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Petrological and geochemical investigations of mantle xenoliths from kimberlites of Botswana

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Abstract

Cratons are the oldest continental lithospheric units we find on Earth. These ancient regions are associated with deep reaching lithospheric roots. The occurrence of kimberlites is typically restricted to these cratonic areas. Kimberlites sample the surrounding sub continental lithospheric mantle (SCLM) during their fast ascent. Furthermore, they are the main source of economically mined diamonds. For petrologists incorporated peridotitic xenoliths reveal a unique view into processes, which are taking place in the upper mantle. The aim of this thesis is to apply petrological and geochemical techniques to establish a detailed petrological and geochemical characterisation of the SCLM revealed by peridotitic xenoliths emplaced 93 million years ago in Letlhakane, Botswana. Collected samples were divided into five groups, and according pressures and temperatures were calculated including the following: (1) Spinel Peridotites (temperature 732°C-874°C; pressure 28kbar- 35kbar), (2) Spinel-garnet lherzolites (temperature 713°C- 952°C; pressures 28kbar- 44 kbar), (3) Garnet lherzolites (temperature 871°C- 1142°C; pressure 38kbar- 56kbar) , (4) Garnet harzburgites (temperature 835°C- 1240°C; pressure 35 kbar- 61 kbar) and (5) Porphyroclastic lherzolites (temperature 1286°C- 1454°C; pressure 64 kbar- 73 kbar). Geothermobarometrical calculations yield a very good fit with a 40 mW/m² geotherm at the emplacement date and define the base of lithosphere by elevated temperatures and strain rates in porphyroclastic lherzolites in approximately 240 km depth. Rare earth element (REE) measurements show a complex history and re-enrichment of the SCLM by mobile fluids/melts percolating in the SCLM. Metasomatic agents cause an enrichment in heavy REE in garnets, which are coexisting with clinopyroxene. In contrast garnets with sinusoidal elevated light REE occure only in samples without clinopyroxene. Minor affected garnets are depleted in light REE and heavy REE and reveal inhomogeneous metasomatism within the lithospheric mantle of Letlhakane. Oxygen fugacity calculations reveal oxidizing conditions for metasomatized samples resulting in a destabilization of diamond.

Kurzfassung

Kratone sind die ältesten lithospherischen Einheiten welche wir auf unserem Planeten finden. Diese archäischen Regionen besitzen tiefreichende Lithosphärenwurzeln und unterscheidet sie dadurch von anderen kontinentalen Gebieten. Diese besondere Architektur der kratonischen Mantellithossphäre ist ursächlich für alkaline und volatilreiche Schmelzen. Diese Schmelzen, Kimberlit genannt, beproben den kontinentalen lithospherischen Mantel den sie durchschlagen. Dies geschieht während eines rasanten Aufstieges zur Erdoberfläche. Weiters sind Kimberlite bekannt für wirtschaftlich relevante Vorkommen von Diamant, welche sie auf gleichem Weg aus großen tiefen mitfördern. Petrologen nutzen mitgerissene peridotitische Einschlüsse als Fenster um Prozesse im Erdinneren zu verstehen und schließen so folglich auf die Entstehung und Entwicklung des Planeten. Ziel dieser Arbeit war es eine detaillierte geochemische und petrologische Charakterisierung des lithospherischen Mantel in der Region Letlhakane/Botswana vorzunehmen. Basis dafür waren peridotitische Mantelxenolithe welche vor 93 Millionen Jahren beim Kimberlitausbruch in Letlhakane/Botswana zutage gefördert wurden. Gesammelte Gesteine wurden in fünf Gruppen unterteilt und mineralchemisch untersucht um deren Ursprungsdruck und Temperaturverhältnisse zu errechnen. Folgende Ergebnisse wurden erzielt (1) Spinel Peridotite ergaben Temperaturen von 732°C-874°C; und Drücke von 28kbar- 35kbar, (2) Spinel-Granat Lherzolite ergaben Temperaturen von 713°C- 952°C und Drücke von 28kbar- 44 kbar, (3) Granat Lherzolite ergaben Temperaturen 871°C- 1142°C und Drücke von 38kbar- 56kbar, (4) Granat Harzburgite ergaben Temperaturen 835°C- 1240°C und Drücke von 35 kbar- 61 kbar und (5) Porphyroclastische Lherzolite ergaben Temperaturen von 1286°C- 1454°C und Drücke von 64 kbar- 73 kbar. Diese Ergebnisse stimmen mit einem 40 mW/m^2 Geotherm überein. Ausschließlich die Basis der Lithosphere, welche durch porphyroclastische Lherzolite in ca. 240 km Tiefe repräsentiert wird, zeigt ein Abweichung zu höheren Temperaturen kombiniert mit erhöhten Deformationsraten. Selten Erd Elementanalysen von Mineralen verdeutlichen eine komplexe Vergangenheit in einem chemisch verarmten lithospherischen Mantel. Metasomatische Wiederanreicherung von chemischen Elementen durch Fluide und/oder Schmelzen konnte dabei nachgewiesen werden. Chondritnormalisierte Selten Erdmuster zeigen Anreicherung von schweren Seltenen Erden in Granat in Anwesenheit von Klinopyroxen und zusätzliche Anreicherung von leichten Seltenen Erden in Granaten in Abwesenheit von Klinopyroxen. Gering schmelzbeeinflusste Granate zeigen indes Verarmung bei leichten sowie schweren selten Erden. Berechnungen der Sauerstofffugazität ergaben oxidiernde Bedingungen für genannt auffällige Seltenerdmuster, welche nicht mit der Stabilität von Diamand vereinbar sind. Unsere Untersucheungen ergaben, dass metasomatische Prozesse im Erdinneren nicht homogen alle Bereiche des lithospherischen Mantle unter Letlhakane betroffen haben.

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Abbreviations

Apfu	atoms per formula unit
Cpx	Clinopyroxene
Equ.	Equation
Ga	Billion Years
Grt	Garnet
Hzb	Garnet harzburgite
Lhz	Garnet lherzolite
HREE	Heavy rare earth elements
LREE	Light rare earth elements
Ma	Million years
Ol	Olivine
Opx	Orthopyroxene
Phl	Phlogopite
Por	Prophyroclastic lherzolite
REE	Rare earth elements
SCLM	Subcontinatel Lithospheric Mantle
Spl	Spinel or Spinel bearing peridoite
SplGrt	Spinel-Garnet Lherzolite
TE	Trace elements
TTG	tonalite – trondhjemite– granodiorite
vol.%	volume percentage
wt.%	weight percentage
X Mg	Mg/(Fe+Mg)

1 Introduction

The Earth´s mantle, reaching from approximately 45 to 2900 km depth, presents one of the most fascinating parts of our planet. Because of the fact that deep regions of solid earth are not reachable by any drilling technique, scientists need to take advantage of alternative approaches. Not only geophysical methods help to define a theoretical structure of the unknown parts of the mantle using seismic waves, but geologists also contribute in understanding this parts by using upper mantle fragments found in lava flows and magmatic intrusives. These hand specimens belong to the subcontinental lithospheric mantle (SCLM) and provide precise insight into our terrestrial planet. To investigate these rocks it helps to understand the formation of our planet. Moreover, it is pivotal to understand the processes, which were taking place during lithospheric evolution.

2 Earth´s structure

By subdividing the Earth's interior, we can describe three major units:

- Crust (ca. 0-45 km)
- Mantle (ca. 45-2900 km)
- Core (ca. 2900-6380 km)

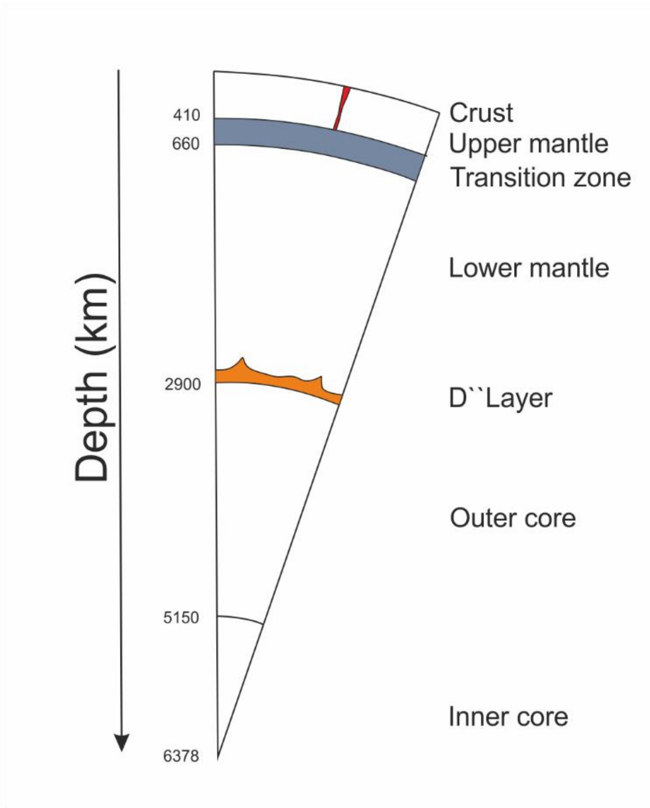


Figure 1| Simplified structure of the Earth. Red colored dyke: possible kimberlite mantle source.

The crust contributes the smallest compositional amount and represents approximately 1 vol.% of the earth (Winter, 2013). We divide the crust further into continental and oceanic crust. The thickness of the crust is heterogeneous and depends on the prevailing tectonic situation for the continental crust and the age of the crust for oceanic crust. In general, oceanic crust is thinner with about 8 to 10km thickness and continental crust is thicker with a thickness of 35 km in stable continental regions (but extending up to 60-90 km in orogenic regions; Winter, 2013).

The Earth´s mantle is continuing below the crust accounting for 83 vol.% of the earth (Winter, 2013). It´s subdivided into three mayor layers:

- Lithospheric mantle
- Asthenosphere
- Mesosphere

Crust and the underlying lithospheric mantle (in continental regions abbreviated as sub continental lithospheric mantle, SCLM) are collectively called lithosphere. Close to oceanic ridges the lithosphere is about 50 km thin, but during cooling over time lithospheric thickness reaches up to 110 km (Winter, 2013). Continental lithosphere extends much further beneath old and stable crust and reaches depths of about 200-250km in cratonic regions. Lithospheric mantle is consisting of olivine, orthopyroxene, clinopyroxene and a various amount of spinel or garnet. The transition of spinel to garnet is thereby depending on the chromium content of the peridotitic rock (Klemme and O'Neill, 2000). The boundary between lithosphere and asthenosphere (LAB) is primary a geodynamic discontinuity explaining plate tectonics. The rigid upper part represented by the lithosphere moves relative to the lower ductile part represented by the asthenosphere. This mechanical boundary layer with elevated strain rates defines the LAB on the one hand, but other geophysical approaches and correlations are also discussed in Eaton et al. (2009), O'Reilly and Griffin, (2010) and Priestley and McKenzie (2006). One definition regards to a prominent seismic discontinuity, which indicates the base of the lithosphere. After high shear wave velocities in the lithosphere, a low velocity zone is continuing till the L-Discontinuity, which represents the base of the asthenosphere (Eaton et al., 2009; Lehmann, 1960). Assuming regional geotherms, the low velocity zone is closely corresponding to depths, which reach melting temperatures of mantle material (Priestley and McKenzie, 2006). Nevertheless, the low velocity zone is not everywhere observable (Eaton et al., 2009). A second rheological definition of the LAB defines the LAB as boundary, where the conductive heat flow of the lithosphere is changing to convective heat flow in the mantle, caused by little amounts of partial melt (1-5%; Winter, 2013).

The asthenosphere is followed by the mesosphere, which reaches to the Earth´s core.

Within the mantle, several seismic discontinuities are interpreted as phase transitions and resulting in an increase of mineral densities. The 410-km- discontinuity refers to the change of the α-structure of olivine to the β-structure of wadsleyite, which is stable till 520 km. Furthermore, pyroxenes are changing their crystal lattice to garnet structure. Between 520 and 660 km the γ-structure ringwoodite is stable, till a new major discontinuity occurs. The region between 410 and 660 km is also known as transition zone and linked to significant amounts of dissolved water in this zone (Huang et al., 2005). At 660 km the tetrahedral coordination of silicon changes to an octahedral coordination resulting in the most abundant mineral on earth called (Mg,Fe)SiO_3-perovskit. Magnesiowüstite is also forming, taking the released excess iron and magnesium (for more details see Winter, 2013, Chapter 1).

The D" and Wiechert-Gutenberg-Discontinuity marks the lowest and an approximately 200 km thick layer bordering the Earth's core. The origin of this layer is not clarified yet, but it is related to the post-perovskite phase transition of Mg,Fe)SiO_3-perovskit (Murakami et al., 2004).

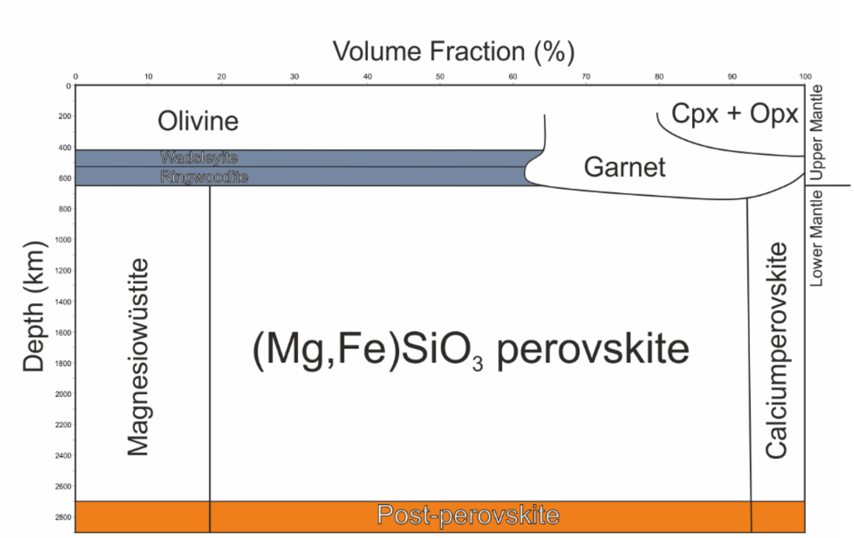


Figure 2| Volumetric abundance of mantle minerals according to depths. Cpx=Clinopyroxene; Opx=Orthopyroxene. Modified after Bina (1998).

Below the D'' layer, Earth´s core continues with a distinct chemical change. Dense iron alloys are prevalent and just have traces of Si, O, Ni and other elements. While the outer core is molten, the inner core behaves dens and solid (Winter, 2013).

2.1 Cratons

Cratons are the oldest continental crust we know and seem to be robust and without tectonic overprint at least for the last 2.5 Ga (Hoffman, 1988). These Archean shields are mainly made of felsic lithologies, typically referred to as Archaean tonalite – trondhjemite– granodiorite (TTG) suits with intercalated metabasic greenstone belts. Deep reaching (up to 250 km) lithospheric roots are beside lithological differences and long-term stability an important feature discriminating cratonic regions from non cratonic regions (Figure *3*). These shields are comparable with a buoyant ice bloc floating in water, where the main volume is situated below the water surface. Cratonic roots reach temperature and pressure conditions, which are matching with the diamond stability (Kennedy and Kennedy, 1976). The mantle beneath such regions is classified to be depleted in lithophil elements (e.g. Fe, Al, Ca, Ti), which were extracted during mantle differentiation (O'Reilly and Griffin, 2013). Southern African cratons were amalgamated by Proterozoic orogenies, which are nowadays represented by almost entirely sediment covered Proterozoic belts (Miensopust et al., 2011).

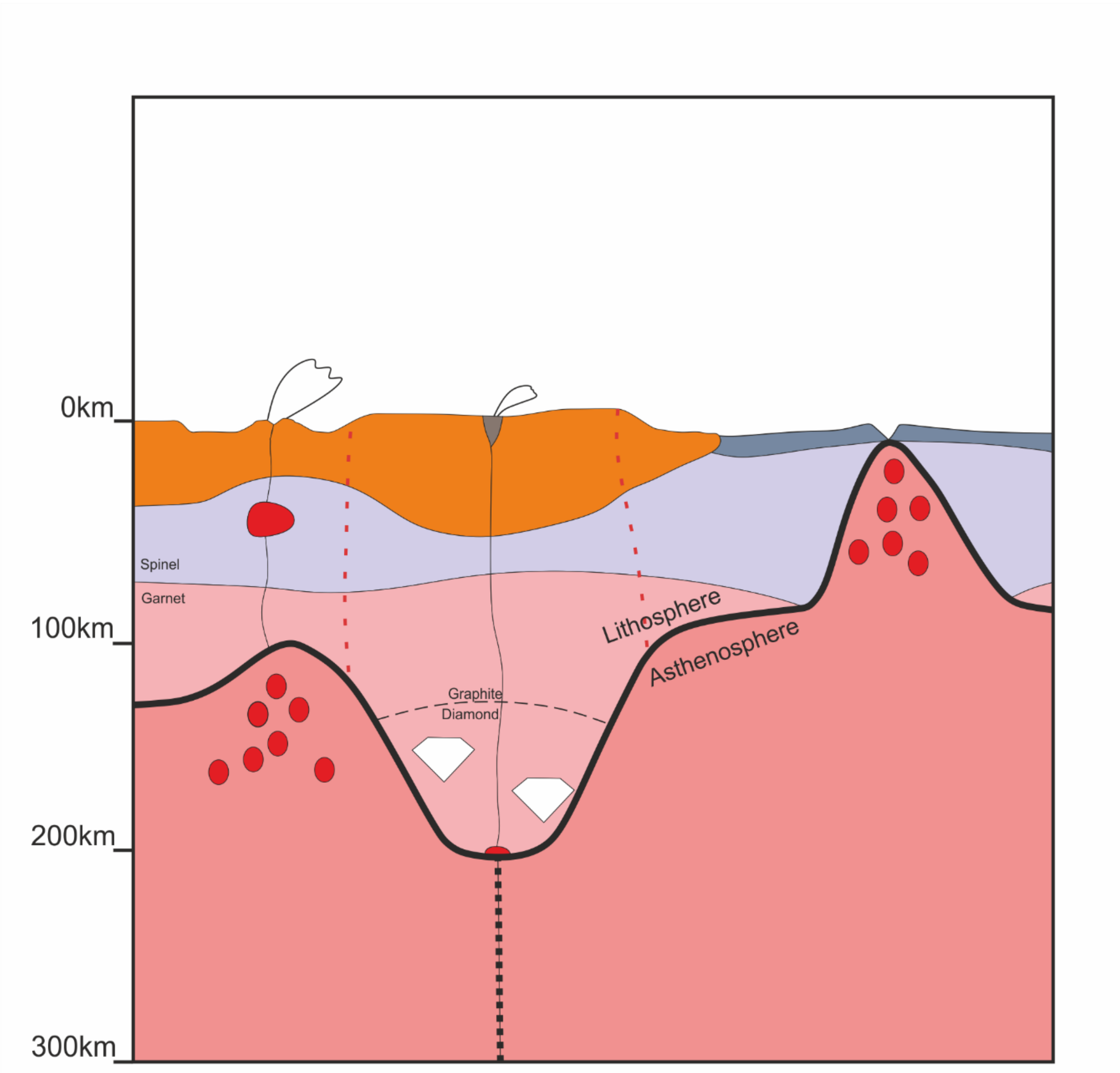


Figure 3| Simplified profile trough different types of lithosphere. Red dashed line indicating cratonic lithosphere. Modified after Stachel and Harris (2008).

Southern Africa is well known for several alkaline and carbonatitic volcanic extrusions, which are related to cratons. Nevertheless, eruptions of carbonatites, melnoites, lamproites and kimberlites are a world wide phenomena and are taking place at cratonic shields, their borders or continental rifting zones (Figure 4). Alkaline rocks are undersaturated in SiO_2 referred to Na_2O, K_2O ad CaO. Further, carbonatites are not necessarily alkaline rocks and show a model abundance of more than 50% igneous carbonate (Winter, 2013).

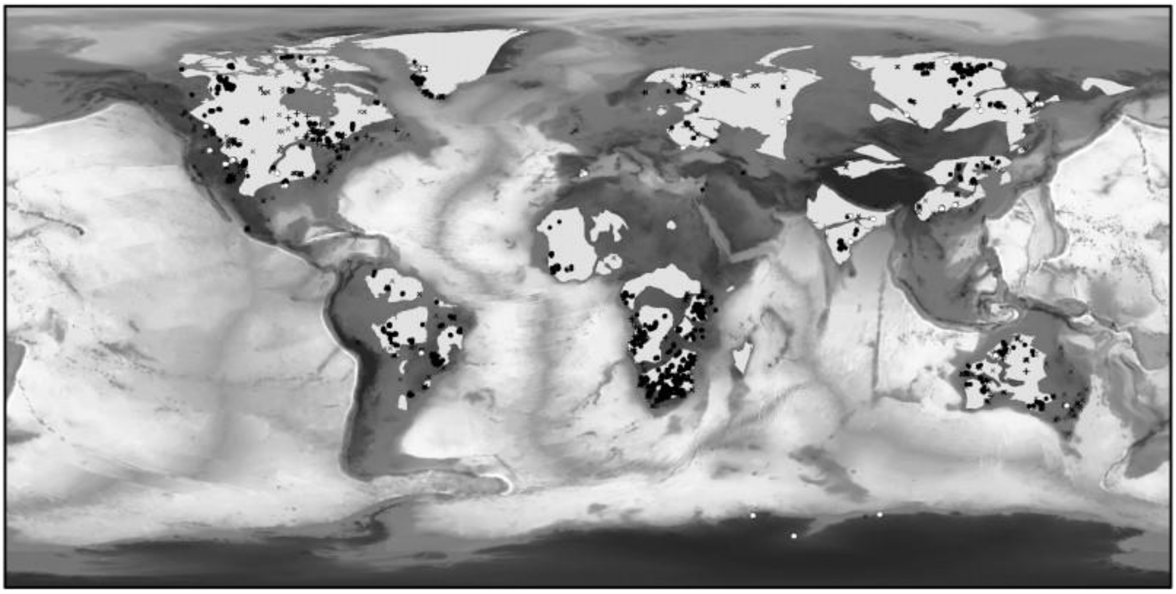


Figure 4| Distribution of Kimberlites (●), Lamproites (○), melnoites (x) and carbonatites (+) compared to cratons and continental shields worldwide. Graphic published in Jelsma et al (2009).

Kimberlites and lamproites are two groups of volatile rich, SiO_2 understaurated and alkaline magmas found within cratons and their surrounding belts. They possibly bear diamonds, deep crustal and mantle xenolithes. Lamproites and kimberlites are highly enriched in incompatible and light rare earth elements and are possible agents, causing metasomatic changes in the lithospheric mantle (Russell et al., 2012).

Kimberlites are volatile and potassium rich ultrabasic volcanic rock, which are linked to Archean cratons and their Proterozoic margins (Sparks, 2013; Wilson and Head, 2007; Winter, 2013). The genesis of this type of magma is part of an active scientific discussion (Golovin et al., 2018; Russell et al., 2012; Sparks, 2013; Wilson and Head, 2007).

Especially diamantiferous kimberlites are deeply related to cratons and therefore their chemistry and eruption style is correlated to the architecture of deep reaching lithospheric roots. Kimberlitic eruptions are a worldwide phenomenon, but recent events are not observed (Sparks, 2013). The oldest kimberlites are reported in Venezuela (Strontium isochrones age of 1.7 Ga), whereas the youngest kimberlites, erupted during the upper Pleistocene/Holocene (ca. 11,600 a) and are found in Tanzania (Brown et al., 2012; Nixon et al., 1992). Highly altered and eroded carrot shaped volcanic pipes are typical leftovers of an explosive eruption. Dykes are proposed to be narrow in the range of 1 m and ascent velocities of the magma are calculated to be several meters per second (Sparks et al., 2006).

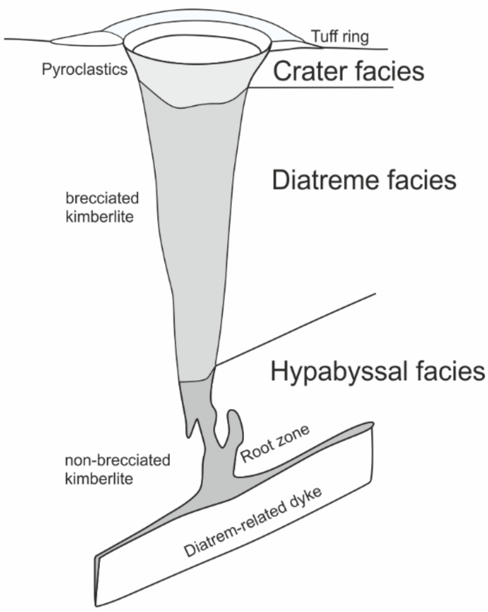
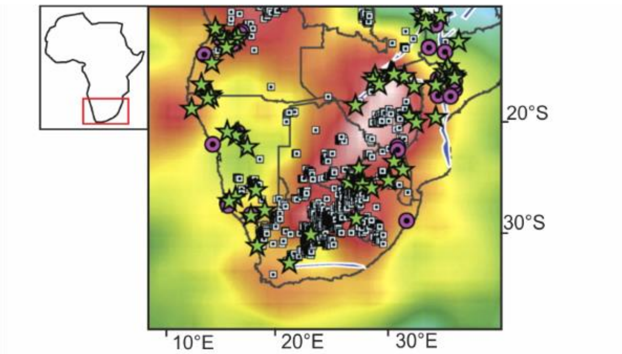


Figure 5| Idealized structure of a kimberlite dyke. Carrot shaped pipes reveal different facies indicating different stages of an explosive extrusion. Modified after *Wilson and Head (2007*).

There are two types of kimberlites described for the Kalahari craton differing by eruption date and geochemical characteristics. Type I Kimberlites (ca. 90Ma) are more radiogenic in the isotopic signature and Type II Kimberlites (100-200 Ma, also named orangeites) display a more micaceous mineralogy (Becker and Le Roex, 2006; Winter, 2013). Type II Kimberlites are only described for southern Africa.

Several models propose how this kind of magma is evolving, (1) enhanced plum activity, (2) subduction related melting or (3) thermal inhomogeneities of the mantle, assuming source regions in the asthenosphere or deeper (Becker and Le Roex, 2006; Jelsma et al., 2009). Scientific consensus is found in the low degree of partial melting for kimberlite formation and the origin of melts in depths deeper as needed to form diamond (Sparks, 2013). The origin of Type II Kimberlites is definitely limited to an lithospheric source (Becker and Le Roex, 2006; Coe et al., 2008).



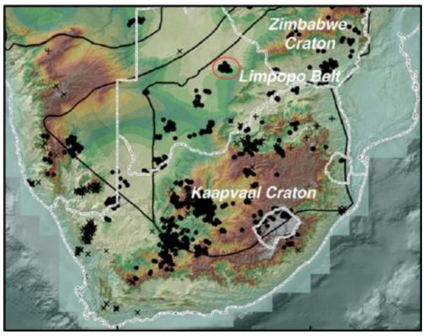


Figure 6| Left: Distribution of Kimberlites (squares), carbonatites (green stars) and nepheline syenites (pink circles) in southern Africa. Contours indicate shear wave velocities in 100-175 km depth. Colors are red for higher shear-wave velocities and green for lower shear-wave velocities. Red zones are correlated with deep reaching lithospheric roots. Graphic modified after Begg et al (2009). Right: Topographic map of southern Africa showing (•) kimberlite (x) melnoite, (+) carbonatite distribution. Red circle indicates the Orapa/Letlhakane kimberlite field. Modified after Jelsman et al (2009)

Lamproites are an additional group of ultrapotassic and peralkaline volatile rich alkaline magmas, which are described for 30-40 localities worldwide (Mitchell and Bergman, 1991; Winter, 2013). There isn´t a locality of lamproites in southern Africa, but olivine lamproites bear a similarity to Type II Kimberlites. Nevertheless, lamproites are a separate lithology and represent a wide diversity in mineralogy. Compared to kimberlites they have less volatiles, are more micaecous and are more enriched in LREE (Mitchell and Bergman, 1991).

Lamproite dykes are also known for their possibility to bear diamond, but they are seldom occurring directly within cratons (Winter, 2013). The melt source is situated in the deep lithosphere and all of the localities occur above paleo subduction zones (Winter, 2013).

In this study, we sampled xenoliths from the Lethlakane kimberlite pipe, which is classified to be a Type I Kimberlite with an eruption date 93 Ma ago (Griffin et al., 2003).

2.2 Lethlakane mine

Africa has a high abundance of kimberlite dykes throughout all cratonic regions (Kalahari craton, Congo craton, West African craton). Bostwana and South African kimberlites are world famous diamond sources. The Lethlakane mine is situated in the Orapa/Letlhakane kimberlite field, a cluster of approximately 82 dykes, located in central-east Botswana and is owend by Debswana. Beside open pits in Orapa, Damthsaa, Jwaneng (operated by Debswana) and Karowe (operated by Lucara Diamonds), the Letlhakane kimberlite dyke was one of the five big diamond sources in the country. The mine consists of two kimberlite pipes. The bigger pipe DK1 was mined constantly, whereas the smaller DK2 was mined between 1985 and 1986 (Field et al., 2008). Mining has ceased in 2017 and the operation changed to process tailings at this location. Previous scientific work, investigating mantle xenoliths found in the Letlhakane kimberlite, are published in Stiefenhofer et al. (1997), van Achterberg et al. (2001) and Borst (2012) and already propose complex metasomatic re-enrichment of the lithospheric mantle at this location.

