show enrichment in the most compatible elements, such as Fe, Mg and Ni.

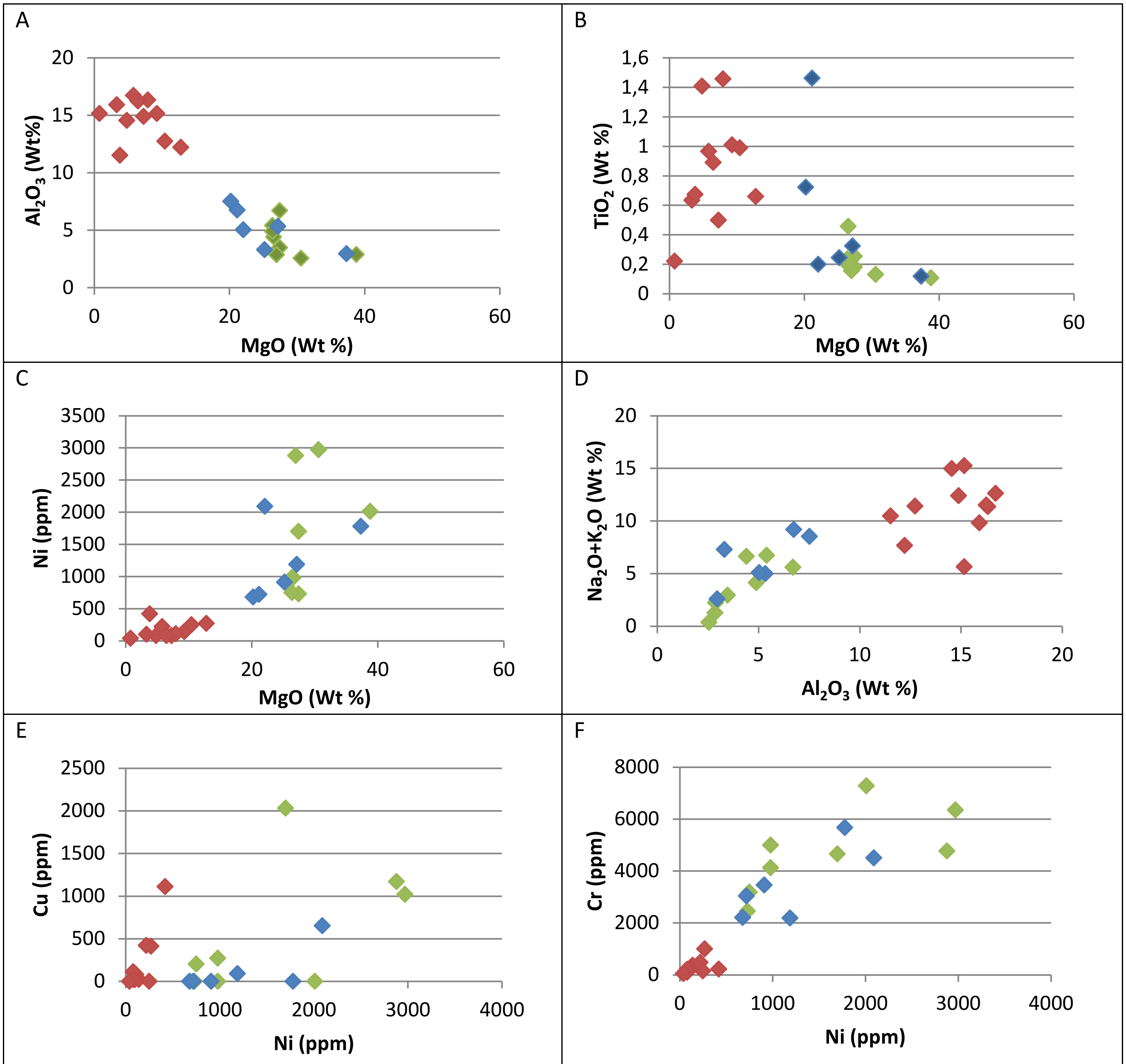


Figure 12. Whole-rock chemistry plots showing a negative correlation between MgO and Al_2O_3 in the rocks which comprise the mafic bands. The gabbroids are plotted in red, the peridotites in green and the pyroxenites in blue. There is significant overlap between the peridotites and the pyroxenites. **A, C, D** and **F** show strong correlations. Outliers above the trend in **C** most likely indicate mineralized samples. **B** and **E** do not show good correlations. If the gabbroids are considered separately from the ultramafic rocks in **E** there is a steep positive correlation. This trend most likely represents an increase in sulphide content.

The mineralised ultramafic population is the most depleted population. It has a flat intermediate to compatible element trend, significantly depleted relative to N-MORBs. The mineralised ultramafic rocks show more significant enrichment of incompatible elements relative to the intermediate elements, reaching just above N-MORB concentrations in the most enriched elements. The mineralised ultramafic population is also enriched in the most compatible elements with a strong positive anomaly in Cu. There is a well defined negative anomaly in Nb, with some samples also showing negative anomalies in Ti, Na and Ca. Strontium shows both negative and positive anomalies.

Chondrite normalised REE diagrams have distinguished two populations within the gabbroids and four within the ultramafic rocks (**Figure 14.**). No controlling factor on which population a given sample falls in has been identified. The first of the gabbroid populations (**A**) displays a flat normalised trend at about 20-30 times chondrite abundance. It shows a minor negative Eu anomaly in some samples. The second gabbroid population (**B**) has a pronounced negative slope, being about 70-700 times chondrite abundance in the light rare earth elements (LREEs) and only about 5-15 times chondrite abundance in the HREEs.

The first two of the four ultramafic populations (**C** and **D**) are similar in that they have negative Eu anomalies and a concave down pattern in the LREEs having an overall negative slope but being depleted in La relative to Sm. The first of these two populations (**C**) is very consistent, with the LREE at about 60-90 times chondrite abundances and the HREE at about 8-15 times chondrite abundances. The second ultramafic population has much more variation, with LREEs at 1-100 times chondrite abundances and HREEs at about 1.5-15 times chondrite abundances. The third ultramafic population (**E**) has negatively sloping LREEs, flat HREEs and a negative Eu anomaly. LREEs in the third ultramafic population range from 8-10 times chondrite abundances while HREEs range from 2-6 times chondrite abundances. The fourth ultramafic population (**F**) has negatively sloping LREEs ranging from about 8-80 times chondrite abundances and flat HREEs ranging from about 2-8 times chondrite abundances.

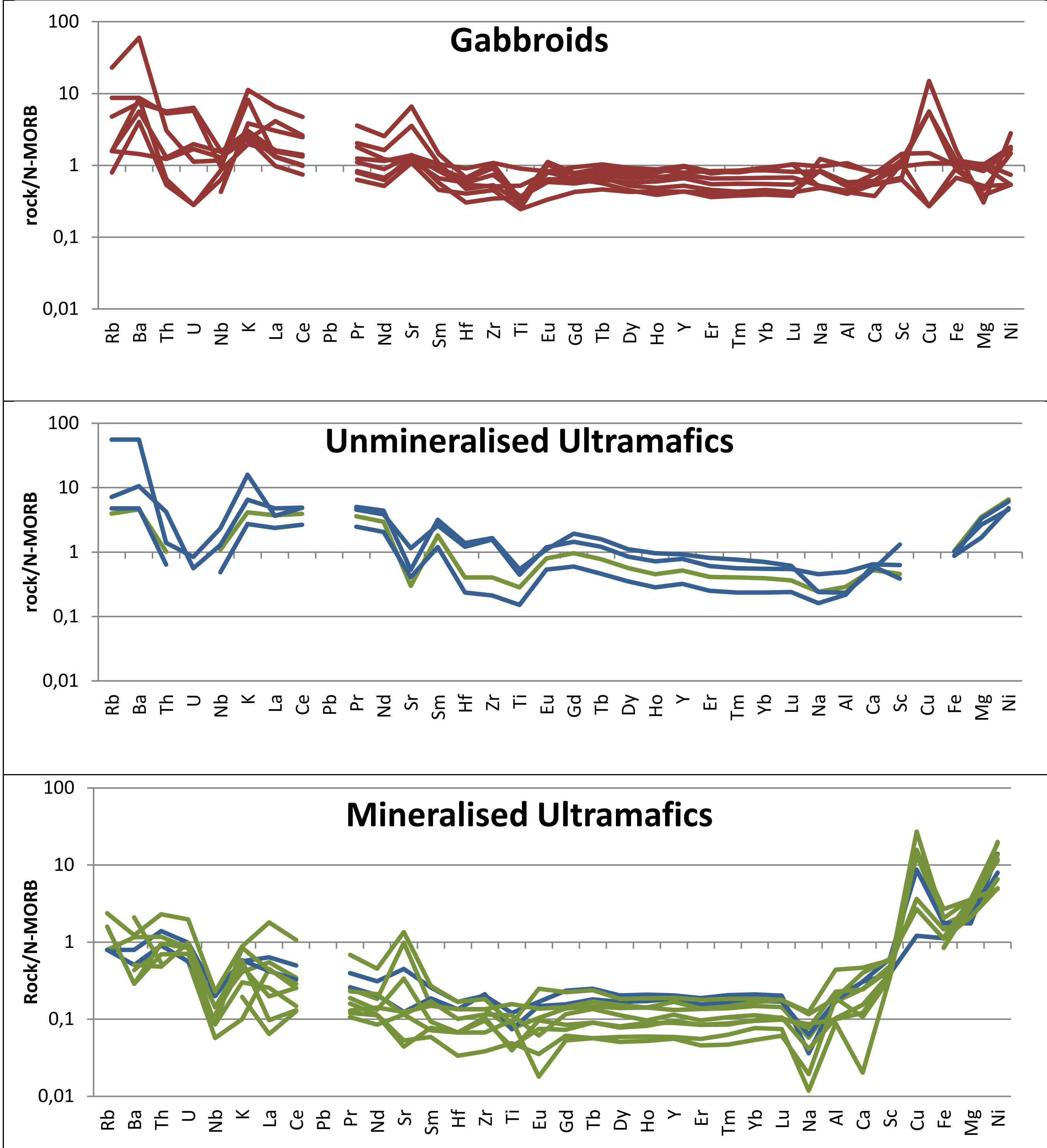


Figure 13. N-MORB normalised trace-element diagrams for the mafic and ultramafic rocks [normalisation values taken from Hofmann (1988)]. Gabbroic rocks are plotted in red, peridotites in green and pyroxenites in blue.

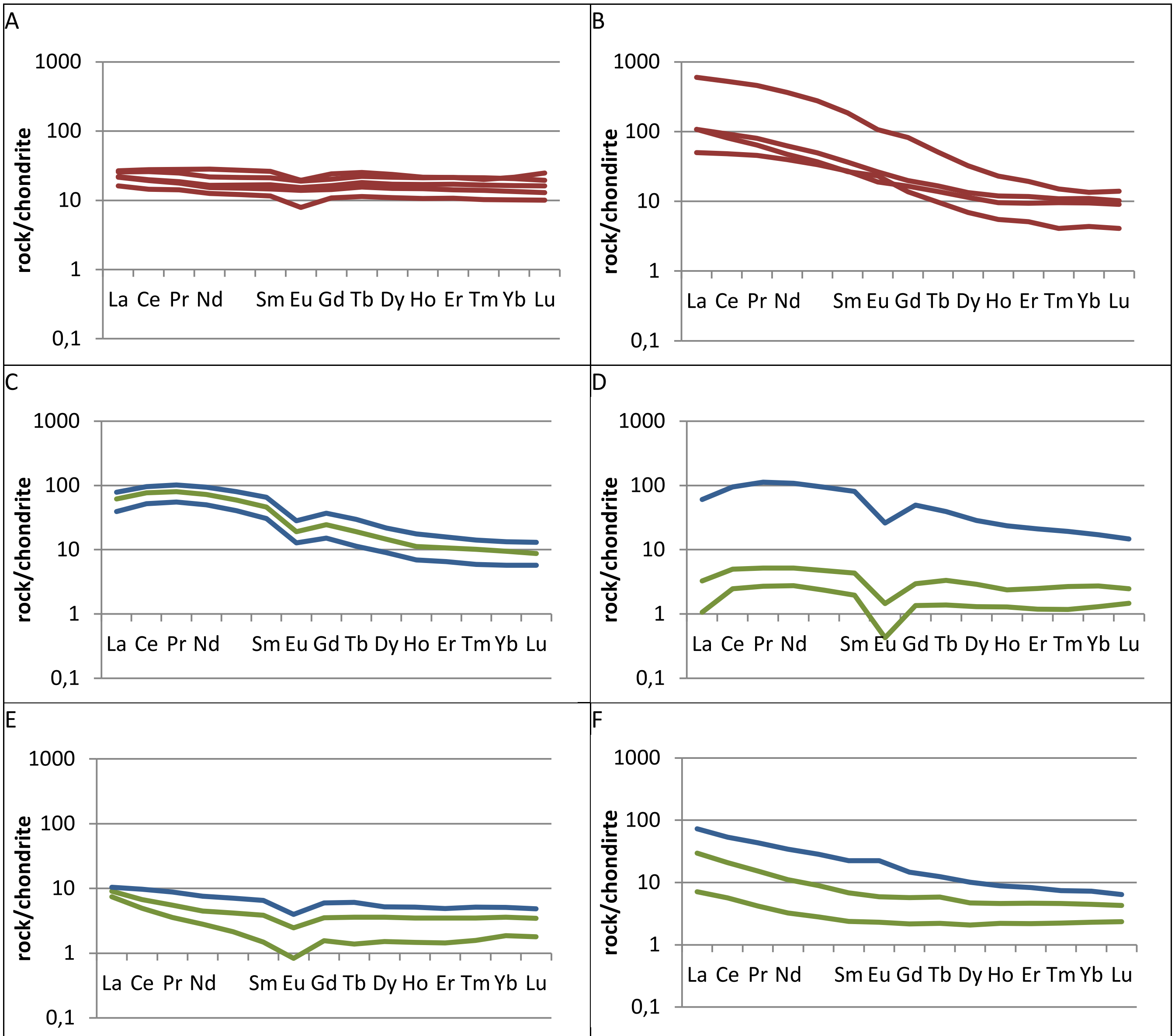


Figure 14. Whole-rock chondrite normalised REE diagrams for the mafic and ultramafic rocks [normalisation values taken from McDonough and Sun (1995)]. Gabbroic rocks are plotted in red, peridotites in green and pyroxenites in blue. **A** contains samples from the Lommen mineralisation, the second Graah Fjord mineralisation and the Jættefjorden mineralisation. **B** contains samples from the Lommen mineralisation and the Jættefjorden mineralisation. **C** and **D** contain samples from the Lommen mineralisation. **E** contains samples from the Lommen mineralisation, the second Graah Fjord mineralisation and the third Graah Fjord mineralisation. **F** contains samples from the Lommen mineralisation and the third Graah Fjord mineralisation.

4. Discussion and Conclusions

The data collected over the course of this project have been used to formulate theories about the origin and nature of the mafic bands and the sulphide mineralisation that they contain.

4.1. Nature and origin of the gabbroids

By far the most abundant rock in the mafic bands is the gabbroids. The region, including the mafic bands are at the granulite facies metamorphic grade (Andrews 1973). The metamorphic grade and the gabbroic composition of the bands suggests a lower crustal setting (Fountain & Salisbury 1981, Rudnick & Fountain 1995). Formation at a lower crustal level is a simpler and therefore preferable explanation than formation at shallow crustal levels, followed by burial to greater depths and subsequent exhumation. Also, it is worth noting that the mafic bands share several characteristics with the mafic complex of the Ivrea-Verbano Zone (IVZ) in Italy. Both largely comprise amphibole-bearing gabbroic rocks, containing bodies of peridotite (Rivalenti *et al.* 1981, Sinigoi *et al.* 1991, Quick *et al.* 1994). The mafic complex of the IVZ is considered possible lower crustal material (Mehnert 1975, Fountain 1976). The similarities between the IVZ and the mafic bands therefore act as further evidence for a lower crustal setting.

The gabbroids have a large component of volatile associated phases (pargasite, biotite and apatite), which could either be the result of the volatiles being concentrated in the melt by fractionation and/or the result of the addition of volatiles from another fluid. Both processes could also explain the enrichment of the incompatible elements that is observed in the gabbroids. However, fractionation alone cannot explain the negative anomaly in Nb. Interaction of the gabbroids with an incompatible element and volatile bearing fluid with a negative Nb anomaly is therefore likely.

A negative Nb anomaly may be the result of a residual Nb bearing phase at the fluid source. It is also possible for a fluid interacting with large volumes of mantle material to become depleted in Nb relative to K and La (Kelemen *et al.* 1993). The crystal/liquid distribution coefficient of Nb in mantle minerals such as garnet, orthopyroxene, spinel and olivine is much greater than that of K and L.

These points lead to the interpretation that the gabbroids represent lower crustal material that has been partially enriched in incompatible elements by an incompatible element and volatile-bearing fluid which has interacted with a significant volume of mantle rock. The variation apparent in the REE diagrams combined with the variations in the mineralogy of the gabbroids suggests that they are quite laterally complex and variable; this most likely reflects the complex nature of the lower crust.

The negative Eu anomaly in the ultramafic rocks suggests that the ultramafic rocks have equilibrated with plagioclase, which has subsequently been removed from the system. It would be expected for a rock containing the removed plagioclase to have a corresponding positive Eu anomaly. The gabbroids do not show a positive anomaly in Eu, which suggests that the gabbroids are not the petrological complement to the ultramafic intrusions.

4.2. Nature and origin of the unmineralised ultramafic rocks

The apparent intrusion of the ultramafic rocks in to the gabbroids (interpreted as lower crust) suggests a mantle source for these rocks. The enrichment of the most compatible elements suggests that these rocks are the products of melts derived from high degree partial melting of a depleted source. The geochemical signature of the unmineralised ultramafic rocks would most likely have been enhanced by accumulation of early crystallising phases, which is supported by the cumulate texture of the rocks. The intermediately compatible elements (HREEs) in the N-MORB normalised diagram show some degree of fractionation. This fractionation suggests the presence of a residual phase at the melt source. The residual phase is most likely garnet, which suggests that the unmineralised ultramafic rocks are derived from a deeply sourced melt. Additionally, the ultramafic rocks show some enrichment in incompatible elements with a negative anomaly in Nb. This is very similar to the enrichment observed in the gabbroids and suggests that the ultramafic rocks interacted with the same fluid that interacted with the gabbroids.

4.3. Nature and origin of the mineralised ultramafic rocks

The mineralised ultramafic rocks display some similarities to the unmineralised ultramafic rocks. In terms of lithology they are indistinguishable apart from the sulphide content. Similar to the unmineralised ultramafic rocks, the mineralised ultramafic rocks are largely peridotites with a smaller volume of pegmatitic pyroxenites.

From a geochemical point of view, the trace element diagrams show the mineralised ultramafic rocks to be very different from the unmineralised ultramafic rocks. The mineralised ultramafic rocks are, in general, much more depleted than the unmineralised ultramafic rocks and there is no appreciable fractionation of the HREEs. The depletion in the mineralised ultramafic rocks, together with the enrichment in the most compatible elements suggests that these rocks are derived from melts formed by high degree partial melting of a depleted source. The enrichment of the most compatible elements was most likely enhanced by crystal accumulation, which is supported by the cumulate texture of the rocks. The mineralised ultramafic rocks are far more depleted relative to the unmineralised ultramafic rocks, suggesting they have a far more depleted source than the unmineralised ultramafic rocks. The lack of fractionation of the HREES suggests that the mineralised ultramafic rocks were sourced from a shallower depth, at which garnet was not stable.

For both the mineralised and unmineralised ultramafic rocks, the trace element chemistry of the pyroxenites is indistinguishable from that of the associated peridotites. The pyroxenites appear as relatively small volume intrusions in to the peridotites. The pyroxenites commonly have a coarser grain size and increased volatile-bearing phase content relative to the peridotites. The coarser grain size pyroxenites typically contain little to no sulphides. These observations lead to the interpretation that the pyroxenites represent a pegmatitic last phase of intrusion of the ultramafic rocks.

Similar to both the gabbroids and the unmineralised ultramafic rocks, the mineralised ultramafic rocks show enrichment of incompatible elements with a negative Nb anomaly. This is most likely to be the result of interaction with the same fluid, which interacted with the gabbroids and the unmineralised ultramafic rocks. However, the mineralised ultramafic rocks show a greater degree of enrichment and additional enrichment of Cu and Ni. This is most easily explained by interaction with an additional fluid containing incompatible elements, S, Cu and Ni. The additional fluid may have caused the melting of the source of the mineralised ultramafic rocks by lowering the solidus with the addition of volatiles. This scenario is very similar to a scenario proposed in the IVZ , in which a depleted mantle protolith interacted with a volatile, incompatible element, Pb, Cu and S bearing fluid (Fiorentini & Beresford 2008). The interaction between the fluid and the source-rock caused partial melting, resulting in the formation of volatile-rich sulphide bearing ultramafic magma.

4.4. Mineralising system and emplacement

The peridotites are the most commonly mineralised units, containing Ni and Cu rich sulphides. Mineralisation in the gabbroids is largely Cu rich and limited to gabbroids in close proximity to peridotites. However, the Jættefjorden mineralisation has by far the most heavily mineralised gabbroids with no apparent peridotites at the location. At Jættefjorden, the petrography revealed the sulphides to be largely secondary, suggesting that the concentration at this location is the result of remobilisation. If this is the case, the most likely source for the remobilised sulphides is the mineralised ultramafic rocks.

The sulphide mineralisation does not appear to represent an orthomagmatic sulphide system in the traditional sense. Traditional orthomagmatic sulphide systems form at shallow crustal levels with trans-lithospheric structures considered necessary fluid pathways for their emplacement (Maier & Groves 2011). In traditional orthomagmatic systems, interaction with crustal material is typically considered necessary for their formation. This is because of the need for the magmas to achieve sulphur saturation to form an immiscible sulphide liquid to effectively concentrate and segregate the metals(Scoates & Mitchell 2000). At shallow crustal levels the sulphur content at sulphur saturation (SCSS) of a melt is higher than it was at the melt source, due to the inverse relationship between SCSS and pressure (Wendlandt 1982, Mavrogenes & O'Neill 1999, Holzheid & Grove 2002, Li & Ripley 2005). The implication is that ordinarily, a mantle sourced melt will not be sulphur saturated at shallow crustal levels even if it was at formation. Interaction with crustal material has been considered necessary for the formation of many deposits. The addition of crustal sulphur to a mafic magma is the dominant mechanism for reaching sulphur saturation at Voisey's Bay, Pechenga, Noril'sk, Archean Komatiite-hosted deposits and Kabanga (Li & Naldrett 1999, Barnes *et al.* 2001, Ripley *et al.* 2003, Bekker *et al.* 2009, Maier & Barnes 2010). In addition, the Jinchuan deposit shows evidence for having achieved sulphur saturation by the addition of CO_2 rich fluids, which may have lowered the SCSS (Lehmann *et al.* 2007). The sulphide mineralisation that is the topic of this study most likely formed at a much deeper crustal level, near to the crust-mantle boundary and shows now evidence for interaction with crustal material.

A background sulphide content is present in all of the gabbroids, peridotites and pyroxenites, which represents the sulphide content of the lower crust/upper mantle. Beyond that, the mineralised ultramafics have an increased sulphide content, enriched in Cu and Ni. Gabbroids proximal to the mineralised ultramafic rocks also show a higher sulphide content, particularly enriched in Cu. This suggests that the intrusion of the mineralised ultramafic rocks caused metasomatism of the hosting gabbroids which resulted in increased sulphide mineralisation within the gabbroids.

The most likely explanation for the current situation, with the gabbroids and ultramafic rocks forming deformed bands within the orthogneiss that dominates the region is that the mafic bands are tectonically emplaced. Subsequent to the intrusion of the mantle-sourced ultramafic rocks in to the lower crust gabbroids the rocks were intruded by the granite protoliths of the current gneisses and underwent a complex structural history (Kolb *et al.* in review). The structural evolution of the region lead to the mafic bands being slivers of lower crust/upper mantle material tectonically emplaced within the gneiss.

An alternative explanation for the mafic bands could be that they represent intrusive sills. This explanation can be discarded for a number of reasons. Preserved intrusive contacts show the protolith of the gneiss intruding the mafic bands. Additionally, there are inclusions of the mafic bands in the gneiss and no inclusions of the gneiss in the mafic bands. This means that the mafic bands predate the protolith of the gneiss. If the mafic bands were sills, it would be reasonable to observe some of the original host lithology of the sills preserved around the edges of the mafic bands. In addition, there is no consistent zonation or variation from the edges to the cores of the mafic bands, which would be expected in sills of an equivalent thickness. On a similar note, a sill would be expected to show much more of a pattern to the distribution of sulphide mineralisation.

4.5. Conclusions

The mafic bands most likely represent tectonically emplaced slivers of lower crust intruded by mantle-sourced ultramafic rocks. Two phases of ultramafic rocks intruded the gabbroids of the lower crust. One phase was sourced from a relatively undepleted deep mantle source within the stability field of garnet. The other phase was sourced from a shallower depleted mantle source. The phase of ultramafic rocks sourced from the shallower mantle source shows evidence for being partially refertilised by an incompatible element, S, Cu and Ni bearing fluid. This phase of ultramafic rocks contains the bulk of the mineralisation and there is evidence to suggest that the intrusion of this phase resulted in metasomatism of the gabbroids proximal to the mineralised ultramafic intrusions causing increased sulphide content. All of the rocks in the mafic bands show evidence for interaction with a second volatile and incompatible element rich fluid with a Nb anomaly. Since all of the lithotypes show evidence for having interacted with this fluid, the introduction of this fluid most likely occurred after the intrusion of the ultramafic rocks in to the gabbroids.

More study is needed to evaluate the economic potential of this sulphide mineralisation. Work is ongoing and further data will prove very useful in determining if there is likely to be sulphide mineralisation below the weathered surfaces at many localities, which appeared rusty but had no significant visible sulphides in the field. This will help constrain the extent of the mineralisation. It is important to note that the difficult logistics of mining in Greenland can easily make, what would be an economic mineralisation in a more convenient location, uneconomic.

The mineralisation most likely does not represent a classic orthomagmatic sulphide system, forming at shallow crustal levels and reliant on assimilation of crustal material for the achievement of sulphur saturation. As such, exploration in the area should not be carried out in the traditional way. The mantle processes leading to the formation of the specific melts control the mineralisation. Interaction with host rocks at the site of emplacement, do not. Further work will need to focus on the source of the metasomatic fluids and the controls on their emplacement.

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6. Appendices

6.1. Primary Data

6.1.1. Whole rock geochemistry

Table 8. Whole rock geochemistry from AcmeLabs for 18 samples.

Sample ID		516120	516121	516122	516123	516124	516125
SiO2	%	48.08	47.86	54.37	49.62	49.73	52.47
TiO2	%	1.005	0.458	0.5	1.455	0.721	0.244
Al2O3	%	15.1	4.41	14.93	16.31	7.5	3.31
Fe2O3	%	8.92	12.09	10.73	12.37	11.74	10.1
MnO	%	0.161	0.2	0.151	0.164	0.207	0.195
MgO	%	9.24	26.55	7.31	7.94	20.19	25.18
CaO	%	12.23	5.98	9.13	8.76	7.31	6.85
Na2O	%	2.97	0.65	3.29	2.59	1.21	0.43
K2O	%	0.74	0.44	0.41	0.32	0.69	0.29
P2O5	%	0.97	0.13	0.09	0.12	0.19	0.07
LOI	%	0.38	0	-0.28	0.13	0.16	0.04
Total	%	99.796	98.768	100.63	99.779	99.648	99.179
Cr	PPM	360	4120	90	260	2200	3450
Ni	PPM	140	980	80	110	680	910
Co	PPM	39	100	46	48	75	85
Sc	PPM	26	19	44	40	26	16
V	PPM	192	99	216	314	112	76
Cu	PPM	20	< 10	20	80	< 10	< 10
Pb	PPM	< 5	< 5	< 5	< 5	< 5	< 5
Zn	PPM	110	150	90	200	160	120
Bi	PPM	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sn	PPM	2	2	< 1	1	2	< 1
Cd	PPM						
In	PPM	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tl	PPM	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
W	PPM	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Mo	PPM	< 2	< 2	< 2	< 2	< 2	< 2

As	PPM	< 5	< 5	< 5	< 5	< 5	< 5
Se	PPM						
Sb	PPM	0.5	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Ag	PPM	0.9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Au	PPB	2	< 1	< 1	4	< 1	4
Pt	PPB	2.3	2.1	8.3	2.5	2	5
Pd	PPB	4.7	4.2	8.4	3.8	1.7	10.4
Ir	PPM						
Hg	PPM						
Rb	PPM	3	5	< 1	2	9	6
Cs	PPM	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
Ba	PPM	484	64	312	78	147	66
Sr	PPM	1508	34	402	156	130	46
Ga	PPM	19	9	14	19	14	6
Ge	PPM	1.8	1.9	1.8	1.7	1.7	1.9
Hf	PPM	6.5	1.2	1.4	2.7	3.6	0.7
Zr	PPM	311	42	55	113	163	22
Nb	PPM	11.3	3.8	1.5	5.4	4.5	1.7
Y	PPM	36.8	18.6	15.5	35.1	28.1	11.5
Th	PPM	4.99	0.19	< 0.05	0.24	0.79	0.12
U	PPM	0.3	< 0.01	< 0.01	0.14	0.04	< 0.01
La	PPM	141	14.5	11.8	6.3	18.5	9.27
Ce	PPM	322	47.2	29.5	16.9	58.5	31.8
Pr	PPM	42.7	7.43	4.22	2.59	9.42	5.13
Nd	PPM	167	33	18.2	12.9	42.9	22.9
Sm	PPM	27.5	6.8	4	3.88	9.68	4.52
Eu	PPM	5.98	1.07	1.07	1.1	1.59	0.717
Gd	PPM	16.4	4.87	3.28	4.8	7.36	3.02
Tb	PPM	1.84	0.69	0.5	0.91	1.07	0.41
Dy	PPM	7.99	3.57	2.81	5.81	5.37	2.21
Ho	PPM	1.25	0.61	0.52	1.18	0.96	0.38
Er	PPM	3.09	1.71	1.5	3.4	2.51	1.04
Tm	PPM	0.373	0.251	0.236	0.496	0.348	0.146
Yb	PPM	2.17	1.53	1.53	3.47	2.15	0.92
Lu	PPM	0.343	0.214	0.222	0.609	0.322	0.141
Ta	PPM	0.41	0.09	0.03	0.33	0.14	0.03
Be	PPM	2	< 1	< 1	< 1	< 1	< 1

Sample ID		516126	516127	516128	516137	516138	516143
SiO2	%	71.28	45.36	44.37	38.66	33.4	37.82
TiO2	%	0.22	0.251	0.29	0.177	0.15	0.018
Al2O3	%	15.34	6.65	7.51	3.39	2.75	0.54
Fe2O3	%	1.83	13.18	13.2	23.04	29.96	11.18
MnO	%	0.02	0.246	0.178	0.182	0.171	0.217
MgO	%	0.57	27.21	24.32	26.75	25.95	43.09
CaO	%	2.56	5.21	5.29	2.67	1.16	0.26
Na2O	%	4.07	0.33	0.42	0.2	0.05	0.02
K2O	%	3.38	0.06	0.09	0.05	0.02	0.05
P2O5	%	0.09	0.03	0.03	0.01	< 0.01	0.01
LOI	%	0.4	0.86	2.74	2.45	3.76	4.82
Total	%	99.76	99.387	98.438	97.579	97.371	98.025
Cr	PPM		2450	2570	4650	4770	5660
Ni	PPM	8.9	730	710	1700	2880	1710
Co	PPM	4.4	111	112	233	333	174
Sc	PPM		24	26	18	14	5
V	PPM	15	127	142	99	85	23
Cu	PPM	4.4	< 10	< 10	2030	1170	< 10
Pb	PPM	1.5	< 5	< 5	< 5	< 5	< 5
Zn	PPM	13	90	130	300	480	80
Bi	PPM	<0.1	< 0.1	< 0.1	<0.1	<0.1	<0.1
Sn	PPM	<1	< 1	< 1	< 1	< 1	< 1
Cd	PPM	<0.1					
In	PPM		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tl	PPM	<0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
W	PPM	<0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Mo	PPM	<0.1	< 2	< 2	< 2	< 2	< 2
As	PPM	<0.5	< 5	< 5	< 5	< 5	< 5
Se	PPM	<0.5					
Sb	PPM	<0.1	< 0.2	< 0.2	< 0.2	< 0.2	0.3
Ag	PPM	<0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Au	PPB	<0.5	3	2	21	6	< 1
Pt	PPB		11.3	11	10.7	24	1.3
Pd	PPB		12	12.1	66.8	162	1.1
Ir	PPM						
Hg	PPM	<0.01					

Rb	PPM	42.4	< 1	< 1	< 1	< 1	3
Cs	PPM	<0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.5
Ba	PPM	1490	7	72	29	4	7
Sr	PPM	589.8	14	20	13	5	4
Ga	PPM	14.5	5	7	4	5	1
Ge	PPM		1.6	1.5	1.2	1	1.2
Hf	PPM	3.6	0.4	0.4	0.3	0.2	< 0.1
Zr	PPM	124.6	14	18	12	7	< 1
Nb	PPM	1.1	0.5	0.4	0.4	< 0.2	< 0.2
Y	PPM	1.9	6	7.3	4.1	2	< 0.5
Th	PPM	<0.2	0.09	0.14	0.1	< 0.05	< 0.05
U	PPM	<0.1	0.07	0.12	< 0.01	< 0.01	< 0.01
La	PPM	16.3	0.38	2.36	0.77	0.25	< 0.05
Ce	PPM	28.3	1.57	6.12	3.05	1.52	< 0.05
Pr	PPM	2.82	0.27	0.79	0.48	0.25	< 0.01
Nd	PPM	9.9	1.58	3.3	2.36	1.26	0.11
Sm	PPM	1.18	0.56	0.79	0.64	0.29	0.03
Eu	PPM	0.7	0.182	0.272	0.082	0.024	< 0.005
Gd	PPM	0.82	0.73	0.91	0.59	0.27	< 0.01
Tb	PPM	0.09	0.15	0.18	0.12	0.05	< 0.01
Dy	PPM	0.42	0.96	1.16	0.71	0.32	< 0.01
Ho	PPM	0.07	0.19	0.24	0.13	0.07	< 0.01
Er	PPM	0.17	0.57	0.71	0.4	0.19	< 0.01
Tm	PPM	0.02	0.091	0.111	0.066	0.029	< 0.005
Yb	PPM	0.16	0.65	0.78	0.44	0.21	< 0.01
Lu	PPM	0.02	0.104	0.127	0.061	0.036	< 0.002
Ta	PPM	<0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Be	PPM	<1	< 1	< 1	<1	<1	< 1
Sample ID		516144	516145	516148	516159	516160	516167
SiO2	%	42.43	38.81	39.72	52.52	44.23	43.07
TiO2	%	0.499	0.047	0.079	0.182	0.487	0.226
Al2O3	%	6.66	1.49	2.44	2.07	7.25	5.4
Fe2O3	%	9.95	12.38	10.86	14.51	13.56	13.34
MnO	%	0.181	0.197	0.161	0.253	0.181	0.206
MgO	%	12.55	37.55	40.4	25.51	24.06	27.74
CaO	%	6.62	1.46	0.84	2.47	5.51	4.39
Na2O	%	1.09	0.06	0.08	0.37	1.16	0.28

K2O	%	1.28	0.03	0.02	0.28	0.88	0.05
P2O5	%	0.17	0.01	0.01	0.14	0.13	0.03
LOI	%	17.41	5.9	2.73	0.31	1.12	3.68
Total	%	98.84	97.934	97.34	98.615	98.568	98.412
Cr	PPM	1050	6290	6520	80	70	2640
Ni	PPM	330	1090	2110	240	310	730
Co	PPM	55	157	142	102	116	119
Sc	PPM	30	10	13	20	18	20
V	PPM	159	62	63	92	126	109
Cu	PPM	< 10	< 10	< 10	40	30	< 10
Pb	PPM	< 5	< 5	< 5	< 5	< 5	< 5
Zn	PPM	90	100	60	170	110	120
Bi	PPM	<0.1	<0.1	<0.1	<0.1	<0.1	< 0.1
Sn	PPM	< 1	< 1	< 1	< 1	< 1	< 1
Cd	PPM						
In	PPM	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tl	PPM	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
W	PPM	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Mo	PPM	< 2	< 2	< 2	< 2	< 2	< 2
As	PPM	< 5	< 5	< 5	< 5	< 5	< 5
Se	PPM						
Sb	PPM	0.6	< 0.2	< 0.2	2.3	0.3	0.4
Ag	PPM	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Au	PPB	< 1	< 1	< 1	< 1	< 1	< 1
Pt	PPB	1.7	0.3	3.9	0.2	0.9	2.1
Pd	PPB	1.5	1.5	3.1	< 0.1	0.7	0.9
Ir	PPM						
Hg	PPM						
Rb	PPM	41	< 1	< 1	15	15	< 1
Cs	PPM	0.2	< 0.1	0.1	< 0.1	0.1	< 0.1
Ba	PPM	357	13	6	115	273	5
Sr	PPM	251	9	12	38	289	10
Ga	PPM	10	2	2	6	8	5
Ge	PPM	1.6	1.4	1.7	1.8	1.2	1.6
Hf	PPM	1.3	< 0.1	< 0.1	0.6	1.8	0.3
Zr	PPM	50	2	4	19	74	14
Nb	PPM	1.6	0.3	< 0.2	0.4	1.7	< 0.2

Y	PPM	11.4	1	2.1	5.9	9.8	6.1
Th	PPM	0.13	0.16	0.06	1.82	2.57	0.09
U	PPM	< 0.01	< 0.01	< 0.01	0.14	0.45	< 0.01
La	PPM	10.9	0.7	0.15	12	19.2	0.81
Ce	PPM	27.5	1.96	0.72	27.5	46.8	2.35
Pr	PPM	3.79	0.2	0.11	3.46	6.52	0.33
Nd	PPM	16.4	0.76	0.65	13.8	28.3	1.68
Sm	PPM	3.33	0.15	0.21	2.55	5.59	0.55
Eu	PPM	0.777	< 0.005	0.018	0.388	1.36	0.119
Gd	PPM	2.56	0.12	0.26	1.73	3.55	0.72
Tb	PPM	0.37	0.02	0.05	0.21	0.39	0.15
Dy	PPM	2.09	0.16	0.32	1.08	1.98	1.01
Ho	PPM	0.39	0.03	0.06	0.2	0.32	0.18
Er	PPM	1.09	0.08	0.19	0.55	0.86	0.56
Tm	PPM	0.16	0.011	0.03	0.093	0.114	0.096
Yb	PPM	1	0.08	0.21	0.62	0.7	0.65
Lu	PPM	0.146	0.014	0.036	0.095	0.105	0.1
Ta	PPM	0.05	0.07	< 0.01	< 0.01	0.05	< 0.01
Be	PPM	< 1	< 1	< 1	<1	<1	<1

Table 9. Whole rock geochemistry from Activation Laboratories Ltd. For the 18 samples received before the completion of this project.

Sample ID		523514	523515	525717	525724	523568	523575
SiO_2	%	43.27	37.48	49.76	47.5	36.21	42.78
Al_2O_3	%	5.17	4.47	14.53	12.1	2.39	2.87
Fe_2O_3(T)	%	15.77	20.03	14.77	17.44	23.68	12.67
MnO	%	0.209	0.158	0.286	0.181	0.191	0.194
MgO	%	25.24	24.11	4.82	12.69	28.63	38.63
CaO	%	6.04	3.58	12	5.85	0.3	1.9
Na_2O	%	0.4	0.19	2.95	1.73	0.04	0.31
K_2O	%	0.09	0.04	0.21	0.25	0.01	0.09
TiO_2	%	0.226	0.186	1.406	0.654	0.123	0.106
P_2O_5	%	0.06	0.03	0.1	0.04	0.03	0.02
LOI	%	4.33	8.49	0.11	0.92	6.32	0.42
Total	%	100.8	98.76	100.9	99.36	97.92	99.98
Sc	ppm	25	20	60	44	14	16

Be	ppm	< 1	< 1	< 1	< 1	< 1	< 1
V	ppm	120	114	419	222	95	75
Cr	ppm	3180	4990	140	990	6340	7280
Co	ppm	102	149	58	86	255	135
Ni	ppm	750	980	80	270	2970	2010
Cu	ppm	200	270	110	410	1020	< 10
Zn	ppm	180	260	70	630	390	40
Ga	ppm	5	5	20	15	4	3
Ge	ppm	1.7	1.7	2.3	1.8	1.3	1.9
As	ppm	< 5	9	9	13	12	12
Rb	ppm	3	1	1	2	< 1	2
Sr	ppm	153	111	158	122	6	38
Y	ppm	6.8	4.7	28.4	15.4	2.1	3.2
Zr	ppm	19	14	53	47	4	11
Nb	ppm	0.8	0.5	3	4.5	0.2	0.3
Mo	ppm	< 2	< 2	< 2	< 2	< 2	< 2
Ag	ppm	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
In	ppm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn	ppm	2	< 1	< 1	< 1	2	< 1
Sb	ppm	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cs	ppm	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ba	ppm	17	16	56	20	6	4
La	ppm	7	2.13	6.04	3.81	1.75	1.68
Ce	ppm	12.8	4.13	15.9	8.89	3.02	3.45
Pr	ppm	1.42	0.51	2.29	1.31	0.33	0.39
Nd	ppm	5.05	2.05	9.92	5.76	1.28	1.48
Sm	ppm	1.01	0.57	3.13	1.71	0.22	0.35
Eu	ppm	0.331	0.139	1.06	0.446	0.047	0.129
Gd	ppm	1.14	0.7	4	2.16	0.31	0.43
Tb	ppm	0.21	0.13	0.8	0.41	0.05	0.08
Dy	ppm	1.16	0.88	5.31	2.68	0.37	0.51
Ho	ppm	0.25	0.19	1.16	0.58	0.08	0.12
Er	ppm	0.74	0.56	3.43	1.72	0.23	0.35
Tm	ppm	0.114	0.086	0.524	0.252	0.039	0.055
Yb	ppm	0.72	0.58	3.32	1.64	0.3	0.37
Lu	ppm	0.105	0.085	0.477	0.248	0.044	0.058
Hf	ppm	0.5	0.4	1.6	1.2	0.1	0.2
Ta	ppm	0.05	0.02	0.15	0.43	0.01	< 0.01

W	ppm	1.1	< 0.5	< 0.5	0.7	1	< 0.5
Tl	ppm	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Pb	ppm	< 5	< 5	< 5	< 5	< 5	< 5
Bi	ppm						
Th	ppm	0.43	0.22	0.1	0.23	0.17	0.18
U	ppm	0.14	0.06	0.02	0.12	0.04	0.06
Bi	ppm	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sample ID		523576	523579	535706	535707	535708	535709
SiO_2	%	47.06	62.35	44.04	37.47	40.98	48.95
Al_2O_3	%	6.69	15.66	5.31	4.89	2.78	16.54
Fe_2O_3(T)	%	13.05	5.55	16.61	25.65	11.8	12.69
MnO	%	0.192	0.074	0.241	0.178	0.169	0.217
MgO	%	21	3.27	27.01	21.44	35.01	5.75
CaO	%	8.24	6.03	4.82	4.73	2.28	9.52
Na_2O	%	0.86	3.63	0.13	0.22	0.14	2.97
K_2O	%	1.68	0.51	0.06	0.06	0.03	0.28
TiO_2	%	1.451	0.624	0.322	0.194	0.111	0.956
P_2O_5	%	0.02	0.28	0.04	0.02	0.02	0.07
LOI	%	0.74	1.53	0.54	2.75	6.19	1.02
Total	%	101	99.53	99.12	97.61	99.51	98.96
Sc	ppm	54	12	16	25	16	49
Be	ppm	< 1	1	< 1	< 1	< 1	< 1
V	ppm	275	94	107	129	70	327
Cr	ppm	3030	180	2180	4500	5670	470
Co	ppm	69	20	114	198	128	67
Ni	ppm	720	100	1190	2090	1780	220
Cu	ppm	< 10	20	90	650	< 10	420
Zn	ppm	110	< 30	90	320	40	110
Ga	ppm	14	20	7	10	3	19
Ge	ppm	2.2	1.1	1.6	1.7	2	1.8
As	ppm	< 5	14	< 5	13	11	16
Rb	ppm	70	2	1	1	< 1	2
Sr	ppm	60	662	51	14	13	152
Y	ppm	33	7.3	7.3	6.6	3.4	23.6
Zr	ppm	172	158	21	22	10	36
Nb	ppm	8.2	2.4	0.8	0.7	0.3	2.2