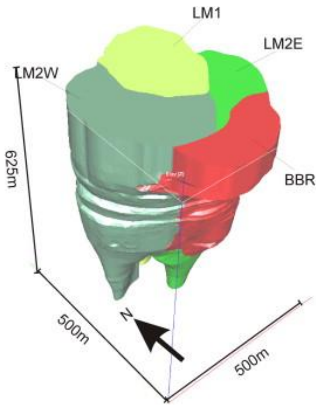


Figure 7| Left side: Aerial image of the Letlhakane mine (©Debswana). Right side: Geological model of the Letlhakane Kimberlite dyke DK1. BBR= southern basalt-breccia; LM1, LM2E and LM2W are volcanoclastic kimberlite units. Model published in Field et al (2008).

2.3 Geological setting

2.3.1 Cratons

The examined location is situated in Botswana, southern Africa. From the geological point of view the country is dominated by Archean and Proterozoic geological units, which are covered by young sediments (Figure 8). There are two cratonic units postulated in Botswana. Northeast of the country, a part of the Zimbabwe craton is separated from the southern Kaapvaal craton by the younger Limpopo mobile belt (Barton and Key, 1981; Hutchins and Reeves, 1980; Roering et al., 1992). Both, cratons and surrounding mobile belts, are summarized as Kalahari craton. These cratons merged with a metamorphic peak age 2.7 Ga ago (van Reenen et al., 1987). The younger Proterozoic belts amalgamated during a complex tectonic period afterwards and represent suture zones of multiple orogeny periodes (Begg et al., 2009; Eglington and Armstrong, 2004)

2.3.2 Proterozoic regions

Young sediments are covering most of Botswana making it difficult to understand and interpret the boundaries between different terrains. Geophysical research mainly tries to solve this structural problem (Miensopust et al., 2011).

The Limpopo belt occures in between the Zimbawe and Kaapvaal craton and is mainly consisting of Archean high grade metamorphic cratonic lithologies (Begg et al., 2009; van Reenen et al., 1987).

West of the cratons the paleoproterozoic Kheis belt continues, a thrust and fold belt made up of metasedimentary rocks (Griffin et al., 2003; Moen, 1999).

The Okwa terrain is an almost entirely buried inlier of folded and thrusted granites and metasediments (Aldiss and Carney, 1992; Griffin et al., 2003).

Further west, Rohoboth Terrain is continuing. Young Sediments, Kalahari and Karroo in age, are underlain by this unit (Muller et al., 2009). It is described to be a vulcanosedimentary suite (Griffin et al., 2003; Muller et al., 2009).

The Mokandi belt is the bordering geological unit west of Zimbawe craton. Furthermore, it represents a geological unit the Lethlakane kimberlite pipe cutted through (Stiefenhofer et al., 1997). Nowadays geophysical data suggests that the Zimbawe craton is reaching further west and the kimberlite is a feature of the western rim of the Zimbabwe craton (Miensopust et al., 2011). The Mokandi belt is consisting of felsic volcanics, quarzites and carbonates (Begg et al., 2009; Stiefenhofer et al., 1997).

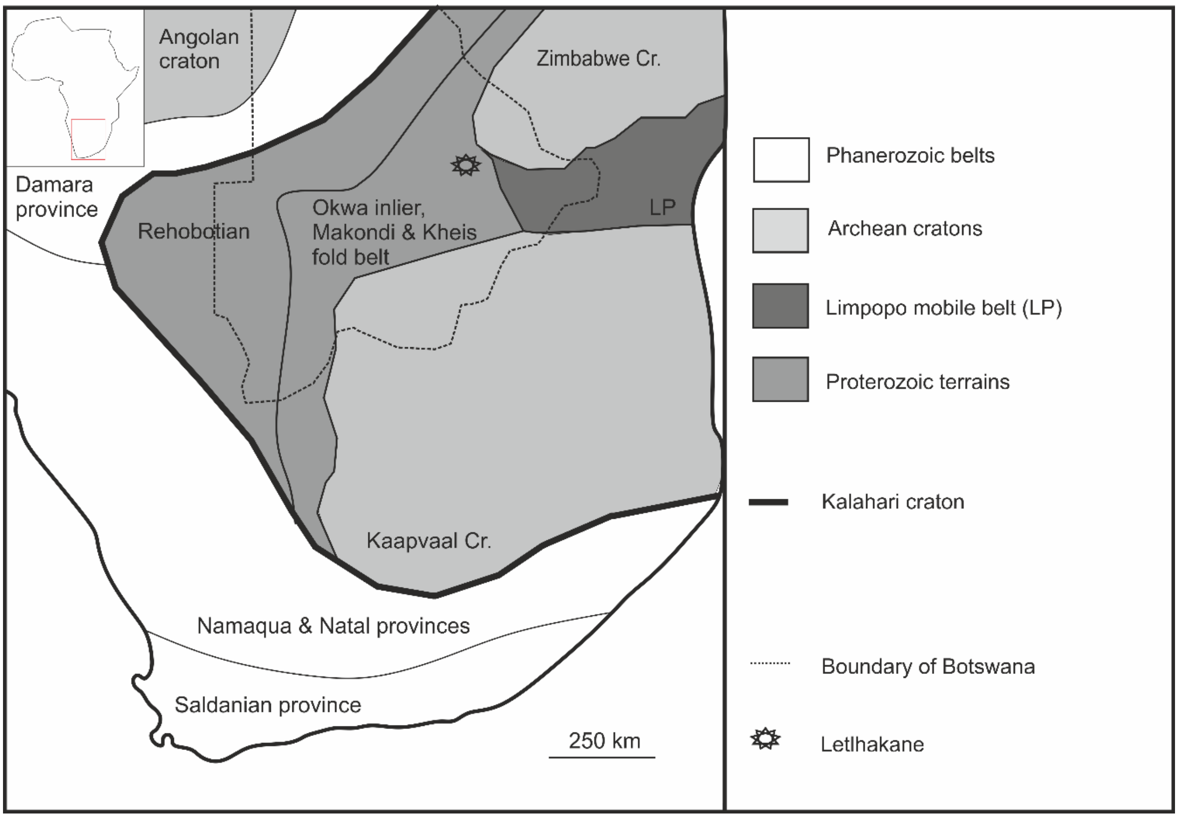


Figure 8| Simplified geological overview of southern Africa. Map modified after Griffin et al. (2003).

2.4 Mantle Metasomatism

“Metasomatism is a metamorphic process by which the chemical composition of a rock or rock portion is altered in a pervasive manner and which involves the introduction and/or removal of chemical components as a result of the interaction of the rock with aqueous fluids (solutions). During metasomatism the rock remains in a solid state.” (Zharikov et al., 2007)

Within the Earth´s mantle, numerous metasomatic processes and modifications occur which are not only related to volatile and aqueous rich phases as transport medium and therefore the general definition of metasomatism needs to be extended. During mantel metasomatism a variety of fluids and melts are circulating in the upper mantle. Silica melts, carbonatite melts, methane, carbon dioxide, hydrocarbon melts/fluids, brines and sulfidic melts are possible reactants in SCLM regimes (O’Reilly and Griffin, 2013). A mixture of different fluids is thereby likely (O’Reilly and Griffin, 2013). Hints for involved melts or fluids can be found directly in melt or fluid inclusions or possible compositions are derived indirectly due to characteristic changes in mineral compositions (e.g. rare earth elements) or petrographic features (O’Reilly and Griffin, 2013). Reactive melts/fluids change the chemical composition of the mantle by infiltration along cracks ore grain boundaries (crack propagation versus grain-boundary infiltration) caused by physical gradients and/or diffusion driven by chemical gradients (O’Reilly and Griffin, 2013; Zharikov et al., 2007). The range of metasomatic influence of the mantle is thereby observable on a microscopical scale, up to meters, maybe even several kilometres depending on the geological setting. The mobility of the fluid is essential and various between different metasomatic agents, depending on the wetting properties of the melt/fluid. (O’Reilly and Griffin, 2013; Zharikov et al., 2007). Basaltic or carbonatitic melts do have small wetting angels below 60° and infiltrate grain boundaries easily, whereas H_2O ore CO_2 rich fluids have wetting angels above 60° and establish isolated droplets (O’Reilly and Griffin, 2013).

Modern mantle petrology divides three main metasomatic types observable in mantle xenolithes:

- Modal Metasomatism- untypical new phases like amphibole, mica, apatite, sulphides, ilmenite or zircon are introduced (Harte, 1983)
- Cryptic Metasomatism- especially rare earth elements display noticeable changes, new phases are not added (Dawson, 1984)
- Stealth Metasomatism- is a special type of modal metasomatism with basaltic magmaphil elements. The difference is the refertilisation of the SCLM with minerals like Grt, Spl and Cpx, which are part of the typical four phase lherzolite assemblage Grt-Cpx-Opx-Ol (Griffin et al., 2009)

The aim of this thesis is to describe the petrological and geochemical state of the sub lithospheric mantle of the Kalahari craton at the eruption date of the Letlhakane kimberlite pipe 93 Ma ago. Therefore, peridotitic xenolithes serve as the basis for scientific interpretations. Our samples were inherited during the ascent of the Letlhakane kimberlite melt and stored after diamond extraction at the old Debswana recovery pile in Orapa, Botswana.

3 Methods

Thin-sections were prepared and polished at the Department of Petrology and Geochemistry, NAWI Graz Geocentre, University of Graz, Austria. A thickness of about 50 µm was intended to conduct laser ablation analyses after completing optical microscopy and electron probe microanalyses.

Major Elements for mineral chemistry where obtained by a JEOL JSM-6310 Scaning Electron Microscope at the Department of Petrology and Geochemistry, NAWI Graz Geocenter. Operating conditions where 15 kV and 6 nA. The light elements sodium and fluorine where carried out with a MICROSPEC wavenlenght dispersive detector, all the other elements were captured by an LINK ISIS energy dispersive detector. Natural and synthetic silica standards were used for the calibration (Table 1).

Additional analyses where obtained with a JEOL JXA 8200 Electron Microprobe situated at the Mining University Leoben. Operation conditions were 15 kV acceralation voltage and 10 nA sample current on PCD. Natural and synthetic silica standards provided by the Department of Petrology and Geochemistry, NAWI Graz Geocentre, were used.

Table 1| Summary of used standards for microprobe analyses.

Element	Standard	Source
F	F-phlogopite	Bucher-Basel
Na	Jadeit	
Mg	Garnet	U.C. Berkley (Evans)
Al	Adular	Natural History Museum Vienna
Si	Adular	Natural History Museum Vienna
K	Adular	Natural History Museum Vienna
Ca	Titanite	ETH Zürich
Ti	Titanite	ETH Zürich
Cr	Chromite (53-IN-8)	U.S. Geological Service
Mn	Rhodonite	Evans
Fe	Garnet	U.C. Berkley (Evans)
Ni	NiO	

Trace and rare earth elements were analysed using a Laser Ablation–Inductively Coupled Plasma–Mass Spectrometry (LA-ICP-MS). An ESI New Wave NWR 193 Laser (193 nm wavelength) is thereby coupled with an Agilent 7500ce quadrupole ICP-MS located at the NAWI Graz Central Lab for Water, Minerals and Rocks (University of Graz and Graz University of Technology, Austria). 41 Elements were determined. Spot size was 75 µm, operated at 10 Hz pulse frequency, applying an energy of approximately 8mJ cm^{-1}. A laser warm up time of 30 seconds and ablation times of 60 seconds were used. The ablation material was transported by a 0.7 l/min helium gas stream into the argon plasma torch. Standard glasses NIST 610 for olivine, NIST612 for all other silicas and BCR-2 as unknown standard were analysed on a regular basis every 20 spots (concentrations used of Jochum et al., 2011). Unknown standards analyses were reproduced within a tolerance of 10%. For internal standardization SiO_2 contents of the relevant phases were used (See appendix for SiO_2 contents of relevant mineral phases). Element analyses were assessed using the software Glitter (van Achterberg et al., 2001).

PTQuick was used for normalizing minerals (Dolivo-Dobrovolsky & Simakov, 2016, http://www.dimadd.ru/en/Programs/ptquick). Pressures and Temperatures calculations were conducted with Excel spreadsheets.

Rare earth and major elements were normalized and plotted with the software GCDkit (Janoušek et al., 2006).

4 Petrography

During a fieldtrip in February 2017 126 samples were taken from an old recovery pile in Orapa/Botswana. Modern mining techniques do not allow sampling of huge xenolithes as it is known for localities in South Africa. Because of heavy rains and geotechnical issues, an access to the open pit was not possible. After kimberlite excavation the produced material gets crushed and sieved to pieces of approximately 5cm in diameter. There was no possibility to obtain information on the finde frequency of the different peridotite types in kimberlite.

From all collected samples, polished thin sections were prepared at the thin section laboratory of the Department for Petrology and Geochemistry, University Graz. Further analyses were conducted on elected samples. A classification of the different mantle xenoliths was made based on mineralogy and texture observable in hand specimen.

We divided samples into five groups:

- Garnet lherzolite (Lhz, 37 samples)
- Garnet harzburgite (Hzb, 26 samples)
- Spinel-Garnet lherzolite (SplGrt, 9 samples)
- Porphyroclastic lherzolite (Por, 19 samples)
- Spinel peridotites (Spl, 31 samples)

Four samples where not investigated because they were classified as pyroxenites.

Table 2| Summary of samples and according petrography.

Type	Mineral assemblage	Remarks	Samples
Garnet lherzolite	Grt- Opx- Cpx- Ol	Accessory Phl- Cc-Ser- Melt; Grt keliphitic rims; Cpx spongy rims	A1, A3, A4, B3, B4, BW1, BW2, BW3, BW4, BW5, BW6, BW7, BW8, BW9, BW10, BW11, BW12, BW14, BW15, BW16, BW17, BW18 BW20 BW21, BW23, BW24, BW25, BW26, BW27, BW41, BW42, BW44, BW56, BW57, BW78, BW79, E3, G3
Garnet harzburgite	Grt- Opx- Ol	Accessory Phl- Cpx-Melt Grt keliphitic rims;	BW22, BW28, BW29, BW30, BW31, BW32, BW33, BW34, BW35, BW36, BW37, BW38, BW39, BW40, BW43, BW46, BW47, BW48, BW77, D1, D2, D3, D4, E2, E4, G1
Porphyroclastic lherzolites	Grt- Opx- Cpx -Ol	Accessory Melt; Grt keliphitic rims; Cpx spongy rims	A2, B2, Bw13, BW17, BW19, BW49, BW50, BW51, BW52, BW53, BW54, BW55, BW58, H1, H2, H3, H4, H5, H6
Spinel-garnet lherzolites	Spl- Grt- Opx -Cpx- Ol	Accessory Phl-Melt; Spl with Grt corona	BW80, BW81, BW82, BW83, E1, G2, G4, G5, G6
Spinel peridotites	Spl- +/-Opx- +/-Cpx- Ol	Accessory Phl-Melt	Bw59, , BW60, BW61, , BW62, BW63, BW64, BW65, BW66, BW67, BW68, BW69, BW70, BW71, BW72, BW73, BW74, BW75, BW76, C1, C2, C4, F1, F2, F3, F4, F5, I1, I2, I3, I4, I5

4.1 Garnet Lherzolite

Garnte lherzolites consist of olivine (more than 40%), clinopyroxene, orthopyroxene, and garnet (Le Bas and Streckeisen, 1991; Winter, 2013). The predominant texture is coarse equigranular (Harte, 1977). All investigated samples are influenced by melt veinlets. The veinlet size ranges up to 0.5mm and are usually found at grain boundaries. They are seldom crosscutting mineral grains.

Coarse grained euhedral olivine is the main matrix mineral. Unregular brittle fractures are common. Fluid tracks often intersect grains and cause a blurry appearance.

Clinpyroxenes are intergranular situated and possibly indicate stealth metasomatic growth. Spongy rims are a regular feature. The characteristic greenish crystal colour is prominent in an almost colourless matrix.

Garnets range from 3mm up to 8mm in diameter and are redish or purple in colour. Grains have a subhedral rounded shape or seldom show irregular rims. Break down reactions are observed as up to 0.5 mm thick keliphitic rims composed of orthopyroxene, clinopyroxene, spinel and in some cases hydrous minerals like phlogopite. Phlogopite and clinopyroxenes occure sometimes at garnet rims. Circular olivine and pyroxene inclusions are observed.

Newly formed minerals are associated with kimberlitic veinlets, such as fine grained clinopyroxene, calcite, spinel, phlogopite and seldom secondary serpentinite.

Sample BW6 shows replacement reactions of Opx by Cpx due to infiltrating kimberlitic melt.

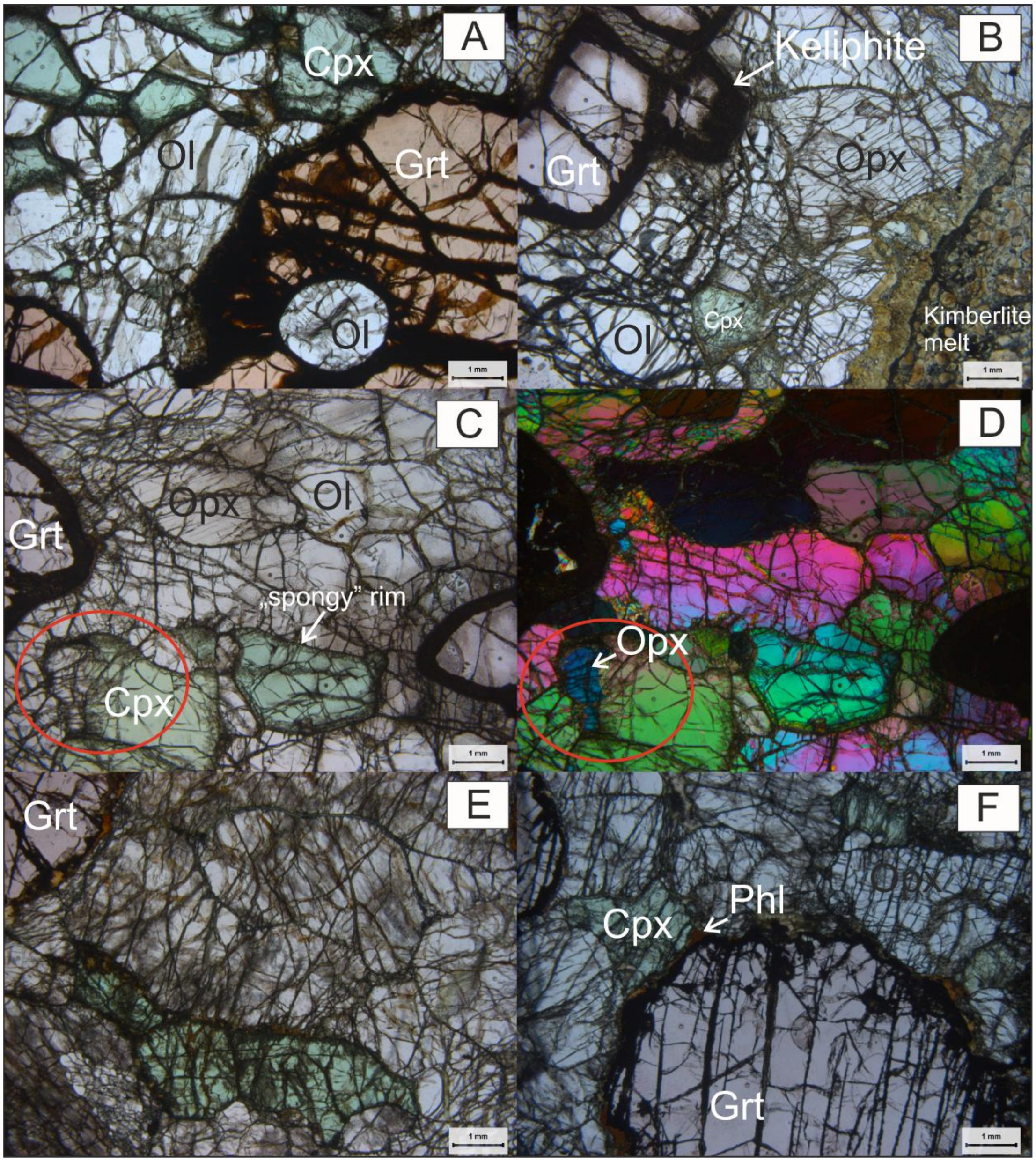


Figure 9| Thin section images of garnet lherzolites. All samples show coarse textures. (A) Sample A1 showing olivine inclusion in a 8mm garnet grain. Clinopyroxene with spongy rims. (B) Kimberlitic melt in contact with sample BW6 and prominent keliphitic rim. (C) and (D) showing sample BW6. Red circle highlights a reaction of orthopyroxene with clinopyroxene. (E) Sample BW44: elongated subhedral clinopyroxene displaying melt alteration. (F) BW26: irregular shaped garnet with phlogopite rim in contact with clinopyroxene.

4.2 Spinel-Garnet Lherzolite

This group of xenoliths represent a special mineral assemblage. Besides the classic garnet lherzolite assemblage of olivine, clinopyroxene, orthopyroxene and garnet, spinel coexists as well. Experimental approaches proofed an existing stability field of garnet and spinel depending on the chromium content of the sample (Klemme and O'Neill, 2000).

Subhedral olivine up to 2 mm forms the groundmass. All grains show brittle fractures and secondary fluid trails.

Orthopyroxenes are euhedral or subhedral and up to 4 mm in size. Thin layered exsolution lamellas are in all grains detectable.

Clinopyroxenes are interstial subhedral or anhedral and green in colour. They display a strong affinity to stealth metasomatism with irregular crystal shapes. Spongy rims are similar to those described in other lherzolites samples. Clinopyroxene does also show brownish exsolutions of spinel.

Garnets are reddish, fine granular and affected by keliphitic rims. Garnet grains form coronas around spinel and small grains in the matrix.

Almost all of the spinel grains are surrounded by garnet corona. Spinel is hereby anhedral amoeboid in shape and sometimes implemented in keliphitic rims. We also find spinel without garnet corona, which reveals a similar habitus compared to spinel surrounded by garnet.

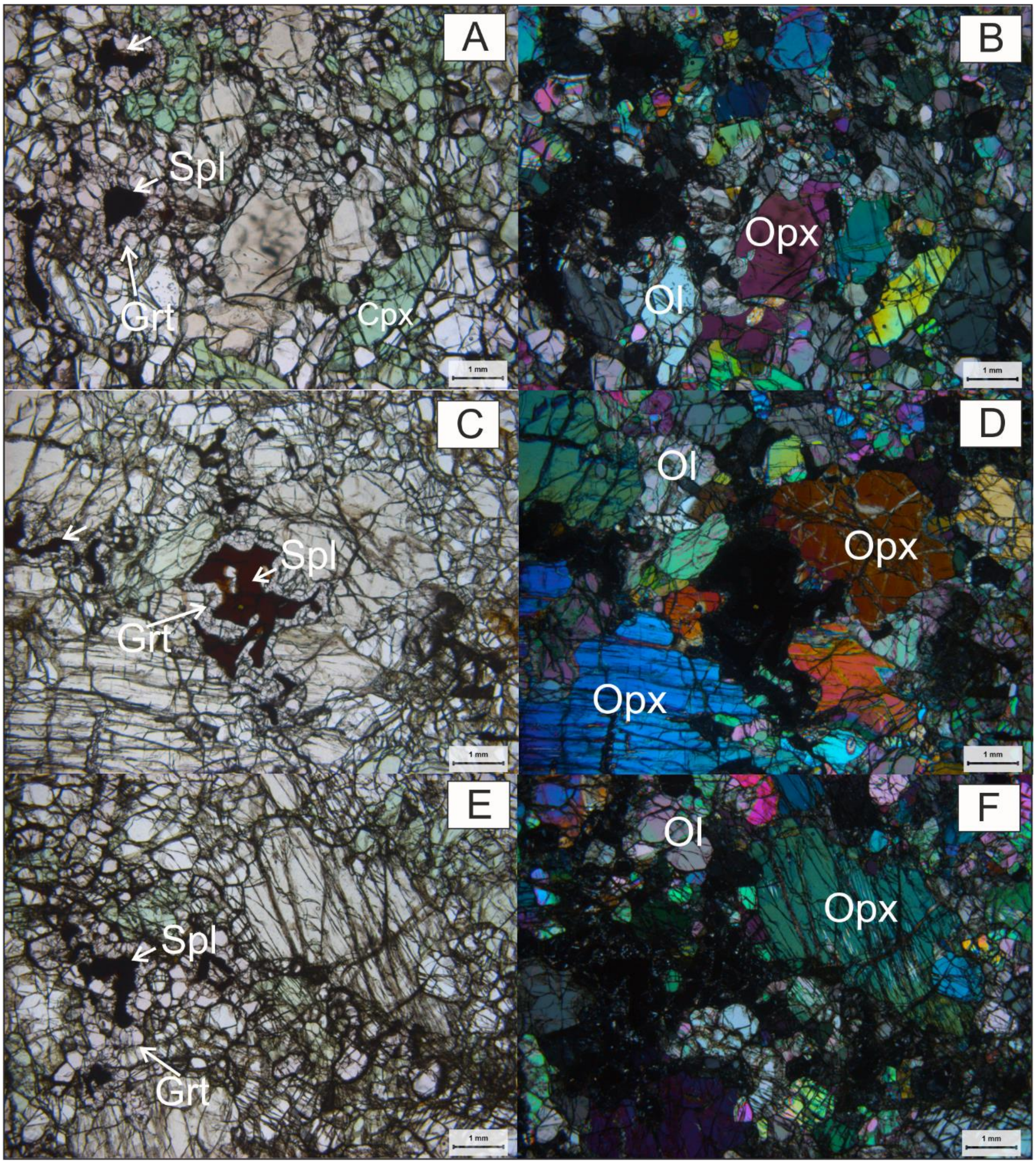


Figure 10|Thin section images of spinel-garnet lherzolites. (A) and (B) plane and cross polarized images of sample G5. Spinel wit corona of garnet and fine grained garnet in the matrix. (C) and (D) plane and cross polarized images of sample G6. Spinel and garnet growing next to orthopyroxene. (E) and (F) plane and cross polarized images of sample BW82. Fine grained garnet in between clinopyroxene and orthopyroxene. Orthopyroxene with exsolution lamella visible with cross polarized lights.

4.3 Porphyroclastic Lherzolite

Porphyroclastic lherzolites are not well understood, especially possible processes causing this texture are still discussed and so they are considered to represent a separate group.

The most important feature is the mosaic-porphyroclastic (predominantly fine grained material) or porphyroclastic (predominantly clasts) texture, which consists of coarse clinopyroxenes, orthopyroxenes and garnets in a matrix of fine grained olivine which also contain various amount of coarse olivine (Harte, 1977). Grain size reduction is observed for olivine and in few samples orthopyroxene grains as well.

Olivine is the weakest mineral if we consider rheological properties. Rounded grains smaller than 1 mm traverse samples in between the coarse clasts. Triple juctions between fine olivine grains are observed as a sign of re-equilibration.

Orthopyroxenes are also reduced in grain size compared to coarse samples. In general orthopyroxene is elongated with rounded edges and 2-3 mm in size. A general orientation is sometimes indicated by elongated orthopyroxene grains. In few cases orthopyroxene displays dynamic recrystallization. Core-mantle textures of fine grained orthopyroxene neoblasts are surrounding a coarse clast. Exsolution lamellas of clinopyroxene are rare but existing.

Clinopyroxenes are reduce in grain size and do not show intense greenish colour compared to coarse samples. The shape is anhedral rounded or amoeboid. Spongy rims are common and are darker, comparable with keliphitic rims described for garnet.

Light red garnets are regularly distributed and display compared to coarse textured types a reduced grain size. Spherical-shaped or irregular grains have a size up to 3 mm. Dark, almost opaque keliphitic rims are always observed.