Mo	ppm	< 2	< 2	< 2	< 2	< 2	< 2
Ag	ppm	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
In	ppm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn	ppm	4	< 1	2	< 1	< 1	< 1
Sb	ppm	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cs	ppm	0.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ba	ppm	774	505	11	7	4	117
La	ppm	14.3	25.4	2.47	1.64	1	5.09
Ce	ppm	58.3	49.9	5.98	3.92	1.78	11.8
Pr	ppm	10.4	5.96	0.82	0.54	0.22	1.64
Nd	ppm	49.4	21.6	3.47	2.29	0.95	7
Sm	ppm	11.9	3.95	0.97	0.7	0.27	2.15
Eu	ppm	1.46	1.31	0.224	0.198	0.1	0.783
Gd	ppm	9.82	2.73	1.19	0.79	0.37	2.84
Tb	ppm	1.41	0.35	0.22	0.16	0.08	0.56
Dy	ppm	7.01	1.7	1.28	1.06	0.49	3.64
Ho	ppm	1.29	0.3	0.28	0.23	0.11	0.8
Er	ppm	3.38	0.82	0.78	0.64	0.35	2.26
Tm	ppm	0.476	0.101	0.127	0.103	0.053	0.345
Yb	ppm	2.76	0.7	0.82	0.67	0.38	2.15
Lu	ppm	0.361	0.101	0.119	0.1	0.062	0.317
Hf	ppm	4.1	3.6	0.5	0.4	0.2	0.9
Ta	ppm	0.2	0.05	0.05	0.02	< 0.01	0.06
W	ppm	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Tl	ppm	0.48	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Pb	ppm	< 5	< 5	< 5	< 5	< 5	< 5
Bi	ppm		< 0.1				
Th	ppm	0.26	0.15	0.26	0.17	0.13	0.12
U	ppm	0.06	0.11	0.07	0.04	0.05	0.02
Bi	ppm	< 0.1		< 0.1	< 0.1	< 0.1	< 0.1
Au	ppb				35		
Pt	ppb				15.2		
Pd	ppb				174		
Sample ID		523580	523584	535301	535302	535304	535314
SiO_2	%	55.27	50.21	70.27	44.36	47.66	52.19
Al_2O_3	%	23.73	9.58	14.94	10.86	12.72	16.03
Fe_2O_3(T)	%	3.26	19.72	1.84	22.72	15.69	9.89

MnO	%	0.035	0.283	0.022	0.266	0.231	0.151
MgO	%	2.1	8.54	0.76	3.6	10.43	6.39
CaO	%	9.04	5.99	1.75	8.19	9.53	8.35
Na_2O	%	5.21	2.05	3.8	1.67	1.86	3.01
K_2O	%	0.6	0.27	4.1	0.23	0.87	1.18
TiO_2	%	0.378	1.638	0.218	0.636	0.988	0.878
P_2O_5	%	0.03	0.05	0.03	0.18	0.08	0.36
LOI	%	0.29	1.2	1.44	5.64	0.09	1.34
Total	%	99.94	99.55	99.18	98.35	100.2	99.76
Sc	ppm	13	41	3	28	40	26
Be	ppm	1	< 1	< 1	1	< 1	1
V	ppm	56	353	28	169	293	181
Cr	ppm	120	1350	40	220	140	210
Co	ppm	10	28	4	111	67	33
Ni	ppm	100	60	40	420	250	80
Cu	ppm	< 10	70	< 10	1110	< 10	20
Zn	ppm	< 30	230	< 30	160	70	< 30
Ga	ppm	25	17	15	15	16	19
Ge	ppm	1.1	2.7	1.1	2.8	2.2	1.7
As	ppm	16	10	9	< 5	< 5	< 5
Rb	ppm	4	2	122	6	11	29
Sr	ppm	809	218	384	121	133	744
Y	ppm	14.8	14.5	0.9	34.1	26.4	18.7
Zr	ppm	232	1940	252	95	77	108
Nb	ppm	2.2	11.3	4.1	5.6	3.3	4.1
Mo	ppm	< 2	6	< 2	5	< 2	< 2
Ag	ppm	0.6		0.5	0.6	< 0.5	< 0.5
In	ppm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn	ppm	< 1	< 1	< 1	< 1	< 1	< 1
Sb	ppm	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cs	ppm	< 0.1	< 0.1	0.2	0.3	< 0.1	< 0.1
Ba	ppm	279	154	1587	102	121	830
La	ppm	17.2	7.28	15	16.1	5.19	25.4
Ce	ppm	32.7	15.2	19.3	31.3	12.1	56.9
Pr	ppm	4.01	2.09	1.6	3.71	1.72	7.43
Nd	ppm	15.6	8.71	4.05	13.6	7.52	28.5
Sm	ppm	3.32	2.09	0.45	3.44	2.47	5.4

Eu	ppm	1.26	0.748	0.712	1.36	0.856	1.49
Gd	ppm	2.93	1.97	0.23	3.75	3.25	3.94
Tb	ppm	0.45	0.35	0.02	0.74	0.65	0.6
Dy	ppm	2.48	2.14	0.11	4.72	4.2	3.29
Ho	ppm	0.48	0.47	0.02	1.06	0.92	0.65
Er	ppm	1.33	1.41	0.09	3.18	2.72	1.88
Tm	ppm	0.183	0.238	0.017	0.524	0.411	0.268
Yb	ppm	1.17	1.65	0.22	3.61	2.62	1.77
Lu	ppm	0.158	0.28	0.033	0.602	0.397	0.25
Hf	ppm	3.9	35.5	4.9	1.9	1.7	2
Ta	ppm	0.04	0.33	0.1	0.47	0.15	0.09
W	ppm	< 0.5	< 0.5	< 0.5	0.7	< 0.5	< 0.5
Tl	ppm	< 0.05	0.05	0.51	0.1	0.13	0.15
Pb	ppm	< 5	< 5	10	< 5	< 5	< 5
Bi	ppm						
Th	ppm	0.15	0.3	0.59	1.05	0.99	0.57
U	ppm	0.07	0.37	0.39	0.45	0.41	0.08
Bi	ppm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Au	ppb						
Pt	ppb						
Pd	ppb						

6.1.2. WDS analysis results

Table 10. WDS analysis results. Analysis totals outside of the range 98-102 were discarded for all minerals apart from amphibole. Analysis totals for amphibole outside of the range 96-99 were discarded.

Sample	516127	516127	516127	516127	516127	516127	516127
No.	A01	A02	A03	A04	A05	A06	A07
SiO2	0.009	0	0.025	42.64	42.57	41.78	42.36
FeO	18.22	18.17	18.92	6.45	7.1	6.55	6.57
K2O	0	0.026	0	0.821	0.69	0.715	0.735
NiO	0.34	0.319	0.315	0.065	0.054	0.044	0.06
Na2O	0.016	0.007	0	2.59	2.51	2.68	2.57
Al2O3	59.55	60.29	59.47	14.14	13.79	15.03	13.53
MnO	0.288	0.236	0.246	0.113	0.137	0.111	0.079
CaO	0.002	0.005	0.013	12.43	12.33	12.45	12.36
Cr2O3	3.44	3.33	3.6	0.257	0.259	0.27	0.224
MgO	17.67	17.89	17.87	16.4	16.26	15.98	16.55
TiO2	0.023	0	0	1.201	1.172	1.422	1.225
Total	99.558	100.273	100.459	97.108	96.872	97.032	96.263
Comment	Spinel	Spinel	Spinel	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516127	516127	516127	516127	516127	516127	516127
No.	A08	A09	A10	A11	A12	A13	A14
SiO2	53.91	54.55	54.29	54.57	54.23	53.66	54.07
FeO	11.15	10.69	11.11	10.88	10.57	10.52	11.09
K2O	0	0	0	0	0.002	0	0.015
NiO	0.075	0.051	0.05	0.042	0.018	0.087	0.027
Na2O	0.003	0	0.034	0	0.004	0	0
Al2O3	3.67	3.47	3.53	3.04	3.8	3.73	3.23
MnO	0.328	0.376	0.431	0.436	0.408	0.373	0.365
CaO	0.467	0.427	0.352	0.372	0.371	0.433	0.315
Cr2O3	0.074	0.047	0.07	0.026	0.068	0.036	0.09
MgO	30.61	30.9	30.64	30.65	30.69	30.74	30.94
TiO2	0.057	0.092	0.04	0.014	0.09	0.087	0.066
Total	100.344	100.603	100.547	100.03	100.251	99.667	100.208
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516127	516127	516127	516127	516127	516127	516127
No.	A15	A16	A17	A18	A19	A20	A21
SiO2	54.09	40.13	39.97	39.9	0.027	0	0.058
FeO	10.9	14.2	14.35	15.26	17.53	16.12	17.18
K2O	0.007	0.022	0	0.024	0	0.01	0.029
NiO	0.022	0.16	0.181	0.195	0.282	0.366	0.303
Na2O	0	0.015	0	0	0.017	0.032	0.003
Al2O3	3.4	0	0.035	0	59.16	61.2	57.92

MnO	0.308	0.314	0.377	0.405	0.239	0.239	0.265
CaO	0.363	0.009	0.011	0	0	0.015	0.023
Cr2O3	0.071	0.032	0	0.004	3.76	3.65	3.64
MgO	30.78	46.47	46.04	46.07	18.18	18.99	17.56
TiO2	0.049	0.016	0	0.002	0.024	0.034	0
Total	99.99	101.367	100.963	101.86	99.219	100.656	96.981
Comment	Enstatite	Olivine	Olivine	Olivine	Spinel	Spinel	Discarded
Sample	516127	516127	516127	516127	516127	516127	516127
No.	A22	A23	A24	A25	A26	A27	A28
SiO2	42.26	42.28	42.22	42.89	40.06	39.85	53.92
FeO	6.98	6.87	6.35	6.31	13.94	14.34	10.76
K2O	0.749	0.738	0.724	0.841	0	0	0
NiO	0.027	0.05	0.028	0.061	0.191	0.126	0.069
Na2O	2.64	2.54	2.54	2.53	0.014	0	0.002
Al2O3	13.53	13.81	13.53	13.14	0.028	0	3.71
MnO	0.111	0.063	0.163	0.09	0.335	0.327	0.31
CaO	12.31	12.36	12.51	12.48	0.009	0.002	0.42
Cr2O3	0.224	0.234	0.235	0.31	0.031	0	0.096
MgO	16.57	16.47	16.59	16.8	45.9	45.59	30.8
TiO2	1.305	1.079	1.301	1.279	0	0	0.073
Total	96.706	96.495	96.191	96.729	100.507	100.235	100.159
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Olivine	Olivine	Enstatite
Sample	516127	516127	516127	516127	516127	516127	516127
No.	A29	A30	A31	A32	A33	A34	A35
SiO2	54.43	53.86	55.77	0.034	0	0.006	39.53
FeO	10.82	10.96	10.56	15.37	25.71	19.25	14.33
K2O	0.001	0	0.004	0	0	0.012	0
NiO	0.034	0.026	0.028	0.287	0.278	0.275	0.191
Na2O	0.02	0.036	0.006	0.024	0	0.012	0.016
Al2O3	3	3.62	2.19	60.95	56.48	59.31	0.01
MnO	0.326	0.315	0.36	0.301	0.232	0.326	0.287
CaO	0.341	0.438	0.295	0	0.022	0.036	0.012
Cr2O3	0.068	0.06	0.008	4.01	3.59	4.22	0.072
MgO	31.19	30.71	31.98	19.34	17.14	17.63	46.33
TiO2	0.085	0.049	0.046	0.011	0.02	0	0
Total	100.315	100.074	101.247	100.328	103.471	101.076	100.778
Comment	Enstatite	Enstatite	Enstatite	Spinel	Spinel	Spinel	Olivine
Sample	516127	516127	516127	516127	516127	516127	516127
No.	A36	A37	A38	A39	A40	A41	A42
SiO2	39.79	40.11	40.3	42.72	42.2	42.14	42.45
FeO	14.58	14.69	15.01	7.02	6.68	6.96	6.49

K2O	0	0.01	0	0.743	0.738	0.736	0.848
NiO	0.194	0.191	0.234	0.061	0.06	0.044	0.041
Na2O	0	0.018	0.018	2.72	2.68	2.64	2.58
Al2O3	0.031	0	0.019	13.97	13.85	13.8	14.22
MnO	0.29	0.374	0.306	0.068	0.105	0.09	0.034
CaO	0.021	0.026	0.001	12.2	12.36	12.13	12.34
Cr2O3	0.018	0	0.009	0.235	0.258	0.253	0.275
MgO	46.28	45.81	45.64	16.41	16.34	16.42	16.14
TiO2	0.042	0	0.011	1.304	1.306	1.297	1.229
Total	101.246	101.229	101.547	97.451	96.577	96.509	96.648
Comment	Olivine	Olivine	Olivine	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516127	516127	516127	516127	516127	516127	516127
No.	B01	B02	B03	B04	B05	B06	B07
SiO2	40.31	39.89	0.02	0.089	0.027	54.36	55.4
FeO	13.72	13.65	17.91	16.59	17.45	10.76	9.79
K2O	0	0.013	0	0.02	0.002	0.015	0.002
NiO	0.206	0.214	0.296	0.288	0.298	0.047	0.053
Na2O	0.009	0	0.011	0	0.013	0	0.003
Al2O3	0.026	0.015	58.99	60.01	58.71	3.54	1.811
MnO	0.38	0.32	0.162	0.208	0.37	0.389	0.342
CaO	0.008	0	0.013	0.007	0.01	0.523	0.143
Cr2O3	0.03	0	4.08	4.16	4.28	0.044	0.029
MgO	46.49	46.39	17.64	18.44	17.98	30.65	31.86
TiO2	0	0	0	0.055	0	0.12	0.03
Total	101.179	100.492	99.121	99.868	99.14	100.449	99.464
Comment	Olivine	Olivine	Spinel	Spinel	Spinel	Enstatite	Enstatite
Sample	516127	516127	516127	516127	516127	516127	516127
No.	B08	B09	B10	B11	B12	B13	B14
SiO2	54.69	54.37	42.27	42.49	42.45	42.49	0
FeO	9.59	10.16	6.61	6.65	6.66	6.86	18.03
K2O	0	0.01	0.604	0.692	0.771	0.75	0.014
NiO	0.031	0.007	0.042	0.076	0.076	0.074	0.247
Na2O	0.008	0.005	2.59	2.58	2.57	2.57	0.038
Al2O3	2.89	3.03	13.87	13.97	13.66	13.41	58.3
MnO	0.345	0.353	0.129	0.066	0.14	0.084	0.282
CaO	0.323	0.356	12.32	12.31	12.35	12.46	0.022
Cr2O3	0.061	0.107	0.198	0.223	0.208	0.26	4.17
MgO	31.76	30.74	16.49	16.4	16.65	16.28	17.86
TiO2	0.073	0.128	1.297	1.276	1.262	1.295	0.015
Total	99.77	99.266	96.42	96.733	96.797	96.534	98.978
Comment	Enstatite	Enstatite	Hornblende	Hornblende	Hornblende	Hornblende	Spinel

Sample	516127	516127	516127	516127	516127	516127	516127
No.	B15	B16	B17	B18	B19	B20	B21
SiO2	0	0.02	0.039	42.24	41.76	42.38	42.34
FeO	16.48	17.06	18.46	6.76	6.97	6.08	6.2
K2O	0.009	0	0	0.729	0.77	0.791	0.81
NiO	0.236	0.179	0.244	0.056	0.021	0.055	0.11
Na2O	0	0.009	0	2.67	2.61	2.52	2.53
Al2O3	59.62	59.72	59.13	14.1	13.36	14.4	14.68
MnO	0.272	0.236	0.226	0.113	0.15	0.076	0.153
CaO	0.015	0	0	12.39	12.17	12.36	12.55
Cr2O3	3.91	4.17	4.04	0.285	0.213	0.296	0.276
MgO	18.27	18.08	17.88	16.36	16.5	16.33	16.33
TiO2	0.014	0	0	1.328	1.371	1.48	1.313
Total	98.826	99.475	100.018	97.032	95.895	96.769	97.292
Comment	Spinel	Spinel	Spinel	Hornblende	Discarded	Hornblende	Hornblende
Sample	516127	516127	516127	516127	516127	516127	516127
No.	B22	B23	B24	B25	B26	B27	B28
SiO2	41.53	41.7	42.24	41.86	53.7	53.91	49.13
FeO	6.91	6.52	7.08	6.57	10.77	10.69	10.84
K2O	0.676	0.614	0.681	0.685	0.002	0.002	0
NiO	0.049	0.073	0.075	0.061	0.017	0.038	0.015
Na2O	2.67	2.68	2.63	2.55	0.027	0.014	0
Al2O3	14.07	14.33	14.22	13.91	3.64	3.25	2.18
MnO	0.066	0.147	0.097	0.2	0.402	0.334	0.412
CaO	12.08	12.57	12.35	12.28	0.464	0.345	0.17
Cr2O3	0.25	0.226	0.25	0.268	0.099	0.079	0.046
MgO	16.31	15.97	16.37	16.12	30.64	30.73	29.96
TiO2	1.211	1.316	1.15	1.238	0.076	0.044	0.049
Total	95.822	96.147	97.143	95.743	99.838	99.437	92.803
Comment	Discarded	Hornblende	Hornblende	Discarded	Enstatite	Enstatite	Discarded
Sample	516127	516127	516127	516127	516127	516127	516127
No.	B29	B30	B31	B32	B33	B34	B35
SiO2	53.62	39.23	39.38	39.75	0	0	0
FeO	10.86	13.5	14.09	13.95	18.42	18.98	19
K2O	0.01	0	0	0.006	0.009	0	0.004
NiO	0.075	0.243	0.246	0.244	0.323	0.345	0.319
Na2O	0.015	0.01	0	0	0.001	0	0.006
Al2O3	3.74	0.019	0.024	0.003	59.32	58.62	59.67
MnO	0.308	0.337	0.314	0.327	0.269	0.159	0.282
CaO	0.535	0.026	0.004	0.011	0.003	0.017	0
Cr2O3	0.068	0	0	0	3.9	4.03	4.1

MgO	30.46	46.4	45.8	45.62	18.07	17.19	17.78
TiO2	0.116	0.005	0.052	0.002	0.008	0.065	0.008
Total	99.807	99.77	99.91	99.912	100.323	99.407	101.169
Comment	Enstatite	Olivine	Olivine	Olivine	Spinel	Spinel	Spinel
Sample	516127	516127	516127	516127	516127	516127	516127
No.	B36	B37	B38	B39	B40	B41	B42
SiO2	52.91	54.02	52.34	55.83	39.86	39.61	39.29
FeO	10.75	10.63	10.2	9.91	13.97	13.28	13.77
K2O	0.009	0	0.019	0.013	0	0.018	0.018
NiO	0.016	0.034	0.027	0.007	0.206	0.187	0.223
Na2O	0.028	0	0	0	0	0	0
Al2O3	3.65	3.3	5.91	1.684	0.028	0.09	0
MnO	0.37	0.342	0.389	0.363	0.322	0.359	0.33
CaO	0.407	0.342	0.156	0.154	0	0.021	0.007
Cr2O3	0.056	0.061	0.177	0.078	0	0.01	0.01
MgO	30.49	30.96	30.91	31.54	46.32	45.84	44.64
TiO2	0.043	0.098	0.06	0	0.038	0	0
Total	98.729	99.787	100.188	99.579	100.744	99.414	98.287
Comment	Discarded	Enstatite	Enstatite	Enstatite	Olivine	Olivine	Olivine
Sample	516127	516127	516127	516127	516127	516127	516127
No.	B43	B44	B45	B46	B47	B48	B49
SiO2	50.65	50.38	54.18	55.21	53.51	54.15	54.07
FeO	4.14	4.23	9.77	10.07	10.92	10.65	11
K2O	0	0.017	0	0.008	0	0	0.009
NiO	0.038	0	0.047	0	0.057	0.05	0.047
Na2O	0.26	0.298	0	0	0.014	0.019	0.014
Al2O3	4.35	4.48	2.7	2.29	3.72	3.61	3.54
MnO	0.17	0.156	0.461	0.374	0.397	0.355	0.368
CaO	23.63	24.04	0.293	0.19	0.51	0.487	0.433
Cr2O3	0.17	0.1	0.05	0.041	0.077	0.077	0.086
MgO	15.08	14.74	31.94	31.81	30.82	30.57	30.77
TiO2	0.359	0.41	0.089	0.038	0.112	0.027	0.085
Total	98.846	98.851	99.529	100.03	100.139	99.996	100.422
Comment	Discarded	Discarded	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516127	516137	516137	516137	516137	516137	516137
No.	B50	A01	A02	A03	A04	A05	A06
SiO2	53.45	42.43	42.67	41.3	42.17	42.92	42.19
FeO	10.9	7.48	6.9	7.02	6.93	6.88	7.02
K2O	0.004	0.628	0.557	0.499	0.641	0.588	0.666
NiO	0.059	0.013	0	0.051	0	0.012	0
Na2O	0.001	2.8	2.84	2.58	2.8	2.83	2.84

Al2O3	3.39	13.72	13.73	12.68	13.85	13.71	13.78
MnO	0.447	0.087	0.024	0.01	0.1	0.055	0.071
CaO	0.414	12.09	12.09	11.17	12.31	12.14	12.3
Cr2O3	0.092	0.566	0.368	0.426	0.515	0.466	0.401
MgO	30.69	16.15	16.78	17.48	16.37	16.28	16.1
TiO2	0.146	1.113	1.02	1.004	0.973	1.087	0.916
Total	99.592	97.076	96.978	94.221	96.659	96.969	96.285
Comment	Enstatite	Hornblende	Hornblende	Discarded	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A07	A08	A09	A10	A11	A12	A13
SiO2	43.21	42.33	53.67	54.32	54.24	55.02	54.53
FeO	6.2	7.09	11.32	11.58	11.62	11.6	11.58
K2O	0.546	0.646	0	0.004	0	0.007	0.013
NiO	0.051	0	0.022	0	0	0	0.01
Na2O	2.47	2.78	0.005	0.044	0.001	0.022	0.021
Al2O3	13.49	13.87	2.63	2.86	2.45	2.29	2.49
MnO	0.082	0.04	0.299	0.328	0.205	0.268	0.268
CaO	12.37	11.97	0.462	0.493	0.422	0.308	0.408
Cr2O3	0.465	0.444	0.14	0.147	0.09	0.119	0.142
MgO	16.56	16.22	29.92	29.93	30.34	30.8	30.2
TiO2	0.887	1.131	0.098	0.076	0.036	0.06	0.038
Total	96.331	96.52	98.567	99.782	99.405	100.494	99.7
Comment	Hornblende	Hornblende	Discarded	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A14	A15	A16	A17	A18	A19	A1S01
SiO2	54.81	55.84	55.39	42.09	42.75	41.94	39.66
FeO	11.23	11.18	11.62	7.42	7.12	7.12	15.39
K2O	0.012	0.01	0	0.643	0.648	0.479	0
NiO	0	0.045	0	0	0.015	0.029	0.089
Na2O	0.03	0.009	0.011	2.85	2.76	2.92	0.006
Al2O3	2.56	1.3	2.21	13.71	13.69	14.11	0.045
MnO	0.281	0.323	0.318	0.042	0.066	0.103	0.287
CaO	0.346	0.223	0.338	12.13	12.13	12.16	0
Cr2O3	0.144	0.088	0.099	0.609	0.536	0.339	0
MgO	30.27	31.21	30.58	16.28	16.33	16.07	44.44
TiO2	0.043	0.059	0.028	0.934	1.105	0.972	0.014
Total	99.726	100.287	100.594	96.709	97.15	96.242	99.931
Comment	Enstatite	Enstatite	Enstatite	Hornblende	Hornblende	Hornblende	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A1S02	A1S03	A1S04	A1S05	A1S06	A1S07	A1S08
SiO2	39.86	39.65	39.23	39.47	39.59	39.8	40.24