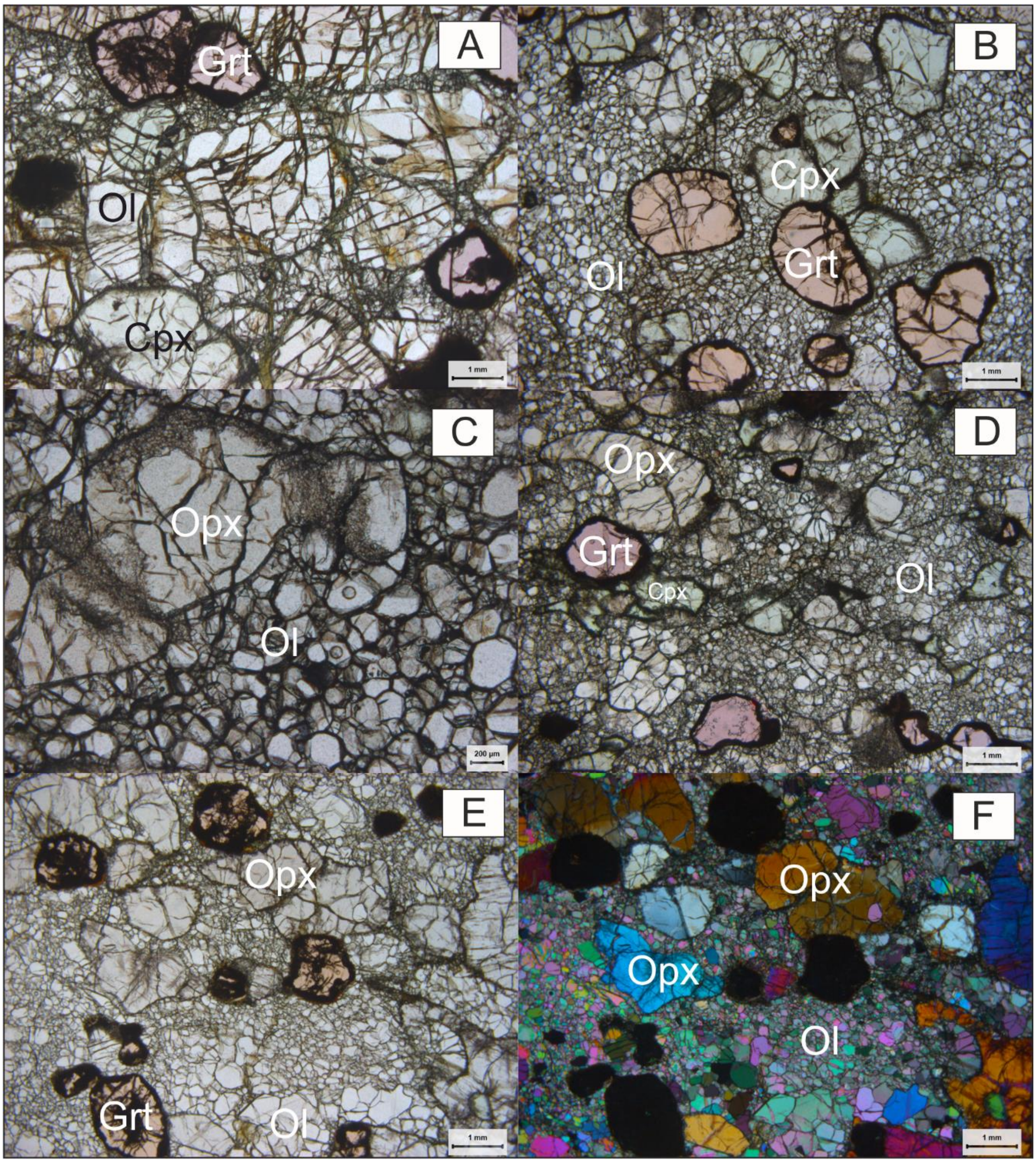


Figure 11| Thin section images of porphyroclastic lherzolites. (A) beginning porphyroclastic texture in sample BW17. (B) mosaic porphyroclastic texture in sample H2 with coarse clinopyroxene. Clinopyroxene show dark secondary rims. (C) Orthopyroxene forming neoblasts in sample H2. (D) Irregular garnet grains within a mosaic porphyroclastic texture in sample H6. (E) and (F) Elongated pyroxenes with coarse and fine grained olivine in sample H3.

4.4 Garnet Harzburgite

Harzburgites are nominal consisting of olivine (more than 40%), orthopyroxene and clinopyroxene less than 5% (Le Bas and Streckeisen, 1991; Winter, 2013). Nowadays the community tends to classify absolute clinopyroxene free samples as harzburgite. All samples show influence of kimberlitic melt as we described it in the case of lherzolites.

Olivines are euhedral and up to 5 mm in size. They are commonly fractured and in some cases they show a beginning porphyroclastic texture. Fluidtracks are regular features.

Orthopyroxenes are up to 5 mm in size and tabular in shape. In some cases intergranular anhedral growth is observed. It is also possible to find olivine inclusions in orthopyroxene.

Clinopyroxene is observed in little amounts. Greenish clinopyroxene close to garnet forms coronas as part of the keliphitic rim or close to orthopyroxene. Therefore it is not interpreted as equilibrium phase.

Red garnets are up to 6 mm in diameter and subhedral rounded. Some samples show reduced garnet size. Keliphitic rims are omnipresent and typically associated with clinopyroxene and phlogopite. Two samples show garnets with irregular shapes. Inclusions of olivine are also detectable.

Accessory minerals are phlogopite and clinopyroxene.

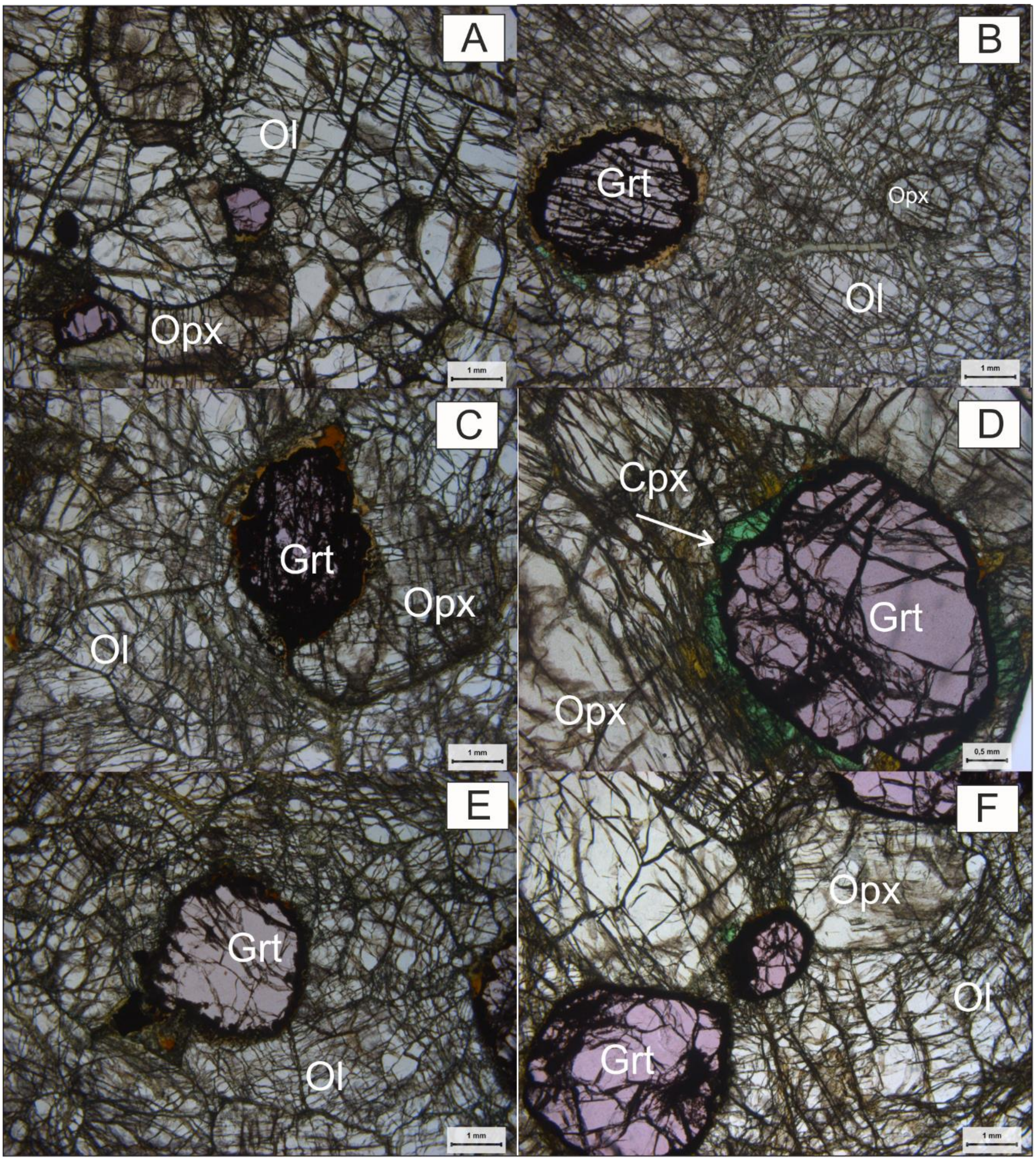


Figure 12| Thin section imags of garnet harzburgite. All samples show coarse textures. (A) Beginning porphyroclastic texture in sample D1. (B) Sample D4: Heavily altered garnet with newly formed clinopyroxene in the keliphte. (C) Sample D3 with garnet next to orthopyroxene. (D) Sample BW33 displaying a secondary clinopyroxene corona around garnet.(E) BW22 showing small amounts of phlogopite in the keliphitic rim (F) Sample BW33 displaying minor amounts of clinopyroxene enclosed in orthopyroxene next to garnet.

4.5 Spinel Peridotite

Spinel bearing samples without garnet are summarized in this group.

Spinel lherzolites are defined as olivine, clinopyroxene, orthopyroxene and spinel bearing peridotites (Le Bas and Streckeisen, 1991; Winter, 2013). Influence of kimberlitic melt is in every sample detectable.

Olivine tends to be smaller in grain size compared to coarse garnet bearing samples (up to 2 mm) with euhedral sometimes subhedral shape. Olivine is always fractured by brittle cracks. Secondary fluid tracks are commonly intersecting grains.

Orthopyroxenes are coarse grained up 4mm with an elongated or tabular shape. Exsolution are observable with crossed polarized filters as thin lamella and are in almost every sample present.

Greenish clinopyroxenes are fine grained with interstitial anhedral growth. Spongy rims aren´t well established or absent. Brownish exsolutions are observered on a regular basis.

Spinel is also located interstitially and shows irregular crystal shape. Inclusions of pyroxene and olivine in spinel are possible.

Spinel harzburgites are the minor number of samples and show similarities to dunites. The transition is thereby floating.

Equigranular olivine up to 3mm is the main matrix mineral. Fluidtracks are, compared to other peridotite types, seldom. Brittle cracks are crossing all grains.

Orthopyroxene are coarse euhedral crystals up to 4 mm in size. Exsolution lamella are detectable using cross polarized filters.

Dunites are peridotites mainly consisting of olivine (Modal > 90%, Le Bas and Streckeisen, 1991)

Olivines are up to 3 mm in size and show a coarse equigranular or weak pronounced porphyroclastic texture. Kink bands and undulous extinction indicate brittle stress during ascent. Fluidtracks poorly developed or absent.

Clinopyroxene and orthopyroxene are accessories and are subhedral or anhedral in shape. Fine secondary grains, smaller than 1 mm, of clinopyroxene and orthopyroxene grew between the larger and sometimes deformed olivine crystals. Orthopyroxene shows thin exsolution lammella with crossed polarized filters.

Anhedral spinel is in minor amount present in harzburgites and dunites.

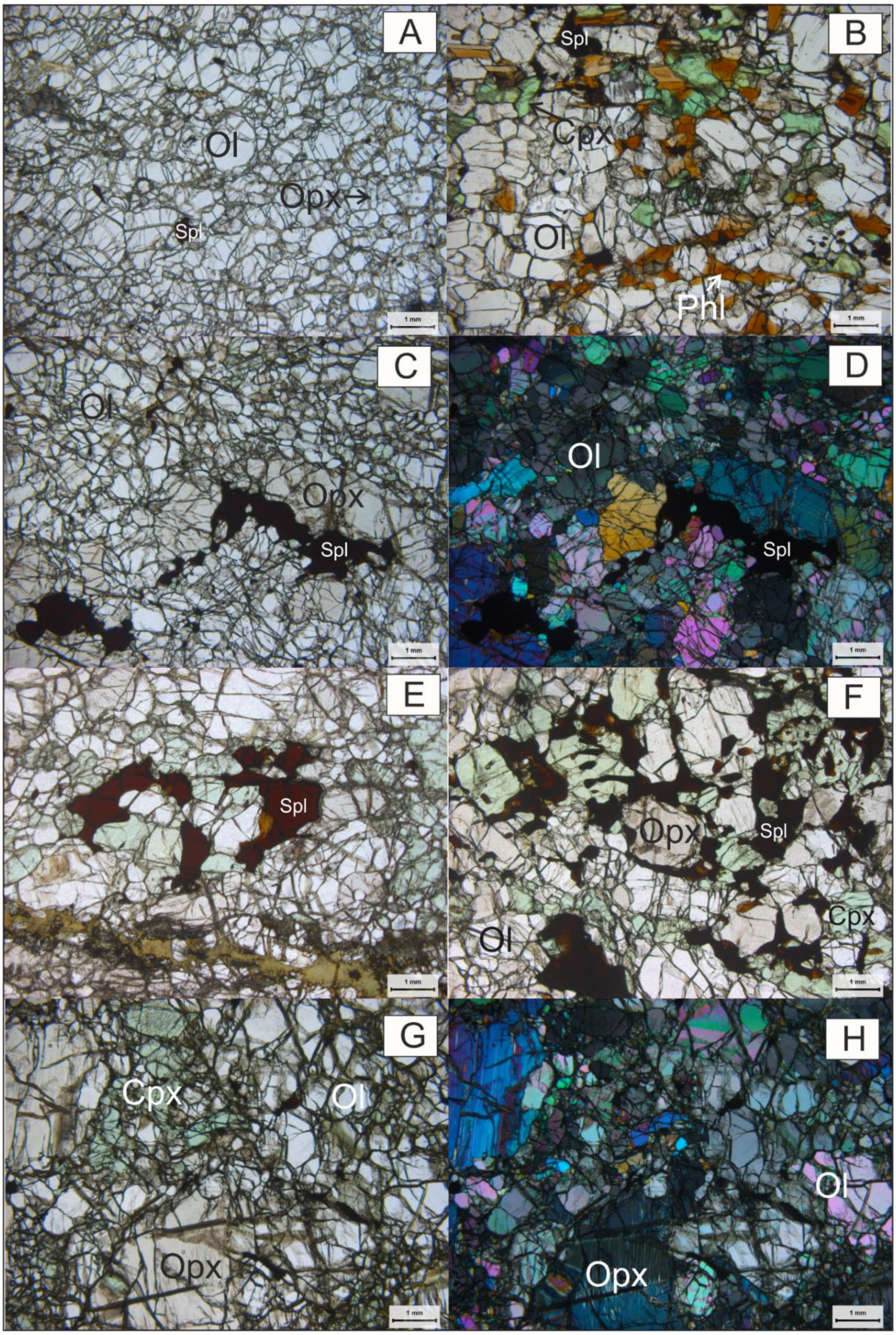


Figure 13| Thin section images of peridotitic xenolithes. (A) Sample I5 indicating dunitic mineral assamblage (B) Sample C4 displaying a spinel lherzolite with phlogopite in the matrix. (C) and (D) plane and cross polarized images of sample BW76 displaying a spinel harzburgite with anhedral spinel similar in shape like we find it in spinel-garnet lherzolites(E) Sample BW59 displaying a spinel lherzolite. (F) Sample BW59 showing high abundance of anhedral spinel. (G) and (H) plane and cross polarized light images of sample F4 showing fine spinel in a spinel lherzolite and exsolution lammellas in orthopyroxene.

5 Mineral Chemistry

Atomic formula units were calculated with the software PTQuick (Dolivo-Dobrovolsky & Simakov, 2016, http://www.dimadd.ru/en/Programs/ptquick). For detailed analyses, see the appendix.

5.1 Garnets

Table 3| Representative compositions of garnets.

Type	Lhz	Lhz	Lhz	Hzb	Hzb	Hzb	SplGrt	SplGrt	SplGrt	Por	Por	Por
Sample	BW1-1-g3	BW6-4-g1	BW7-3-g1	Line 3 D1-2-1	D4-4-g1	G1-5-g1	G5-2-grt1	BW80-1-g1	BW82-1-g1	BW17-1-g3	H6-1-g1c	H4-1-grt12
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	41.91	41.93	42.49	40.92	41.48	42.46	41.99	42.61	41.93	41.86	42.46	41.57
TiO2	0.54	0.16	0.30	0.05	0.13		0.04	0.09	0.06	0.21	0.14	
Al2O3	20.25	22.05	20.89	17.30	19.32	21.51	23.04	22.63	23.09	19.48	20.80	19.29
Cr2O3	3.76	2.22	2.66	8.39	6.86	2.99	0.86	1.83	0.97	4.13	2.94	5.53
FeO	8.58	8.62	7.45	6.74	6.62	7.92	9.29	8.41	9.79	7.64	7.64	6.50
MnO	0.32	0.41	0.37	0.32	0.43	0.51	0.39	0.46	0.47	0.28	0.25	0.24
MgO	19.7	20.41	20.93	18.72	19.87	19.49	19.57	19.30	18.63	20.75	19.79	21.42
CaO	4.74	4.32	4.34	7.22	5.36	5.45	4.77	4.69	4.69	5.24	5.36	5.67
Total	99.8	100.12	99.43	99.66	100.07	100.33	99.95	100.02	99.63	99.59	99.37	100.22
Si	3.019	2.984	3.039	2.989	2.989	3.029	2.993	3.043	3.013	3.006	3.053	2.960
Ti	0.029	0.009	0.016	0.003	0.007		0.002	0.005	0.003	0.011	0.008	
Al	1.719	1.850	1.762	1.489	1.641	1.809	1.935	1.905	1.955	1.648	1.763	1.619
Cr	0.214	0.125	0.150	0.484	0.391	0.169	0.049	0.103	0.055	0.234	0.167	0.312
Fe2+	0.517	0.473	0.446	0.368	0.399	0.473	0.527	0.502	0.588	0.376	0.459	0.239
Fe3+		0.040		0.044			0.027			0.083		0.148
Mn	0.02	0.025	0.023	0.020	0.026	0.031	0.023	0.028	0.029	0.017	0.015	0.014
Mg	2.116	2.166	2.232	2.039	2.134	2.073	2.08	2.055	1.996	2.221	2.122	2.275
Ca	0.366	0.329	0.332	0.565	0.414	0.417	0.365	0.359	0.361	0.403	0.413	0.432
Cations	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12
X Mg	0.804	0.808	0.834	0.832	0.842	0.814	0.79	0.804	0.772	0.829	0.822	0.854
X Cr	0.111	0.063	0.079	0.245	0.192	0.085	0.025	0.052	0.027	0.124	0.087	0.162

The analysed garnets can be classified as chromian pyropes with a pyrope contents between 65% to 70% in garnet-spinel bearing samples, 69% to 75% in garnet lherzolites, 67% to 77% in garnet harzburgite and 71% to 75% in porphyroclastic lherzolites.

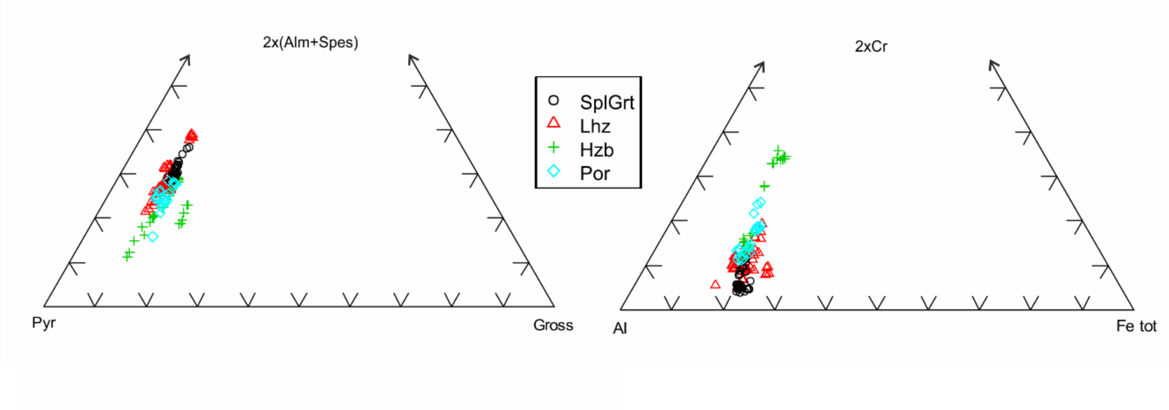


Figure 14|Ternary diagrams based on atoms per formula unit (apfu). Left: End members grossular (Gross), Almandin (Alm), spessartin (Spes) and pyrope (Pyr). Right: Element variations showing apfu.

Al_2O_3 in garnet lherzolites ranges between 20.0 and 22.5 wt.%, Cr_2O_3 between 1.0 and 3.2 wt.% and FeO between 7.0 and 9.1 wt.%. Sample B3 displays unusual elevated FeO contents of 11.2 to 11.6 wt.%. This correlates with higher abundance of metasomatic clinopyroxene in this sample. Sample

A1 exceeds the regular TiO_2 content with 0.75-0.85 wt.% (regular 0.15-0.45 wt.%), which is probably explainable with higher, eventually kimberlitic metasomatic influence.

Al_2O_3 in garnet harzburgites are varying between 17.1 and 21.9 wt.%. Low concentrations in Al_2O_3 is found in only sample, whereas Cr_2O_3 is elevated. FeO ranges from 6.6 to 8.0 wt.%. CaO contents are higher than in Lhz (Lhz 3.9-5.1 wt.%; Hzb 4.3-7.2 wt.%).

Garnets in spinel-garnet lherzolites represent a special texture with garnets forming coronas around spinel. They represent the lowest TiO_2 (<0.15 wt.%), MgO (17.5-20.3 wt.%)and Cr_2O_3 (0.9-2.7 wt.%) concentrations of all analysed garnets.

Porphyroclastic garnets are characterized by a smaller grain size compared to garnets of the other types. Al_2O_3 ranges from 18.5 to 21.0 wt%. Just sample H2 shows high TiO_2 contents between 0.88 and 1.0 wt.% compared to average values between 0.14 and 0.49 wt.%. Porphyroclastic garnets do have major element trend between garnet lherzolite and garnet harzburgite samples.

Stoichiometric Fe^{3+} ranges from 0 to 0.247 apfu in lherzolites, 0 to 0.207 apfu in harzburgites, 0 to 0.81 apfu in spinel garnet lherzolites and 0 to 0.148 apfu in porphyroclastic lherzolites.

Samples plotted against Al_2O_3 reveal positive correlations with FeO and MnO. Negativ correlations are found for CaO, MgO.

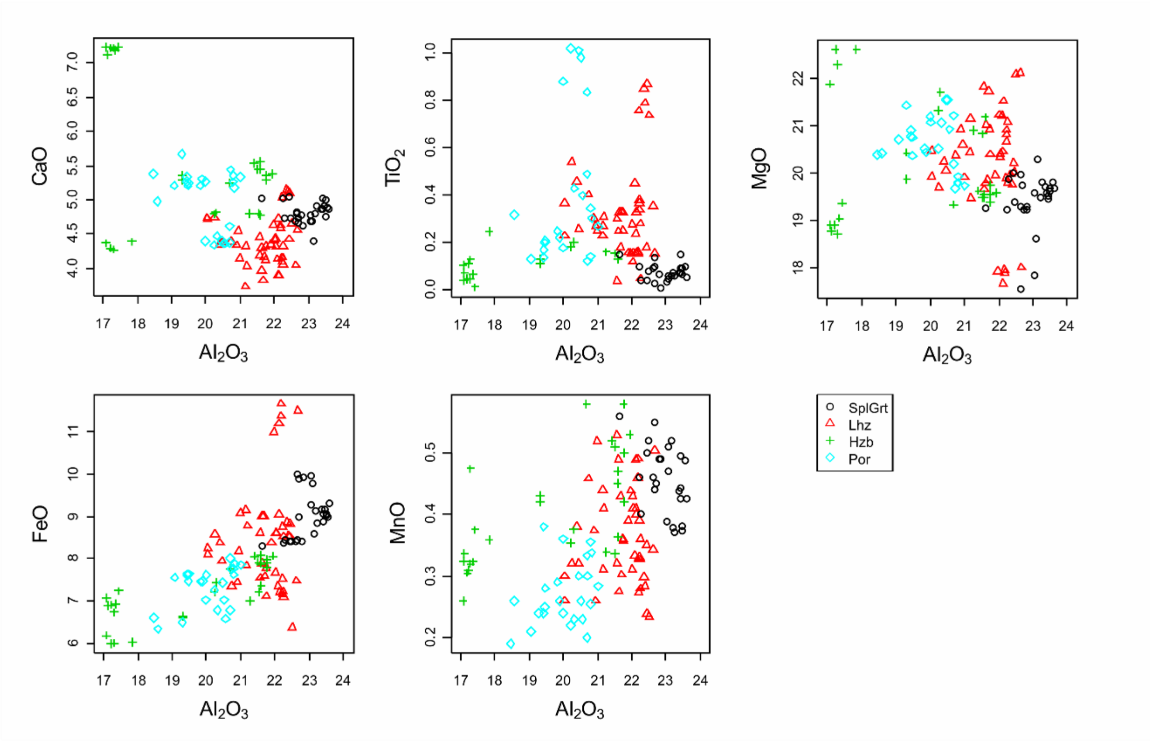


Figure 15| Compositional varieties of garnet compared to Al_2O_3.

LIL-elments are very low or below detection limit in almost every sample. Sr shows elevation in harzburgites and porphyroclastic lherzolites (up to 1 ppm) HFS-elements display most depletion in spinel-garnet peridotites.

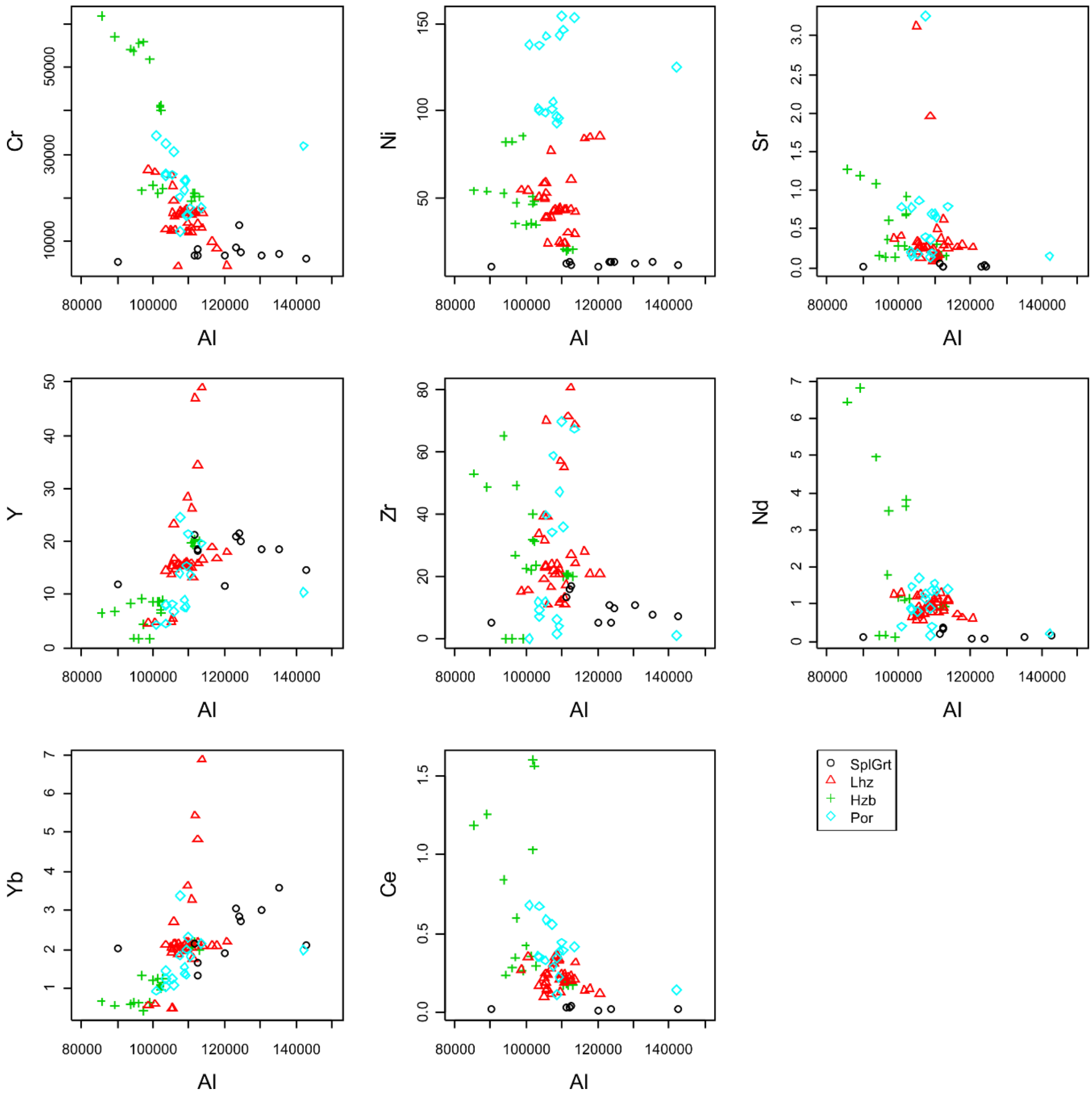


Figure 16| Selected trace elements (in ppm) compared to Al (in ppm).

The garnet classification schema after Grütter et al (2004) and Sobolev (1977) are shown in Figure 17. Grütter et al (2004) was primary developed for diamond exploration to estimate diamond potential by analysing garnet grains. A noticeable cluster in the G9/lherzolite field is observed. G5/pyroxenitic field and G1/ megacrystic field are overlapping the G9 field but can be excluded because of the proposed X_{Mg} and TiO_2 values published for differentiation of these overlapping fields. One harzburgitic sample is plotting in the G10/hazburgite field. Further harzburgitic samples are either bordering the G12/wherlite field or lie in the G9/lherzolite field. However, clinopyroxene is not or only in subordinate amounts present and it seems that these two samples are probably not compatible with the classification schemes.

The scheme of Sobolev (1977) which is in general the Grütter diagram 90° turned, identifies garnets as lherzolitic and reveals a chromium depletion trend towards spinel garnet lherzolites. This trend is also displayed in the Grütter et al (2004) diagram. One garnet harzburgite (D1) is plotting in the wherlite field in scheme of Sobolev (1977).

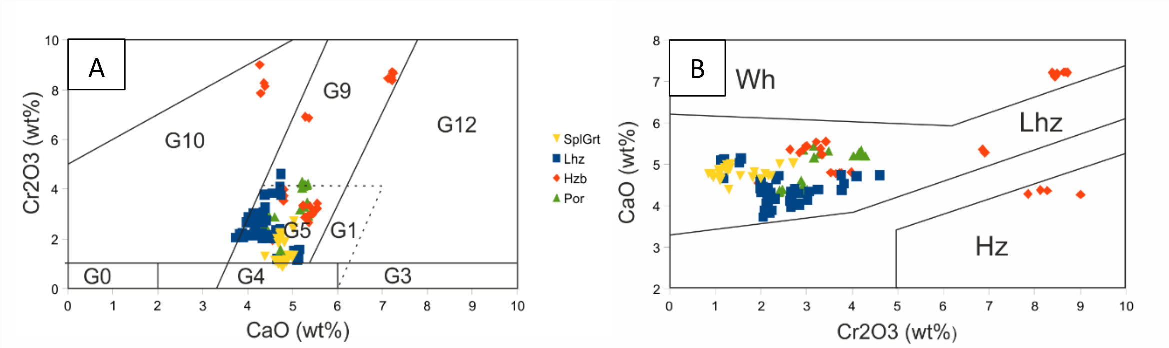


Figure 17| (A) Garnet classification of Grütter et al (2004). Garnets are mainly plotting in the G9 (lherzolite) field. Overlapping with G5 and G1 are discriminated by X_{Mg} and TiO_2 concentrations. One harzburgitic samples is plotting in the according G10 (harzburgite) field. (B) Classification after Sobolev (1977). Majority of samples displays lherzolitic compositions of garnet. Just one garnet harzburgite sample shows compositions according to this scheme. This scheme is highlighting a chromium depletion towards spinel garnet lherzolites. Hz=Harzburgite; Lhz=Lherzolite;Wh=Wherlite. Sample types like it is described in chapter Petrography.

5.2 Orthopyroxenes

Table 4| Representative compositions of orthopyroxene.

Type	Lhz	Lhz	Lhz	Hzb	Hzb	Hzb	GrtSpl	GrtSpl	Por	Por	Spl	Spl
Sample	BW1-1-opx1	BW5-2-Opx2	BW6-4-opx1	opxD1-1	D3-1-Opx1	D4-4-opx4	BW80-8-opx1	BW82-1-opx1	H3-1-opx1	H6-1-opx1c	F3-1-Opx1	Line 4 F4-2-1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.7	59.29	57.94	58.36	59.14	58.42	58.42	57.29	58.97	58.00	58.73	56.44
TiO2	0.27			0.04		0.05			0.15	0.17		0.07
Al2O3	0.32	0.46	0.87	0.55	0.34	0.56	0.85	1.53	0.43	0.90	0.52	2.71
Cr2O3	0.1	0.11	0.19	0.25	0.29	0.48	0.33	0.32	0.24	0.08	0.20	0.36
FeO	6.03	4.68	5.32	5.26	4.01	4.23	5.01	5.84	5.39	5.74	4.93	4.86
MnO	0.14	0.15	0.16	0.11	0.08	0.10	0.14		0.18	0.14	0.08	0.16
MgO	34.16	34.37	34.71	34.00	34.98	35.74	34.26	33.30	32.54	33.39	35.13	34.88
CaO	0.56	0.44	0.29	0.85	0.38	0.38	0.20	0.17	1.39	1.00	0.24	0.25
Na2O	0.13	0.12	0.05	0.04	0.15	0.13			0.14	0.28	0.01	0.02
Total	100.4	99.62	99.53	99.45	99.37	100.09	99.22	98.45	99.45	99.88	99.85	99.87
Si	2.019	2.046	2.001	2.023	2.039	1.996	2.027	2.009	2.056	2.005	2.019	1.937
Ti	0.007			0.001		0.001			0.004	0.004		0.002
Al	0.013	0.019	0.036	0.023	0.014	0.023	0.035	0.063	0.018	0.037	0.021	0.110
Cr	0.003	0.003	0.005	0.007	0.008	0.013	0.009	0.009	0.007	0.002	0.006	0.010
Fe2+	0.173	0.135	0.153	0.152	0.116	0.121	0.145	0.171	0.157	0.166	0.142	0.134
Fe3+												0.005
Mn	0.004	0.004	0.005	0.003	0.002	0.003	0.004		0.005	0.004	0.002	0.005
Mg	1.751	1.768	1.786	1.757	1.798	1.820	1.772	1.741	1.691	1.721	1.800	1.784
Ca	0.021	0.016	0.011	0.032	0.014	0.014	0.008	0.006	0.052	0.037	0.009	0.009
Na	0.009	0.008	0.003	0.003	0.010	0.009			0.010	0.019		0.001
Kations	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6
X Mg	0.91	0.929	0.921	0.920	0.939	0.938	0.924	0.910	0.915	0.912	0.927	0.928

Orthopyroxene is chemically homogeneous in all samples and display a X_{Mg} in the range between 0.90 and 0.93. Fine subsolidus exsolution lamellae of Cpx are commonly seen in Opx.

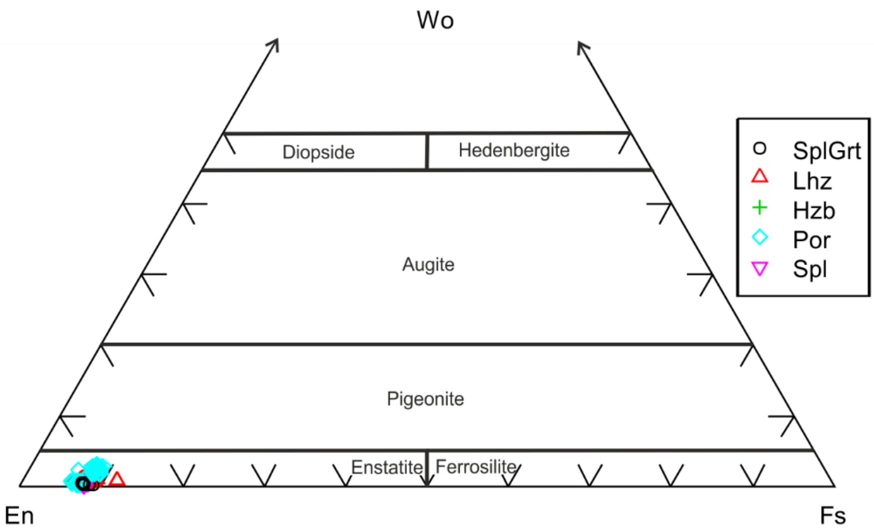


Figure 18|Ternary diagram after Morimoto (1988) displaying molar enstatite component between 87 and 92%. Wollastonite (Wo); Ferrosilit (Fs); Enstatite (En)

Al_2O_3 contents are correlated and very sensitive to pressure and temperature as well as whole rock chemistry changes (Pearson et al., 2003). In spinel facies samples the Al_2O_3 content should be between 1 and 6 wt.% and in garnet facies samples below 2 wt.% (Pearson et al., 2003). This predictions are matching with our observations. We find highest values for Al_2O_3 in spinel peridotites (1.1-3.4 wt.%). Sample F3 is exhibiting lower values between 0.53 and 0.79 wt.%. Garnet lherzolites contents range between 0.15 and 0.88 wt.%, garnet harzburgite between 0.55 and 0.85 and porphyroclastic lherzolites between 0.31 and 0.97 wt.%. Samples showing garnet coronas surrounding spinel, display Al_2O_3 contents higher in concentration compared to garnet lherzolites (0.85-1.43 wt.%). Spinel bearing sample reveal constant low values for Na_2O and CaO compared to Al_2O_3 concentrations, whereas garnet samples show constant low Al_2O_3 concentrations with changing Na_2O and CaO.

Na_2O concentrations are also temperature dependent and reveal high concentrations towards porphyroclastic lherzolites and low values for spinel peridotites.

Cr contents are below 4000 ppm in all samples. Ti concentrations are below 1200 ppm, Mn and Ni below 1100 ppm and display negative correlations with X_{Mg}.

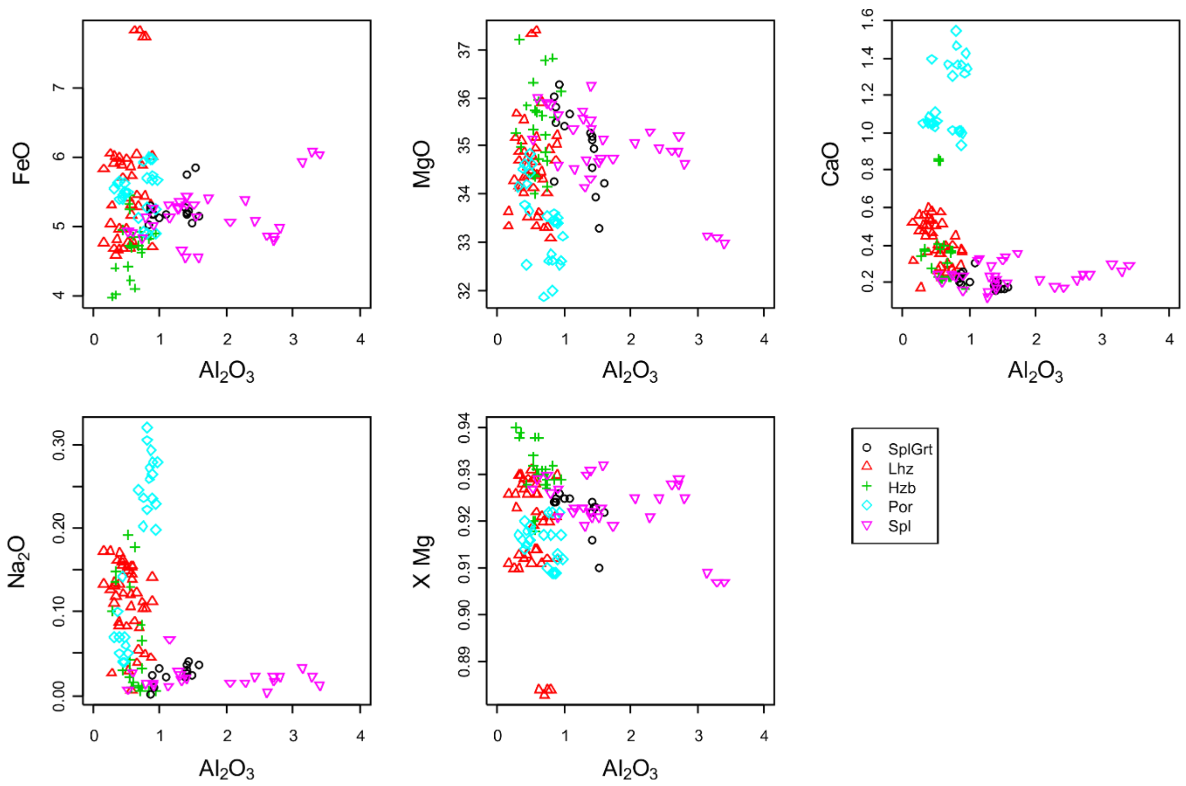


Figure 19| Compositional varieties of orthopyroxene compared to X_{Mg}.

Trace Elements are very low in concentration in orthopyroxenes. Trace elements versus the temperature sensitive Al displays two similar correlation trends like it is seen in major element diagrams. One group is formed by garnet peridotites and as second group is formed by spinel garnet lherzolites and spinel peridotites (Figure 20).

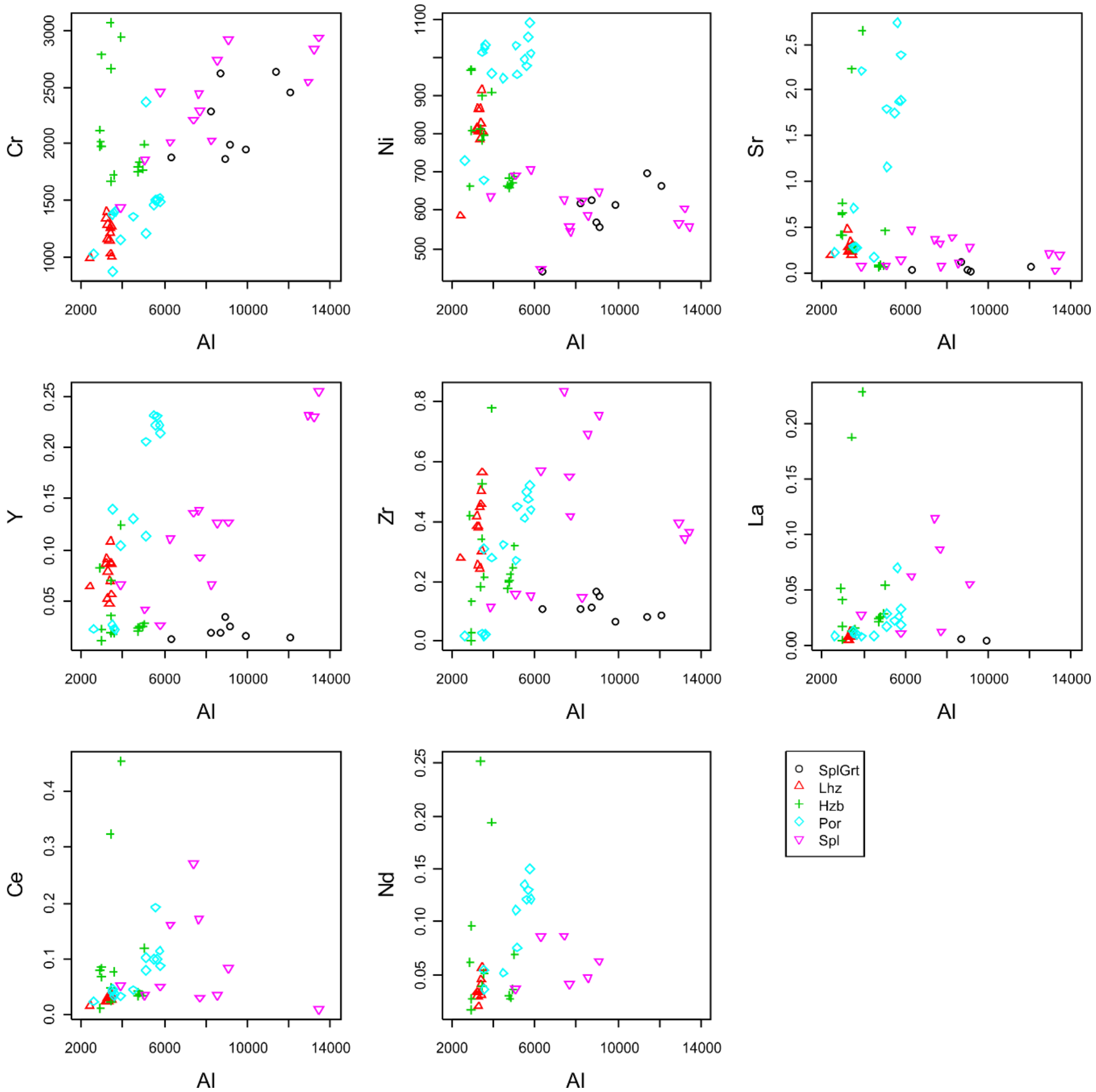


Figure 20| Selected trace elements (in ppm) compared to Al (in ppm).

5.3 Clinopyroxenes

Table 5| Representative compositions of clinopyroxene

Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	SplGrt	SplGrt	Por	Por	Spl	Spl
	Core	Rim	Core	Rim	Core	Rim	Core	Rim	Core	Rim	Core	Rim
Sample	BW4-cpx	BW4-cpx6r	BW6-2-2-c2	BW6-6-Cpx2	BW7-6-c2	BW7-6-c3	BW82-1-cpx1	BW82-2-cpx4	H6-2-cpx1c	H6-2-cpx1r	F3-1-Cpx2	F3-4-Cpx1
Mineral	Cpx	cpx	Cpx	cpx	Cpx	cpx	Cpx	cpx	Cpx	cpx	Cpx	cpx
SiO2	56.32	55.58	55.65	54.27	54.83	52.69	54.99	55.08	55.56	55.39	55.48	55.17
TiO2	0.29	0.40	0.27	0.41	0.35	0.35	0.21	0.11	0.32	0.34	0.17	0.15
Al2O3	2.53	1.79	3.24	1.08	3.28	3.78	3.65	4.10	2.32	2.43	2.64	2.82
Cr2O3	1.28	1.33	1.72	1.71	1.83	1.59	0.84	0.78	0.45	0.53	2.02	2.05
FeO	2.64	2.67	2.04	2.44	2.41	2.74	1.77	2.07	3.83	3.97	1.5	1.54
MnO						0.11			0.07	0.12	0.1	0.07
MgO	16.25	16.35	15.21	16.72	16.20	15.60	15.67	15.73	18.41	18.08	15.89	15.48
CaO	18.05	20.68	19.76	21.41	17.41	21.26	20.80	20.49	16.83	16.62	20.63	20.64
Na2O	2.23	1.2	2.02	1.02	2.73	0.91	1.72	1.68	1.84	1.81	1.59	1.66
Total	99.61	100.02	99.91	99.06	99.04	99.03	99.64	100.05	99.71	99.29	100.03	99.56
Si	2.036	2.018	2.015	1.990	1.985	1.936	1.989	1.952	1.997	2.016	2.008	1.999
Ti	0.008	0.011	0.007	0.011	0.010	0.010	0.006	0.024	0.009	0.015	0.005	0.007
Al	0.108	0.077	0.138	0.047	0.140	0.164	0.155	0.099	0.098	0.107	0.113	0.067
Cr	0.037	0.038	0.049	0.050	0.052	0.046	0.024	0.050	0.013	0.020	0.058	0.006
Fe2+	0.08	0.081	0.062	0.075	0.062	0.084	0.053	0.070	0.110	0.112	0.045	0.096
Fe3+					0.011				0.005			0.013
Mn						0.003			0.002	0.003	0.003	0.004
Mg	0.876	0.885	0.821	0.914	0.874	0.854	0.845	0.871	0.986	0.977	0.857	1.002
Ca	0.699	0.805	0.766	0.841	0.675	0.837	0.806	0.865	0.648	0.633	0.8	0.707
Na	0.157	0.085	0.142	0.073	0.192	0.065	0.121	0.070	0.128	0.117	0.111	0.099
Cations	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6
X Mg	0.917	0.92	0.930	0.920	0.923	0.910	0.941	0.930	0.896	0.890	0.95	0.95
X Cr	0.252	0.33	0.263	0.520	0.271	0.220	0.134	0.110	0.116	0.130	0.341	0.33

Clinopyroxenes is the most important host mineral of most trace elements in peridotitic xenolithes. In spinel peridotites and spinel-garnet lherzolite clinopyroxene is classified as Cr- diopside, wheras garnet lherzolite and porphyroclastic type clinopyroxenes plot into the augite field. Secondary clinopyroxene, which occurs as so called "spongy rim" around primary grains show a tendency to higher CaO and FeO contents and lower Na_2O and Al_2O_3. Al_2O_3 in clinopyroxene correlates with equilibration temperature and bulk composition (Figure 23; Pearson et al., 2003).

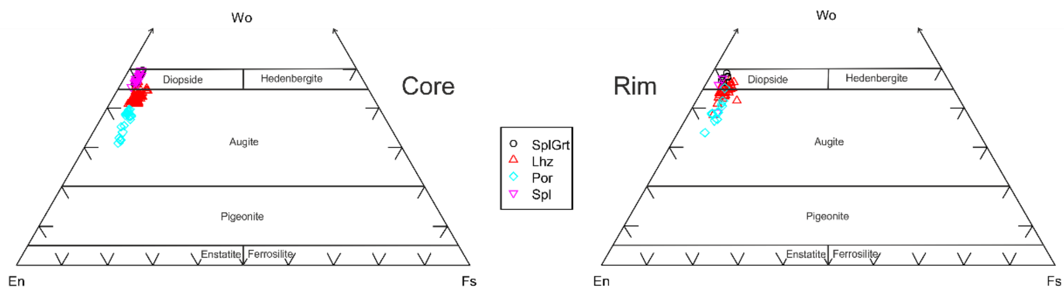


Figure 21|Ternery diagram after Morimoto (1988). Spinel peridotite and spinel-garnet lherzolite clinopyroxene belongs to the diopside field, whereas garnet lherzolite and porphyroclastic lherzolite clinopyroxenes represent augites. Wollastonite (Wo); Ferrosilt (Fs); Enstatite (En).

X_{Mg} values are more diverse than in orthopyroxenes. Garnet lherzolites show X_{Mg} values, which are between 0.88 and 0.93. Porphyroclastic samples lie between 0.89 and 0.91. Spinel-garnet lherzolites and spinel peridotites reveal the highest X_{Mg} with values between 0.93 and 0.95.

Al_2O_3 shows negative correlations with FeO and MgO. The lowest values of Al2O3 are found in porphyroclastic lherzolites (0.75-2.35 wt.%) and the highest are found in spinel peridotites and spinel-garnet lherzolites (1.90-5.03wt.%). TiO_2 contents are in all samples low and range between 0.1 and 0.5 wt.%.

Cr_2O_3 concentrations are low in porphyroclastic samples (0.24-0.75 wt.%) and increase towards spinel-garnet lherzolites (0.90-1.76 wt.%), spinel peridotites (1.00-2.30 wt.%) and garnet lherzolites (0.93-1.85 wt.%). Garnet lherzolite sample A1 displays low contents, which are similar to porphyroclastic samples (Cr_2O_3 0.69-0.72 wt.%).

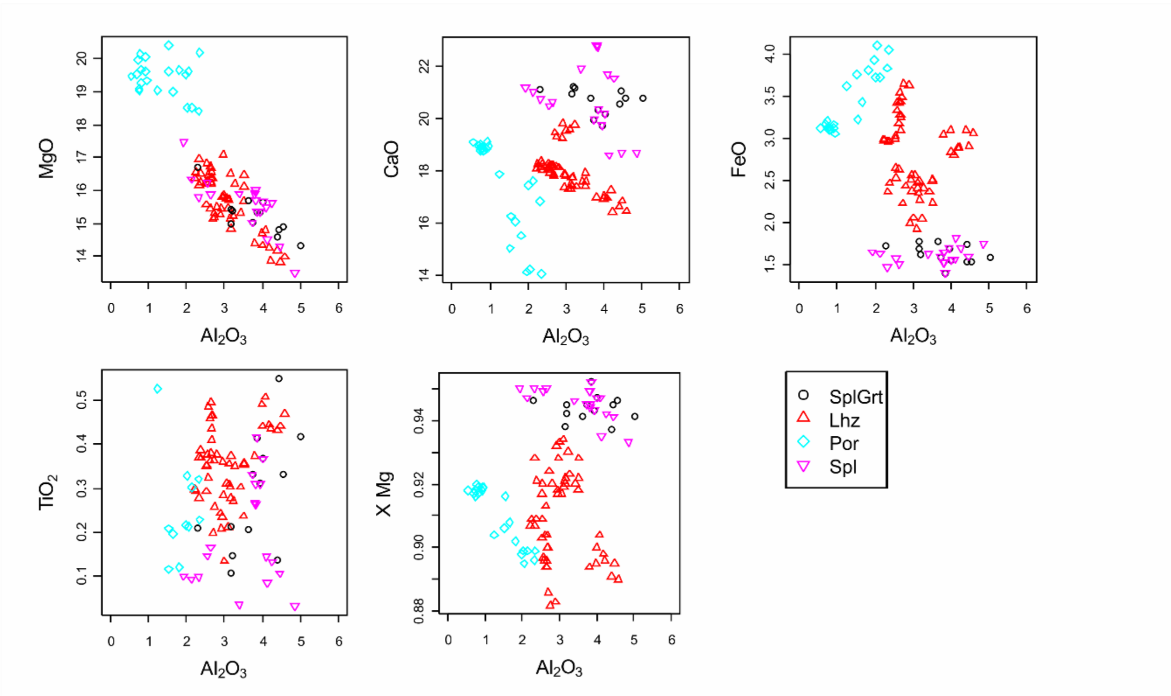


Figure 22|Compositional varieties of clinopyroxene compared to X_{Mg}.

Trace elements Cr, Zr, Sr, Y, Eu show positive correlations in clinopyroxene compared to the element Al. Porphyroclastic lherzolites represent lowest values for these elements, whereas garnet lherzolites reach the highest concentrations. Spinel-garnet lherzolites form a separate group indicating a flat correlation trend with spinel peridotites for the elments Zr, Y, Eu. LIL elements except Sr are low in concentration. Ni displays a negative correlation compared to Al (Figure 24).

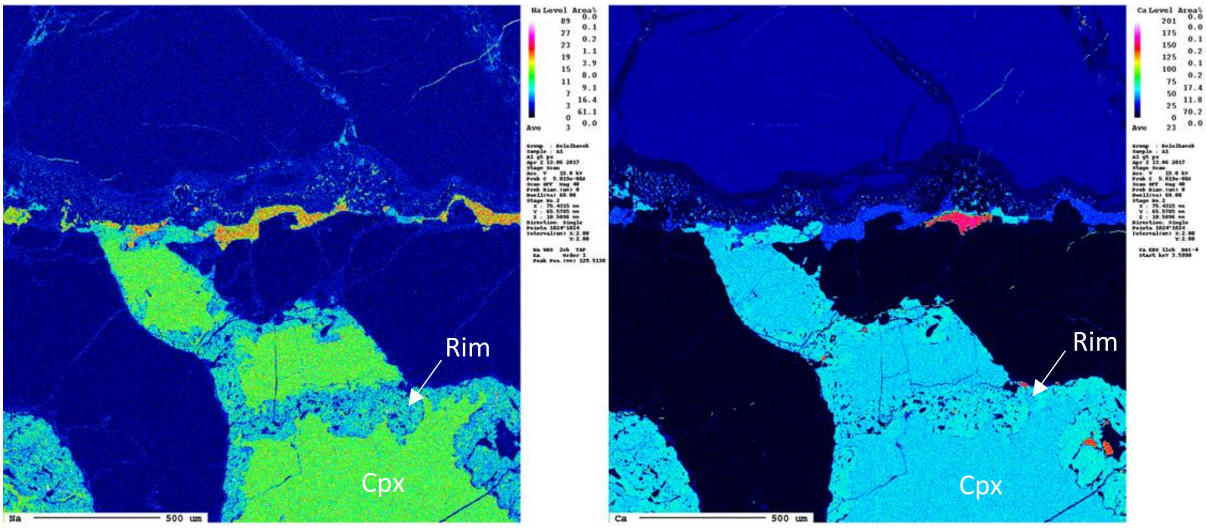


Figure 23| Mapping of a secondary „spongy" clinopyroxene rim in sample A1. Left: Sodium concentrations showing decrease in concentration towards the rim. Right: Calcium concentration showing elevation in concentration towards the rim.

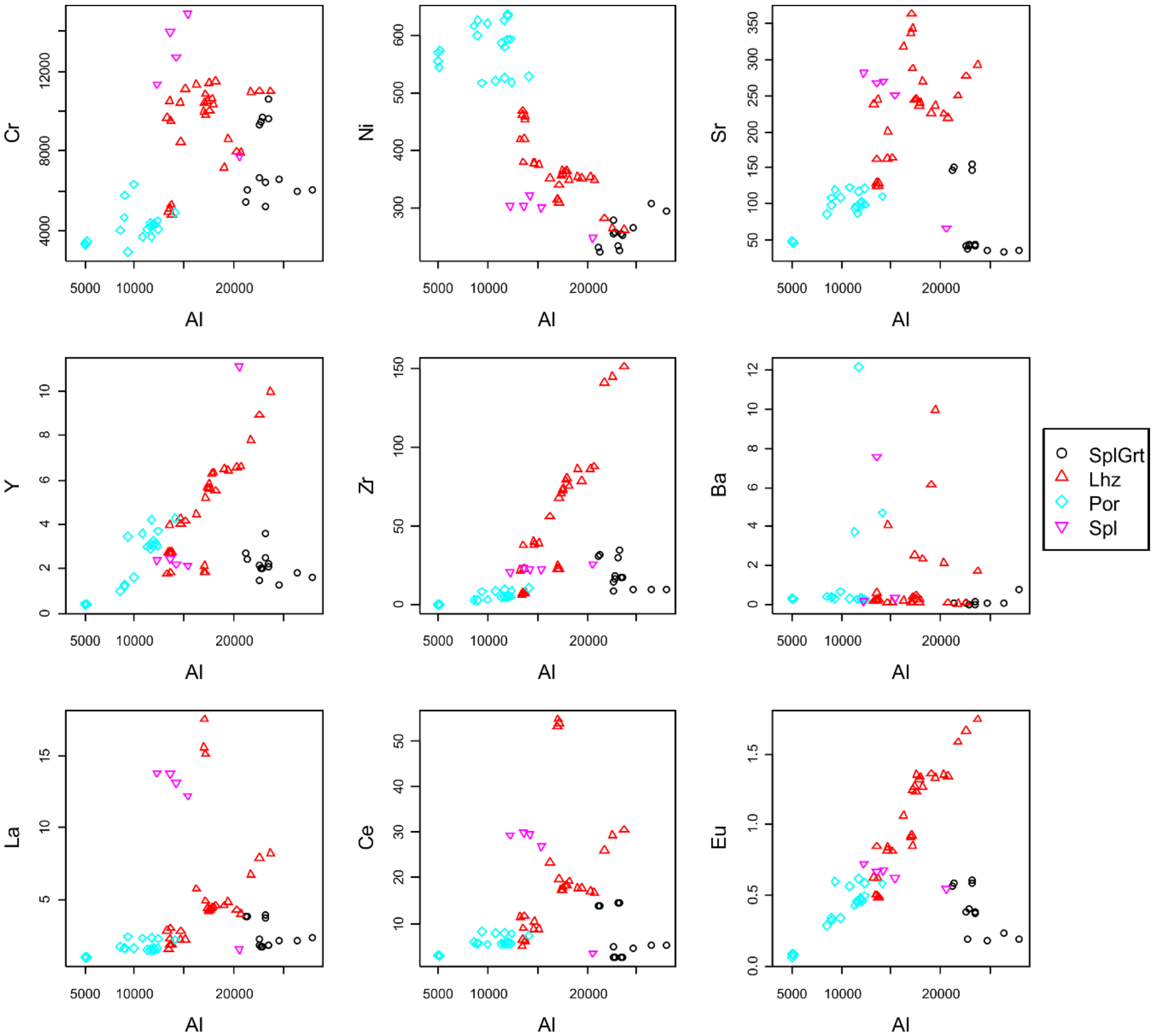


Figure 24| Selected Trace Elements (in ppm) compared to Al (in ppm).