FeO	15.83	15.62	15.77	15.5	15.54	15.62	15.9
K2O	0.006	0.006	0.006	0	0.009	0.014	0
NiO	0.037	0.033	0.032	0.064	0.068	0.052	0.035
Na2O	0.001	0.031	0	0.015	0.015	0.015	0.011
Al2O3	0.012	0	0.011	0.055	0	0	0.045
MnO	0.224	0.216	0.245	0.204	0.237	0.193	0.086
CaO	0	0.002	0	0	0	0.025	0.002
Cr2O3	0	0.011	0.009	0.001	0	0	0.037
MgO	45.07	44.9	44.97	44.92	45.46	45.39	47.69
TiO2	0.047	0.033	0.02	0.016	0	0	0
Total	101.087	100.502	100.294	100.243	100.92	101.109	104.046
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A1S09	A1S10	A1S11	A1S12	A1S13	A1S14	A1S15
SiO2	35.8	39.34	39.2	38.86	39.24	39.77	39.77
FeO	14.93	16.03	15.86	15.68	15.99	15.79	16.21
K2O	0.018	0	0.009	0	0	0.001	0.009
NiO	0.031	0.003	0.076	0.018	0.044	0.072	0.027
Na2O	0.073	0	0.012	0.001	0	0.012	0.01
Al2O3	0.31	0	0.03	0	0.004	0	0.019
MnO	0.206	0.269	0.211	0.243	0.167	0.248	0.206
CaO	0.04	0	0.02	0	0.007	0.006	0.006
Cr2O3	0.019	0	0.014	0	0.009	0.037	0.028
MgO	46.52	45.03	44.8	44.23	44.94	44.91	45.08
TiO2	0.019	0	0.025	0.066	0	0.027	0.008
Total	97.967	100.672	100.258	99.097	100.4	100.873	101.373
Comment	Discarded	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A1S16	A1S17	A1S18	A1S19	A1S20	A1S21	A1S22
SiO2	39.32	39.64	39.55	39.99	40.03	39.08	39.7
FeO	15.65	16.08	15.95	16	15.85	15.93	16.11
K2O	0.002	0.001	0	0.013	0	0	0.009
NiO	0.03	0.071	0.037	0.061	0.049	0.043	0
Na2O	0.018	0.002	0	0.019	0	0	0.009
Al2O3	0.009	0.025	0.024	0.143	0.062	0.038	0.011
MnO	0.358	0.237	0.276	0.227	0.248	0.216	0.266
CaO	0.012	0.009	0	0.015	0	0.023	0.013
Cr2O3	0	0.008	0.006	0	0.011	0.031	0
MgO	44.52	44.72	44.59	48.85	46.29	43.89	44.78
TiO2	0	0.008	0.031	0	0	0.005	0
Total	99.918	100.802	100.464	105.317	102.54	99.255	100.898

Comment	Olivine	Olivine	Olivine	Discarded	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A1S23	A1S24	A1S25	A20	A21	A22	A23
SiO2	39.53	39.03	39.32	43.57	54.11	54.63	55.02
FeO	14.15	15.9	16.18	6.89	11.98	11.24	11.99
K2O	0	0.01	0	0.544	0	0	0.008
NiO	0.039	0.038	0.052	0	0	0.026	0.042
Na2O	0	0.017	0.029	2.78	0.015	0.016	0
Al2O3	0.066	0.049	0	12.85	2.54	2.47	2.4
MnO	0.225	0.287	0.263	0.034	0.362	0.223	0.228
CaO	0	0	0	12.26	0.48	0.387	0.258
Cr2O3	0	0.016	0	0.315	0.163	0.12	0.11
MgO	44.73	44.52	44.76	16.81	30.15	30.33	30.18
TiO2	0.028	0.008	0	0.956	0.017	0.068	0.052
Total	98.769	99.875	100.603	97.009	99.818	99.51	100.288
Comment	Olivine	Olivine	Olivine	Hornblende	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A24	A25	A26	A27	A28	A29	A2S01
SiO2	54.76	0	0	0.014	0.038	0	41.22
FeO	11.29	21.25	21.52	20.55	23.92	21.7	15.45
K2O	0	0	0.001	0.01	0	0	0
NiO	0.018	0.002	0	0.012	0.005	0.034	0.099
Na2O	0.035	0.058	0.07	0.053	0.083	0.068	0.001
Al2O3	2	52.83	52.11	51.96	49.35	51.2	0.025
MnO	0.242	0.185	0.193	0.256	0.225	0.306	0.305
CaO	0.31	0.015	0.016	0	0.003	0.002	0.005
Cr2O3	0.109	10.25	10.38	11.8	12.66	12.5	0
MgO	30.78	14.71	14.11	14.63	12.98	14.25	45.52
TiO2	0.025	0.064	0	0	0.034	0	0.016
Total	99.569	99.365	98.399	99.285	99.297	100.06	102.642
Comment	Enstatite	Spinel	Spinel	Spinel	Spinel	Spinel	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A2S02	A2S03	A2S04	A2S05	A2S06	A2S07	A2S08
SiO2	40.11	39.77	39.97	39.29	39.51	39.93	39.28
FeO	15.18	15.62	15.78	16.46	16.21	16.14	15.73
K2O	0.017	0	0.002	0.017	0.008	0.005	0
NiO	0.101	0.023	0.051	0.034	0.047	0.091	0.073
Na2O	0	0.012	0	0.024	0.007	0	0
Al2O3	0	0	0.013	0	0	0.03	0.05
MnO	0.237	0.222	0.188	0.25	0.326	0.308	0.266
CaO	0	0.024	0.005	0.006	0.01	0.01	0.011

Cr2O3	0	0.016	0.004	0.008	0	0.001	0.008
MgO	45.09	44.88	44.92	45	45.23	44.58	48.12
TiO2	0.014	0.014	0	0	0.006	0	0.013
Total	100.75	100.582	100.933	101.089	101.355	101.094	103.55
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A2S09	A2S10	A2S11	A2S12	A2S13	A2S14	A2S15
SiO2	35.05	41.4	40	39.74	39.62	39.86	39.2
FeO	4.49	7.53	15.99	16.2	15.97	15.96	15.82
K2O	0	0.031	0.017	0	0.012	0.003	0
NiO	0.002	0.021	0.071	0.038	0	0.046	0.034
Na2O	0.024	0.008	0.016	0.015	0	0.014	0
Al2O3	0.041	0.152	0	0.009	0.055	0.017	0.003
MnO	0.024	0.111	0.295	0.245	0.216	0.229	0.214
CaO	0.027	0.02	0.005	0.015	0.015	0.015	0
Cr2O3	0.007	0.007	0	0.011	0	0.023	0.008
MgO	38.58	38.9	44.57	44.77	44.78	44.74	44.63
TiO2	0	0	0	0	0.019	0	0
Total	78.245	88.179	100.964	101.043	100.687	100.908	99.908
Comment	Discarded	Discarded	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A2S16	A2S17	A2S18	A2S19	A2S20	A2S21	A2S22
SiO2	39.34	39.31	39.75	39.29	29.89	32.68	40.19
FeO	15.87	15.62	16.15	15.93	16.33	13.92	16.03
K2O	0	0	0.013	0.008	0.06	0.042	0.014
NiO	0.048	0.067	0.038	0.007	0.051	0.102	0.049
Na2O	0.005	0.024	0	0.022	0.024	0.082	0.035
Al2O3	0.006	0.028	0.053	0.041	0.882	1.69	0.151
MnO	0.224	0.209	0.313	0.216	0.266	0.205	0.253
CaO	0.006	0.005	0.023	0.004	0.005	0.055	0.041
Cr2O3	0	0.046	0	0.053	0.007	0.025	0
MgO	44.77	44.68	44.87	44.96	22.95	28.39	39.6
TiO2	0.002	0	0	0	0.052	0.071	0.036
Total	100.27	99.99	101.21	100.532	70.518	77.264	96.399
Comment	Olivine	Olivine	Olivine	Olivine	Discarded	Discarded	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A2S23	A2S24	A2S25	A30	A3S01	A3S02	A3S03
SiO2	39.65	39.69	24.59	0	42.03	40.45	39.73
FeO	16.11	16.04	15.09	25.33	15.57	15.95	16.07
K2O	0.024	0	0.025	0.022	0.005	0	0
NiO	0.051	0.039	0.012	0.034	0.004	0.031	0.018

Na2O	0	0.007	0.017	0.048	0	0.02	0.03
Al2O3	0	0.001	1.024	46.88	0.021	0	0.008
MnO	0.279	0.253	0.241	0.227	0.253	0.227	0.237
CaO	0.017	0.002	0.037	0.041	0	0	0.01
Cr2O3	0.022	0.029	0.013	13.15	0.076	0.091	0.071
MgO	44.76	44.63	34.65	12.15	44.84	44.9	44.95
TiO2	0	0	0.074	0.009	0.019	0.009	0
Total	100.913	100.69	75.774	97.891	102.817	101.678	101.124
Comment	Olivine	Olivine	Discarded	Discarded	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A3S04	A3S05	A3S06	A3S07	A3S08	A3S09	A3S10
SiO2	39.42	40.02	40.37	39.57	39.54	39.54	39.93
FeO	16.04	16.3	15.65	15.62	15.95	15.71	15.37
K2O	0	0.02	0.008	0	0.007	0	0.002
NiO	0.069	0.036	0.027	0.029	0.061	0.074	0.035
Na2O	0	0	0.002	0.019	0	0.024	0.031
Al2O3	0	0.002	0	0.017	0	0.011	0.023
MnO	0.245	0.3	0.331	0.303	0.235	0.305	0.198
CaO	0.026	0	0.019	0.005	0	0.01	0
Cr2O3	0.025	0.024	0.026	0.027	0.001	0.013	0
MgO	44.62	44.43	43.79	45.83	45.29	44.86	44.9
TiO2	0	0	0	0	0.02	0	0.013
Total	100.445	101.13	100.222	101.419	101.104	100.548	100.503
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A3S11	A3S12	A3S13	A3S14	A3S15	A3S16	A3S17
SiO2	39.45	39.61	39.29	39.63	39.97	39.62	39.62
FeO	16.13	15.87	15.66	15.98	15.99	16.25	15.91
K2O	0	0	0	0.012	0	0.017	0
NiO	0.071	0.052	0.05	0.036	0.05	0.036	0.047
Na2O	0	0	0	0.004	0.011	0	0
Al2O3	0	0.014	0.017	0	0.005	0.024	0.005
MnO	0.274	0.282	0.235	0.274	0.269	0.248	0.292
CaO	0	0.022	0.013	0.013	0.026	0.003	0.013
Cr2O3	0	0.033	0	0.003	0	0.015	0.009
MgO	45.16	45.05	44.96	45.2	45.23	44.91	44.81
TiO2	0.016	0.006	0	0	0.041	0	0.02
Total	101.1	100.939	100.225	101.152	101.591	101.122	100.727
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A3S18	A3S19	A3S20	A3S21	A3S22	A3S23	A3S24

SiO2	39.47	39.8	39.4	39.68	39.62	39.28	33.24
FeO	15.94	15.9	15.55	16.12	15.79	15.9	12.72
K2O	0	0.014	0.008	0	0.013	0.021	0
NiO	0.021	0.013	0.087	0.057	0.049	0.009	0.076
Na2O	0	0.019	0.009	0.01	0.02	0.003	0.019
Al2O3	0	0	0	0	0.028	0	0.97
MnO	0.245	0.232	0.24	0.276	0.211	0.245	0.195
CaO	0	0.009	0.015	0.001	0.018	0.01	0.036
Cr2O3	0.027	0	0	0.02	0.034	0	0.024
MgO	44.93	44.58	44.7	44.52	44.66	44.48	27.9
TiO2	0.03	0	0.005	0	0.031	0.042	0.006
Total	100.663	100.567	100.013	100.684	100.474	99.99	75.186
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A3S25	A5S01	A5S02	A5S03	A5S04	A5S05	A5S06
SiO2	42	42.62	42.55	42.29	42.77	42.31	42.8
FeO	3.87	6.67	6.81	6.72	6.79	7.08	7.05
K2O	0.008	0.624	0.587	0.619	0.588	0.645	0.617
NiO	0.018	0.022	0.003	0	0.002	0	0.039
Na2O	0	2.78	2.78	2.78	2.83	2.85	2.79
Al2O3	0.148	13.9	13.92	14.17	13.78	13.65	13.7
MnO	0.053	0.031	0.076	0.097	0.131	0.068	0.068
CaO	0.027	12.26	12.22	12.35	12.19	12.25	12.16
Cr2O3	0.005	0.581	0.562	0.555	0.596	0.568	0.597
MgO	39.28	16.36	16.48	16.73	16.64	16.59	16.44
TiO2	0	1.059	1.054	1.095	1.016	1.104	1.043
Total	85.409	96.907	97.042	97.406	97.334	97.115	97.304
Comment	Discarded	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A5S07	A5S08	A5S09	A5S10	A5S11	A5S12	A5S13
SiO2	42.55	42.62	42.57	42.92	36.46	42.81	42.2
FeO	6.97	7.18	6.85	6.86	12.96	6.9	6.75
K2O	0.62	0.593	0.619	0.613	0.496	0.632	0.593
NiO	0.015	0.024	0.021	0.029	0	0.002	0.024
Na2O	2.39	2.88	2.73	2.77	1.79	2.77	2.86
Al2O3	13.7	13.94	13.63	14.13	10.79	13.7	13.99
MnO	0.105	0.118	0.123	0.108	0.023	0.081	0.024
CaO	12.18	12.27	12.23	12.22	9.53	12.23	12.17
Cr2O3	0.559	0.585	0.53	0.566	0.487	0.489	0.558
MgO	16.59	16.7	16.52	16.65	15.29	16.46	16.6
TiO2	1.026	1.077	1.036	1.031	0.844	1.036	1.05

Total	96.706	97.987	96.859	97.897	88.67	97.11	96.818
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Discarded	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A5S14	A5S15	A5S16	A5S17	A5S18	A5S19	A5S20
SiO2	42.46	42.64	42.94	42.05	42.71	42.12	42.94
FeO	7.21	6.79	7.05	7.03	6.83	6.81	6.91
K2O	0.575	0.591	0.565	0.604	0.634	0.63	0.53
NiO	0.008	0.002	0.019	0.018	0.019	0.022	0
Na2O	2.83	2.86	2.84	2.81	2.82	2.86	2.78
Al2O3	13.84	13.75	13.88	13.76	13.71	13.64	13.6
MnO	0.092	0.013	0.089	0.055	0.116	0.081	0.073
CaO	12.14	12.22	12.16	12.16	12.09	12.18	12.16
Cr2O3	0.579	0.529	0.57	0.558	0.562	0.54	0.551
MgO	16.48	16.55	16.54	16.59	16.6	16.58	16.65
TiO2	1.014	1.035	0.965	0.945	1.024	1.066	1.083
Total	97.227	96.98	97.618	96.58	97.114	96.528	97.277
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A5S21	A5S22	A5S23	A5S24	A5S25	A6S01	A6S02
SiO2	41.98	42.66	42.8	42.77	42.77	42.98	42.58
FeO	6.85	6.98	7.21	7.02	7.19	7.53	7.27
K2O	0.573	0.6	0.573	0.572	0.597	0.639	0.627
NiO	0	0.004	0	0	0.032	0.045	0.043
Na2O	2.84	2.85	2.84	2.84	2.87	2.83	2.81
Al2O3	13.69	13.74	13.35	13.69	13.76	13.87	13.81
MnO	0.105	0.06	0.152	0.081	0.068	0.042	0.039
CaO	12.2	12.16	12.42	12.15	12.15	12.03	12.31
Cr2O3	0.545	0.506	0.547	0.511	0.503	0.509	0.54
MgO	16.5	16.64	16.51	16.53	16.63	16.61	16.42
TiO2	0.935	1.038	0.962	0.962	0.959	1.126	1.082
Total	96.218	97.238	97.364	97.126	97.529	98.211	97.532
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A6S03	A6S04	A6S05	A6S06	A6S07	A6S08	A6S09
SiO2	42.32	42.31	42.18	42.31	42.79	42.58	42.54
FeO	7.2	7.35	7.01	7.06	7.25	7.14	7.29
K2O	0.682	0.7	0.612	0.704	0.633	0.592	0.644
NiO	0	0.003	0.019	0	0	0	0.005
Na2O	2.75	2.84	2.84	2.75	2.84	2.88	2.94
Al2O3	13.65	13.83	13.87	13.78	13.8	13.77	13.78
MnO	0.026	0.063	0.163	0.094	0.092	0.079	0.039

CaO	12.42	12.31	12.11	12.09	12.36	12.27	12.1
Cr2O3	0.558	0.537	0.587	0.563	0.534	0.526	0.51
MgO	16.69	16.61	16.49	16.48	16.58	16.58	16.43
TiO2	1.092	1.155	1.162	1.143	1.121	1.124	1.126
Total	97.387	97.707	97.043	96.974	98	97.542	97.404
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A6S10	A6S11	A6S12	A6S13	A6S14	A6S15	A6S16
SiO2	42.3	42.52	42.62	41.17	42.78	42.27	42.73
FeO	7.35	7.17	6.9	9.81	7.12	7.03	6.94
K2O	0.659	0.615	0.623	0.539	0.644	0.673	0.647
NiO	0.033	0	0	0.166	0.026	0.026	0.022
Na2O	2.9	2.89	2.75	2.07	2.88	2.7	2.79
Al2O3	13.75	13.89	13.63	10.81	13.49	13.6	13.94
MnO	0.087	0.092	0.073	0.131	0.105	0.029	0.087
CaO	12.15	12.28	12.16	9.53	12.3	12.16	12.36
Cr2O3	0.508	0.501	0.533	0.373	0.449	0.53	0.51
MgO	16.59	16.71	16.49	17.2	16.78	16.57	16.63
TiO2	1.115	1.12	1.119	0.849	1.046	1.031	1.17
Total	97.442	97.788	96.899	92.648	97.621	96.619	97.826
Comment	Hornblende	Hornblende	Hornblende	Discarded	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A6S17	A6S18	A6S19	A6S20	A6S21	A6S22	A6S23
SiO2	42.54	42.81	42.02	42.6	42.51	42.65	42.32
FeO	7.12	7.25	6.86	7.22	7.06	7.05	6.82
K2O	0.688	0.67	0.654	0.642	0.619	0.569	0.555
NiO	0	0.041	0.018	0.008	0.043	0.018	0.03
Na2O	2.73	2.93	2.84	2.87	2.81	2.81	2.79
Al2O3	13.58	13.78	13.65	13.61	13.77	13.7	14.03
MnO	0.06	0.081	0.055	0.076	0.094	0.087	0.055
CaO	12.37	12.17	12.2	12.21	12.26	12.36	12.17
Cr2O3	0.557	0.55	0.511	0.516	0.519	0.465	0.414
MgO	16.49	16.76	16.6	16.68	16.54	16.71	16.74
TiO2	0.988	0.982	1.044	1.104	0.995	1.016	0.924
Total	97.123	98.025	96.452	97.537	97.221	97.435	96.848
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A6S24	A6S25	A7S01	A7S02	A7S03	A7S04	A7S05
SiO2	42.91	7.98	54.87	54.61	54.45	54.53	54.87
FeO	6.81	77.87	11.14	11.71	11.44	11.24	11.78
K2O	0.543	0.019	0.009	0	0.006	0.009	0

NiO	0.051	0.182	0.016	0	0.007	0.014	0.02
Na2O	2.96	0.392	0	0.022	0	0	0.004
Al2O3	13.83	1.453	2.64	2.76	2.53	2.52	2.57
MnO	0.066	0.217	0.27	0.34	0.217	0.327	0.309
CaO	12.29	1.316	0.401	0.41	0.417	0.388	0.372
Cr2O3	0.418	0.12	0.137	0.143	0.125	0.125	0.132
MgO	16.73	5.31	30.66	30.95	30.64	30.88	30.75
TiO2	0.968	0.117	0.041	0.05	0.101	0.058	0.064
Total	97.575	94.977	100.184	100.996	99.933	100.092	100.871
Comment	Hornblende	Discarded	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A7S06	A7S07	A7S08	A7S09	A7S10	A7S11	A7S12
SiO2	54.79	54.31	54.45	54.62	54.29	54.62	54.43
FeO	11.26	10.85	11.4	11.54	11.44	11.47	11.2
K2O	0	0.004	0.01	0	0.032	0	0.015
NiO	0.017	0.018	0.004	0	0.033	0	0
Na2O	0	0	0	0.017	0.011	0.018	0.005
Al2O3	2.41	2.58	2.51	2.51	2.57	2.49	2.48
MnO	0.241	0.278	0.314	0.288	0.264	0.228	0.235
CaO	0.396	0.388	0.392	0.399	0.417	0.431	0.368
Cr2O3	0.136	0.155	0.124	0.166	0.153	0.11	0.102
MgO	30.55	30.93	30.91	30.99	30.6	30.75	30.63
TiO2	0.002	0.062	0.069	0.055	0.08	0.055	0.05
Total	99.801	99.574	100.185	100.585	99.891	100.172	99.517
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A7S13	A7S14	A7S15	A7S16	A7S17	A7S18	A7S19
SiO2	54.73	54.65	54.88	54.3	54.38	53.74	55.76
FeO	11.36	11.37	11.44	11.44	11.14	11.33	11.55
K2O	0	0	0.009	0	0	0.022	0.005
NiO	0	0	0.013	0.02	0	0.025	0
Na2O	0.013	0	0.006	0.036	0.036	0.026	0.018
Al2O3	2.61	2.55	2.56	2.7	2.46	2.89	2.75
MnO	0.262	0.272	0.257	0.299	0.327	0.303	0.311
CaO	0.384	0.386	0.388	0.429	0.37	0.371	0.414
Cr2O3	0.121	0.144	0.091	0.13	0.124	0.086	0.11
MgO	30.94	30.78	30.74	30.81	30.88	30.52	31.84
TiO2	0.096	0.054	0.083	0.06	0.002	0	0.024
Total	100.516	100.205	100.467	100.223	99.719	99.315	102.782
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137