5.4 Olivine

Olivine from undepleted mantle sources displays a very uniform X_{Mg} of 0.88 and Ni contents of 2900 +/-300 ppm. Ni predictions are true for garnet harzburgites and lherzolites. Spinel peridotites and spinel-garnet samples show elevated levels of Ni (3300ppm-3800ppm). Throughout all analysed peridotites, the X_{Mg} lies between 0.90-0.93, whereas the highest values are reached in harzburgite with 0.91-0.93. Only sample B3 shows a primitive mantle composition with a X_{Mg} of 0.88, correlating with higher FeO contents in garnet. X_{Mg} values of Olivine compared to coexisting pyroxenes should display trends with slightly higher X_{Mg} in pyroxenes (Pearson et al., 2003). This is mainly true for orthopyroxenes, but not evident for clinopyroxene (Figure 24).

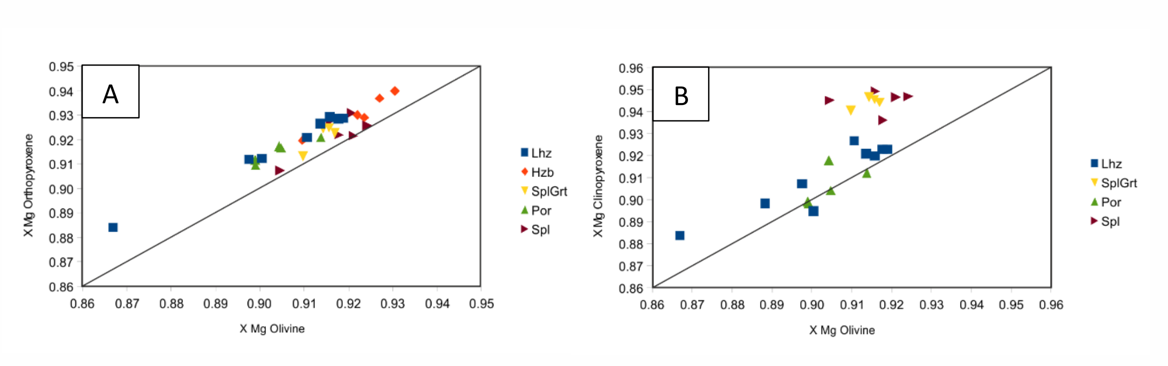


Figure 25| Binary diagram comparing X_{Mg} of olivine with X_{Mg} (A) of orthopyroxene and (B) of clinopyroxene. Well equilibrated olivine compared to pyroxenes should exhibit a X_{Mg} of Pyroxene slightly higher. (B) is highlighting a possible disequilibrium between clinopyroxene and olivine.

Olivine is the main mineral phase in peridotites. Because of the very low element contents, beside MgO, NiO, SiO_2 and FeO, X_{Mg} values where plotted against selected trace elements. Ti concentrations are below 250 ppm in all samples. Al concentrations in olivine are used as thermometer and exhibit the highest values in porphyroclastic samples (150ppm-200ppm). Ti contents range between 0.7 and 215 ppm with highest values in garnet lherzolites (152ppm-215ppm). Cr ranges between 9ppm and 447ppm (highest values in porpyroclasic lherzolites and garnet harzburgites, 305ppm-447ppm). Zn contents are elevated compared to further analysed types in garnet lherzolites and porphyroclastic lherzolites with 67ppm-92ppm. V displays highest values in porphyroclastic samples (9.7ppm- 12.5ppm).

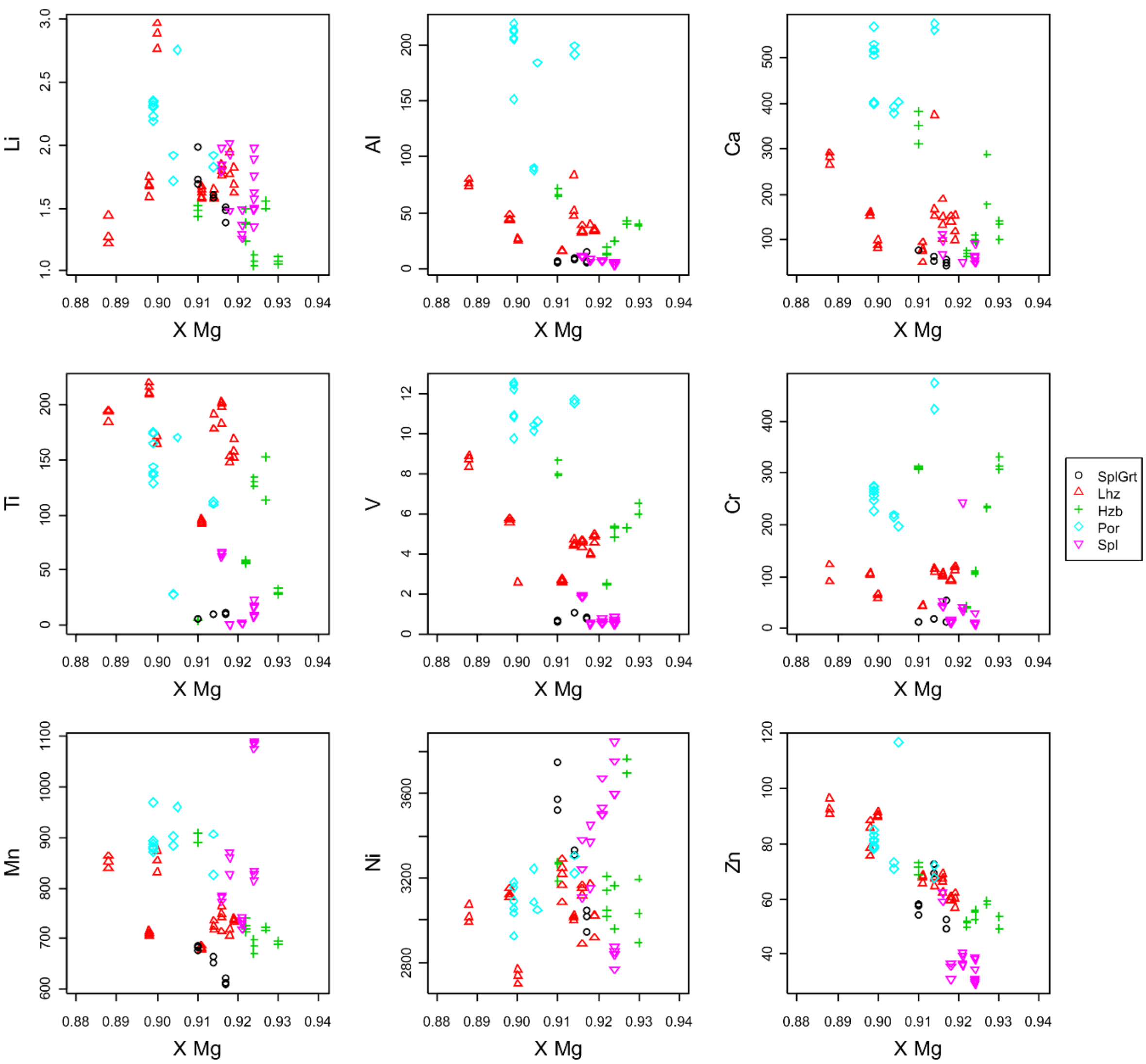


Figure 26| Binary diagram displaying compositional varieties of trace elements compared to X_{Mg} in olivine.

Non of the analysed olivines displayes zoning, except sample I5, which exhibits enrichment in FeO along rims due to influence of infiltrating melt.

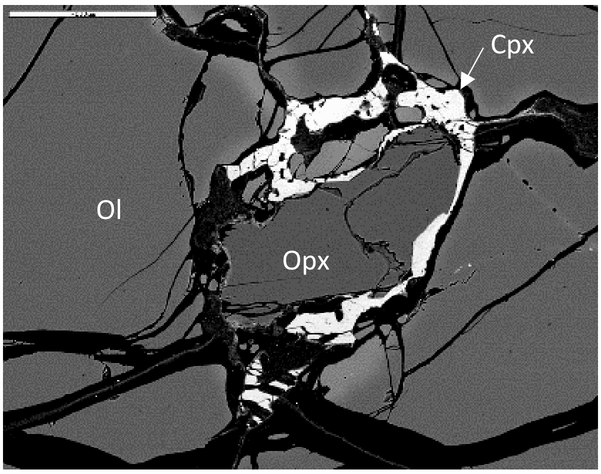


Figure 27| Sample I5 (dunite) showing chemical zonation in olivine. Light grey rims indicate iron enrichment. Clinopyroxene and orthopyroxene intergrowth as secondary phases in dunite (Scale bar 200µm).

5.5 Spinel

Table 6| Representative compositions of spinel.

	SplGrt	SplGrt	Por	Lhz	Hzb	Spl	Spl	Spl
Sample	BW80-3-spl1	BW82-1-spl1	H4-1-Spl1	Bw44-2-spl1	D4-2-spl1	I5-1-spl1	Bw60-1-spl2	F3-1-Spl2
Mineral	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl
SiO2		0.14	0.26		0.23	0.11		0.34
TiO2	0.18	0.12	1.97	1.53	1.49	0.66		0.6
Al2O3	51.10	36.55	31.59	31.49	13.84	27.07	56.12	15.67
Cr2O3	15.47	31.63	34.07	33.52	55.16	39.78	13.79	50.47
FeO	14.48	15.4	15.24	16.72	14.33	14.38	11.23	18.03
MnO	0.12	0.1	0.21		0.46	0.25		0.45
MgO	17.85	14.52	16.97	16.00	14.72	16.34	18.49	12.2
NiO			0.15			0.13	0.27	
Total	99.20	98.46	100.46	99.26	100.23	98.72	99.9	98.16
Si	0.005	0.001	0.007		0.007	0.003		0.011
Ti	0.024	0.006	0.043	0.034	0.035	0.015		0.015
Al	0.594	1.236	1.071	1.085	0.512	0.951	1.737	0.594
Cr	1.276	0.757	0.775	0.775	1.369	0.937	0.286	1.284
Fe2+	0.436	0.345	0.314	0.336	0.341	0.283	0.247	0.414
Fe3+	0.073		0.053	0.073	0.035	0.076		0.071
Mn	0.009	0.003	0.005		0.012	0.006		0.012
Mg	0.575	0.649	0.728	0.697	0.689	0.726	0.724	0.585
Ni	0.003	0.002	0.003			0.003	0.006	
Kations	3	3	3	3	3	3	3	3
Oxygen	4	4	4	4	4	4	4	4
Location	Grt corona	Grt corona	Keliphite	Keliphite	Keliphite	Matrix	Matrix	Exsolution cpx
X Mg	0.687	0.627	0.665	0.63	0.647	0.669	0.746	0.547
X Cr	0.169	0.367	0.42	0.417	0.728	0.496	0.142	0.683

Spinel is in garnet bearing samples part of the keliphitic rim with submicroscopic grainsize. Keliphitic rims are thereby decrompressional subsolidus reactions of garnet to orthopyroxene, clinopyroxene, spinel and in some cases hydrous minerals like phlogopite or amphibol. Spinel peridotites and spinel-garnet lherzolites do bear grains which are bigger than 1 mm in diameter and located in the matrix. Cpx further displays exsolutions of Cr-spinel. The range of Cr_2O_3 is between 12 and 55 wt%, whereas no specific trend is detectable between keliphitic spinel, matrix spinel or spinel with garnet corona. MgO contents are between 11.2 and 19.85 wt%. Al_2O_3 contents range from 14.22 to 50.97 wt%.

Samples with stoichiometric Fe^{3+} display formula coefficients from 0.001 to 0.083 apfu.

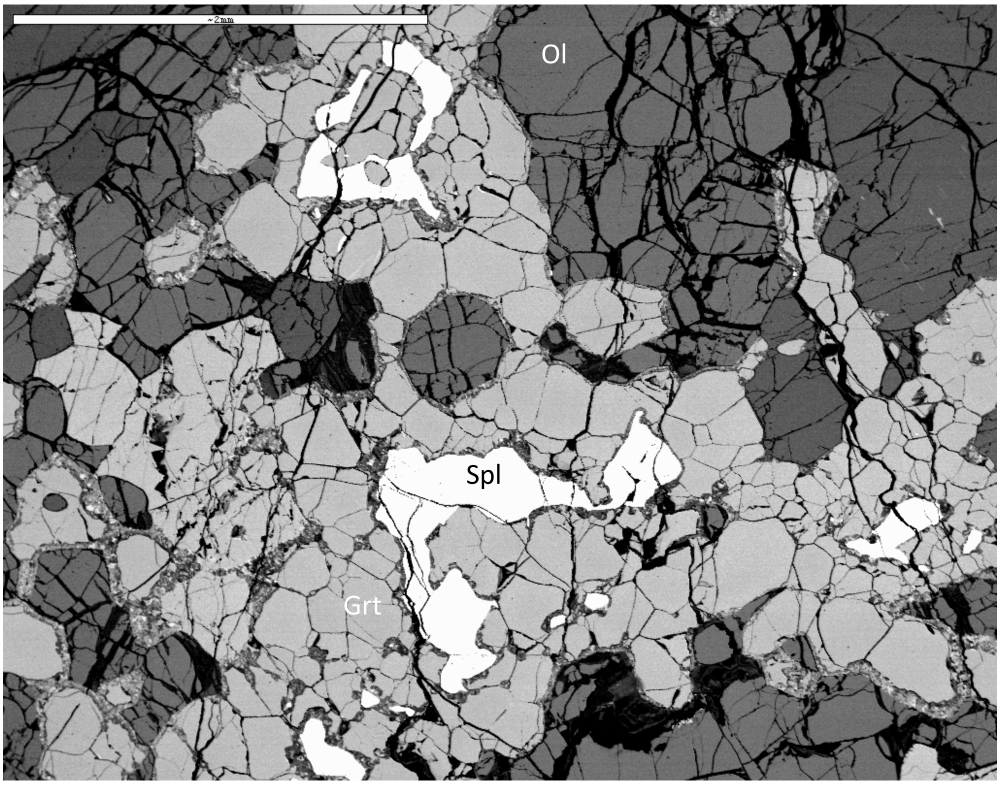


Figure 28| Spinel with garnet corona in sample BW82 (scale bar 2mm).

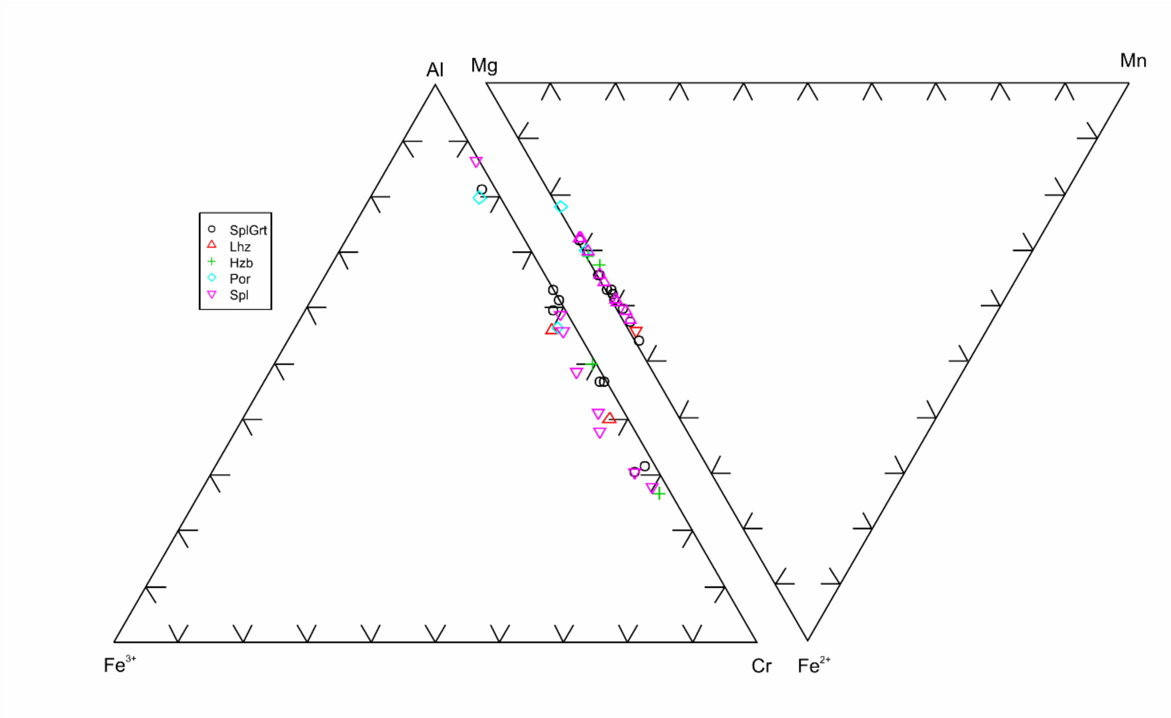


Figure 29| Ternary diagram displaying compositional variaties considering atoms per formula unit in spinel. Garnet harzburigite (Hzb), garnet lherzolite (Lhz) and porphyroclastic lherzolite (Por) spinel are found in keliphte rims of garnet. Spinel-garnet lherzolites (SplGrt) and spinel peridotites represent matrix spinel.

5.6 Phlogopite

Table 7| Representative compositions of phlogopite.

Type	Lhz	Hzb	Spl	Spl
Sample	BW10-0917-p1	D4-1-p1	C4-1-P2	F3-2-p1
Mineral	Phl	Phl	Phl	Phl
SiO2	41.33	40.09	38.09	38.94
TiO2	1.00	1.70	2.78	4.64
Al2O3	13.08	15.12	14.79	14.03
Cr2O3	0.43	2.28	1.41	2.05
FeO	3.24	2.88	3.15	3.86
MgO	25.58	23.74	22.59	20.85
Na2O	0.58	0.43	0.13	0.51
K2O	10.79	10.58	10.92	9.66
NiO		0.06	0.14	0.12
Total	96.04	96.88	94.00	94.65
Si	2.932	2.873	2.805	2.815
Ti	0.053	0.257	0.154	0.173
Al	1.094	1.220	1.284	1.236
Cr	0.024	0.119	0.082	0.123
Fe	0.192	0.238	0.194	0.266
Mg	2.705	2.293	2.481	2.387
Na	0.080	0.072	0.018	0.071
K	0.976	0.909	1.027	0.877
Ni		0.007	0.008	0.006
Kations	8.057	7.989	8.053	7.954
Oxygen	11	11	11	11
F	0.20	0.10	0.07	
Location	Keliphite	Keliphite	Matrix	Matrix
X Mg	0.934	0.936	0.927	0.906

Phlogopites are not part of the equilibrium assemblage in peridotites. In general, they are related to keliphite rims in all garnet bearing samples and in spinel peridotites they are also detectable in the matrix. Al_2O_3 contents are between 11.57 and 15.90 wt% overall samples. NaO_2 contents are below 0.67 wt.%. TiO_2 rages from 0.17 to 2 wt.% and K2O ranges from 9.44 to 10.98 wt%. FeO ranges from 2.87 wt.% to 4.34 wt.%.

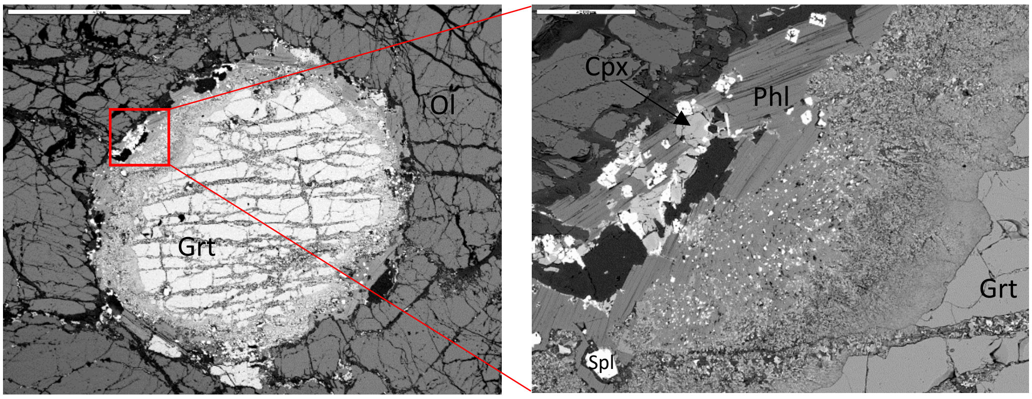


Figure 30| Left: Back scattered electron picture of a garnet in garnet harzburgite sample D4 with prominent keliphitic rim (Scale bar 2mm). Right: Details of the fine-grained keliphitic rim showing overgrowth of phlogopite (Scale bar 200µm).

6 Geothermobarometry

Geochemical data were further used to calculate pressure and temperature conditions of the different mantle xenolithes based on. One of the toughest problems calculating depth and temperatures from whereas xenoliths are originating from is, that most of the obtainable calibrations are just valid for four-phase-lherzolites in the garnet stability field. The main principal is, that we are taking advantage of either major element or trace element distributions, which are experimentally tested to be pressure or temperature dependent. High pressure and temperature experiments are further compared to natural rock samples. In most cases, iterative solutions are needed because of slight but significant converse influences of pressure and temperature, which are further regarded in equations. All calculations of thermometer and barometer were performed with Excel spread sheets using according published equations.

6.1 Thermometry based on distribution of major elements

Fe and Mg partitioning is a widely used method in Earth Science to calculate temperatures. Harley (1984) published an equation and calibration, which is applicable to mantle rocks regarding to the partitioning of Fe and Mg between garnet and aluminous orthopyroxene.

Brey and Köhler (1990) developed calibrations, which are widely used in literature. Three alternative thermometers were published. (1) A thermometer based on the Ca content in orthopyroxene, (2) T-dependent solvus between clinopyroxene and orthopyroxene, (3) Correlation regarding the distribution coefficient of Na between orthopyroxene and clinopyroxene. Because of very low Na contents in orthopyroxene and a questionable accuracy of the calibration it is just mentioned for integrity and not recommended by Nimis and Grütter (2010).

Nimis and Grütter (2010) established guidelines for geothermobarometry in peridotitic xenoliths. Considering their suggestions the two pyroxene thermometer depending on the enstatite activitys in Opx and Cpx published by Taylor (1998) provides the most reliable and robust outcomes (Ta98).

Nimis and Taylor (2000) developed a thermometer, which is based on the enstatite content of clinopyroxene and is used especially for the single clinopyroxene thermobarometry they established.

6.2 Thermometry based on distribution of trace elements

Nickel shows a strong temperature dependent partitioning between olivine and garnet (Canil, 1999). Equations published by Canil (1999) were used to obtain temperatures for analysed samples. This thermometer is the only one, which has no pressure dependency regarded. The calibration for Ni in garnet by Ryan et al. (1996) was neglected. Calculations resulted in abnormal high temperatures exceeding other estimations by 200°C, in some cases up to 1700°C. This is maybe due to the fact that there isn´t a correction regarded for partitioning of Ni between garnet and olivine.

Bussweiler et al. (2017) and De Hoog et al. (2010) released temperature estimations focused on the Al content of olivine. The calibration by De Hoog (2010) was further used in this study because of the possibility to apply this thermometer in spinel peridotites. Wan et al. (2008) established a calibration for Al in olivine, considering element distribution between olivine and Cr-spinel.

6.3 Barometers

There is an obvious amount of thermometers, but little possibilities to estimate pressure. Circumstances getting worse if garnet or orthopyroxenes are missing. These minerals are essential components in almost every available calibration. Estimations considering an assumed geotherm are thereby the only possibility to estimate pressures.

Brey and Köhler published the most used barometer for peridotitic xenolithes in literature (Brey and Köhler, 1990). The pressure dependent reaction is thereby the Al content of orthopyroxene requiring coexisting garnet.

Nickel and Green (1985) established a barometer, which is also based on the Al content of orthopyroxene and coexisting garnet. Experimental data of Nimis and Grütter (2010) prefer this barometer compared to the barometer of Brey and Köhler. Their experimental data suggest that the recommended barometer behaves more stable reproducing especially higher pressures in experiments.

A third option to estimate pressure conditions is the single clinopyroxene geothermobarometer (Nimis and Taylor, 2000). Advantage and disadvantage at once of this estimation is the calculation of thermobarometric values using a single analyses. The pressure in this calibration depends on the chromium content of a single clinopyroxene grain coexisting with garnet (Nimis and Taylor, 2000). The uncertainties are definitely higher, while clinopyroxene is often introduced as metasomatic phase and therefore eventually not representing conditions of the whole rock.

Grütter and Nimis (2010) proposed that Nickel and Green (1985) and Taylor (1998) is the most recommendable combination. Ca in Opx thermometer of Brey and Köhler (1990) and the Fe-Mg portioning thermometer of Harley (1984) reproduced temperatures using the Nickel and Green pressures within the standard error of 50°C at temperatures of 1000°C and are therefore not presented. Additionally eight additional pairs were calculated (Table 8). Mean values for representative analyses were used to ensure comparability. In the case of the single clinopyroxene thermobarometer (NT00/NT00) a mean of temperature and pressure for calculated grains are given in Table 8.

New corrections by Nimis und Grütter (2010) for the Ca in Opx thermometer (Brey and Köhler, 1990) and the Harley (1985) thermometer were not obtained. The solvusthermometer was not applied because of documented overestimation, especially because of the missing correction for Na in the equation (Nimis and Grütter, 2010).

6.4 Results

Table 8| Calculated geothermobarometric results for analysed samples. NT00= Nimis and Taylor (2000); NG85= Nickel and Green(1985); BKN= Brey and Köhler (1990); Al in Ol= De Hoog et al.(2010); Ni in Grt= Canil (1999); TA98= Taylor (1998); Harley85= Harley (1984); Ca in Opx= Brey and Köhler (1990);Wan08= Wan et al. (2008); P geotherm=manuel fitted pressures. Missing values caused by not existing analyses or missing minerals in the thin section. *NT00/NT00 pressure assumed

Sample	Type	NT00/NT00 (Mean)		NG85; BKN/Ni in Grt			NG85/Al in Ol		geotherm/Wan08		BKN/Al in Ol		BKN/BK90 Ca in Opx		BKN/TA98		BKN/Harley84		NG85/Ta98	
		P (kbar)	T (°C)	P (kbar) NG85	P (kbar) BKN	T (°C)	P (kbar)	T (°C)			P (kbar)	T (°C)	P (kbar)	T (°C)	P (kbar)	T (°C)	P (kbar)	T (°C)	P(Kbar)	T(°C)
BW 1	Lhz	51.1	1122	51.9	58.9	1067	55.3	1127			71.9	1217	65.0	1139	68.9	1182	72.8	1248	56.4	1143
BW 4	Lhz	50.3	1115	50.1	55.1	1054	55.7	1148			66.3	1206	57.9	1094	62.7	1158	65.6	1197	55.0	1135
BW 5	Lhz	41.5	1069	47.3	44.2	1010	50.8	1069			46.6	1046	42.2	978	49.2	1087	47.0	1053	52.7	1099
BW 6	Lhz	34.7	939	41.1	39.5	908	41.7	916			39.3	904	36.2	856	43	961	41.8	942	44.7	967
BW 7	Lhz	45.9	1054	48.2	46.8	1019	50.7	1062			49.1	1053	43.2	965	43	962	41.7	941	51.6	1075
BW 10	Lhz	39.2	944	44.4	37.8	968	45.6	988			36.0	940	33.1	895	36.1	943	35.9	939	44.5	969
BW 44	Lhz	46.6	1047	49.9	51.3	1047	51.2	1068			53.8	1082	46.1	971	52.5	1064	51.7	1052	50.7	1060
B3	Lhz	51.5	875										37.7	955	30	847	35.3	923	38.4	871
A1	Lhz	51.6	1132		51.6*	1154		1141			51.6*	1141								
D1	Hzb			62.7	55.1	1146	69.4	1282			60.1	1230	60.7	1240			56.3	1167		
D3	Hzb			55.1	51.7	1059	61.2	1170			58.2	1154	45.1	959			57.3	1141		
D4	Hzb			51.1	39.8	999	60.1	1162			44.5	1079	42.0	1036			35.5	922		
E4	Hzb			46.7	42.6	977	49.6	1027			44.0	999	40.9	950			46.5	1038		
G1	Hzb			41.1	38.1	882	43.0	913			38.9	894	35.5	841			38.0	880		
G2	SplGrt	33.7	923										30.3	824	37	930	32.4	857	44.4	953
G5	SplGrt	14.3	678	34.5	23.6	812	34.8	816	27.0	694	20.5	751	20.1	740	17.8	693	21.8	775	28.6	713
BW 80	SplGrt	27.1	887	35.3	29.1	812	35.2	812	30.0	750	26.9	774	29.0	810	34	896	31.1	847	41.7	919
BW 82	SplGrt	24.1	831	32.0	20.3	774	31.6	767	27.5	709	16.8	701	17.5	716	23.3	833	19.1	752	38.1	875
H2	Por	63.2	1388	64.6	56.1	1306	73.9	1462			60.9	1379	62.4	1402	61.3	1385	54.6	1284	71.8	1425
H3	Por	61.0	1413	59.0	52.5	1203	70.8	1402			62.0	1347	69.9	1459	67.8	1430	60.8	1329	73.9	1455
H4	Por	63.9	1383	64.7	52.9	1271	77.4	1499			60.4	1391	59.6	1379	58.7	1364	50.7	1234	73.0	1419
H6	Por	72.2	1291	59.4	48.2	1207	72.3	1428			56.1	1326	49.5	1227	50	1235	41.3	1100	64.1	1286
BW 17	Por	64.5	1333	59.9	64.8	1193	64.4	1271			77.5	1346	84.8	1430	82.2	1400	71.4	1274	69.0	1351
							P geotherm/ Al in Ol													
C4	Spl						30.0	770	28.0	727										
F3	Spl						35.0	874	32.0	816										
F4	Spl						28.0	732												
I5	Spl						33.0	826	28.0	729										

Comparing obtained temperatures to the preferred combination by Nimis and Grütter (2010) displays best agreements of NG85/Ta98 with the average of NT00/NT00 and BKN/Ta98. All the other combinations show deviations either at higher temperatures, lower temperatures or in both cases (Figure 31). Especially the Ni in olivine thermometer and the Fe-Mg exchange thermometer are significant divergent.

The scatter of pressure in the same sample comparing different methods is prominent (up to 15kbar; Figure 32). Pressure values show a distinct variability caused by slight temperature differences. The small hand specimen size (5 cm in diameter or smaller) is maybe enhancing the vulnerability of element systems. The highest deviations are found in spinel-garnet lherzolites and in porphyroclastic lherzolites. Samples of these types are in the case of spinel-garnet lherzolites obviously metasomatised or in case of porphyroclastic lherzolites sheared and metasomatised.

Thermometers deviate in all samples +/- 100°C compared by the recommended couple by Grütter and Nimis (2010).

Nevertheless, all samples show realistic and comparable trends revisiting all calculated couples.

The thermobarometric pair favoured by Grütter and Nimis (2010) results in the best fit for a 40mW/m^2 geotherm.

Spinel-garnet samples are the shallowest and porphyroclastic samples represent the deepest parts of the SCLM. There is no significant chemical layering if we compare lherzolites and harzburgites. Those two groups seem to confine a coarse garnet peridotite layer between the two other types.

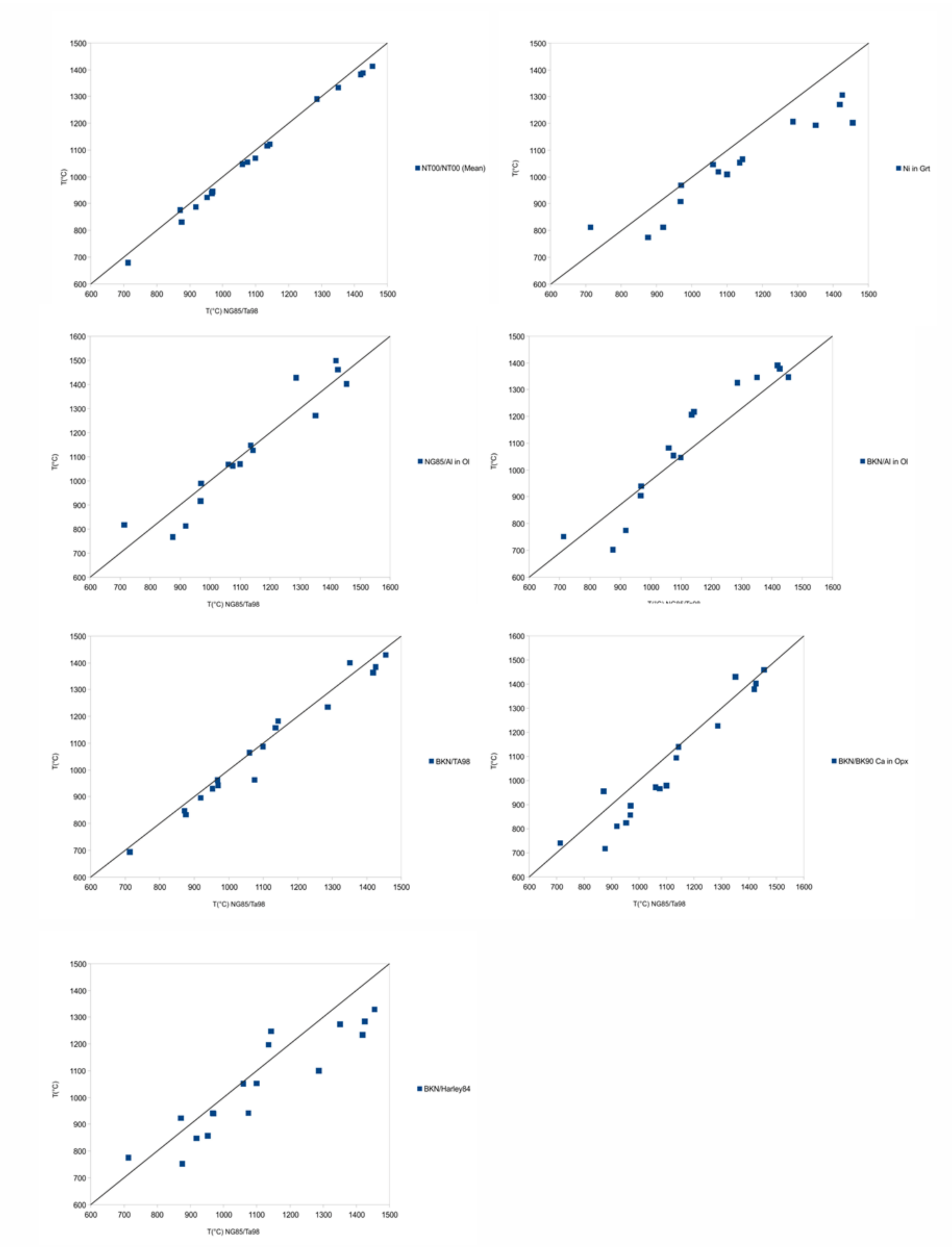


Figure 31|Binary diagram comparing all calculated temperatures to the assumed combination NG85/Ta98 of Nimis and Grütter (2010). Abbreviations as in Table 8.

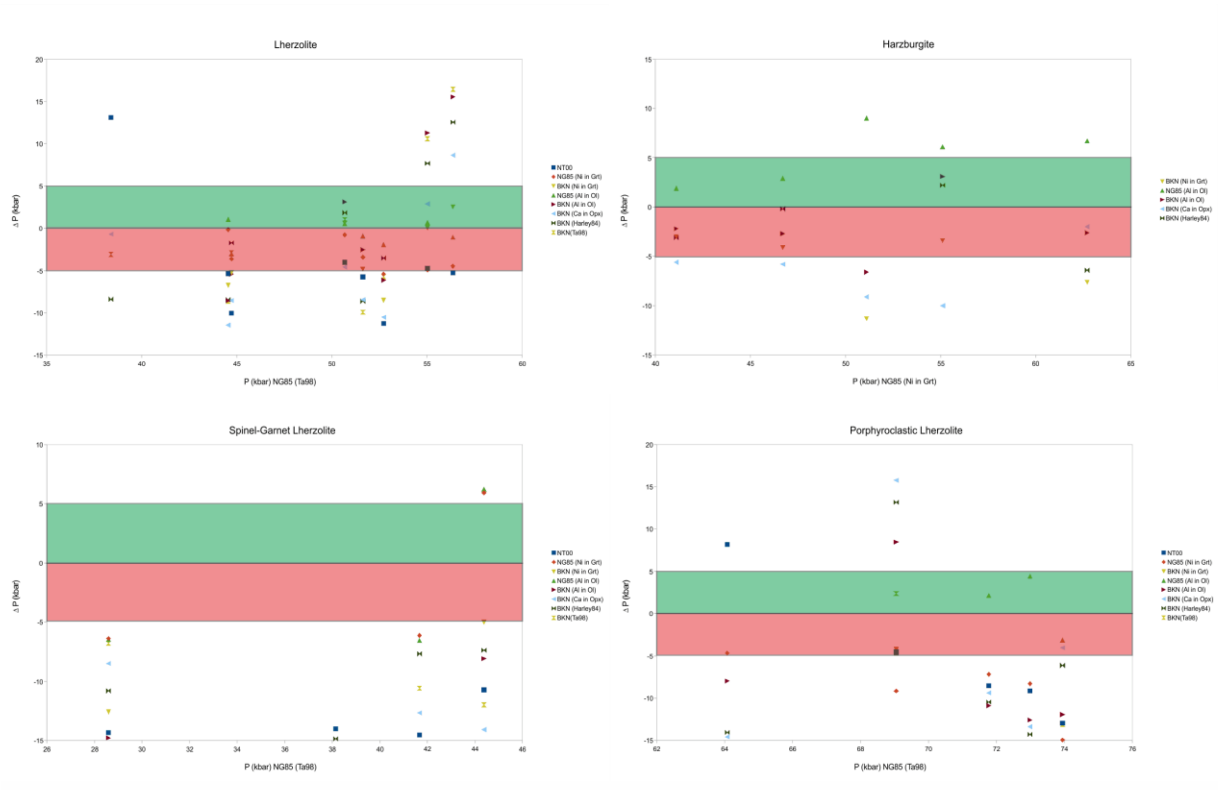


Figure 32|Various calculated pressures compared to the pressure obtained by the proposed couple of Nimis and Grütter (2010). Red zone indicates -5 kbar and green zone indicates +5 kbar pressure difference. Abbreviations as in Table 8.

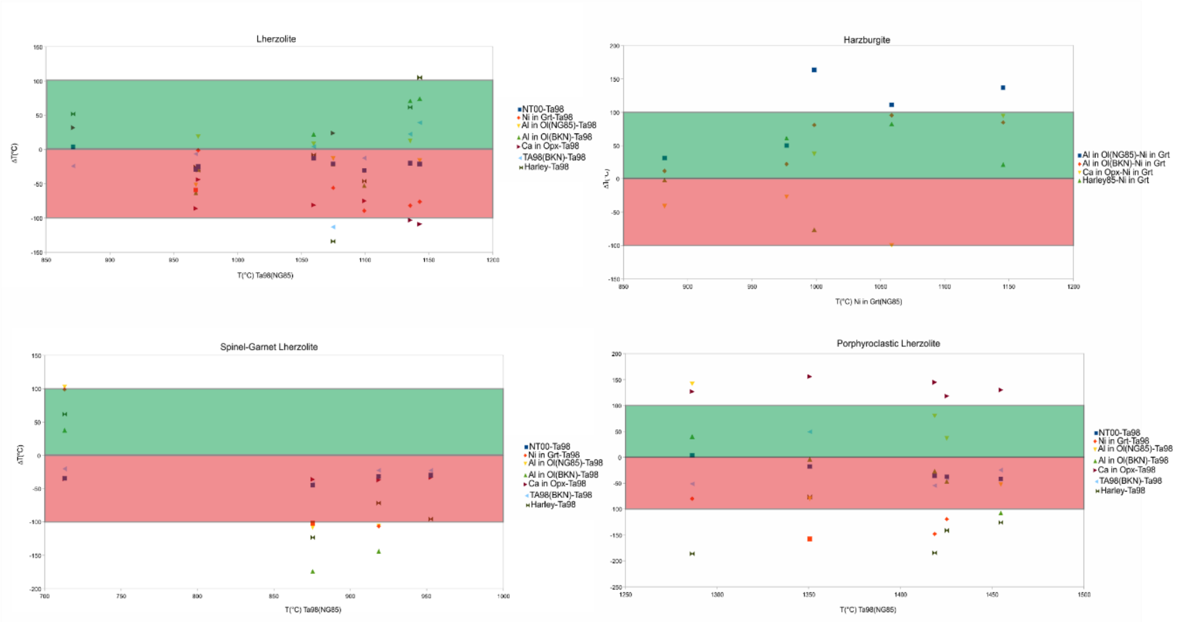


Figure 33|Various calculated temperatures compared to the temperature obtained by the proposed couple of Nimis and Grütter (2010). Red zone indicates -100°C and green zone indicates +100°C temperature difference. Abbreviations as in Table 8.

Regarding our best fit thermobarometric couple, spinel-garnet lherzolites are the shallowest samples in the SCLM beneath Ltlhakane ranging from 38 to 44 kbar (94-146 km) with temperatures ranging from 710 to 950 °C. Those overlap the lherzolite field, which is found between 38-56 kbars

(126-186 km) with temperatures ranging from 870 to 1140 °C. There is no possibility to obtain temperatures for harzburgites using Tayler (1998) because of the lack in clinopyroxene, which is obligate in the equation. But alternative couples (De Hoog et al., 2010/Nickel and Green, 1985) imply pressures from 43 to 69 kbars (163-229 km) and temperatures from 910 to 1280 °C.

Porphyroclastic samples leave the calculated geotherm to higher temperatures (1350-1425 °C) and implicate pressures between 64 and 74 kbar (211-244 km). An observation, which is already well described in literature and believed to represent the basal shear zone of the lithosphere (Franz et al., 1996; Kennedy et al., 2002; O'Reilly and Griffin, 2013; O'Reilly and Griffin, 2010; Skemer and Karato, 2008).

Spinel bearing samples were not differentiated during calculations. The Al in Ol thermometers are the only methods applicable to paragenesis without garnet (De Hoog et al., 2010; Wan et al., 2008). Pressures were fitted by plotting the obtained temperatures on a 40 mW/m^2geotherm. Estimated pressures range from 29 to 35 kbar (99-115 km) and temperatures range between 730 and 875 °C suggest overlaps with samples of the spinel-garnet lherzolites.

Single-clinopyroxene-thermobarometry gives sufficient trends if enough grains are analysed. But, for precise predictions scattering is significant. This is likely due to the fact, that clinopyroxene is chemically the most altered mineral considering secondary effects in peridotitic assemblages. Respectively it is possible that clinopyroxene is profoundly affected by kimberlitic veinlets.

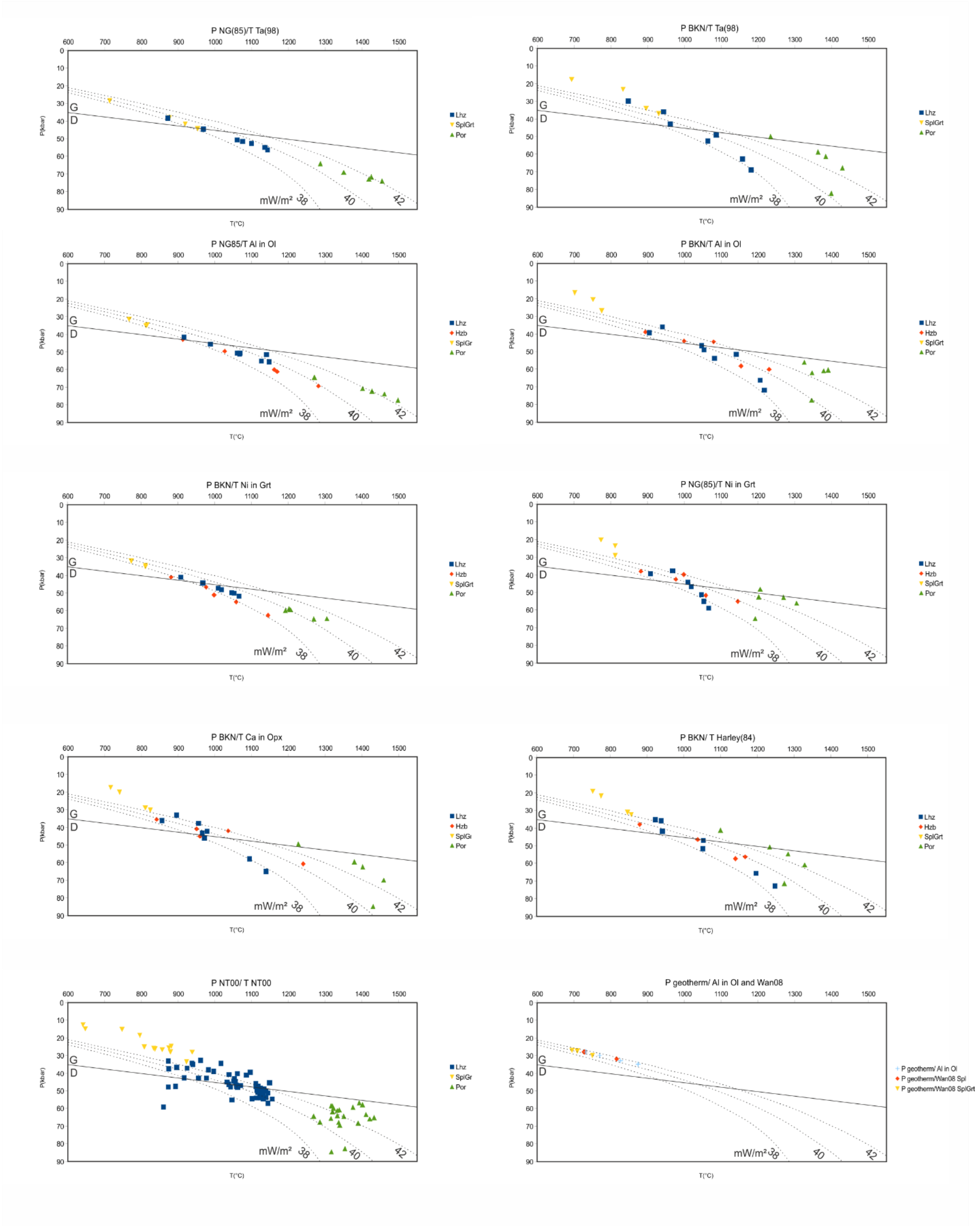


Figure 34| PT-diagram of different calculated couples. Couple recommended by Grütter and Nimis (2010) displayes the best fit for a 40mW/m² geotherm (NG85/Ta98). Continuous line correspondents to the graphite-diamond transition by Kennedy and Kennedy (1976). Dashed lines geotherm proposed by Pollack and Chapman (1977). Abbreviations as in Table 8.

7 Rare Earth Element Chemistry

Twenty five samples from all different types were investigate systematically for rare earth element distribution in garnet, clinopyroxene and orthopyroxene. Trace and rare earth elements were determent by LA-ICPMS. Chondrite normalization were applied with values of Nakamura (1974). For detailed analyses see the Appendix.

7.1 Orthopyroxene

Orthopyroxenes have in all samples low rare earth element (REE) concentrations close to or below the detection limit. Garnet lherzolite orthopyroxenes are more depleted in light rare earth elements (LREE) with chondrite normalized values <0.01 and HREE close to 0.1. Garnet harzburgite orthpyroxene is compared to orthopyroxene in garnet lherzolite more enriched in LREE with values of 0.1 reaching higher values in a view cases. Similar patterns are found in porphyroclastic samples with flat curves and values around 0.1. Prominent, the wide spread between samples within the same type.

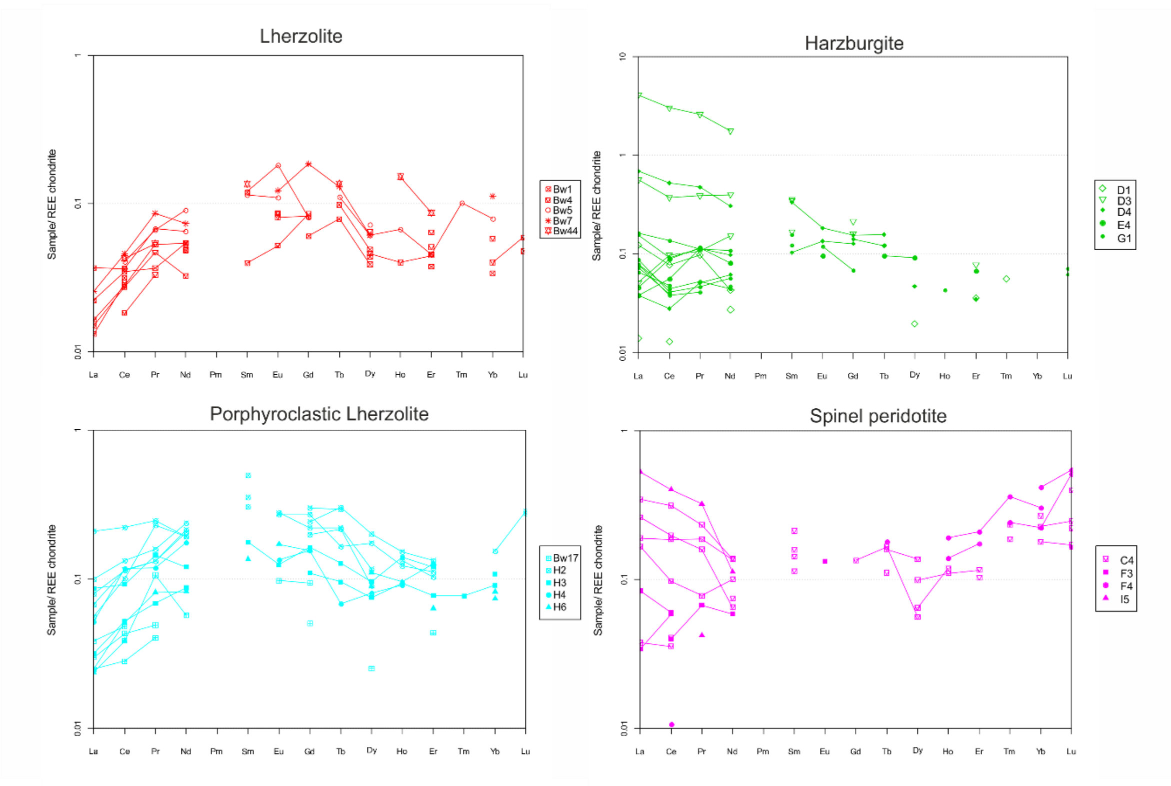


Figure 35|Chondrit normalized REE diagrams for orthopyroxene (Nakamura, 1974).

7.2 Clinopyroxene

Clinopyroxenes in garnet lherzolites show typical chondrite normalized curves as expected for crystallization in the presence of garnet. All samples show enrichement in LREE with a Praseodymium peak and an overall negative slope. LREE show enrichment by factor of 10-100, whereas heavy rare earth elements (HREE) represent values <1-10. One sample displays a steeper slope with the highest enrichment in LREE. This can be associated with direct contact of kimberlitic melt in thin section BW6 and hence metasomatic influence.

Clinopyroxenes in spinel-garnet lherzolites display patterns similar to garnet lherzolites with an enrichment in LREE and depletion in HREE. LREE display enrichment by the factor 1.5 - 12 compared to chondritic composition. HREE are below 1 compared to chondrites. One sample shows a very shallow slope and one sample shows a sinusoidal shape. The sinusoidal curve has a maximum at the Element Europium.

Porphyroclastic samples show similar patterns compared to lherzolites. Like spinel-garnet bearing samples they are less enriched in LREE between 1.1-10 enrichment factor normalized to chondritic composition. Sinousoidal shapes are not detectable. HREE show the same trend indicating crystallization in the presence of garnet.

Spinel lherzolites show a variety of patterns. In general two samples show patterns, which are conform with Cpx crystallizing in the presence of garnet. One sample shows a flat pattern with enrichment approximately by the factor 10 in LREE and HREE, which indicates crystallization in the absence of garnet. Samples showing patterns, which are comparable with garnet bearing samples are enriched by the factor 80-100 in LREE.

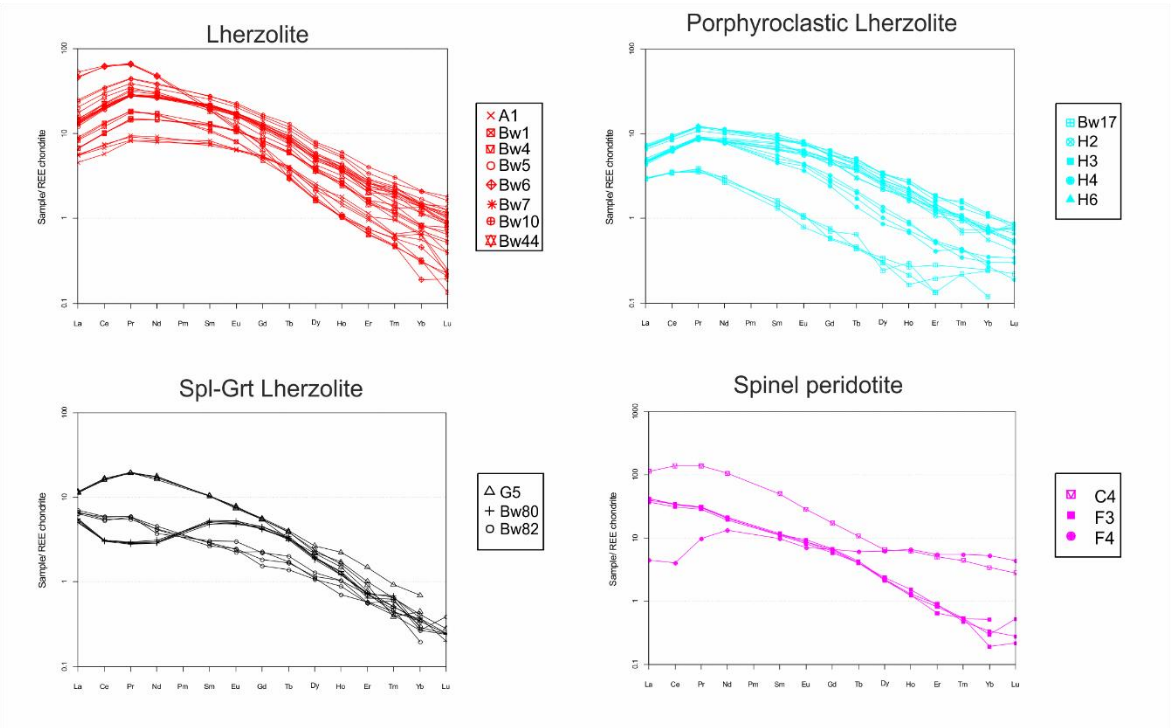


Figure 36| Chondrit normalized REE diagrams for clinopyroxene (Nakamura, 1974).

7.3 Garnet

Garnets in garnet lherzolites are typically homogenious considering their REE patterns between samples and display parabolic curves with a positive slope. Contrary patterns to Cpx with enrichment in HREE ranging from 10-50 times normalized to chondrites are usually observed Sample BW1 displays a sinusoidal shape with an $(Sm/Er)_N$ ratio higher than 1 (1.3- 2.1). $(Sm/Er)_N$ ranges amongst the other samples from 0.2- 0.5.

Garnet harzburgites are a very diverse group if we consider REE. Very flat, sinusoidal shapes and classic garnet lherzolite patterns were analysed. Enrichment by the factor 10 for HREE is comparable to samples of the garnet lherzolite group. Sinusoidal patterns reveal certain influence by metasomatism with fluids/melts in absence of clinopyroxene. This fluids/melt should be enriched in LREE, which is typically for basaltic, kimberlitic and especially carbonatitic. Sample D1 indicates a depleted pattern, which is corresponding to pre metasomatized harzburgitic garnets in literature (Howarth et al., 2014; Tomlinson et al., 2017).

Spinel garnet lherzolites display typical lherzolitic patterns with small variations in magnitude and enrichment by the factor 10 for HREE.

Porphyroclastic lherzolites garnets show inconspicuous pattern with LREE <1-10 and HREE enrich by the factor roughly 10. Only sample H4 displays a flat shape with scattered element distribution between Pr and Ho comparing different grains in the sample. Three different grains were analysed and every single grain indicates a different stage of enrichment between Pr and Ho. Sample H6 shows also more depleted composition with a flat slope towards HREE.

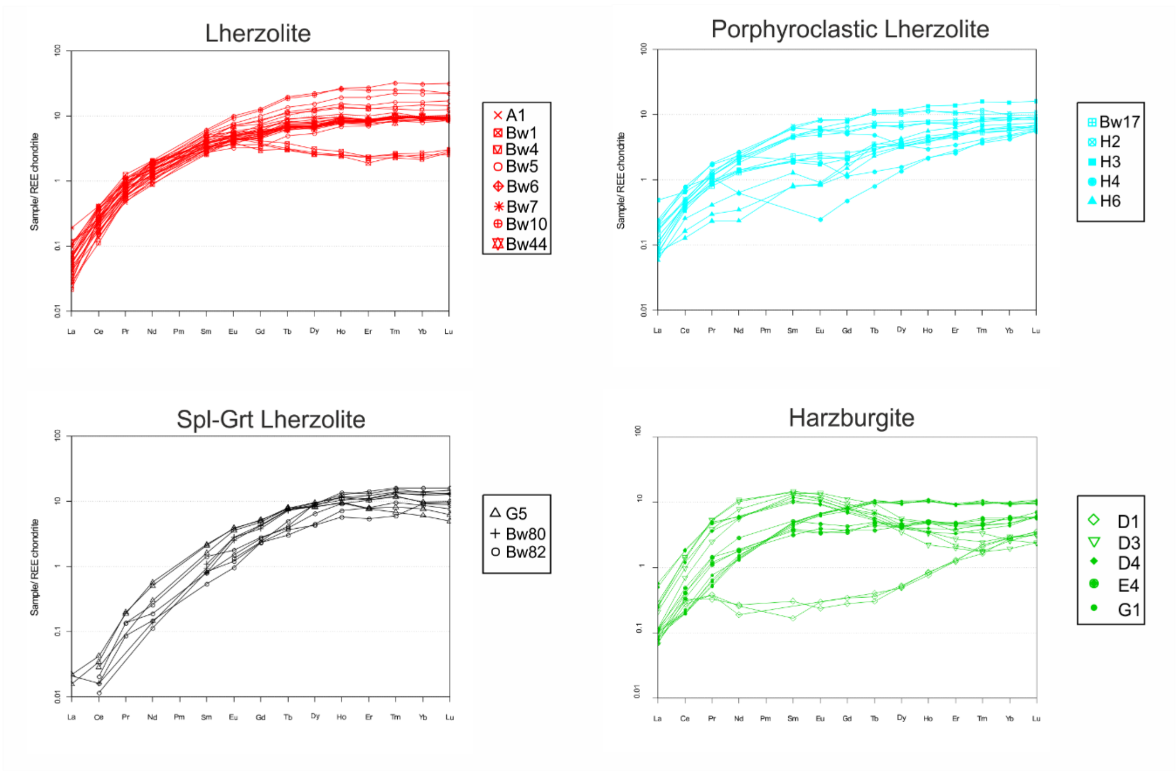


Figure 37| Chondrite normalized REE diagrams for garnet (Nakamura, 1974).