No.	A7S20	A7S21	A7S22	A7S23	A7S24	A7S25	A8S01
SiO2	54.83	54.88	54.75	55.09	55.4	53.5	55.23
FeO	11.39	11.32	11.54	11.64	11.81	12.6	11.34
K2O	0	0.001	0.009	0	0.01	0.006	0
NiO	0	0	0.032	0.02	0	0.025	0.023
Na2O	0.021	0	0.024	0.015	0.024	0.024	0
Al2O3	2.37	2.25	2.21	2.3	2.04	1.515	2.04
MnO	0.298	0.262	0.243	0.277	0.335	0.235	0.299
CaO	0.343	0.395	0.371	0.32	0.282	0.163	0.241
Cr2O3	0.144	0.118	0.132	0.065	0.108	0.018	0.176
MgO	30.87	31.1	31.2	30.98	31.41	31.88	31.81
TiO2	0	0	0.068	0.038	0.03	0.024	0.06
Total	100.266	100.326	100.581	100.745	101.449	99.991	101.219
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A8S02	A8S03	A8S04	A8S05	A8S06	A8S07	A8S08
SiO2	55.29	55.5	55.14	54.67	55.11	53.27	54.76
FeO	11.41	11.6	11.34	11.71	11.47	11.34	11.26
K2O	0	0.012	0.004	0	0	0.015	0
NiO	0	0.039	0.018	0	0	0.031	0
Na2O	0.017	0.02	0.017	0	0	0.031	0.009
Al2O3	2.18	2.26	2.29	2.44	2.4	2.43	2.67
MnO	0.28	0.28	0.23	0.329	0.288	0.29	0.246
CaO	0.307	0.329	0.35	0.366	0.385	0.45	0.448
Cr2O3	0.217	0.176	0.151	0.182	0.122	0.136	0.122
MgO	31.68	31.47	31.59	31.41	31.11	30.22	31.12
TiO2	0.033	0.002	0.076	0.044	0.085	0.061	0.033
Total	101.413	101.687	101.206	101.152	100.969	98.274	100.669
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Discarded	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A8S09	A8S10	A8S11	A8S12	A8S13	A8S14	A8S15
SiO2	54.62	29.74	54.85	55.13	55.32	40.25	51.56
FeO	11.31	8.55	11.36	11.35	10.68	8.45	10.97
K2O	0.012	0.201	0.013	0	0.221	0.147	0.01
NiO	0	0.049	0.019	0	0	0.067	0.021
Na2O	0.012	2.71	0.025	0.019	0.082	0.338	0.094
Al2O3	2.6	20.43	2.62	2.6	5.88	7.61	2.62
MnO	0.236	0.208	0.296	0.199	0.241	0.245	0.303
CaO	0.421	0.394	0.448	0.433	0.443	0.48	0.449
Cr2O3	0.123	0.177	0.154	0.155	0.131	0.136	0.149
MgO	31.53	17	30.94	31.27	31.63	8.1	27.67

TiO2	0.057	0.038	0.106	0.085	0.011	0.069	0.097
Total	100.921	79.497	100.831	101.241	104.638	65.893	93.945
Comment	Enstatite	Discarded	Enstatite	Enstatite	Discarded	Discarded	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A8S16	A8S17	A8S18	A8S19	A8S20	A8S21	A8S22
SiO2	53.12	54.59	54.26	55.05	53.57	54.76	55.02
FeO	10.86	11.38	11.61	11.33	11.33	11.28	11.35
K2O	0.014	0.001	0	0.022	0.002	0.008	0
NiO	0	0.005	0	0.032	0.029	0.03	0
Na2O	0.026	0	0.024	0.018	0.033	0.015	0.006
Al2O3	4.23	2.71	2.54	2.64	2.61	2.67	2.6
MnO	0.217	0.254	0.272	0.165	0.298	0.29	0.228
CaO	0.472	0.451	0.456	0.49	0.516	0.492	0.422
Cr2O3	0.127	0.143	0.129	0.158	0.129	0.154	0.147
MgO	27.5	30.95	30.92	31.25	29.91	31.15	30.9
TiO2	0.057	0.017	0.055	0.033	0.054	0.088	0.054
Total	96.623	100.501	100.267	101.188	98.481	100.938	100.726
Comment	Discarded	Enstatite	Enstatite	Enstatite	Discarded	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A8S23	A8S24	A8S25	A9S01	A9S02	A9S03	A9S04
SiO2	54.42	54.32	54.92	39.19	39.93	39.51	39.25
FeO	11.16	11.76	11.37	16.14	16.37	15.74	16.12
K2O	0	0.012	0	0.025	0	0.015	0.015
NiO	0.004	0.004	0.009	0.024	0.045	0.046	0.026
Na2O	0	0	0.019	0.03	0	0	0
Al2O3	2.57	2.64	2.55	0.034	0.01	0.044	0
MnO	0.384	0.329	0.314	0.273	0.281	0.278	0.231
CaO	0.466	0.499	0.495	0.01	0	0	0.011
Cr2O3	0.142	0.179	0.142	0.017	0.001	0.004	0
MgO	30.94	30.84	30.76	45.58	45.41	45.39	45.6
TiO2	0.036	0.108	0.043	0.005	0.011	0.003	0.051
Total	100.123	100.691	100.622	101.328	102.058	101.029	101.305
Comment	Enstatite	Enstatite	Enstatite	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A9S05	A9S06	A9S07	A9S08	A9S09	A9S10	A9S11
SiO2	39.54	39.68	39.96	39.75	39.83	39.74	39.99
FeO	15.58	16.03	15.6	15.71	16.32	15.66	16
K2O	0	0.008	0	0.017	0.002	0	0.01
NiO	0.029	0.059	0.036	0.003	0.036	0.036	0.02
Na2O	0	0.018	0.022	0	0.001	0	0
Al2O3	0.013	0.015	0.003	0	0.04	0	0

MnO	0.232	0.265	0.273	0.245	0.205	0.234	0.213
CaO	0.012	0.012	0.001	0	0.008	0.026	0.012
Cr2O3	0	0.006	0	0.019	0.006	0	0
MgO	45.24	45.6	45.59	45.4	45.26	45.45	45.28
TiO2	0	0.028	0	0	0	0	0
Total	100.646	101.721	101.486	101.144	101.709	101.146	101.525
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A9S12	A9S13	A9S14	A9S15	A9S16	A9S17	A9S18
SiO2	39.58	39.25	39.7	39.82	40.06	39.66	39.65
FeO	15.72	15.56	15.96	15.49	15.86	16.19	15.81
K2O	0.003	0.023	0.007	0	0	0	0
NiO	0.011	0.036	0.039	0.048	0.004	0.023	0.027
Na2O	0	0	0	0.003	0.013	0.045	0.003
Al2O3	0.044	0.025	0.031	0	0.003	0	0.029
MnO	0.304	0.374	0.203	0.219	0.237	0.208	0.224
CaO	0.002	0.015	0.024	0.009	0.006	0.006	0.018
Cr2O3	0.008	0	0.014	0.008	0	0.023	0.015
MgO	45.78	45.48	45.86	45.25	45.35	45.43	45.51
TiO2	0.02	0	0.008	0.023	0	0.008	0
Total	101.472	100.764	101.846	100.869	101.533	101.592	101.285
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	A9S19	A9S20	A9S21	A9S22	A9S23	A9S24	A9S25
SiO2	39.86	39.63	39.41	39.82	39.41	38.84	40.14
FeO	16.11	15.84	15.8	16.5	15.3	15.72	6.29
K2O	0	0.002	0	0.016	0	0	0.045
NiO	0.001	0.035	0.028	0.039	0.038	0.018	0.038
Na2O	0.027	0	0	0	0	0.029	0.075
Al2O3	0	0	0	0	0.074	0.035	0.091
MnO	0.309	0.198	0.143	0.184	0.278	0.221	0.094
CaO	0.001	0	0.014	0.001	0.013	0.016	0.037
Cr2O3	0	0	0.022	0	0.008	0	0.004
MgO	45.72	45.62	45.38	45.72	45.89	48.2	31.04
TiO2	0	0	0.026	0	0	0	0
Total	102.028	101.325	100.824	102.281	101.011	103.079	77.855
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded	Discarded
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B01	B02	B03	B04	B05	B06	B07
SiO2	55.94	55.26	56.17	55.89	42.9	43.57	42.6
FeO	11.13	11.13	11.01	11.06	6.91	6.93	6.87

K2O	0	0.006	0.006	0	0.611	0.624	0.544
NiO	0.025	0	0	0.023	0.012	0	0
Na2O	0	0	0	0.005	2.87	2.37	2.93
Al2O3	2.36	2.64	1.479	2.42	13.06	13.33	13.52
MnO	0.291	0.291	0.255	0.292	0.042	0.076	0.071
CaO	0.364	0.402	0.197	0.344	12.47	12.14	12.36
Cr2O3	0.108	0.128	0.066	0.124	0.588	0.587	0.572
MgO	31.25	31.05	31.56	30.98	16.66	17.03	16.58
TiO2	0.067	0.047	0.024	0.06	0.858	1.055	1.055
Total	101.535	100.955	100.766	101.199	96.981	97.712	97.102
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B08	B09	B10	B11	B12	B13	B14
SiO2	42.99	55.19	55.7	55.58	55.43	42.78	42.61
FeO	6.8	11.4	10.8	11.92	11.5	7.09	6.72
K2O	0.622	0	0	0	0.006	0.591	0.559
NiO	0.03	0.026	0	0	0.011	0.009	0
Na2O	2.82	0.01	0.038	0.016	0	2.91	2.89
Al2O3	13.59	2.68	2.54	1.95	2.16	13.86	13.72
MnO	0.074	0.341	0.268	0.302	0.254	0.037	0.021
CaO	12.33	0.474	0.482	0.132	0.35	12.35	12.6
Cr2O3	0.597	0.139	0.158	0.15	0.103	0.56	0.519
MgO	16.45	30.73	31.08	31.12	31.12	16.78	16.81
TiO2	1.063	0.06	0.043	0.028	0.046	0.931	1.016
Total	97.366	101.05	101.109	101.198	100.98	97.898	97.464
Comment	Hornblende	Enstatite	Enstatite	Enstatite	Enstatite	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B15	B16	B17	B18	B19	B1S01	B1S02
SiO2	42.63	43.19	0	0.012	0.009	39.78	40.45
FeO	6.67	7.34	23.18	20.12	22.41	15.51	16.62
K2O	0.503	0.581	0	0.009	0	0	0
NiO	0	0.067	0.046	0.02	0.023	0.046	0.015
Na2O	2.86	2.86	0.093	0.076	0.082	0.011	0.012
Al2O3	13.61	13.66	50.88	52.16	50.37	0.029	0.042
MnO	0.052	0.042	0.243	0.221	0.215	0.256	0.307
CaO	12.39	12.33	0.006	0.015	0	0.027	0.013
Cr2O3	0.529	0.572	11.49	11.54	12.06	0	0
MgO	16.54	16.62	14.49	15.1	14.08	45.4	45.59
TiO2	0.958	1.044	0	0.007	0.044	0.016	0
Total	96.743	98.307	100.428	99.28	99.293	101.075	103.05
Comment	Hornblende	Hornblende	Spinel	Spinel	Spinel	Olivine	Discarded

Sample	516137	516137	516137	516137	516137	516137	516137
No.	B1S03	B1S04	B1S05	B1S06	B1S07	B1S08	B1S09
SiO2	41.08	37.89	45.12	40.62	39.95	39.85	40.12
FeO	15.33	14.86	15.55	15.44	15.22	15.11	15.82
K2O	0.024	0	0	0.003	0.012	0	0
NiO	0.051	0.043	0.039	0.026	0.056	0.014	0.018
Na2O	0.001	0.025	0.012	0.015	0.003	0.031	0
Al2O3	0.019	0.189	0.256	0	0.019	0.026	0.051
MnO	0.295	0.266	0.285	0.24	0.216	0.245	0.235
CaO	0.041	0.005	0.002	0.01	0.016	0.011	0.012
Cr2O3	0.004	0.001	0.019	0.012	0.01	0.026	0
MgO	45.5	40.3	46.18	44.85	45.32	45.64	45.8
TiO2	0	0.022	0.009	0	0	0.022	0
Total	102.345	93.601	107.472	101.217	100.823	100.975	102.055
Comment	Olivine	Discarded	Discarded	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B1S10	B1S11	B1S12	B1S13	B1S14	B1S15	B1S16
SiO2	38.32	40.52	41.05	39.51	40.37	39.66	39.91
FeO	13.06	14.52	15.57	15.7	15.15	14.88	15.03
K2O	0.002	0	0.01	0.003	0	0.006	0.002
NiO	0.107	0.027	0.179	0.049	0.004	0.028	0.045
Na2O	0.008	0	0.008	0.017	0.026	0	0
Al2O3	0.084	0.143	0.043	0	0.017	0.042	0
MnO	0.133	0.253	0.269	0.307	0.272	0.266	0.292
CaO	0.018	0	0.011	0.011	0.005	0	0.004
Cr2O3	0.019	0.026	0.023	0.002	0.038	0.015	0
MgO	32.27	31.62	44.22	45.79	45.59	45.53	45.69
TiO2	0	0	0	0.012	0	0.003	0
Total	84.021	87.109	101.383	101.402	101.472	100.43	100.973
Comment	Discarded	Discarded	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B1S17	B1S18	B1S19	B1S20	B1S21	B1S22	B1S23
SiO2	42.47	39.81	41.51	40.61	39.95	39.9	40.03
FeO	15.94	15.05	14.49	15.28	15.13	15.25	15.48
K2O	0	0.012	0	0	0.005	0	0.029
NiO	0.031	0.018	0.054	0	0.069	0.044	0.004
Na2O	0	0	0	0.018	0.017	0.027	0
Al2O3	0.033	0.028	0.446	0.052	0	0	0.015
MnO	0.284	0.24	0.261	0.271	0.204	0.224	0.284
CaO	0.015	0.004	0.009	0.022	0.027	0	0
Cr2O3	0.005	0	0	0	0.027	0.024	0.014

MgO	45.02	47.26	52.29	45.87	45.77	45.74	45.57
TiO2	0.045	0.002	0	0	0.011	0.017	0
Total	103.843	102.423	109.06	102.124	101.21	101.226	101.426
Comment	Discarded	Olivine	Discarded	Olivine	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B1S24	B1S25	B20	B21	B22	B23	B24
SiO2	38.55	38.09	54.84	55.23	55.15	55.35	0
FeO	14.04	6.71	11.61	11.47	11.03	11.56	21.09
K2O	0.002	0	0.016	0.024	0.02	0	0
NiO	0.121	0.302	0.032	0	0.011	0	0.019
Na2O	0	0.01	0.014	0.026	0.012	0.001	0.092
Al2O3	0.071	0.085	2.68	2.42	2.15	2.18	51.05
MnO	0.209	0.084	0.265	0.247	0.299	0.213	0.233
CaO	0.023	0.035	0.457	0.378	0.263	0.367	0.001
Cr2O3	0.029	0.015	0.139	0.101	0.179	0.083	12.5
MgO	43.9	32.99	30.79	31.3	31.31	31.2	14.67
TiO2	0.02	0.03	0.032	0.041	0	0.021	0.006
Total	96.965	78.351	100.876	101.237	100.425	100.973	99.661
Comment	Discarded	Discarded	Enstatite	Enstatite	Enstatite	Enstatite	Spinel
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B25	B26	B27	B28	B29	B2S01	B2S02
SiO2	0.005	0.03	42.37	42.79	42.54	36.61	40.15
FeO	22.64	20.42	6.92	7.1	6.99	15.66	16.06
K2O	0	0	0.569	0.622	0.565	0	0.014
NiO	0.02	0	0.012	0.029	0.046	0.046	0.086
Na2O	0.073	0.069	2.87	2.79	2.78	0	0
Al2O3	50.46	51.81	13.81	13.55	13.68	0.083	0.079
MnO	0.298	0.203	0.113	0.081	0.071	0.227	0.219
CaO	0.011	0	12.23	12.33	12.31	0	0.012
Cr2O3	12.33	12.23	0.524	0.579	0.42	0.016	0
MgO	13.66	15.18	16.52	16.73	16.73	44.01	44.88
TiO2	0.038	0.062	1.115	0.916	0.864	0.008	0.002
Total	99.535	100.005	97.052	97.517	96.996	96.659	101.501
Comment	Spinel	Spinel	Hornblende	Hornblende	Hornblende	Discarded	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B2S03	B2S04	B2S05	B2S06	B2S07	B2S08	B2S09
SiO2	41	41.06	37.49	39.74	39.76	42.58	40.15
FeO	15.81	15.53	15.67	15.47	16.08	15.81	15.58
K2O	0.009	0.013	0.014	0	0	0.004	0.008
NiO	0.02	0.028	0.029	0.075	0.076	0.021	0.014
Na2O	0.009	0	0.018	0.012	0	0.022	0.06

Al2O3	0.068	0	0.187	0	0.005	0.05	0
MnO	0.227	0.261	0.286	0.201	0.274	0.246	0.248
CaO	0	0	0.018	0.035	0.008	0.006	0.014
Cr2O3	0.013	0	0.006	0	0	0	0.01
MgO	44.78	45.63	36.61	44.06	45.38	47.62	45.33
TiO2	0	0.022	0.002	0	0.016	0.034	0
Total	101.936	102.543	90.329	99.593	101.598	106.392	101.415
Comment	Olivine	Olivine	Discarded	Olivine	Olivine	Discarded	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B2S10	B2S11	B2S12	B2S13	B2S14	B2S15	B2S16
SiO2	39.94	34.19	39.62	40.01	39.54	39.57	39.23
FeO	15.9	14.98	15.73	15.87	15.69	15.76	15.67
K2O	0	0	0.006	0	0	0	0
NiO	0.037	0.731	0.023	0.026	0.047	0.065	0.024
Na2O	0.004	0	0	0	0	0.014	0
Al2O3	0	0.191	0.003	0.141	0.012	0.042	0.043
MnO	0.221	0.119	0.24	0.24	0.235	0.211	0.295
CaO	0	0.039	0.024	0.015	0	0	0
Cr2O3	0	0.01	0.018	0.016	0.001	0	0
MgO	45.2	23.36	45.06	47.02	45.64	45.69	45.05
TiO2	0.011	0.02	0	0.034	0	0.013	0.031
Total	101.313	73.641	100.724	103.372	101.164	101.365	100.343
Comment	Olivine	Discarded	Olivine	Discarded	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B2S17	B2S18	B2S19	B2S20	B2S21	B2S22	B2S23
SiO2	37.17	37.43	41.16	41.37	39.99	40.16	40.11
FeO	5.01	12.26	15.88	15.11	15.25	15.11	14.82
K2O	0	0.029	0.001	0.012	0.021	0	0
NiO	0.083	0.861	0.043	0.068	0.042	0.056	0.038
Na2O	0	0.019	0	0.027	0.024	0.007	0
Al2O3	0.228	0.219	0	0.91	0.007	0.047	0
MnO	0.108	0.208	0.323	0.225	0.276	0.282	0.227
CaO	0.039	0.068	0.002	0.028	0.011	0.005	0.009
Cr2O3	0.009	0	0.018	0	0.034	0.006	0.002
MgO	37.9	32.82	45.51	51.07	46.18	45.9	46.14
TiO2	0.006	0	0.038	0.072	0	0.016	0
Total	80.554	83.914	102.974	108.89	101.836	101.588	101.345
Comment	Discarded	Discarded	Olivine	Discarded	Olivine	Olivine	Olivine
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B2S24	B2S25	B30	B31	B32	B3S01	B3S02
SiO2	40.25	41.71	42.76	0.035	0	43.51	42.83

FeO	14.16	12.89	7.32	21.45	23.62	7.15	6.63
K2O	0	0.02	0.608	0	0.01	0.621	0.603
NiO	0.027	0.03	0.147	0.009	0.032	0.049	0.032
Na2O	0.007	0.015	2.77	0.087	0.065	3	2.78
Al2O3	0.015	0.097	13.77	50.69	50.95	14	13.64
MnO	0.319	0.22	0.058	0.251	0.203	0.053	0.06
CaO	0	0.016	12.17	0	0.011	12.04	12.19
Cr2O3	0.016	0.038	0.509	11.8	10.93	0.561	0.521
MgO	46.37	47.56	16.67	14.6	14.14	17.07	16.29
TiO2	0.002	0	0.911	0.003	0.104	1	1.011
Total	101.165	102.596	97.693	98.924	100.064	99.054	96.587
Comment	Olivine	Olivine	Hornblende	Spinel	Spinel	Discarded	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B3S03	B3S04	B3S05	B3S06	B3S07	B3S08	B3S09
SiO2	42.62	42.95	43.02	42.77	42.75	42.71	43.11
FeO	7.04	6.91	6.97	7.28	6.96	6.37	7.02
K2O	0.607	0.585	0.621	0.648	0.633	0.604	0.603
NiO	0	0.029	0.052	0.026	0.039	0.001	0.014
Na2O	2.76	2.88	2.86	2.89	2.83	2.83	2.78
Al2O3	13.85	13.73	13.73	13.67	14.26	13.79	13.82
MnO	0.116	0.068	0.121	0.1	0.05	0.076	0.068
CaO	12.11	12.01	11.98	12.26	12.12	12.08	12.17
Cr2O3	0.582	0.569	0.508	0.57	0.516	0.536	0.497
MgO	16.46	16.34	16.51	16.61	16.56	16.38	16.47
TiO2	1.113	1.008	1.081	1.038	1.032	1.01	1.041
Total	97.257	97.079	97.452	97.862	97.749	96.386	97.594
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B3S10	B3S11	B3S12	B3S13	B3S14	B3S15	B3S16
SiO2	42.73	43.03	42.49	42.61	42.79	43.23	42.79
FeO	7.07	7.2	6.96	7.11	6.75	6.76	6.84
K2O	0.584	0.594	0.583	0.595	0.629	0.623	0.605
NiO	0	0.047	0.009	0	0.006	0.033	0
Na2O	2.93	2.88	2.89	2.98	2.86	2.89	2.93
Al2O3	13.94	13.6	13.69	13.71	13.62	13.79	13.84
MnO	0.079	0.052	0.097	0.095	0.1	0.068	0.029
CaO	12.16	12.13	12.26	12.24	12.17	12.33	12.42
Cr2O3	0.52	0.472	0.537	0.421	0.442	0.458	0.432
MgO	16.56	16.55	16.68	16.53	16.61	16.56	16.54
TiO2	0.963	0.998	1.091	1.009	1.025	1.033	0.958
Total	97.535	97.553	97.287	97.299	97.002	97.776	97.385

Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B3S17	B3S18	B3S19	B3S20	B3S21	B3S22	B3S23
SiO2	42.73	42.43	42.85	42.66	43.23	30.07	42.79
FeO	7	6.97	7.19	6.93	7	12.38	7.11
K2O	0.594	0.637	0.645	0.557	0.555	0.313	0.577
NiO	0.059	0.04	0.062	0.01	0.03	15.82	0.031
Na2O	2.9	2.79	2.84	2.89	2.82	1.9	2.87
Al2O3	13.8	13.84	13.76	13.96	13.84	9.4	13.94
MnO	0.11	0.1	0.063	0.097	0.055	0.052	0.116
CaO	12.18	12.26	12.41	12.31	12.45	6.34	12.3
Cr2O3	0.518	0.49	0.582	0.478	0.465	0.325	0.445
MgO	16.54	16.55	16.57	16.68	16.49	18.22	16.79
TiO2	1.056	0.938	0.983	0.953	0.924	0.549	0.927
Total	97.488	97.046	97.955	97.525	97.859	95.369	97.895
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Discarded	Hornblende
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B3S24	B3S25	B4S01	B4S02	B4S03	B4S04	B4S05
SiO2	42.82	43.33	55.74	55.02	54.47	55.12	52.56
FeO	7.23	6.55	11.44	11.8	11.49	11.75	15.56
K2O	0.581	0.553	0	0.013	0	0.017	0.008
NiO	0	0.015	0.022	0	0.043	0.007	0.024
Na2O	2.79	2.85	0.039	0.008	0.014	0	0.025
Al2O3	13.68	13.95	2.82	2.8	2.88	2.92	2.78
MnO	0.092	0.089	0.277	0.246	0.327	0.241	0.255
CaO	12.3	12.3	0.552	0.534	0.563	0.49	0.549
Cr2O3	0.476	0.426	0.184	0.148	0.201	0.133	0.149
MgO	16.89	16.92	30.74	30.27	30.18	30.33	29.01
TiO2	0.832	0.855	0.095	0.036	0.153	0.077	0.128
Total	97.691	97.839	101.909	100.875	100.322	101.086	101.049
Comment	Hornblende	Hornblende	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B4S06	B4S07	B4S08	B4S09	B4S10	B4S11	B4S12
SiO2	54.45	54.98	54.09	54.41	54.39	54.51	54.87
FeO	12.01	12.18	11.67	11.46	11.4	11.71	11.82
K2O	0.025	0.014	0	0.009	0.004	0.009	0
NiO	0.029	0.02	0	0	0	0.022	0.001
Na2O	0	0.005	0	0	0.005	0.009	0.002
Al2O3	2.89	2.7	2.79	2.8	2.84	2.66	2.81
MnO	0.23	0.264	0.299	0.32	0.273	0.28	0.254
CaO	0.489	0.535	0.528	0.527	0.525	0.468	0.499

Cr2O3	0.163	0.15	0.129	0.139	0.135	0.164	0.181
MgO	30.65	30.68	30.26	30.59	30.53	30.41	30.42
TiO2	0.08	0.055	0.068	0.06	0.117	0.082	0.124
Total	101.017	101.583	99.834	100.315	100.218	100.324	100.982
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B4S13	B4S14	B4S15	B4S16	B4S17	B4S18	B4S19
SiO2	55.09	55.03	54.55	54.84	54.39	55.01	54.9
FeO	11.94	11.54	11.35	11.24	11.83	11.61	11.71
K2O	0.002	0	0.022	0	0	0.012	0
NiO	0	0	0	0.019	0	0.055	0.041
Na2O	0.013	0	0.017	0.022	0	0.012	0.011
Al2O3	2.81	2.73	2.62	2.63	2.72	2.72	2.52
MnO	0.325	0.267	0.29	0.207	0.231	0.33	0.254
CaO	0.451	0.491	0.491	0.477	0.458	0.458	0.46
Cr2O3	0.153	0.155	0.171	0.118	0.133	0.177	0.132
MgO	30.75	30.22	30.28	30.45	30.59	30.73	30.84
TiO2	0.062	0.076	0.08	0.058	0.087	0.03	0.028
Total	101.595	100.509	99.872	100.061	100.439	101.143	100.896
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516137	516137	516137	516137	516137	516137	516137
No.	B4S20	B4S21	B4S22	B4S23	B4S24	B4S25	C01
SiO2	54.72	54.68	55.25	55.01	55.91	0.085	54.66
FeO	11.36	11.83	11.81	11.37	11.34	80.52	11.57
K2O	0.01	0	0.012	0.016	0.002	0.006	0
NiO	0.032	0.036	0.031	0.015	0	0.324	0.001
Na2O	0	0.036	0.007	0.028	0.028	0.007	0.02
Al2O3	2.62	2.7	2.36	2.28	2.04	0.005	2.42
MnO	0.248	0.244	0.317	0.218	0.328	0.014	0.238
CaO	0.43	0.438	0.359	0.372	0.263	0	0.228
Cr2O3	0.112	0.109	0.116	0.134	0.094	0	0.099
MgO	30.51	30.86	31.16	31.23	32.41	0.081	31.2
TiO2	0.03	0.057	0.05	0.074	0.055	0	0
Total	100.073	100.989	101.472	100.747	102.47	81.041	100.436
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Discarded	Discarded	Enstatite
Sample	516137	516137	516137	516137	516137	516138	516138
No.	C02	C03	C04	C05	C06	A1S01	A1S02
SiO2	55.05	54.66	52.79	0	0.025	54.27	54.31
FeO	11.8	11.51	11.7	23.12	25.53	11.92	11.87
K2O	0	0.006	0.006	0	0.004	0.02	0.005
NiO	0.002	0	0	0.051	0.064	0	0

Na2O	0.014	0	0	0.062	0.089	0.012	0.01
Al2O3	2.23	2.54	1.844	49.62	47.28	2.81	2.77
MnO	0.241	0.351	0.27	0.161	0.163	0.243	0.272
CaO	0.317	0.365	0.286	0.011	0.005	0.502	0.505
Cr2O3	0.202	0.119	0.105	13.32	13.64	0.142	0.152
MgO	31.1	31.44	31.46	12.98	12.79	30.46	30.64
TiO2	0.011	0.036	0.041	0.019	0.01	0.097	0.116
Total	100.967	101.026	98.502	99.344	99.601	100.477	100.65
Comment	Enstatite	Enstatite	Discarded	Spinel	Spinel	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A1S03	A1S04	A1S05	A1S06	A1S07	A1S08	A1S09
SiO2	54.6	54.18	54.45	53.92	54.57	54.42	54.36
FeO	11.66	11.92	11.86	11.56	11.62	11.96	11.58
K2O	0	0	0.004	0	0	0.031	0.006
NiO	0.019	0	0.02	0.021	0.03	0.003	0.014
Na2O	0	0.021	0.03	0.031	0.008	0.017	0.015
Al2O3	2.8	2.65	2.84	2.81	2.78	2.88	2.65
MnO	0.23	0.274	0.222	0.287	0.303	0.238	0.313
CaO	0.477	0.485	0.445	0.473	0.463	0.467	0.453
Cr2O3	0.141	0.166	0.152	0.145	0.131	0.143	0.118
MgO	30.78	30.7	30.72	30.94	30.78	31	30.74
TiO2	0.126	0.154	0.105	0.126	0.101	0.08	0.036
Total	100.833	100.55	100.848	100.313	100.786	101.239	100.286
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A1S10	A1S11	A1S12	A1S13	A1S14	A1S15	A1S16
SiO2	54.04	54.71	54.74	54.4	54.44	54.29	55.01
FeO	11.26	11.62	11.96	11.81	11.53	11.52	11.56
K2O	0.006	0	0	0	0	0.005	0.024
NiO	0	0.042	0.024	0	0.021	0	0.013
Na2O	0	0	0.007	0.013	0.026	0	0.02
Al2O3	2.7	2.7	2.64	2.69	2.71	2.68	2.65
MnO	0.225	0.301	0.313	0.356	0.23	0.274	0.259
CaO	0.432	0.429	0.374	0.428	0.399	0.4	0.406
Cr2O3	0.158	0.191	0.163	0.137	0.143	0.178	0.184
MgO	30.8	30.84	30.83	30.73	30.72	30.69	30.79
TiO2	0.124	0.096	0.101	0.043	0.087	0.069	0.077
Total	99.746	100.928	101.152	100.605	100.306	100.107	100.993
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A1S17	A1S18	A1S19	A1S20	A1S21	A1S22	A1S23

SiO2	54.69	54.79	55.3	55.39	54.77	54.7	54.64
FeO	11.73	11.71	11.74	11.93	11.82	11.89	12.16
K2O	0.017	0	0.043	0	0	0	0.008
NiO	0.019	0	0	0.024	0	0.024	0.009
Na2O	0.015	0	0.021	0.004	0.03	0.023	0.007
Al2O3	2.72	2.59	2.66	2.54	2.43	2.24	1.887
MnO	0.288	0.288	0.274	0.287	0.293	0.243	0.287
CaO	0.403	0.398	0.383	0.389	0.361	0.346	0.22
Cr2O3	0.116	0.158	0.192	0.239	0.211	0.288	0.403
MgO	31.62	31.17	30.69	31.17	31.44	31.35	31.75
TiO2	0.124	0.064	0.055	0.057	0.085	0.046	0.159
Total	101.742	101.168	101.358	102.031	101.439	101.15	101.529
Comment	Enstatite	Enstatite	Enstatite	Discarded	Enstatite	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A1S24	A1S25	A2S01	A2S02	A2S03	A2S04	A2S05
SiO2	0.029	0	42.04	42.37	42.53	41.88	42.08
FeO	80.42	81.49	7.02	7.33	7	6.85	7
K2O	0	0	1.39	1.39	1.38	1.39	1.39
NiO	0.07	0.031	0	0.021	0.018	0.002	0.003
Na2O	0.03	0.009	2.35	2.32	2.29	2.36	2.43
Al2O3	2.97	2.69	13.85	13.77	13.78	14.02	13.62
MnO	0.255	0.244	0.034	0.102	0.094	0.11	0.052
CaO	0.007	0	12.46	12.28	12.32	12.4	12.22
Cr2O3	9.68	9.51	0.519	0.54	0.465	0.5	0.519
MgO	1.148	0.967	16.39	16.54	16.42	16.39	16.46
TiO2	0.14	0.067	1.267	1.295	1.329	1.22	1.203
Total	94.75	95.007	97.321	97.958	97.626	97.122	96.978
Comment	Discarded	Discarded	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A2S06	A2S07	A2S08	A2S09	A2S10	A2S11	A2S12
SiO2	42.51	42.32	42.04	42.43	41.82	42.04	42.04
FeO	6.95	7.11	6.81	7.04	6.7	6.67	7.1
K2O	1.37	1.37	1.32	1.36	1.45	1.3	1.35
NiO	0.002	0.014	0.009	0.006	0.009	0.008	0.003
Na2O	2.33	2.29	2.3	2.3	2.35	2.36	2.29
Al2O3	14.01	13.92	13.74	13.87	13.98	14.11	13.68
MnO	0.058	0.045	0.065	0.11	0.05	0.021	0.126
CaO	12.32	12.42	12.5	12.36	12.39	12.41	12.32
Cr2O3	0.526	0.513	0.517	0.515	0.459	0.469	0.563
MgO	16.63	16.41	16.5	16.4	16.53	16.39	16.32
TiO2	1.229	1.282	1.356	1.219	1.304	1.277	1.255

Total	97.934	97.693	97.157	97.611	97.042	97.055	97.047
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende	Hornblende
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A2S13	A2S14	A2S15	A2S16	A2S17	A2S18	A2S19
SiO2	42.46	42.58	42.44	41.91	41.29	42.3	42.58
FeO	7.14	7.1	6.79	7.28	6.25	6.99	6.95
K2O	1.43	1.43	1.45	1.37	1.152	1.43	1.35
NiO	0.045	0	0.043	0.041	0	0.022	0.004
Na2O	2.39	2.39	2.34	2.42	1.72	2.28	2.24
Al2O3	13.91	13.44	13.92	13.87	13.37	13.82	13.87
MnO	0.034	0.063	0.045	0.029	0	0.01	0.071
CaO	12.46	12.28	12.36	12.48	10.47	12.38	12.43
Cr2O3	0.476	0.511	0.515	0.506	0.424	0.483	0.477
MgO	16.44	16.33	16.33	16.43	19.36	16.31	16.28
TiO2	1.317	1.214	1.292	1.332	1.084	1.237	1.261
Total	98.103	97.339	97.524	97.668	95.12	97.263	97.513
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Discarded	Hornblende	Hornblende
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A2S20	A2S21	A2S22	A2S23	A2S24	A2S25	A3S01
SiO2	42.52	42.7	42.32	44.02	5.15	0.859	51.32
FeO	6.76	6.84	7.19	6.85	50.02	57.69	4.93
K2O	1.4	1.37	1.39	1.26	0.111	0.068	0
NiO	0.019	0.025	0.018	0.033	1.76	2.07	0.004
Na2O	2.33	2.38	2.24	2.29	0.194	0.432	0.272
Al2O3	13.66	13.52	13.68	13.43	0.375	0.081	3.27
MnO	0.11	0.121	0.123	0.06	0.009	0	0.137
CaO	12.49	12.32	12.25	12.27	0.17	0.103	23.29
Cr2O3	0.519	0.458	0.521	0.41	0.03	0.035	0.225
MgO	16.55	16.52	16.53	17.62	0.412	0.117	15.72
TiO2	1.225	1.168	1.205	1.073	0.013	0.036	0.339
Total	97.583	97.422	97.468	99.317	58.245	61.491	99.506
Comment	Hornblende	Hornblende	Hornblende	Discarded	Discarded	Discarded	Diopside
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A3S02	A3S03	A3S04	A3S05	A3S06	A3S07	A3S08
SiO2	51.26	51.66	51.61	51.29	51.62	51.23	51.06
FeO	4.72	4.61	5.02	4.75	4.79	4.76	5.29
K2O	0.005	0	0	0.009	0.005	0	0
NiO	0.012	0.016	0	0	0.012	0	0
Na2O	0.287	0.271	0.24	0.305	0.298	0.291	0.261
Al2O3	3.29	3.19	3.4	3.37	3.3	3.39	3.3
MnO	0.108	0.129	0.074	0.097	0.158	0.121	0.095

CaO	23.78	23.63	22.75	23.66	23.48	23.67	22.01
Cr2O3	0.212	0.227	0.274	0.227	0.267	0.223	0.222
MgO	15.6	15.42	15.67	15.42	15.41	15.34	16.1
TiO2	0.397	0.363	0.327	0.3	0.402	0.32	0.366
Total	99.671	99.517	99.365	99.428	99.742	99.345	98.704
Comment	Diopside	Diopside	Diopside	Diopside	Diopside	Diopside	Discarded
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A3S09	A3S10	A3S11	A3S12	A3S13	A3S14	A3S15
SiO2	51.01	51.19	51.58	51.35	51.55	51.03	51.21
FeO	4.36	4.93	5.68	4.77	4.77	4.41	4.64
K2O	0.018	0.002	0	0.022	0	0	0
NiO	0	0	0.021	0	0.021	0	0.026
Na2O	0.32	0.27	0.267	0.291	0.308	0.302	0.276
Al2O3	3.28	3.51	3.42	3.41	3.5	3.34	3.37
MnO	0.103	0.103	0.14	0.155	0.124	0.092	0.134
CaO	23.6	23.66	22.02	23.57	24.04	23.92	23.64
Cr2O3	0.218	0.231	0.264	0.278	0.294	0.282	0.25
MgO	15.4	15.57	16.43	15.5	15.51	15.43	15.72
TiO2	0.336	0.384	0.359	0.313	0.367	0.372	0.386
Total	98.645	99.851	100.181	99.66	100.484	99.178	99.652
Comment	Discarded	Diopside	Diopside	Diopside	Diopside	Diopside	Diopside
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A3S16	A3S17	A3S18	A3S19	A3S20	A3S21	A3S22
SiO2	50.77	51.09	51.91	51.13	51.78	50.92	50.97
FeO	4.75	4.63	4.71	4.66	8.58	4.83	4.63
K2O	0.014	0	0	0.021	0	0	0
NiO	0.003	0	0	0.045	0	0.009	0.045
Na2O	0.294	0.276	0.259	0.293	0.197	0.312	0.247
Al2O3	3.41	3.41	3.56	3.3	3.21	3.42	3.37
MnO	0.124	0.166	0.14	0.105	0.126	0.174	0.082
CaO	23.99	23.98	23.64	23.91	16.02	23.89	23.84
Cr2O3	0.259	0.279	0.284	0.255	0.225	0.254	0.267
MgO	15.37	15.28	15.31	15.37	19.68	15.6	15.34
TiO2	0.368	0.35	0.38	0.448	0.308	0.339	0.35
Total	99.353	99.462	100.193	99.538	100.124	99.747	99.14
Comment	Diopside	Diopside	Diopside	Diopside	Diopside	Diopside	Diopside
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A3S23	A3S24	A3S25	A4S01	A4S02	A4S03	A4S04
SiO2	51.34	51.53	51.75	40.27	40	40.43	40.67
FeO	4.65	4.63	4.72	15.98	16.58	16.38	16.51
K2O	0	0.009	0	0.025	0.018	0.013	0.006

NiO	0.008	0.007	0.021	0.068	0.04	0.043	0.026
Na2O	0.254	0.234	0.226	0.015	0	0.003	0
Al2O3	3.33	3.12	2.97	0.017	0.019	0.013	0.012
MnO	0.145	0.105	0.103	0.314	0.244	0.28	0.26
CaO	23.82	23.5	23.86	0	0	0	0
Cr2O3	0.303	0.303	0.254	0.007	0.026	0	0
MgO	15.73	15.65	15.82	45.05	45.32	45.12	45.51
TiO2	0.357	0.326	0.358	0	0.025	0	0
Total	99.938	99.415	100.083	101.745	102.272	102.283	102.994
Comment	Diopside	Diopside	Diopside	Olivine	Olivine	Olivine	Olivine
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A4S05	A4S06	A4S07	A4S08	A4S09	A4S10	A4S11
SiO2	40.25	40.58	39.8	40.13	40.01	39.77	40.03
FeO	16.06	16.42	16.34	16.51	16.5	16.48	16.48
K2O	0.001	0	0	0	0.008	0.013	0.003
NiO	0.027	0	0.064	0.031	0.054	0.041	0.032
Na2O	0.008	0.021	0.01	0	0.013	0	0
Al2O3	0.005	0.014	0	0.014	0	0.018	0.037
MnO	0.275	0.171	0.257	0.281	0.242	0.197	0.19
CaO	0.025	0.009	0	0.022	0.01	0	0.004
Cr2O3	0.006	0.006	0	0	0.042	0.018	0.027
MgO	46.18	46.06	45.79	45.53	45.44	45.4	45.42
TiO2	0.008	0.015	0.005	0	0.006	0	0
Total	102.846	103.297	102.265	102.517	102.325	101.937	102.223
Comment	Olivine	Discarded	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516138	516138	516138	516138	516138	516138	516138
No.	A4S12	A4S13	A4S14	A4S15	A4S16	A4S17	A4S18
SiO2	41.07	29.55	36.25	39.47	34.83	39.39	39.66
FeO	16.26	16.06	16.15	15.34	16.06	16.41	15.82
K2O	0	0.023	0	0.016	0	0	0.009
NiO	0.024	0.054	0.052	0.051	0.042	0.027	0.079
Na2O	0.001	0.023	0.013	0	0	0.01	0
Al2O3	0.106	1.524	0.082	0.21	0.322	0	0
MnO	0.283	0.184	0.208	0.187	0.207	0.236	0.27
CaO	0.009	0.034	0	0.02	0.024	0.015	0.002
Cr2O3	0.029	0.054	0.011	0.035	0.024	0.046	0.062
MgO	43.6	40.09	46.29	44.59	48.49	45.65	45.56
TiO2	0.028	0	0.019	0	0	0	0.034
Total	101.409	87.596	99.074	99.92	99.998	101.785	101.497
Comment	Olivine	Discarded	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516138	516138	516138	516138	516138	516138	516138

No.	A4S19	A4S20	A4S21	A4S22	A4S23	A4S24	A4S25
SiO2	39.66	39.28	39.79	40.35	39.89	33.4	0.112
FeO	15.71	15.47	16.01	16.13	15.59	19.65	85.32
K2O	0	0.001	0	0	0.019	0	0.009
NiO	0.04	0.012	0.042	0.032	0.035	0.179	0
Na2O	0	0.002	0.017	0.018	0.001	0	0
Al2O3	0	0	0	0.027	0.054	0.66	1.526
MnO	0.286	0.177	0.301	0.27	0.252	0.213	0.147
CaO	0	0	0	0	0.013	0.032	0.008
Cr2O3	0.03	0.048	0.09	0.071	0.12	0.874	6.25
MgO	46.04	45.72	45.89	45.43	46.21	31.84	0.863
TiO2	0	0.002	0	0	0.003	0.067	0.061
Total	101.766	100.711	102.142	102.327	102.188	86.915	94.297
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded	Discarded
Sample	516138	516138	516138	516138	516138	516138	516138
No.	B01	B02	B1S01	B1S02	B1S03	B1S04	B1S05
SiO2	0.017	0	0.037	38.95	56.26	55.07	55.18
FeO	22.2	23.85	76.49	4.68	11.45	11.79	11.57
K2O	0.023	0.005	0.007	0	0.03	0.014	0
NiO	0.029	0.012	0.768	0.18	0.015	0	0.009
Na2O	0.043	0.101	0.092	0.016	0.042	0.002	0
Al2O3	51.06	45.24	0	9.39	2.53	2.42	2.36
MnO	0.219	0.253	0.016	0.047	0.316	0.264	0.28
CaO	0	0.006	0	0.026	0.167	0.188	0.217
Cr2O3	11.18	17.41	0	0.095	0.049	0.109	0.098
MgO	13.79	12.56	0.062	32.94	30.58	31.55	31.48
TiO2	0.015	0.025	0.008	0.011	0.052	0	0.072
Total	98.576	99.462	77.481	86.336	101.492	101.407	101.266
Comment	Spinel	Spinel	Discarded	Discarded	Enstatite	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516138
No.	B1S06	B1S07	B1S08	B1S09	B1S10	B1S11	B1S12
SiO2	55.4	54.66	55.08	55.25	55.09	54.89	55.4
FeO	11.1	10.84	11.28	11.03	11.82	11.51	11.24
K2O	0	0.009	0.008	0.007	0	0	0.014
NiO	0	0.045	0	0.024	0.035	0	0.033
Na2O	0.005	0.009	0.011	0.02	0.004	0	0
Al2O3	2.38	2.41	2.44	2.38	2.4	2.35	2.25
MnO	0.261	0.251	0.256	0.191	0.246	0.282	0.348
CaO	0.228	0.258	0.271	0.255	0.252	0.291	0.293
Cr2O3	0.123	0.121	0.118	0.108	0.118	0.134	0.097
MgO	31.45	31.46	31.31	31.29	31.23	31.47	31.38