7.4 Onuma Plots

Onuma et al (1968) described constant negative slopes for element distribution coefficients depending on equilibrium and radius of the element between minerals and matrix with a turning point at the best fitting element replacing the major element in the crystal structure of the mineral pair of interest (Higuchi and Nagasawa, 1969; Onuma et al., 1968). For rare earth elements we do not expect a peak, rather we are expecting linear negative dipping trends. Agranier and Lee (2007) conducted a similar approach comparing concentrations between pyroxenes. For this study we compared concentrations of REE in Grt/Cpx, Grt/Opx and Opx/Cpx using ionic radius data of Shannon (1976).

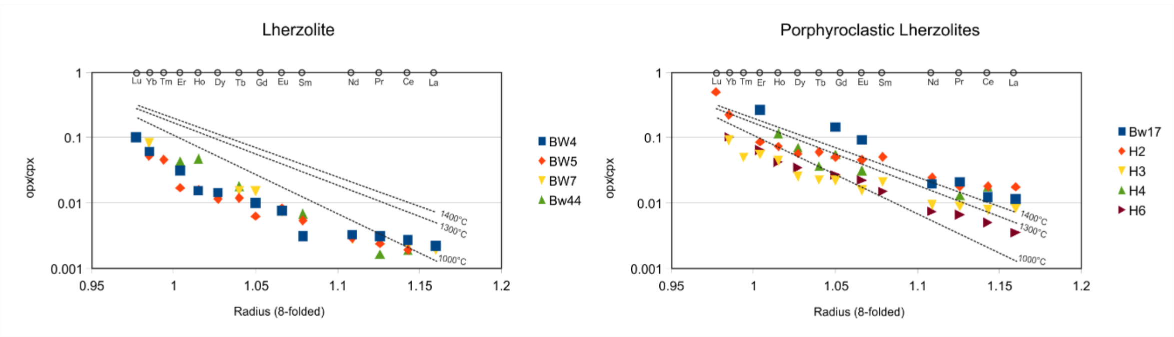


Figure 38| Onuma plots comparing concentrations of REE in orthopyroxene and clinopyroxene assuming linear trends representing equilibrium (Agranier and Lee, 2007). Dashed lines represent calculated equilibrium at indicated temperature.

In the case of Opx compared to Cpx (Figure 38) we do not find well equilibrated rare earth element distribution. Equilibration trends determined by Agranier and Lee (2007) show deviations in garnet lherzolites as well as in porphyroclastic lherzolites.

Temperature trends for concentration ratios in garnet and orthopyroxene are not available in literature. Nevertheless, considering linear trends for REE distribution, we do not find well equilibrated REE between Grt and Opx in all groups (Figure 39). Particularly the transition LREE to HREE shows kinks, which are interpreted as disequilibrium.

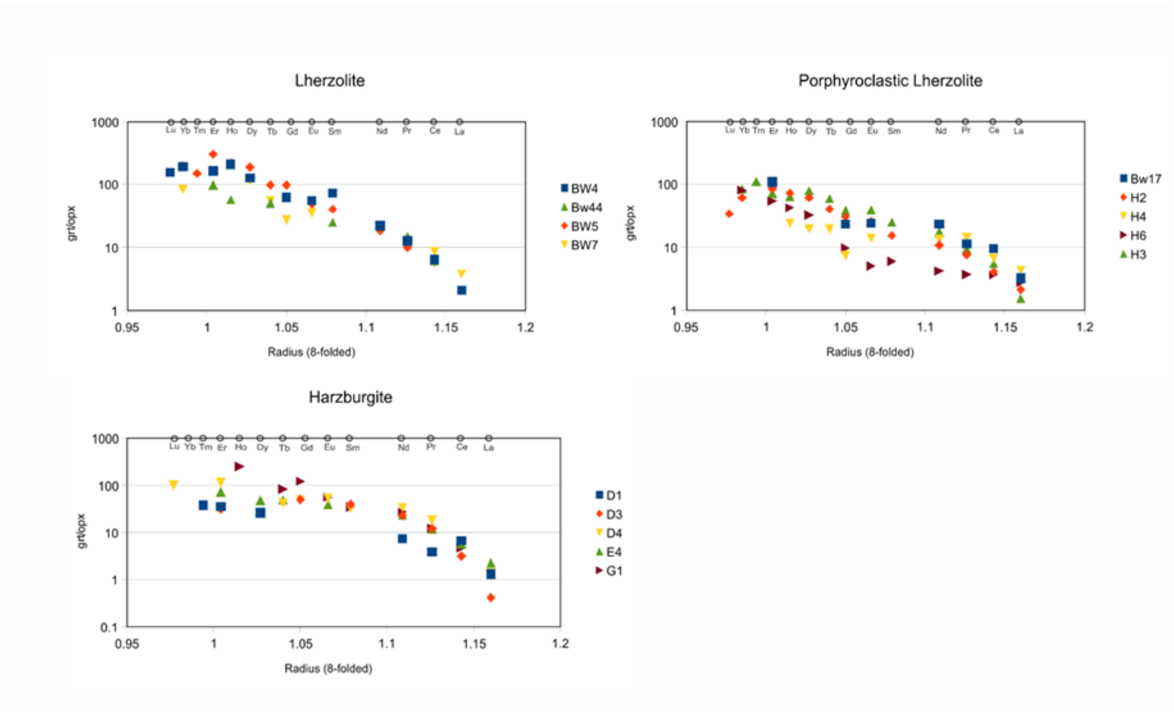


Figure 39| Onuma plots comparing concentrations of REE in garnet and orthopyroxene assuming linear trends representing equilibrium.

Garnet versus clinopyroxene (Figure 40), displays proper equilibration trends for garnet lherzolites and spinel-garnet lerzolites. We do not find this matches in porphyroclastic lherzolite samples.

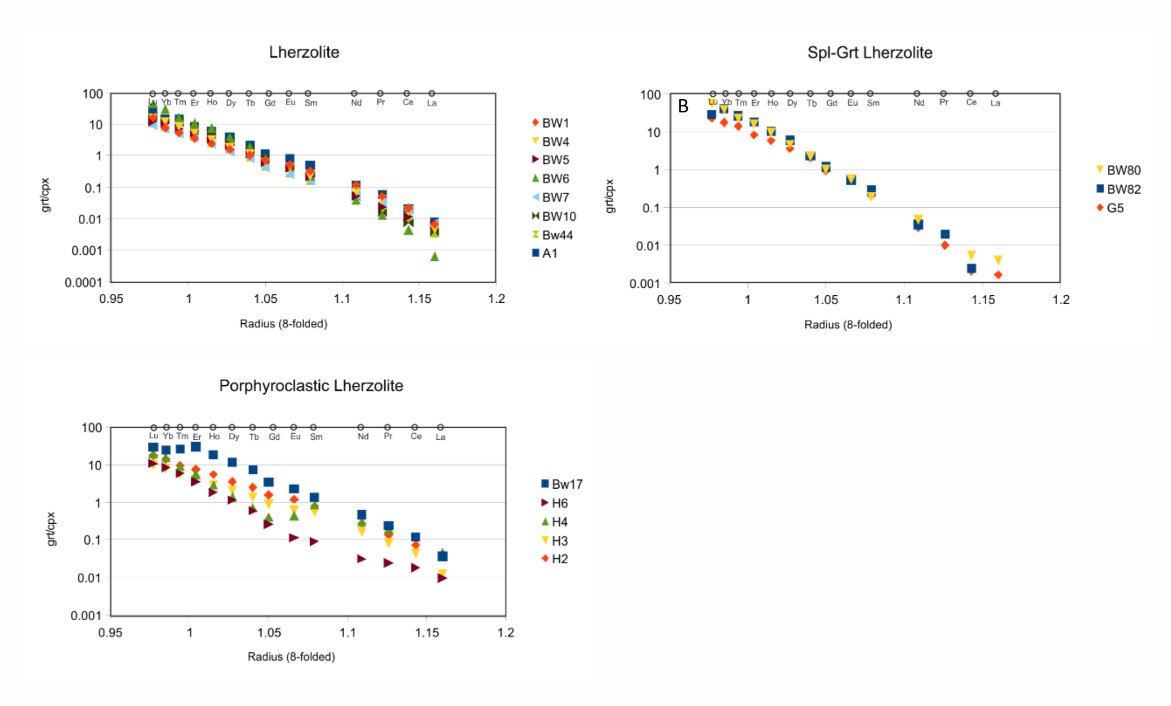


Figure 40|Onuma plots comparing concentrations of REE in garnet and clinopyroxene assuming linear trends representing equilibrium.

8 Oxidation State of the SCLM below Letlhakane

The oxidation state of the SCLM is of special interest, especially if we are thinking of metasomatic processes and diamond stability. In theory there should be decreasing oxygen fugacity with increasing depth in the SCLM (Hanger et al., 2015; Stagno et al., 2013). Spinel bearing peridotites range between +2 and -3 $\Delta\log(f_{O2})^{FMQ}$ and very deep and depleted garnet harzburgites display values up to -4 $\Delta\log(f_{O2})^{FMQ}$ (Stagno et al., 2013). The approach to estimate oxygen fugacity in garnet bearing peridotites is considering the ferric iron content in garnet (Creighton et al., 2008; Stagno et al., 2013). State of the art methods like Mößbauer spectroscopy or X-ray absorption near edge structure (XANES) were not available. Alternative considering the stoichiometric imbalance of charges allowes at least to get a guess ferric iron contents, however it’s a very rough guess. High uncertainties have to be considered e.g. because of lack in accuracy, especially in the SiO_2 and Al_2O_3 acquisition. These element concentrations are very sensitive for errors in Fe^{3+}estimations. As we observed garnets, which tend to exhibit more depleted or sinusoidal REE patterns, it is of utmost interest to correlate redox state variations with samples showing atypical REE patterns. Increasing oxygen fugacity was correlated with enrichment of the SCLM and are described for example for the Siberian craton (Yaxley et al., 2012).

The redox calculations are based on the skiagite component in garnet (Stagno et al., 2013).

$$2\ Fe_3Fe_2^{3+}Si_3O_{12} \leftrightarrow 4\ Fe_2SiO_4 + 2\ FeSiO_3 + O_2 \qquad (1)$$

Published spreadsheets by Stagno et al (2013) were used to calculate $f(O_2)$ values referred to the fayalite-magnesite-quartz buffer (FMQ). EMOD/G represents the Diamond limitation reaction (Luth, 1993).

$$MgSiO_3 + MgCO_3 \leftrightarrow Mg_2SiO_4 + C + O_2 \qquad (2)$$

Some garnet calculations did not result in Fe^{3+}. An average Fe^{3+}/Fe ratio was taken to represent available samples.

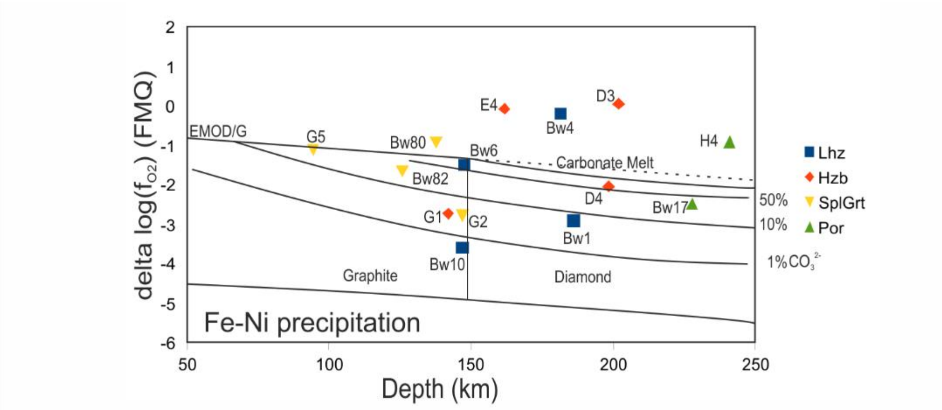


Figure 41|$\Delta\log(f_{O2})^{(FMQ)}$ versus depth. Corresponding values calculated after Stagno et al (2013). EMOD/G is the stability reaction of diamond (see text).

As it is seen in Figure 41, there is not a clear trend of increasing fugacity compared to depth. Nevertheless, samples show evidence that they are capable to coexist with 1% up to 50% of $MgCO_3$ indicated by black contours in Figure 41. Further, samples below the EMOD/G reaction are not threatening diamond stability, although carbonate melt is present. Diamond stability is threatened above the EMOD/G. We consider values above the EMOD/G reaction are reasonable although no direct Fe^{3+}determination was made. Sample BW6 displays reactions of kimberlitic melt with orthopyroxene in thin section and shows fugacity values close to the EMOD/G. Sinusoidal garnets display elevated oxygen fugacity above the EMOD/G. H4 representing very flat REE patterns also reveals a fugacity above diamond stability. BW4 represents the only garnet lherzolite with elevated values, but does not displays sinusoidal or flat REE pattern.

9 Discussion

Geothermobarometry

Reliabe thermobarometry is dependent on equilibration of the different mineral phases within a rock. Short lived metasomatic influence or melt influx may disturb equilibrium needed for precise PT determination and is thus responsible for thermobarometric deviations considering different geothermobarometers applied in this study. Petrographic studies proved a modification of mantle xenolithes by silica melt veinlets. The time frame when fluid/melt modified the peridotites is thereby cryptic. Further, we need to consider multiple and chemical heterogeneous influxes over time. Our samples reveal certain deviations in temperature in the Fe-Mg exchange, the Al in olivine and the Ni in garnet based thermometer. Further we do not know in detail how the pressure decrease in our samples referred from typical decompressional reactions, like keliphites or exsolutions in clinopyroxene, influence our estimations. It seems that the Brey and Köhler (1990) barometer behaves more sensitive at higher and lower pressures if temperatures are slightly different. Therefore, not all calculated PT couples show agreements with calculated geotherms and exhibit certain deviations towards higher and lower geotherm. The best fit for all samples with a 40 mW/m^2 geotherm, which is also proposed for most areas of the Kalahari craton, is achieved by using the Nickel and Green (1985) and the Taylor (1998) geothermobarometers.

Mantle shear zone

Porphyroclastic samples, which are consistently higher in temperature based on our thermobarometric results, represent most probably the base of the lithosphere forming a layer charackterized by higher strain rates and elevated temperatures. Peridotitic samples from depths below 200 km indicate smooth transition of pophyroclastic to coarse texture. These samples displaying elevated strain rates forming minor amounts of subgrains. Strain rates between 10^{-5} s^{-1} and 10^{-9} s^{-1}, which were calculated from porphyroclastic peridotites by Skemer and Karato (2008), cannot be explained by plate motion alone, whereas calculated elevated temperatures in porphyroclastic peridotites cannot be explained by shear heating (Kennedy et al., 2002; Skemer and Karato, 2008). Processes causing high strain rates within stable continental lithosphere are probably mantle plums with assumed ascending velocities of 1 m per year (corresponding strainrate of 10^{-9} s^{-1}). Further, mantle plum activity could explain elevated temperatures in porphyroclastic peridotites (Skemer and Karato, 2008). Considering metasomatic clinopyroxene represents percolating melts of plume enhanced partial melting, we suggest isotopic analyses of clinopyroxene could further reveal predications.

Alternative, 1% to 5% partial melt transporting convective heat in the asthenosphere could transfer heat into the lithosphere more efficiently raising basal lithospheric temperatures. The origin of high strain rates in this scenario is not clarified.

A third option could be superimposed metasomatic infiltration during basal deformation causing observed anomalies in porphyroclastic peridotites (Kennedy et al., 2002).

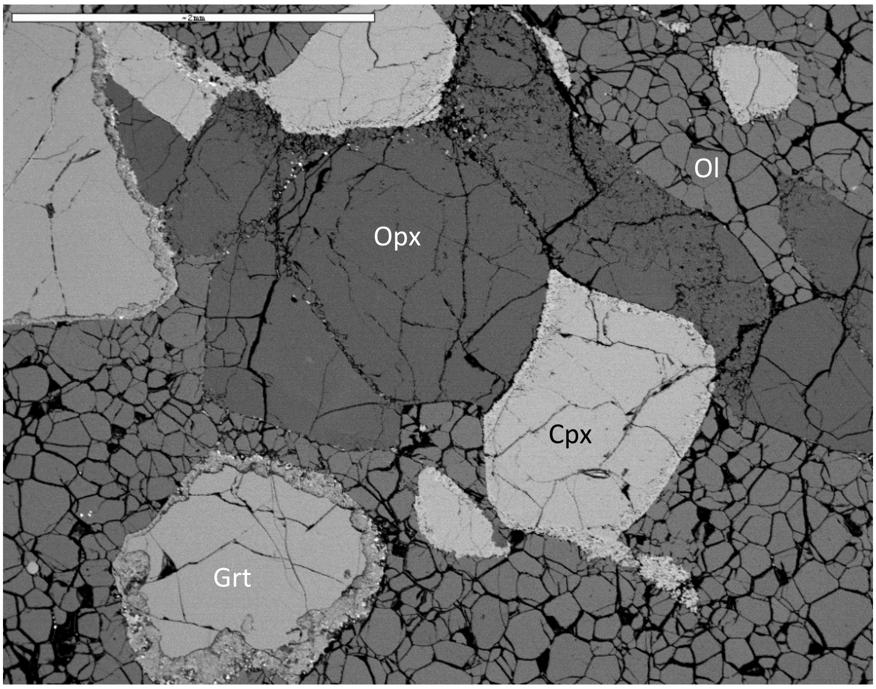


Figure 42| Sample H2 showing neoblasts of clinopyroxene and orthopyroxene in a sheared porphyroclastic lherzolite indicating high strainrates at the base of the SCLM.

Mantle Metasomatism

The investigated garnet lherzolites and garnet harzburgites represent the SCLM between 126 km and 229 km. As there is no systematic distribution of lherzolites and harzburgites with depth we conclude that the SCLM beneath Lethlakane is heterogeneous at a small scale between approximately 120 km and 230 km depth.

Harzburgites represent the depleted history of the SCLM and are considered to be the main lithology of the lithospheric mantle after melt extraction during Archean times (Griffin et al., 2009; Griffin et al., 1999; Pearson and Wittig, 2008; van Achterberg et al., 2001). Melt depletion and subduction stacking during consolidation of the Kalahari craton was further stabilizing the SCLM root (Pearson and Wittig, 2008). Considering high X_{Mg} values of analyzed olivine, the SCLM of Letlhakane experienced 20% to 40% partial melting between 30 kbar and 70 kbar (Figure 43; Pearson and Wittig, 2008). This pronounced melt extraction would cause consumption of almost all clinopyroxene and garnet forming a dunitic or harzburgitic residue (Bernstein et al., 2007). We find garnet and clinopyroxene coexisting with high X_{Mg} olivine and therefore we are able to assume a metasomatic origin of this minerals. Refractory garnet REE patterns indicate that garnets my represent residues or crystalize prior to the formation of clinopyroxene by highly fractionated melts.

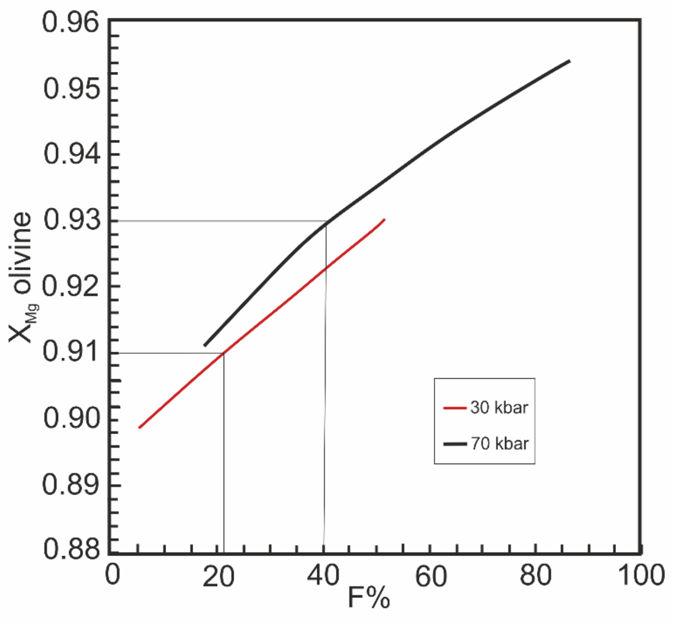


Figure 43| Melt extraction model considering X_{Mg} of olivine (Pearson and Wittig, 2008).

Metasomatic fluids/melts influencing the SCLM at the Kaapvaal craton are believed to be rich in REE and in certain HFS- Elements (Griffin et al., 1999). A combination of pre-kimberlite melts and/or carbonatitic melts are likely regarding typical compositional REE changes in peridotites. Le Roex and Class (2016) propose that extreme compositions of LREE are not necessarily needed to sustain enriched REE patterns observed in metasomatic clinpyroxenes and garnets.

Garnet Evolution

Plots published by Griffin et al (1999) reveal high temperature melt metasomatism considering trace element concentrations in garnet. These diagrams do not show low temperature phlogopite metasomatism garnet signatures, although phlogopite is present in thin sections. We assume that phlogopites are late stage metasomatic minerals with subordinate influence on the garnet composition.

While garnet lherzolites reveal typical trends for REE profiles and trace elment signatures, spinel-garnet lherzolites display depleted compositions for garnets considering trace elements. Garnet coronas grow on the expense of spinel caused by additional heat and melt input during metasomatism. Depleted trace element compositions of these garnet may reflect significant fractionation of the metasomatic melt during porous flow through the SCLM.

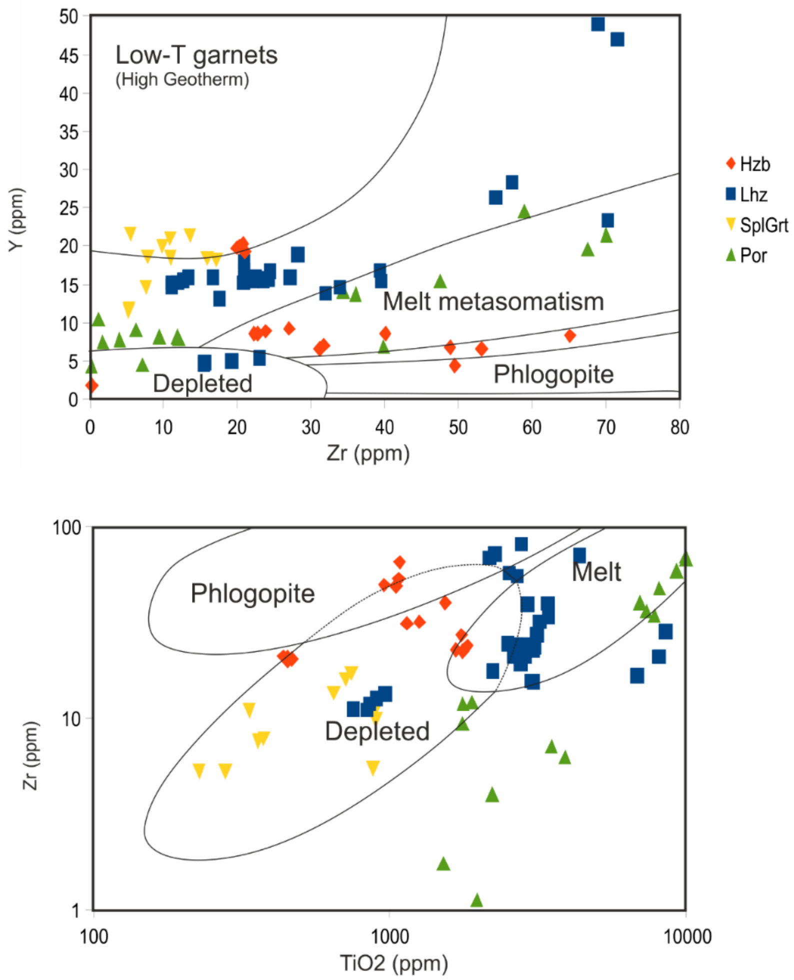


Figure 44| Process signature of metasomatism in pyrop (Griffin and Ryan, 1995).

REE patterns of garnets in porphyroclastic lherzolites and garnet harzburgite garnets are significant depleted between Promethium and Dysprosium compared to typical lherzolitic garnets. These garnets are most likely harzburgitic garnet residues and therefore metasomatic melts are not affecting these garnets in the same pervasive manner like we observe it in typical lherzolitic garnets (Figure 45). Assuming fast equilibration of REE compositions in contact with metasomatic fluids at 1200°C or higher, refractory compositions may represent heterogeneous metasomatic paths in the SCLM. Metasomatic melts may percolate localized and therefore depleted harzburgitic REE patterns sustain in the SCLM. Alternative, it is possible that the metasomatic fluid/melt is part of the evolving kimberlite. In this case metasomatism appeared in a short time before kimberlite emplacement and the contact time was not adequate to start diffusion.

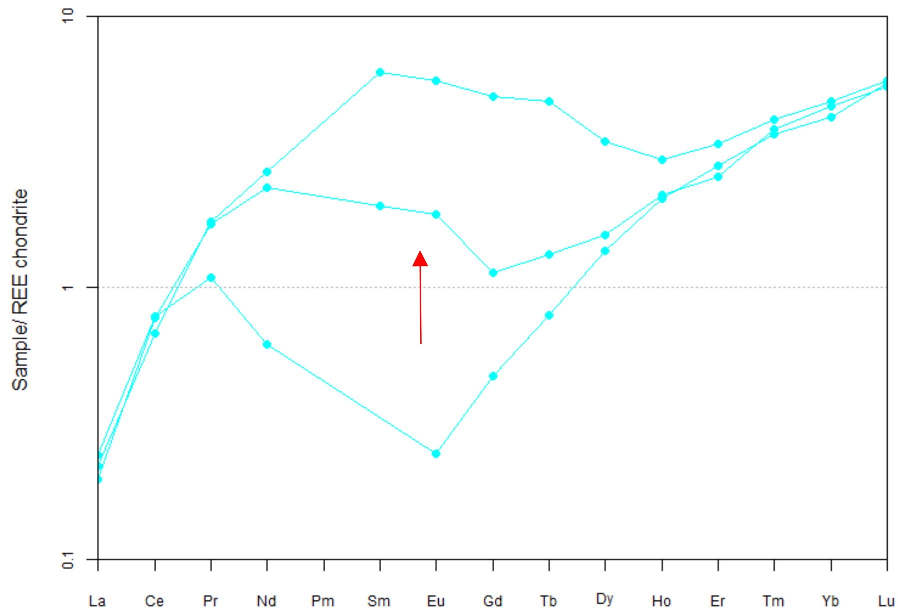


Figure 45| REE patterns off different grains in prophyroclastic lherzolite sample H4 indicating (red arrow) evolution of enrichment.

Sinusoidal patterns in garnets are indications for LREE enriched metasomatism of former depleted harzburgitic garnets (Hoal et al., 1994). Gibson et al. (2008) summarized possible reasons forming “humped” REE patterns in harzburgitic garnets. The absence of clinopyroxene is prominent in samples showing sinusoidal REE profiles. A lack of precipitating clinopyroxene may causes a higher abundance of LREE in metasomatic agents. We favor a theory considering a metasomatic melt, which was changing REE garnet compositions, but was not able to precipitate clinopyroxene. Regional smaller amounts of percolating melt, too small to form significant amounts of clinopyroxene, is thereby a reasonable assumption. We observe as well one lherzolitic garnet, which displays sinusoidal REE patterns without the prominent elevation in LREE. This observation indicates that coexisting clinopyroxene inhibits prominent LREE “humps” in garnet.

Le Roex and Class (2016) mention, based on element distribution modelling, that chromatographic fractionation of the melt, during pervasive reactive porous flow through the mantle, could cause a metasomatic stratigraphy from typical to sinusoidal REE patterns and in our observation further to refractory REE patterns.

Clinopyroxene Evolution

Clinopyroxenes in porphyroclastic lherzolites, showing depleted garnet REE patterns, display typical enriched clinopyroxene REE patterns. We propose precipitation of clinopyroxene from metasomatic melts followed by time-displaced re-equilibration of harzburgitic garnet. It is likely that clinopyroxene formation and enriched REE garnet patterns are caused by the same metasomatic agent. Although Gibson et al. (2008) suggest the possibility to fractionate garnet and clinopyroxene from the same source in SCLM, depleted REE patterns suggest cryptic metasomatism of residue garnets.

Trace Elements in clinopyroxene do display silica melt metasomatism for almost all samples (Figure 40; Coltorti et al., 1999). Elevation of $(La/Yb)_N$ corresponds probably to a kimberlitic/carbonatitic component of the percolating melt. Sample BW6 in direct contact with the kimberlitic melt displays a significant carbonatitic trend we do not observe in any other sample. Clinopyroxene in this sample is crystalizing at the expense of orthopyroxene.

Although clinopyroxenes show typical and homogeneous REE patterns in almost all samples, spinel-garnet peridotite clinopyroxenes show minor affected REE patterns. Garnets of this peridotite type further show depleted trace element signatures (Figure 44) and clinopyroxene trace elements suggest significant silicate melt influence in spinel-garnet lherzolites (Figure 46). Spinel peridotites are probably metasomatised by already highly fractionated metasomatic melts forming spinel-garnet peridotites.