TiO2	0.064	0.06	0.06	0.03	0.087	0.072	0.071
Total	101.012	100.123	100.835	100.585	101.281	100.999	101.125
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516138
No.	B1S13	B1S14	B1S15	B1S16	B1S17	B1S18	B1S19
SiO2	55.18	55.04	54.57	55.14	55.3	54.86	55.33
FeO	11.27	11.34	11.25	11.49	11.37	11.35	11.54
K2O	0	0.01	0.005	0	0	0.004	0
NiO	0.008	0	0.022	0.046	0.013	0	0.008
Na2O	0.033	0.023	0	0.01	0	0.018	0.024
Al2O3	2.48	2.32	2.42	2.34	2.61	2.52	2.29
MnO	0.238	0.261	0.288	0.277	0.282	0.295	0.204
CaO	0.253	0.291	0.282	0.26	0.266	0.258	0.28
Cr2O3	0.143	0.12	0.095	0.17	0.164	0.135	0.136
MgO	31.29	31.73	31.54	31.24	31.66	31.27	31.64
TiO2	0.105	0.068	0.069	0.08	0.072	0.066	0.093
Total	101	101.204	100.541	101.052	101.738	100.776	101.545
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516138	516138	516138	516138	516138	516138	516148
No.	B1S20	B1S21	B1S22	B1S23	B1S24	B1S25	A1S01
SiO2	55.46	55.51	55.03	54.72	55.42	54.65	40.38
FeO	11.02	11.45	11.55	11.7	11.45	11.75	10.79
K2O	0.017	0.001	0	0.02	0.001	0.007	0.007
NiO	0	0.014	0.018	0	0	0.012	0.357
Na2O	0.009	0	0.003	0.015	0.006	0.005	0
Al2O3	2.07	2.39	2.33	2.3	2.47	2.42	0
MnO	0.246	0.217	0.214	0.308	0.222	0.261	0.212
CaO	0.22	0.311	0.381	0.345	0.377	0.369	0.021
Cr2O3	0.123	0.115	0.159	0.17	0.169	0.143	0.017
MgO	31.42	31.08	31.22	30.93	31.15	30.96	48.87
TiO2	0.043	0.049	0.072	0.02	0.096	0.09	0.013
Total	100.628	101.136	100.977	100.528	101.362	100.667	100.666
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Olivine
Sample	516148	516148	516148	516148	516148	516148	516148
No.	A1S02	A1S03	A1S04	A1S05	A1S06	A1S07	A1S08
SiO2	40.52	40.23	40.66	40.41	40.66	40.18	33.67
FeO	11.13	10.89	10.56	10.97	11.04	10.66	2.75
K2O	0.01	0.008	0	0.014	0	0.004	0.024
NiO	0.392	0.415	0.39	0.397	0.368	0.428	0.143
Na2O	0.006	0	0.018	0.005	0	0.01	0.028
Al2O3	0	0	0	0.009	0	0.025	14.68

MnO	0.131	0.204	0.204	0.105	0.183	0.094	0.045
CaO	0.015	0.001	0.025	0.016	0.012	0.002	0.043
Cr2O3	0.011	0.035	0.001	0.034	0.03	0.035	0.561
MgO	49.25	48.86	48.78	49.13	49.29	49.18	35.15
TiO2	0	0.016	0	0	0.008	0	0.002
Total	101.466	100.659	100.638	101.09	101.591	100.618	87.096
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded
Sample	516148	516148	516148	516148	516148	516148	516148
No.	A1S09	A1S10	A1S11	A1S12	A1S13	A1S14	A1S15
SiO2	33.35	0.031	0	0	0.097	0	0.013
FeO	2.96	70.78	27.3	26.7	26.95	26.99	27.01
K2O	0.043	0	0.012	0.014	0	0	0
NiO	0.141	0.206	0.178	0.14	0.172	0.166	0.202
Na2O	0.032	0.032	0.043	0.039	0.065	0.027	0
Al2O3	13.7	1.641	36.55	37.11	22.24	36.41	37.68
MnO	0.034	0.583	0.347	0.348	0.359	0.295	0.263
CaO	0.015	0.024	0	0.012	0.003	0.01	0
Cr2O3	0.268	20.37	23.71	23.92	23.07	23.72	23.81
MgO	35.06	0.817	10.87	11.61	11.75	11.71	11.64
TiO2	0.035	0.333	0.109	0.094	0.119	0.097	0.109
Total	85.639	94.817	99.12	99.986	84.824	99.424	100.727
Comment	Discarded	Discarded	Spinel	Spinel	Discarded	Spinel	Spinel
Sample	516148	516148	516148	516148	516148	516148	516148
No.	A1S16	A1S17	A1S18	A1S19	A1S20	A1S21	A1S22
SiO2	0	0	0	0.014	0	40.13	40.29
FeO	27.18	26.37	26.87	27.21	69.88	10.35	10.83
K2O	0	0.002	0.013	0	0.003	0.012	0.012
NiO	0.176	0.214	0.176	0.181	0.304	0.434	0.394
Na2O	0.041	0.005	0	0.031	0.025	0	0.006
Al2O3	37.51	36.49	37.28	37.29	3.46	0.013	0.04
MnO	0.328	0.263	0.291	0.263	0.447	0.152	0.131
CaO	0.001	0.019	0.007	0.007	0.005	0.015	0.015
Cr2O3	23.74	23.84	23.81	24.09	19.57	0.268	0.081
MgO	11.82	11.82	11.78	11.37	1.136	49.21	49.09
TiO2	0.124	0.078	0.104	0.119	0.075	0.003	0
Total	100.92	99.101	100.331	100.575	94.905	100.587	100.887
Comment	Spinel	Spinel	Spinel	Spinel	Discarded	Olivine	Olivine
Sample	516148	516148	516148	516148	516148	516148	516148
No.	A1S23	A1S24	A1S25	A1S26	A1S27	A1S28	A1S29
SiO2	40.78	40.51	40.06	40.18	40.5	40.8	40.11
FeO	10.71	11.23	10.9	10.4	10.53	11.1	11.24

K2O	0	0.005	0	0	0.012	0	0.006
NiO	0.378	0.351	0.361	0.404	0.334	0.426	0.397
Na2O	0.002	0	0	0.011	0	0.015	0.009
Al2O3	0.047	0.021	0	0.009	0.015	0.041	0.027
MnO	0.136	0.139	0.178	0.202	0.173	0.165	0.186
CaO	0.015	0	0.007	0	0	0.012	0.012
Cr2O3	0.019	0.019	0.01	0.016	0.023	0.015	0
MgO	48.89	48.55	49.08	48.78	48.91	48.78	48.74
TiO2	0.057	0.019	0	0	0	0.009	0.003
Total	101.033	100.843	100.595	100	100.497	101.363	100.729
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516148	516148	516148	516148	516148	516148	516148
No.	A1S30	B01	B02	B03	B04	B05	B06
SiO2	40.56	29.88	30.25	51.05	40.36	40.45	39.84
FeO	10.78	3.55	3.22	3.59	10.92	11.16	10.64
K2O	0	0	0.004	0.119	0	0.005	0.01
NiO	0.37	0.246	0.208	0.119	0.404	0.4	0.447
Na2O	0.01	0	0.012	1.191	0	0	0.001
Al2O3	0	19.33	19.28	6.83	0.054	0	0.019
MnO	0.209	0.034	0	0.066	0.16	0.154	0.086
CaO	0	0.008	0.012	12.33	0.012	0	0.012
Cr2O3	0.01	1.178	1.126	0.465	0	0	0.024
MgO	48.94	31.66	31.76	20.61	48.58	49.08	48.12
TiO2	0.003	0.127	0.095	0.439	0.024	0	0.043
Total	100.882	86.012	85.967	96.809	100.512	101.249	99.243
Comment	Olivine	Discarded	Discarded	Discarded	Olivine	Olivine	Olivine
Sample	516148	516148	516148	516148	516148	516148	516148
No.	B07	B08	B1S01	B1S02	B1S03	B1S04	B1S05
SiO2	40.34	61.6	0	0	0	0	5.96
FeO	11.41	0.959	27.73	27.76	27.37	27.1	22.95
K2O	0	0.035	0	0.009	0	0	0.003
NiO	0.397	0.125	0.204	0.189	0.183	0.2	0.176
Na2O	0.004	0.025	0.023	0.054	0.009	0.063	0.047
Al2O3	0.009	0.452	37.05	37.28	36.83	36.05	25.98
MnO	0.162	0.019	0.313	0.285	0.327	0.298	0.3
CaO	0.006	0	0.031	0	0	0.007	0.022
Cr2O3	0.009	0.131	23.39	23.28	23.01	22.81	19.21
MgO	48.83	30.01	11.34	11.34	11.31	11.38	17.88
TiO2	0	0	0.104	0.062	0.148	0.153	0.098
Total	101.167	93.355	100.184	100.259	99.187	98.061	92.626
Comment	Olivine	Discarded	Spinel	Spinel	Spinel	Spinel	Discarded

Sample	516148	516148	516148	516148	516148	516148	516148
No.	B1S06	B1S07	B1S08	B1S09	B1S10	B1S11	B1S12
SiO2	39.46	40.31	41.42	41.09	38.92	42.94	40.2
FeO	10.74	10.89	10.94	10.84	11.33	10.85	10.88
K2O	0.018	0.005	0.004	0.005	0	0.008	0
NiO	0.417	0.412	0.368	0.381	0.383	0.363	0.417
Na2O	0	0	0.005	0.005	0	0.007	0.016
Al2O3	0.096	0.008	0	0	0.074	0.029	0.06
MnO	0.146	0.133	0.17	0.18	0.152	0.126	0.136
CaO	0.002	0.002	0.019	0.009	0.001	0.021	0.008
Cr2O3	0.215	0.081	0.026	0.019	0.054	0.01	0.024
MgO	48.36	49.04	47.04	48.85	47.71	50.37	48.49
TiO2	0.027	0	0.006	0.032	0	0.025	0
Total	99.482	100.881	99.998	101.41	98.623	104.748	100.232
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Discarded	Olivine
Sample	516148	516148	516148	516148	516148	516148	516148
No.	B1S13	B1S14	B1S15	B1S16	B1S17	B1S18	B1S19
SiO2	40.3	40.63	39.76	40.49	40.21	40.71	40.24
FeO	11.63	11	11.2	11.78	11.32	11.41	10.85
K2O	0	0	0.009	0	0	0	0.015
NiO	0.365	0.377	0.385	0.364	0.358	0.39	0.413
Na2O	0.002	0.004	0	0.012	0	0.01	0
Al2O3	0	0.002	0.03	0.075	0.006	0.016	0.007
MnO	0.235	0.16	0.133	0.199	0.16	0.157	0.141
CaO	0.008	0.008	0	0.013	0.015	0.002	0.027
Cr2O3	0	0.025	0.018	0	0	0.021	0
MgO	48.44	48.21	48.7	47.77	48.53	48.61	48.54
TiO2	0.006	0	0.019	0.009	0.021	0.017	0
Total	100.986	100.415	100.254	100.712	100.618	101.343	100.233
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine
Sample	516148	516148	516148	516148	516148	516148	516121a
No.	B1S20	B1S21	B1S22	B1S23	B1S24	B1S25	A01
SiO2	40.25	40.19	40.45	40.01	40.53	40.64	55.99
FeO	11.29	11.13	11.5	11.31	11.29	10.88	8.48
K2O	0	0.013	0	0	0.008	0	0.012
NiO	0.393	0.374	0.387	0.361	0.369	0.403	0.094
Na2O	0	0.009	0	0.012	0.013	0	0.007
Al2O3	0.004	0.001	0.028	0.027	0.048	0.002	1.216
MnO	0.17	0.115	0.178	0.162	0.194	0.214	0.24
CaO	0	0.012	0.022	0.008	0.001	0	0.478
Cr2O3	0.034	0.016	0.002	0	0	0.013	0.208

MgO	48.52	48.35	48.71	47.9	48.52	48.23	33.06
TiO2	0	0.014	0.016	0.003	0.016	0.013	0.062
Total	100.662	100.224	101.294	99.794	100.989	100.395	99.847
Comment	Olivine	Olivine	Olivine	Olivine	Olivine	Olivine	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A02	A03	A04	A05	A06	A07	A08
SiO2	56.25	55.85	56.04	55.95	56.17	56.79	55.49
FeO	7.95	8.79	8.77	8.72	7.79	8.54	8.7
K2O	0.004	0.012	0	0	0.002	0	0
NiO	0.077	0.044	0.092	0.107	0.067	0.05	0.075
Na2O	0	0.006	0	0.001	0.01	0.001	0
Al2O3	1.04	1.221	0.84	1.311	0.516	1.225	1.185
MnO	0.164	0.216	0.198	0.18	0.188	0.188	0.227
CaO	0.383	0.476	0.216	0.435	0.238	0.341	0.373
Cr2O3	0.142	0.17	0.078	0.185	0.075	0.16	0.127
MgO	33.42	33.44	33.17	33.12	34.42	33.05	33.34
TiO2	0.034	0	0.002	0.048	0.029	0.086	0.048
Total	99.462	100.225	99.406	100.057	99.505	100.43	99.565
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A09	A10	A11	A12	A13	A14	A15
SiO2	39.15	40.07	56.03	56.35	56.43	55.87	55.91
FeO	11.9	11.77	8.39	8.4	8.61	8.31	8.6
K2O	0	0	0.012	0	0	0.016	0.001
NiO	0.469	0.494	0.046	0.124	0.082	0.108	0.065
Na2O	0.026	0	0.007	0	0	0.011	0.025
Al2O3	0.009	0.021	1.005	0.83	1.024	1.011	1.262
MnO	0.194	0.221	0.185	0.19	0.172	0.264	0.253
CaO	0.022	0.009	0.417	0.312	0.339	0.465	0.409
Cr2O3	0.013	0	0.138	0.106	0.119	0.145	0.158
MgO	48.24	47.91	33.26	33.51	33.16	33.35	33.27
TiO2	0.017	0	0.038	0.058	0.056	0.061	0.043
Total	100.04	100.495	99.527	99.88	99.992	99.613	99.997
Comment	Olivine	Olivine	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A16	A17	A18	A19	A20	A21	A22
SiO2	55.77	56.34	55.92	40.27	40.26	45.26	44.74
FeO	8.49	8.58	8.53	11.76	11.86	5.04	4.73
K2O	0.023	0.005	0	0	0.019	1.055	0.947
NiO	0.102	0.086	0.075	0.47	0.447	0.052	0.108
Na2O	0.022	0	0.009	0.001	0	2.09	2.12

Al2O3	1.25	1.035	1.08	0.014	0.011	10.73	10.42
MnO	0.224	0.206	0.243	0.186	0.16	0.048	0.029
CaO	0.438	0.284	0.361	0.016	0.015	12.35	12.41
Cr2O3	0.158	0.164	0.178	0	0	1.061	0.891
MgO	32.87	33.62	33.1	47.76	47.86	18.54	18.73
TiO2	0.006	0.014	0.022	0.006	0	0.613	0.449
Total	99.356	100.334	99.518	100.484	100.631	96.839	95.574
Comment	Enstatite	Enstatite	Enstatite	Olivine	Olivine	Hornblende	Discarded
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A23	A24	A25	A26	A27	A28	A29
SiO2	44.53	45.09	55.86	56.15	55.86	56.11	44.56
FeO	5.22	4.77	8.57	8.43	8.5	8.8	5.38
K2O	1.024	0.927	0.01	0.017	0.005	0.018	0.992
NiO	0.078	0.127	0.094	0.06	0.082	0.056	0.119
Na2O	2.06	2.15	0.017	0.035	0.02	0.01	2.21
Al2O3	10.46	11.08	1.137	1.204	1.075	0.973	10.77
MnO	0.079	0.108	0.243	0.235	0.222	0.124	0.053
CaO	12.39	12.2	0.449	0.453	0.252	0.17	12.34
Cr2O3	1.081	0.913	0.17	0.152	0.131	0.204	1.133
MgO	18.53	18.2	33.22	33.23	33.33	33.68	18.39
TiO2	0.618	0.562	0.053	0.032	0.043	0.072	0.551
Total	96.069	96.128	99.823	99.998	99.52	100.216	96.498
Comment	Hornblende	Hornblende	Enstatite	Enstatite	Enstatite	Enstatite	Hornblende
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A30	A31	A32	A33	A34	A35	A36
SiO2	44.42	44.66	44.76	55.77	56.02	56.11	55.8
FeO	5	5.05	5.33	8.29	8.58	8.39	8.59
K2O	1.003	1.043	1.002	0	0	0	0.001
NiO	0.076	0.145	0.113	0.117	0.064	0.081	0.047
Na2O	2.25	2.13	2.18	0.015	0.006	0	0.014
Al2O3	11.02	10.56	10.48	1.141	1.131	1.041	1.166
MnO	0.071	0.082	0.056	0.327	0.216	0.172	0.23
CaO	12.38	12.34	12.43	0.417	0.348	0.287	0.472
Cr2O3	1.138	1.118	0.948	0.141	0.157	0.099	0.197
MgO	18.31	18.45	18.47	33.18	32.97	33.13	32.95
TiO2	0.631	0.589	0.549	0.045	0.045	0.061	0.025
Total	96.299	96.166	96.318	99.444	99.538	99.371	99.492
Comment	Hornblende	Hornblende	Hornblende	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A37	A38	A39	A40	A41	A42	A43
SiO2	44.39	45.01	45.14	44.96	39.41	40.04	39.47

FeO	5.38	5.04	4.44	5.09	12.46	12.15	12.1
K2O	1.078	0.903	1.25	1.046	0	0.008	0
NiO	0.1	0.154	0.135	0.119	0.441	0.48	0.469
Na2O	2.16	2.21	2.08	2.15	0	0.01	0
Al2O3	11.04	10.8	10.49	10.93	0	0.045	0.006
MnO	0.069	0.092	0.042	0.058	0.226	0.162	0.163
CaO	12.3	12.47	12.33	12.42	0	0.014	0.015
Cr2O3	1.089	1.027	1.419	0.971	0.003	0	0
MgO	17.98	18.45	18.46	18.33	47.99	47.48	47.87
TiO2	0.585	0.482	0.588	0.607	0	0.009	0.025
Total	96.17	96.639	96.374	96.683	100.529	100.398	100.117
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Olivine	Olivine	Olivine
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	A44	B01	B02	B03	B04	B05	B06
SiO2	39.87	55.81	55.36	56.62	55.69	52.45	53.36
FeO	12.31	11.26	11.45	11.16	11.15	3.65	3.64
K2O	0.004	0	0	0.002	0.02	0.004	0.001
NiO	0.428	0.062	0.111	0.117	0.095	0.082	0.095
Na2O	0	0	0.014	0	0	0.328	0.332
Al2O3	0.008	1.242	1.266	1.185	1.077	1.61	1.628
MnO	0.218	0.274	0.318	0.324	0.269	0.143	0.096
CaO	0.019	0.568	0.537	0.369	0.334	23.94	23.86
Cr2O3	0	0.232	0.241	0.194	0.245	0.515	0.458
MgO	47.62	31.77	31.42	31.76	32.05	16.38	16.64
TiO2	0	0	0.036	0.033	0.021	0.093	0.047
Total	100.475	101.218	100.755	101.763	100.95	99.196	100.158
Comment	Olivine	Enstatite	Enstatite	Enstatite	Enstatite	Diopside	Diopside
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	B07	B08	B09	B10	B11	B12	B13
SiO2	54	54	44.91	45.31	45.45	45.7	55.72
FeO	3.54	3.23	5.92	5.74	6.1	5.64	11.03
K2O	0	0	1.22	1.106	1.16	1.151	0
NiO	0.105	0.068	0.166	0.142	0.148	0.21	0.118
Na2O	0.3	0.242	1.94	1.87	1.85	1.89	0.033
Al2O3	1.167	1.314	10.3	10.28	10.45	10.27	1.281
MnO	0.13	0.077	0.047	0.021	0.087	0.032	0.279
CaO	24.35	24.44	12.34	12.19	12.45	12.43	0.499
Cr2O3	0.313	0.37	1.269	1.205	1.218	1.305	0.226
MgO	16.96	16.87	17.96	17.98	17.94	17.98	31.83
TiO2	0.026	0.023	0.531	0.607	0.623	0.661	0.041
Total	100.892	100.634	96.603	96.451	97.476	97.268	101.057

Comment	Diopside	Diopside	Hornblende	Hornblende	Hornblende	Hornblende	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	B14	B15	B16	B17	B18	B19	B20
SiO2	55.82	55.68	55.5	52.98	52.85	53.85	53.83
FeO	10.19	10.58	11.14	3.42	3.65	2.92	3.59
K2O	0.007	0	0.012	0.002	0	0.002	0.007
NiO	0.115	0.116	0.103	0.069	0.033	0.055	0.06
Na2O	0.017	0.019	0	0.379	0.343	0.244	0.275
Al2O3	1.136	1.174	0.881	1.469	1.661	1.084	1.473
MnO	0.229	0.184	0.371	0.127	0.141	0.074	0.114
CaO	0.351	0.409	0.342	23.98	24	24.24	24.08
Cr2O3	0.209	0.238	0.18	0.425	0.425	0.29	0.428
MgO	31.77	32.04	32.46	16.46	16.3	17.01	16.81
TiO2	0.051	0.065	0.054	0.046	0.075	0.095	0.079
Total	99.895	100.505	101.042	99.357	99.477	99.865	100.745
Comment	Enstatite	Enstatite	Enstatite	Diopside	Diopside	Diopside	Diopside
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	B21	B22	B23	B24	B25	B26	B27
SiO2	45.01	44.91	44.48	45.87	55.46	56.85	55.55
FeO	5.96	5.68	6.3	5.4	11.19	10.9	10.86
K2O	1.17	1.23	1.103	1.28	0.002	0	0.004
NiO	0.151	0.197	0.138	0.165	0.161	0.103	0.074
Na2O	1.93	1.83	1.99	1.75	0.034	0.012	0.014
Al2O3	10.44	10.33	10.4	10.33	1.259	1.397	1.031
MnO	0.127	0.053	0.042	0.098	0.287	0.261	0.276
CaO	12.24	12.44	12.61	12.42	0.449	0.559	0.41
Cr2O3	1.223	1.76	1.293	1.59	0.232	0.203	0.269
MgO	17.92	17.72	17.71	17.88	32.04	31.34	32.23
TiO2	0.557	0.632	0.61	0.659	0.04	0.089	0.046
Total	96.728	96.782	96.676	97.442	101.154	101.713	100.764
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Enstatite	Enstatite	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	B28	B29	B30	B31	B32	B33	B34
SiO2	45.5	45.34	42.93	44.68	53.79	53.35	53.74
FeO	5.83	6.04	6.35	6.06	3.49	3.58	3.6
K2O	1.174	1.24	1.31	1.22	0.008	0.009	0.008
NiO	0.178	0.176	0.211	0.185	0.078	0.058	0.049
Na2O	1.76	1.89	2.13	1.89	0.36	0.296	0.333
Al2O3	10.49	10.75	11.8	10.91	1.622	1.311	1.413
MnO	0.092	0.058	0.079	0.045	0.13	0.135	0.096
CaO	12.42	12.51	12.36	12.38	24.06	23.35	24.45

Cr2O3	1.182	1.412	1.49	1.34	0.511	0.423	0.497
MgO	17.79	17.48	16.93	17.56	16.52	16.9	16.56
TiO2	0.612	0.632	0.713	0.656	0.087	0.083	0.085
Total	97.028	97.528	96.303	96.926	100.656	99.496	100.83
Comment	Hornblende	Hornblende	Hornblende	Hornblende	Diopside	Diopside	Diopside
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	B35	B36	B37	B38	B39	B40	B41
SiO2	53.67	54.74	55.26	55.43	55.21	52.73	55.99
FeO	3.48	11.21	11.92	11.59	11.84	13.14	11.77
K2O	0	0.006	0.014	0	0	0	0
NiO	0.073	0.105	0.148	0.117	0.127	0.153	0.103
Na2O	0.317	0	0.002	0	0.026	0	0.022
Al2O3	1.356	1.092	1.398	1.309	1.189	2.21	1.23
MnO	0.181	0.289	0.268	0.244	0.337	0.233	0.365
CaO	24.45	0.475	0.566	0.558	0.405	0.505	0.475
Cr2O3	0.345	0.213	0.263	0.264	0.216	0.767	0.252
MgO	16.6	31.89	31.54	31.36	31.73	30.44	31.35
TiO2	0.079	0.03	0.078	0.086	0.065	0.014	0.046
Total	100.55	100.049	101.456	100.958	101.145	100.193	101.602
Comment	Diopside	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	B42	B43	B44	B45	B46	B47	B48
SiO2	55.73	56.07	55.66	54.94	55.81	56.24	55.31
FeO	11.59	11.63	12.12	11.78	11.28	11.41	11.64
K2O	0.006	0.006	0.012	0.004	0	0.029	0
NiO	0.103	0.13	0.078	0.14	0.117	0.091	0.088
Na2O	0.004	0.036	0.005	0.028	0.034	0.003	0.027
Al2O3	1.145	1.066	1.175	1.384	1.349	1.17	1.402
MnO	0.276	0.266	0.331	0.282	0.316	0.289	0.276
CaO	0.458	0.513	0.362	0.481	0.445	0.317	0.372
Cr2O3	0.182	0.195	0.224	0.263	0.233	0.215	0.245
MgO	31.74	31.54	31.16	31.71	31.15	31.6	31.9
TiO2	0.04	0.021	0.027	0.021	0.025	0.025	0.032
Total	101.274	101.472	101.152	101.032	100.76	101.39	101.291
Comment	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite	Enstatite
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	Bc04	Bc05	Be01	Be02	Be03	Be04	Be05
SiO2	43.33	42.01	44.9	43.76	45.41	43.28	43.1
FeO	10.5	10.28	9.94	10.28	10.43	9.8	10.69
K2O	1.24	1.27	1.061	1.051	0.981	1.099	1.22
NiO	0.128	0.116	0.061	0.072	0.112	0.071	0.069

Na2O	2	1.95	1.91	1.86	2.04	1.82	1.97
Al2O3	10.26	10.26	10.28	9.83	10.38	9.58	10.03
MnO	0.185	0.136	0.068	0.115	0.091	0.139	0.157
CaO	11.52	11.55	11.77	11.87	11.9	11.7	11.53
Cr2O3	0.62	0.592	0.598	0.567	0.54	0.61	0.64
MgO	15.56	15.1	15.62	15.6	15.36	15.66	15.29
TiO2	0.968	0.986	1.054	0.967	0.968	0.977	0.981
Total	96.311	94.25	97.261	95.972	98.213	94.735	95.677
Comment	Hornblende	Discarded	Hornblende	Discarded	Hornblende	Discarded	Discarded
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	C02	C03	C04	C05	C06	C07	C08
SiO2	56.05	46.21	55.22	40.41	40.09	38.45	40.39
FeO	8.62	8.15	8.84	12.38	12.24	12.03	11.8
K2O	0	0.031	0	0	0	0	0.009
NiO	0.03	0.067	0.073	0.338	0.358	0.42	0.377
Na2O	0.008	0.061	0	0	0.017	0	0.01
Al2O3	1.249	0.663	1.114	0.016	0.004	0.011	0
MnO	0.135	0.1	0.217	0.155	0.118	0.176	0.153
CaO	0.427	0.068	0.278	0.008	0.014	0	0.006
Cr2O3	0.167	0.007	0.113	0	0	0.005	0.015
MgO	33.3	38.5	34.25	48.48	48.02	47.96	48.51
TiO2	0.045	0.013	0.027	0.057	0	0.038	0
Total	100.031	93.87	100.133	101.844	100.861	99.09	101.27
Comment	Enstatite	Discarded	Enstatite	Olivine	Olivine	Olivine	Olivine
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	C09	C10	C11	C12	C13	C14	C15
SiO2	44.4	43.89	53.33	53.37	53.44	53.4	44.59
FeO	4.97	4.8	2.73	2.51	2.42	3.02	5.03
K2O	0.807	0.765	0	0.026	0.004	0.01	0.812
NiO	0.1	0.099	0.054	0.037	0.043	0.024	0.048
Na2O	2.41	2.27	0.256	0.235	0.283	0.207	2.43
Al2O3	10.85	9.81	1.414	1.306	1.419	1.41	10.65
MnO	0.106	0.053	0.152	0.061	0.077	0.098	0.093
CaO	12.52	12.29	24.33	24.43	24.2	24.27	12.36
Cr2O3	1.117	0.958	0.251	0.318	0.348	0.336	1.143
MgO	18.23	18.7	17.03	17.12	17.3	17	18.26
TiO2	0.472	0.478	0.077	0.069	0.094	0.089	0.565
Total	95.981	94.113	99.624	99.481	99.628	99.865	95.98
Comment	Discarded	Discarded	Diopside	Diopside	Diopside	Diopside	Discarded
Sample	516121a	516121a	516121a	516121a	516121a	516121a	516121a
No.	C16	C17	C18	C19	C20	C21	C22

SiO2	45.55	44.78	45.33	40.45	33.37	39.5	40.14
FeO	4.81	5.26	5.45	12.07	11.91	12.65	12.16
K2O	0.779	0.833	0.795	0.007	0.076	0.005	0.006
NiO	0.069	0.14	0.085	0.393	0.363	0.361	0.4
Na2O	2.38	2.4	2.35	0.01	0.014	0	0
Al2O3	10.67	10.88	10.8	0.009	0.572	0.008	0.015
MnO	0.154	0.082	0.082	0.163	0.228	0.176	0.181
CaO	12.43	12.32	12.51	0.006	0.026	0.002	0.016
Cr2O3	0.823	1.177	1.019	0.02	0.057	0.024	0.003
MgO	18.47	18.39	18.45	47.79	50.84	48.45	48.63
TiO2	0.509	0.528	0.581	0.009	0.013	0	0
Total	96.645	96.789	97.453	100.927	97.469	101.176	101.552
Comment	Hornblende	Hornblende	Hornblende	Olivine	Discarded	Olivine	Olivine
Sample	516121a	516121a	516121a	516121a	516121a	516121a	
No.	C23	C24	C25	C26	C27	C28	
SiO2	39.67	40.12	39.88	40.24	44.85	43.95	
FeO	11.9	11.81	12.17	12.32	5.07	5.26	
K2O	0	0	0	0.002	0.776	0.813	
NiO	0.389	0.329	0.43	0.36	0.076	0.047	
Na2O	0.007	0	0.006	0	2.41	2.38	
Al2O3	0.016	0.014	0.029	0.015	11.02	11.03	
MnO	0.158	0.137	0.202	0.165	0.082	0.063	
CaO	0.012	0	0.007	0.005	12.43	12.34	
Cr2O3	0	0.139	0.153	0.011	1.051	1.056	
MgO	48.31	48.37	48.92	47.72	18.51	18.4	
TiO2	0	0.011	0	0.009	0.544	0.555	
Total	100.461	100.93	101.797	100.847	96.821	95.894	
Comment	Olivine	Olivine	Olivine	Olivine	Hornblende	Discarded	

6.1.3. EDS analysis results

Table 11 EDS analysis results from sample 516137.

	516137(2)_pt1	516137(2)_pt2	516137(2)_pt3	516137(2)_pt4	516137(2)_pt5
O-K					
Mg-K	0.09	0	0.18	0	0
Al-K	0	0	0	0	0
Si-K	0.18	0.11	0.21	0.17	0.22
S-K	54.12	54.71	54.52	51.49	49.35
Cl-K					
Ca-K				0	
Cr-K					
Mn-K					
Fe-K	45.62	45.18	45.09	24.67	23.98
Ni-K	0	0	0		26.45
Cu-K				23.67	
As-K					
	516137(2)_pt6	516137(2)_pt7	516137(2)_pt8	516137(2)_pt9	516137(2)_pt10
O-K	47.3	49.9	51.12	51.4	49.86
Mg-K	0	1.36	8.36	1.06	10.29
Al-K	0	2.06	23.84	0.95	28.74
Si-K	0.6	0.14		0	
S-K	0.13	0		0	
Cl-K					
Ca-K					
Cr-K	0.35	4.43	7.54	3.79	4.31
Mn-K					
Fe-K	51.63	42.11	9.14	42.81	6.8
Ni-K					
Cu-K					
As-K					
	516137(2)_pt11	516137(2)_pt12	516137(3)_pt1	516137(3)_pt2	516137(3)_pt3
O-K	44.5				53.71
Mg-K	0.37		0	0.09	0
Al-K	0	0	0	0	0
Si-K	0.24	0	0	0.15	0.62
S-K	0.2	67.77	54.2	53.71	0.2
Cl-K					

Ca-K					
Cr-K	0.35				0.15
Mn-K					
Fe-K	54.34	32.23	45.8	45.63	45.31
Ni-K			0	0.41	
Cu-K					
As-K		0			
	516137(3)_pt4	516137(3)_pt5	516137(3)_pt6	516137(3)_pt7	516137(3)_pt8
O-K		48.71			
Mg-K	0	0.53	0	0	0
Al-K	0	0.22	0	0	0
Si-K	0	0	0.16	0	0
S-K	54	0	51.65	54.72	51.73
Cl-K					
Ca-K			0		0.05
Cr-K		0.35			
Mn-K					
Fe-K	46	50.19	24.81	45.28	24.88
Ni-K	0			0	
Cu-K			23.38		23.35
As-K			0		
	516137(3)_pt9	516137(3)_pt10	516137(3)_pt11	516137(3)_pt12	516137(3)_pt13
O-K					52.5
Mg-K	0	0.13	0	0	0
Al-K	0	0	0	0	0
Si-K	0.2	0.13	0.12	0.15	0.36
S-K	54.48	49.23	49.39	49.35	0
Cl-K					
Ca-K					
Cr-K					0.18
Mn-K					
Fe-K	45.32	24.25	24.22	24.38	46.96
Ni-K	0	26.27	26.27	26.13	
Cu-K					
As-K					0
	516137(3)_pt14	516137(3)_pt15	516137(3)_pt16	516137(3)_pt17	516137(3)_pt18
O-K		52.87	45.11	49.67	51.77
Mg-K	0	8.79	0.99	0.71	1.05
Al-K	0	22.78	1.29	1.03	1.87
Si-K	0.15		0.2	0.21	0.31
S-K	54.62		0	0	0

Cl-K					
Ca-K					
Cr-K		6.49	3.64	3.51	3.78
Mn-K					
Fe-K	45.23	9.08	48.78	44.87	41.22
Ni-K	0				
Cu-K					
As-K					
	516137(3)_pt19	516137(3)_pt20	516137(3)_pt21	516137(3)_pt22	516137(4)_pt1
O-K	31.57		62.97		
Mg-K	1.49	0.16	0	0	0
Al-K	0.14	0	0	0	0
Si-K	1.37	0	0.43	0	0
S-K	30.41	50.5	0.28	54.86	54.15
Cl-K					
Ca-K			0		
Cr-K	0.62				
Mn-K					
Fe-K	34.04	28.53	36.05	44.78	45.85
Ni-K	0.37	20.8	0.28	0.35	0
Cu-K					
As-K					
	516137(4)_pt2	516137(4)_pt3	516137(4)_pt4	516137(4)_pt5	516137(4)_pt6
O-K					62.23
Mg-K	0	0	0.2	0.14	0.34
Al-K	0	0	0	0	0
Si-K	0	0.19	0.18	0	0.42
S-K	54.42	48.72	49.13	54.73	0.15
Cl-K					
Ca-K					0
Cr-K					
Mn-K					
Fe-K	45.58	24.96	24.53	45.12	36.86
Ni-K	0	26.13	25.95	0	0
Cu-K					
As-K		0			
	516137(4)_pt7	516137(5)_pt1	516137(5)_pt2	516137(5)_pt3	516137(5)_pt4
O-K	50.84				
Mg-K	1.24				
Al-K	1.7	0.11	0.09	0	0
Si-K	0	0	0	0	0.1

S-K	0	67.75	67.68	67.92	67.56
Cl-K					
Ca-K					
Cr-K	4.11				
Mn-K					
Fe-K	42.11	32.15	32.23	32.08	32.33
Ni-K					
Cu-K					
As-K		0	0	0	0
	516137(5)_pt5	516137(5)_pt6	516137(5)_pt7	516137(5)_pt8	516137(5)_pt9
O-K					
Mg-K			0	0	0
Al-K	0	0	0	0	0
Si-K	0.1	0	0	0	0.16
S-K	67.88	68.04	54.52	54.65	54.61
Cl-K					
Ca-K					
Cr-K					
Mn-K					
Fe-K	32.01	31.96	45.48	45.35	45.23
Ni-K			0	0	0
Cu-K					
As-K	0	0			
	516137(5)_pt10	516137(5)_pt11	516137(5)_pt12	516137(5)_pt13	516137(5)_pt14
O-K					
Mg-K		0	0		0
Al-K	0	0	0	0	0
Si-K	0	0.14	0.41	0	0
S-K	67.81	51.43	51.25	67.97	54.88
Cl-K					
Ca-K		0	0		
Cr-K					
Mn-K					
Fe-K	32.19	24.51	24.59	32.03	45.12
Ni-K					0
Cu-K		23.93	23.75		
As-K	0		0	0	
	516137(5)_pt15	516137(5)_pt16	516137(6)_pt1	516137(6)_pt2	516137(6)_pt3
O-K					
Mg-K	0.17	0.04	0.11	0	0
Al-K	0	0	0	0.09	0

Si-K	0.17	0	0	0	0
S-K	48.83	51.9	49.59	54.36	51.59
Cl-K					
Ca-K		0			0
Cr-K					
Mn-K					
Fe-K	24.21	24.66	24.04	45.04	24.59
Ni-K	26.62		26.25	0.5	
Cu-K		23.4			23.82
As-K					
	516137(6)_pt4	516137(6)_pt5	516137(6)_pt6	516137(6)_pt7	516137(6)_pt8
O-K					
Mg-K	0.47		0	0	
Al-K	0.12	0	0	0	0
Si-K	1.85	0	0.17	0.13	0.16
S-K	56.46	67.85	54.47	51.54	67.53
Cl-K					
Ca-K				0	
Cr-K					
Mn-K					
Fe-K	28.95	31.93	45.36	24.97	32.31
Ni-K	1.25		0		
Cu-K	10.89			23.36	
As-K		0.22			0
	516137(6)_pt9	516137(6)_pt10	516137(6)_pt11	516137(6)_pt12	516137(6)_pt13
O-K					
Mg-K	0		0	0	0
Al-K	0	0	0	0	0
Si-K	0.18	0	0.13	0	0
S-K	53.95	67.82	51.59	49.43	51.26
Cl-K					
Ca-K			0		0
Cr-K					
Mn-K					
Fe-K	45.87	32.18	24.92	24.72	24.92
Ni-K	0			25.86	
Cu-K			23.35		23.82
As-K		0	0		
	516137(6)_pt14	516137(6)_pt15	516137(7)_pt1	516137(7)_pt2	516137(7)_pt3
O-K			46.6	53.54	
Mg-K	0	0	1.26	0.75	

Al-K	0	0	1.78	1.47	0
Si-K	0	0	0	0.16	0
S-K	53.92	51.39	0	0	67.59
Cl-K					
Ca-K		0			
Cr-K			4.47	3.7	
Mn-K					
Fe-K	46.08	24.86	45.88	40.38	32.41
Ni-K	0				
Cu-K		23.76			
As-K					0
	516137(7)_pt4	516137(7)_pt5	516137(7)_pt6	516137(7)_pt7	516137(7)_pt8
O-K				62.21	
Mg-K		0	0	0	0
Al-K	0	0	0	0.18	0
Si-K	0	0	0	0.17	0
S-K	67.77	54.57	51.54	0	54.51
Cl-K					
Ca-K			0	0	
Cr-K					
Mn-K					
Fe-K	32.23	45.43	24.62	37.44	45.49
Ni-K		0		0	0
Cu-K			23.83		
As-K	0				
	516137(7)_pt9	516137(7)_pt10	516137(7)_pt11	516137(7)_pt12	516137(7)_pt13
O-K			61.71	62.46	
Mg-K	0		0.79	0.3	0.12
Al-K	0	0	0.18	0	0
Si-K	0.17	0.12	0.68	0.54	0
S-K	51.04	67.65	0	0	54.57
Cl-K					
Ca-K	0		0	0	
Cr-K					
Mn-K					
Fe-K	24.75	32.23	36.63	36.7	45.31
Ni-K			0	0	0
Cu-K	24.04				
As-K		0			
	516137(7)_pt14	516137(7)_pt15	516137(7)_pt16	516137(7)_pt17	516137(7)_pt18
O-K			62.86	54.07	

Mg-K	0.23	0.36	0	0.81	0
Al-K	0	0.11	0.12	1.74	0
Si-K	0.19	0.34	0.5	0.15	0.09
S-K	48.78	53.44	0	0	51.3
Cl-K					
Ca-K			0.08		0
Cr-K				3.93	
Mn-K					
Fe-K	24.3	29.35	36.44	39.3	24.77
Ni-K	26.49	16.41	0		
Cu-K					23.84
As-K					
	516137(8)_pt1	516137(8)_pt2	516137(8)_pt3	516137(8)_pt4	516137(8)_pt5
O-K			62.91		
Mg-K		0	0.23	0	0
Al-K	0.06	0.2	0.12	0	0
Si-K	0	0.24	0	0	0.19
S-K	67.68	51.07	0.08	51.24	54.23
Cl-K					
Ca-K		0	0	0	
Cr-K					
Mn-K					
Fe-K	32.26	24.61	36.66	24.83	45.58
Ni-K			0		0
Cu-K		23.88		23.93	
As-K	0				
	516137(8)_pt6	516137(8)_pt7	516137(8)_pt8	516137(8)_pt9	516137(8)_pt10
O-K		63.99			
Mg-K	0	0.19	0	0	0
Al-K	0	0.1	0	0	0
Si-K	0	0.15	0.16	0.16	0.17
S-K	52.12	0	57.42	54.75	57.41
Cl-K					
Ca-K	0	0			
Cr-K					
Mn-K					
Fe-K	24.52	35.57	24.46	45.09	25.37
Ni-K		0	17.95	0	17.05
Cu-K	23.36				
As-K					
	516137(8)_pt11	516137(8)_pt12	516137(8)_pt13	516137(8)_pt14	516137(8)_pt15

O-K			68.13	74.61	76.31
Mg-K	0		25.25	13.02	12.61
Al-K	0.23	0			
Si-K	0	0			
S-K	51.63	68.03	0.9	0.13	0
Cl-K					
Ca-K	0			11.91	10.69
Cr-K					
Mn-K			0.51	0	0
Fe-K	24.66	31.97	5.21	0.32	0.39
Ni-K					
Cu-K	23.48				
As-K		0			
	516137(8)_pt16	516137(8)_pt17	516137(8)_pt18	516137(8)_pt19	516137(8)_pt20
O-K	65.71			73.52	77.44
Mg-K	7.79		1.41	13.57	0.95
Al-K	0.85	1.75	4.85		2.34
Si-K	16.66	1.17	4.56		4.79
S-K		48.64	54.36	0	3.53
Cl-K					6.23
Ca-K	7.74			12.03	0.3
Cr-K					
Mn-K				0.08	
Fe-K	1.26	48.43	34.81	0.81	2.88
Ni-K					1.53
Cu-K					
As-K					
	516137(8)_pt21				
O-K	73.33				
Mg-K	13.83				
Al-K					
Si-K					
S-K	0				
Cl-K					
Ca-K	12.24				
Cr-K					
Mn-K	0.12				
Fe-K	0.48				
Ni-K					
Cu-K					
As-K					