Secondary clinopyroxene (spongy rims) display elevated CaO and FeO concentrations combined with lower Na_2O and Al_2O_3 contents compared to core compositions. This observation correlates with high temperature recrystallization in contact with a silicate melt during a short lived influx before decompression/ascent (Pearson et al., 2003).

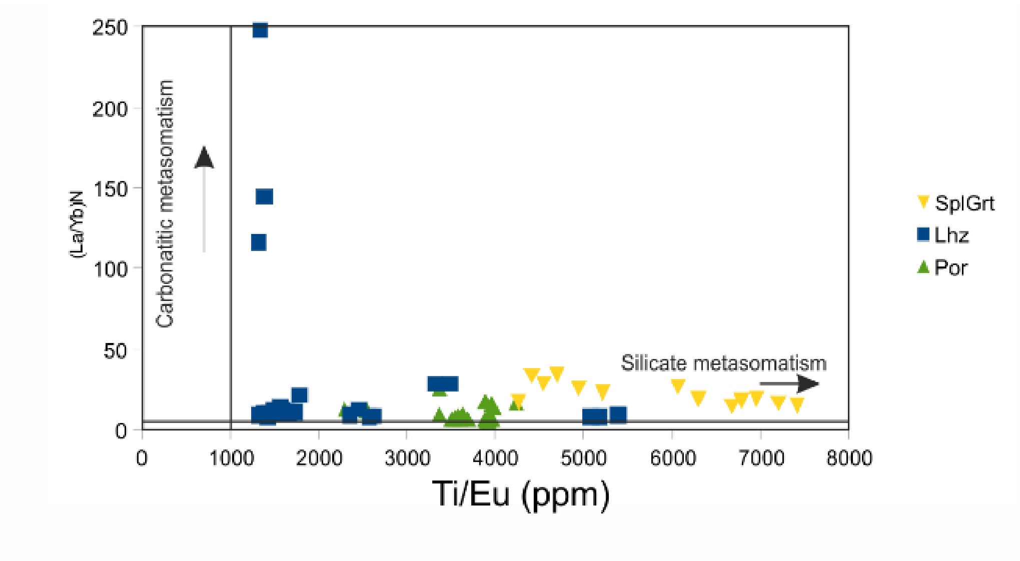


Figure 46| Scheme after Coltorti et al (1999) indication metasomatic signatures in Cpx. Upper value for silicate metasomatisem is indicated by the bottom line (corresponding $(La/Yb)_N$ value=5). Cpx display elevated $(La/Yb)_N$ in silicate metasomtised samples. Sample with significant carbonatitic trend is correlated with direct kimberlite melt contact in the thin section.

Element Disequilibria

There is evidence that clinopyroxene and olivine are still not equilibrated in lherzolite samples comparing X_{Mg} of these minerals (Figure 25).

Further, Onuma plots are supporting the theory of metasomatism without reaching REE equilibration within the SCLM. Just clinopyroxene and garnet display REE equilibrium in garnet lherzolites and spinel-garnet lherzolites. This observation is supporting our assumptions that clinopyroxenes and garnets equilibrated with the same metasomatic melt.

Oxidation state of the SCLM

Garber et al. (2018) determined using geophysical methods an abundance of 2 vol.% of diamond for the SCLM considering cratonic geotherms of 35-40 mW/m^2. Alternatively 20 vol.% eclogite could have similar seismic properties. The percentage by volume of diamond in kimberlitic dykes is much lower, ranging from <0.0001 to 0.01 vol.% (Pearson et al., 2003). Eclogitic and pyroxenitic xenoliths exist at the Letlhakane kimberlite pipe but are hardly documented. Stievenhofer et al. (1999) and van Achterberg et al. (2001) investigated mainly on peridotites at the Letlhakane mine.

Our calculations describing the redox state of the SCLM need to be further refined, but there is indication that the redox potential of the SCLM is elevated during metasomatic periods and diamond may became unstable. Creighton et al (2008) and Creighton et al (2006) proposed for the Kaapvaal region that most of the diamond got oxidized by metasomatic oxidation before or during ascent.

Summary

There is indication that metasomatic events affected the mantle samples recovered from Letlhakane in a short periode before emplacement and probably most clinopyroxene was precipitated from the same melt responsible for metasomatic changes in garnet. Further, percolating melts changed REE compositions of refractory harzburgitic garnet but depleted REE compositions sustained as well. Samples close to metasomatic veins equilibrated fast and completely. Samples in distance to the metasomatic veins show abnormal REE patterns. It is not clear if we are confronted with altered wall rocks of a past volcanic or the present kimberlitic event. We cannot clarify all factors, which contributed to atypical observations in REE chemistry or the lack of clinopyroxene in harzburgites. Russell et al. (2012) proposed that kimberlite melts evolved during ascent through the lithospheric mantle, originating from an alkaline, silica undersatured and carbonated pre-kimberlite. Silica undersaturation leads to dissolution of wall rock orthopyroxene and further volatile enrichment of the (at that time) metasomatic melt (Russell et al., 2012). The melt incorporates orthopyroxene while clinopyroxene is precipitated. This reaction drives the melt to higher silica contents, which is further lowering solubility of CO2 in the melt (Russell et al., 2012). This process exsolves volatiles at a certain point, causing elevated buoyancy and a rapid ascent of evolved kimberlite melts (Russell et al., 2012). Sample BW6 displays orthopyroxene replacement by clinopyroxene in direct contact with kimberlitic melt. Therefore this experimental tested reaction is worth to be considered focusing on kimberlite born metasomatised mantle xenoliths.

10 Conclusion

Xenolith samples of the Letlhakane kimberlite reveal typical features as it is already documented and are comparable to complex metasomatic processes investigated in further kimberlitic xenolithes of the Kaapvaal and Zimbabwe craton. (Freybourger et al., 2001; Griffin et al., 2003; Griffin et al., 1999; O'Reilly and Griffin, 2010; Smith et al., 2009; Stiefenhofer et al., 1997; van Achterberg et al., 2001).

(1) Peridotites of the lethlakane kimberlite dyke display a good agreement with a 40 mW/m^2 geotherm calculating according the model by Pollack and Chapman (1977). Porphyrocalstic lherzolites leave this geotherm to higher temperatures and show evidence of higher strain rates at the base of the lithosphere.

(2) Temperatures range from 730°C-875°C in spinel peridotites, from 710°C-950°C in spinel-garnet lherzolites, from 870°C-1140°C in garnet lherzolites, from 910°C-1280°C in garnet harzburgites and from 1350°C-1425°C in porphyroclastic lherzolites.

(3) Spinel peridotites and spinel-garnet lherzolites represent the shallowest layer beneath Letlhakane. These are situated in depth between 94km and 146 km slightly overlapping with garnet lherzolites. Garnet harzburgites and garnet lherzolites are continuing from 126km to 229km. There is no evidence that there is a significant layering in this lithospheric mantle segment. The bottom of Letlhakane lithospheric mantle is represented by sheared porphyroclastic lherzolites. These xenoliths were inherited from depth of 211km to 244km.

(4) Spinel-garnet lherzolite reveal spinel grains with garnet coronas. Rare earth element patterns in clinopyroxene are not as high as in other clinopyroxene bearing samples. We suppose melt metosomatism which is slightly different in composition because of prior fractionation. Further temperature perturbation cause formation of garnets in precursor spinel peridotites.

(5) Anhedral shapes of clinopyroxene and replacement of orthopyroxene by clinopyroxene indicate stealth metasomatism. The time of crystallization of clinopyroxene is not determinable. Secondary “spongy” clinopyroxene displays high temperature recrystallization caused by silicat/kimberlitic melt prior to ascent.

(6) Garnet rare earth element patterns show sinusoidal shapes in garnet harzburgite samples, with elevated light rare earth elements. Carbonantitic or pre-kimberlitic melts were metasomatising garnet in absence of clinopyroxene. Flat garnet rare earth element patterns in garnet harzburgites and porphyroclastic lherzolites represent samples were metasomatism is not pronounced, although we assume close relationship of latter with elevated asthenospheric temperatures. Depleted REE element profiles seem to be a feature of deep-hot peridotites. Metasomatism in garnet is therefore not significant evident in all mantle segments considering rare earth element distribution.

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12 Appendix

12.1 Mineral Chemistry

12.1.1 Olivine

	A1							B3				BW1	
Sample	A1-1-gt-ol2	A1-1-gt-ol3	A1-1-gt-ol4	A1-1-gt-ol5	A1-1-gt-ol6	A1-2-gt-ol1	A1-2-gt-ol2	B3-1-ol1	B3-1-ol2	B3-1-ol3	B3-3-ol1	BW1-1-o1	BW1-2-o2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	40.84	41.02	41.05	40.44	40.68	40.27	40.68	40.81	40.47	40.39	40.74	40.12	41.59
FeO	10.52	10.43	10.77	10.74	10.43	10.83	10.82	12.7	12.64	12.65	13.09	9.76	10.01
MnO	0.08	0.07	0.07	0.11	0.1	0.03	0.04	0.08	0.16	0.16	0.1	0.18	0.03
MgO	47.2	47.45	47.54	47.17	47.4	47.6	47.94	46.94	46.76	46.77	46.17	47.96	49.49
NiO	0.37	0.32	0.46	0.41	0.35	0.41	0.32	0.35	0.44	0.43	0.37	0.44	0.42
Total	99.01	99.29	99.88	98.87	98.96	99.12	99.8	100.88	100.47	100.39	100.46	98.46	101.54
Si	1.013	1.014	1.011	1.007	1.01	1.001	1.003	1.004	1.001	1	1.008	1	1.004
Fe	0.218	0.216	0.222	0.224	0.216	0.225	0.223	0.261	0.261	0.262	0.271	0.204	0.202
Mn	0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.002	0.003	0.003	0.002	0.004	0.001
Mg	1.746	1.749	1.746	1.751	1.754	1.764	1.763	1.722	1.724	1.726	1.703	1.783	1.781
Ni	0.007	0.006	0.009	0.008	0.007	0.008	0.006	0.007	0.009	0.009	0.007	0.009	0.008
Kations	2.987	2.986	2.989	2.993	2.99	2.999	2.997	2.996	2.999	3	2.992	3	2.996
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.889	0.89	0.887	0.887	0.89	0.887	0.888	0.868	0.869	0.868	0.863	0.897	0.898

											BW4		
Sample	BW1-1-o2	BW1-2-o3	BW1-3-o1	BW1-3-o2	BW1-4-o1	BW1-4-o2	BW1-5-o1	BW1-5-o2	BW1-5-o3	BW1-5-o4	BW4-1-ol1	BW4-1-ol2	BW4-3-ol1
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	41.55	41.53	41.59	41.32	41.63	40.68	40.7	41.11	41.37	41.1	42.15	42.82	42.29
FeO	9.96	9.94	10.08	9.9	9.92	9.82	9.95	9.84	9.84	9.82	8.2	8.25	8.16
MnO	0.16	0.05	0.14	0.18		0.15	0.08	0.2	0.16	0.06			
MgO	48.68	49.25	48.82	47.46	48.85	49.57	47.93	48.51	49.51	48.13	48.32	49.26	48.42
NiO	0.42	0.37	0.46	0.36	0.31	0.45	0.39	0.32	0.19	0.29	0.24	0.39	0.33
Total	100.77	101.14	101.09	99.22	100.71	100.67	99.05	99.98	101.07	99.4	98.91	100.72	99.2
Si	1.01	1.006	1.009	1.02	1.011	0.992	1.008	1.008	1.003	1.012	1.032	1.03	1.032
Fe	0.203	0.201	0.205	0.204	0.202	0.2	0.206	0.202	0.199	0.202	0.168	0.166	0.167
Mn	0.003	0.001	0.003	0.004		0.003	0.002	0.004	0.003	0.001			
Mg	1.765	1.778	1.766	1.746	1.769	1.803	1.769	1.773	1.789	1.767	1.764	1.766	1.762
Ni	0.008	0.007	0.009	0.007	0.006	0.009	0.008	0.006	0.004	0.006	0.005	0.008	0.006
Kations	2.99	2.994	2.991	2.98	2.989	3.008	2.992	2.992	2.997	2.988	2.968	2.97	2.968
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.897	0.898	0.896	0.895	0.898	0.9	0.896	0.898	0.9	0.897	0.913	0.914	0.913

							BW5						
Sample	BW4-ol1i	BW4-ol2	BW4-ol3	BW4-1-ol1	BW4-1-ol2	BW4-3-ol1	BW5-2-ol1	BW5-2-ol2	BW5-2-Ol1	BW5-2-ol3	BW5-1-ol1	BW5-3-ol1	BW5-3-ol2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.48	42.22	42	42.15	42.82	42.29	42.06	42.6	42.39	42.19	41.72	42.76	41.59
FeO	8.11	8.51	8.07	8.2	8.25	8.16	7.74	7.7	7.71	7.63	7.61	7.73	8.56
MnO							0.05	0.06	0.07	0.06	0.02	0.07	0.14
MgO	49.76	48.05	48.86	48.32	49.26	48.42	48.12	49.02	48.41	47.97	49.22	49.29	48.73
NiO	0.27	0.22	0.32	0.24	0.39	0.33	0.49	0.32	0.37	0.31	0.5	0.33	0.03
Total	100.62	99	99.25	98.91	100.72	99.2	98.46	99.7	98.95	98.16	99.07	100.18	99.05
Si	1.023	1.034	1.025	1.032	1.03	1.032	1.034	1.033	1.035	1.038	1.02	1.032	1.02
Fe	0.163	0.174	0.165	0.168	0.166	0.167	0.159	0.156	0.158	0.157	0.156	0.156	0.176
Mn							0.001	0.001	0.001	0.001		0.001	0.003
Mg	1.786	1.754	1.778	1.764	1.766	1.762	1.763	1.771	1.763	1.76	1.794	1.773	1.781
Ni	0.005	0.004	0.006	0.005	0.008	0.006	0.01	0.006	0.007	0.006	0.01	0.006	0.001
Kations	2.977	2.966	2.975	2.968	2.97	2.968	2.966	2.967	2.965	2.962	2.98	2.968	2.98
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.916	0.91	0.915	0.913	0.914	0.913	0.917	0.919	0.918	0.918	0.92	0.919	0.91

		BW6										BW7	
Sample	BW5-2-ol1	BW6-4-o1	BW6-4-o2	BW6-7-o1	BW6-3-o1	BW6-3-o2	BW6-2-1-o1	BW6-2-1-o2	BW6-2-1-o3	BW6-1-o1	BW6-1-o2	BW7-6-O1	BW7-6-O2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.02	41.32	42.04	41.33	41.96	41.64	40.96	41.47	41.27	41.65	41.7	40.9	41.06
FeO	7.83	8.64	8.47	8.74	8.79	8.57	8.54	8.63	8.73	8.77	8.6	8.4	8.26
MnO	0.05	0.05	0.19	0.1		0.13	0.16	0.04	0.08	0.12	0.11		
MgO	50.43	49.92	48.96	50.2	48.89	49.49	49.4	49.88	48.9	49.06	49.41	51.81	50.72
NiO	0.49	0.37	0.2	0.37	0.42	0.42	0.23	0.4	0.38	0.33	0.39	0.3	0.52
Total	100.82	100.3	99.86	100.74	100.06	100.25	99.29	100.42	99.36	99.93	100.21	101.42	100.56
Si	1.011	1.004	1.022	1.001	1.02	1.011	1.005	1.006	1.012	1.015	1.013	0.984	0.995
Fe	0.158	0.176	0.172	0.177	0.179	0.174	0.175	0.175	0.179	0.179	0.175	0.169	0.167
Mn	0.001	0.001	0.004	0.002		0.003	0.003	0.001	0.002	0.002	0.002		
Mg	1.809	1.808	1.775	1.812	1.772	1.792	1.807	1.804	1.788	1.782	1.789	1.858	1.833
Ni	0.009	0.007	0.004	0.007	0.008	0.008	0.005	0.008	0.007	0.006	0.008	0.006	0.01
Kations	2.989	2.996	2.978	2.999	2.98	2.989	2.995	2.994	2.988	2.985	2.987	3.016	3.005
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.92	0.911	0.912	0.911	0.908	0.911	0.912	0.912	0.909	0.909	0.911	0.917	0.917

							BW10						
Sample	BW7-6-1-O3	BW7-6-O4	BW7-5-o1	BW7-1-o1	BW7-2-o1	BW7-2-o2	BW10-172-O1	BW10-172-o2	BW10-4-o1	BW10-4-o2	BW10-5-o1	BW10-5-o2	BW10-5-o3
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	41.18	41.56	41	39.94	41.02	41.01	41.1	40.91	41.26	40.76	40.38	41	42
FeO	8.37	8.49	8.43	8.44	8.36	8.26	9.67	9.75	9.69	9.46	9.75	9.71	9.64
MnO							0.08	0.22	0.06	0.14	0.22	0.21	0.18
MgO	50.61	50.89	51.01	50.76	50.79	52.1	48.5	50.01	48.95	48.69	49.17	48.97	48.84
NiO	0.2	0.31	0.31	0.4	0.49	0.34	0.15	0.23	0.18	0.25	0.31	0.39	0.35
Total	100.36	101.25	100.75	99.54	100.66	101.72	99.5	101.12	100.14	99.3	99.83	100.28	101.01
Si	0.999	0.999	0.992	0.981	0.994	0.983	1.01	0.992	1.008	1.004	0.993	1.002	1.016
Fe	0.17	0.171	0.171	0.173	0.169	0.165	0.199	0.198	0.198	0.195	0.201	0.199	0.195
Mn							0.002	0.005	0.001	0.003	0.005	0.004	0.004
Mg	1.829	1.824	1.84	1.858	1.834	1.862	1.777	1.808	1.782	1.789	1.803	1.785	1.762
Ni	0.004	0.006	0.006	0.008	0.01	0.007	0.003	0.004	0.004	0.005	0.006	0.008	0.007
Kations	3.001	3.001	3.008	3.019	3.006	3.017	2.99	3.008	2.992	2.996	3.007	2.998	2.984
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.915	0.914	0.915	0.915	0.916	0.919	0.899	0.901	0.9	0.902	0.9	0.9	0.9

									BW44				
Sample	BW10-3-o1	BW10-3-o2	BW10-2-o1	BW10-2-o2	BW10-2-o3	BW10-1-o1	BW10-1-o2	BW10-1-o3	Bw44-1-ol1	Bw44-1-ol2	Bw44-1-ol3	Bw44-3-ol1	Bw44-3-ol2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	40.33	40.91	41.42	41.46	41.4	40.95	41.21	41.26	42.77	41.91	42.48	42.33	42.69
FeO	9.68	9.47	9.79	9.74	9.63	9.32	9.58	9.49	7.77	7.75	8.08	7.66	7.77
MnO	0.09	0.06	0.09	0.15	0.17	0.18	0.08	0.1	0.09	0.17	0.1	0.08	0.09
MgO	49.27	48.11	48.51	48.69	48.3	48.48	49.04	48.79	50.15	49.31	49.01	49.3	50.17
NiO	0.33	0.36	0.27	0.31	0.19	0.16	0.26	0.25	0.35	0.22	0.34	0.29	0.29
Total	99.7	98.91	100.08	100.35	99.69	99.09	100.17	99.89	101.13	99.36	100.01	99.66	101.01
Si	0.992	1.011	1.012	1.011	1.015	1.01	1.006	1.01	1.023	1.021	1.029	1.027	1.023
Fe	0.199	0.196	0.2	0.199	0.197	0.192	0.196	0.194	0.155	0.158	0.164	0.155	0.156
Mn	0.002	0.001	0.002	0.003	0.004	0.004	0.002	0.002	0.002	0.004	0.002	0.002	0.002
Mg	1.807	1.773	1.768	1.77	1.765	1.782	1.785	1.78	1.789	1.791	1.77	1.783	1.792
Ni	0.007	0.007	0.005	0.006	0.004	0.003	0.005	0.005	0.007	0.004	0.007	0.006	0.006
Kations	3.008	2.989	2.988	2.989	2.985	2.99	2.994	2.99	2.977	2.979	2.971	2.973	2.977
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.901	0.9	0.898	0.899	0.9	0.903	0.901	0.902	0.92	0.919	0.915	0.92	0.92

		D1									D3		
Sample	Bw44-4-ol1	Line 1 D1-1-1	Line 2 D1-1-1	Line 3 D1-1-1	Line 4 D1-1-1	Line 1 D1-1-2	Line 2 D1-1-2	Line 3 D1-1-2	Line 4 D1-1-2	Line 5 D1-1-2	D3-2-Ol1	D3-2-ol2	D3-1-Ol1
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.76	41.17	41.23	41.43	41.52	40.97	40.99	41.03	41.01	41.01	42.06	42.74	42.33
FeO	7.67	8.79	8.98	8.72	8.88	8.91	8.6	9.13	8.99	8.52	6.71	6.67	6.62
MnO	0.14	0.07	0.11	0.06	0.14	0.1	0.09	0.08	0.07	0.14	0.09	0.15	0.09
MgO	48.74	49.65	49.44	50.06	49.89	50.19	49.59	50.15	50.05	49.9	49.68	49.83	50.7
NiO	0.18	0.31	0.36	0.48	0.4	0.32	0.36	0.29	0.42	0.48	0.3	0.25	0.23
Total	99.49	99.98	100.12	100.74	100.82	100.48	99.62	100.68	100.53	100.05	98.84	99.64	99.97
Si	1.038	1.004	1.005	1.003	1.005	0.996	1.003	0.996	0.997	1	1.025	1.032	1.02
Fe	0.156	0.179	0.183	0.177	0.18	0.181	0.176	0.185	0.183	0.174	0.137	0.135	0.133
Mn	0.003	0.001	0.002	0.001	0.003	0.002	0.002	0.002	0.001	0.003	0.002	0.003	0.002
Mg	1.763	1.805	1.797	1.807	1.8	1.819	1.809	1.815	1.814	1.814	1.805	1.794	1.821
Ni	0.004	0.006	0.007	0.009	0.008	0.006	0.007	0.006	0.008	0.009	0.006	0.005	0.004
Kations	2.962	2.996	2.995	2.997	2.995	3.004	2.997	3.004	3.003	3	2.975	2.968	2.98
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Lhz	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb
Mg#	0.919	0.91	0.908	0.911	0.909	0.91	0.911	0.908	0.908	0.912	0.929	0.93	0.932

		D4							E4			G1	
Sample	D3-1-Ol2	D4-4-ol1	D4-4-ol2	D4-4-ol3	D4-4-ol4	D4-1-ol1	D4-2-ol1	D4-2-ol2	E4-1-Ol1	E4-1-Ol2	E4-4-ol2	G1-3-o1	G1-3-o2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.11	40.42	40.78	42.12	41.58	41.51	41.27	41.26	41.56	40.75	41.02	42.02	40.83
FeO	6.56	7.03	6.95	7.15	6.85	7.13	7.21	7.2	7.57	7.16	7.6	7.62	7.61
MnO	0.08	0.07	0.09	0.01	0.16	0.05	0.15	0.05				0.15	0.08
MgO	49.24	49.35	49.83	50.45	50.46	50.98	51.03	50.72	50.64	50.83	49.98	51.5	50.42
NiO	0.39	0.44	0.25	0.33		0.37	0.38	0.35	0.36	0.33	0.27	0.37	0.4
Total	98.38	97.31	97.9	100.06	99.05	100.04	100.04	99.58	100.12	99.08	98.87	101.66	99.34
Si	1.03	1.006	1.007	1.017	1.013	1.004	1	1.003	1.006	0.997	1.006	1.003	0.998
Fe	0.134	0.146	0.144	0.144	0.14	0.144	0.146	0.146	0.153	0.147	0.156	0.152	0.156
Mn	0.002	0.001	0.002		0.003	0.001	0.003	0.001				0.003	0.002
Mg	1.796	1.831	1.835	1.816	1.832	1.839	1.843	1.839	1.828	1.853	1.827	1.832	1.838
Ni	0.008	0.009	0.005	0.006		0.007	0.007	0.007	0.007	0.007	0.005	0.007	0.008
Kations	2.97	2.994	2.993	2.983	2.987	2.996	3	2.997	2.994	3.003	2.994	2.997	3.002
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb
Mg#	0.931	0.926	0.927	0.927	0.929	0.927	0.927	0.926	0.923	0.927	0.921	0.923	0.922

											G2		
Sample	G1-5-o1	G1-12-o1	G1-12-o2	G1-12-o3	G1-1-o1	G1-5-o2	G1-5-o3	G1-5-o4	G1-45-o5	G1-45-o6	G2-1-Ol1	G2-1-Ol2	G2-1-Ol3
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.07	42.16	42.09	41.95	41.94	41.8	42.21	41.51	41.98	41.78	41.17	41.1	41.43
FeO	7.72	7.67	7.71	7.72	7.61	7.49	7.74	7.46	7.59	7.72	8.21	8.23	8.34
MnO	0.09	0.12	0.08	0.08	0.09	0.06	0.06	0.06	0.13	0.13	0.19	0.2	0.07
MgO	50.34	50.97	50.54	50.64	50.67	48.69	50.93	50.97	51.16	50.79	50.81	49.64	49.83
NiO	0.19	0.41	0.23	0.23	0.35	0.44	0.32	0.34	0.22	0.37	0.39	0.2	0.47
Total	100.41	101.33	100.65	100.62	100.66	98.48	101.26	100.34	101.08	100.79	100.77	99.37	100.14
Si	1.015	1.009	1.013	1.01	1.01	1.027	1.01	1.003	1.006	1.006	0.995	1.006	1.007
Fe	0.156	0.153	0.155	0.155	0.153	0.154	0.155	0.151	0.152	0.155	0.166	0.168	0.17
Mn	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.003	0.003	0.004	0.004	0.001
Mg	1.81	1.818	1.813	1.818	1.819	1.783	1.817	1.836	1.828	1.823	1.832	1.811	1.806
Ni	0.004	0.008	0.004	0.004	0.007	0.009	0.006	0.007	0.004	0.007	0.008	0.004	0.009
Kations	2.985	2.991	2.987	2.99	2.99	2.973	2.99	2.997	2.994	2.994	3.005	2.994	2.993
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	SplGrt	SplGrt	SplGrt
Mg#	0.921	0.922	0.921	0.921	0.922	0.92	0.921	0.924	0.923	0.922	0.917	0.915	0.914

			G5									BW80	
Sample	G2-2-Ol1	G2-3-Ol1	Line 1 G5-1-5	Line 2 G5-1-5	Line 3 G5-1-5	Line 4 G5-1-5	Line 5 G5-1-5	G5-2-ol1	G5-2-ol2	G5-2-ol3	G5-2-ol4	BW80-1-ol1	BW80-1-ol2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	41.24	40.57	40.63	40.51	40.52	40.49	40.34	41.21	40.26	41.74	41.32	42.33	41.62
FeO	8.27	8.23	8.14	7.97	7.82	7.77	7.84	8.26	7.99	8.41	7.94	7.97	8.04
MnO	0.11	0.07	0.1	0.15	0.06	0.08	0.05	0.06	0.05	0.09	0.09	0.15	0.14
MgO	50.95	50.2	49.83	50.06	49.98	50.33	50.8	49.03	48.35	49.42	49.23	49.31	49.05
NiO	0.33	0.26	0.36	0.45	0.38	0.37	0.37	0.45	0.36	0.38	0.25	0.5	0.29
Total	100.9	99.33	99.06	99.14	98.76	99.04	99.39	99	97.01	100.03	98.83	100.26	99.14
Si	0.995	0.995	0.999	0.995	0.998	0.994	0.988	1.012	1.009	1.015	1.014	1.024	1.019
Fe	0.167	0.169	0.167	0.164	0.161	0.16	0.161	0.17	0.167	0.171	0.163	0.161	0.165
Mn	0.002	0.001	0.002	0.003	0.001	0.002	0.001	0.001	0.001	0.002	0.002	0.003	0.003
Mg	1.833	1.835	1.826	1.833	1.835	1.843	1.855	1.795	1.806	1.791	1.802	1.778	1.79
Ni	0.006	0.005	0.007	0.009	0.008	0.007	0.007	0.009	0.007	0.007	0.005	0.01	0.006
Kations	3.005	3.005	3.001	3.005	3.002	3.006	3.012	2.988	2.991	2.985	2.986	2.976	2.981
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt
Mg#	0.917	0.916	0.916	0.918	0.919	0.92	0.92	0.913	0.915	0.913	0.917	0.917	0.916

					BW82						F4		
Sample	BW80-6-ol1	BW80-6-ol2	BW80-6-ol3	BW80-8-ol1	BW82-1-ol3	BW82-1-ol2	BW82-2-ol1	BW82-2-ol2	BW82-2-ol3	BW82-2-ol4	Line 1 F4-1-Ol1	Line 2 F4-1-Ol1	Line 3 F4-1-Ol1
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	41.5	41.57	41.37	42.21	42.17	41.67	41.19	42.44	41.43	41.46	41.02	41.33	41.14
FeO	8.1	7.95	10.04	7.81	8.79	8.96	8.87	8.82	8.75	8.74	7.47	7.65	7.11
MnO		0.04	0.11	0.11	0.07	0.09	0.12	0.04	0.11	0.19	0.13	0.08	0.07
MgO	50.32	51.04	48.18	51.21	50.29	49.5	49.88	49.86	49.31	50.41	50.69	50.33	50.32
NiO	0.29	0.38	0.28	0.33	0.34	0.37	0.39	0.38	0.24	0.33	0.4	0.37	0.35
Total	100.21	100.98	99.98	101.67	101.66	100.59	100.45	101.54	99.84	101.13	99.7	99.76	98.98
Si	1.006	1	1.013	1.007	1.01	1.01	1.001	1.017	1.011	1	0.999	1.005	1.006
Fe	0.164	0.16	0.206	0.156	0.176	0.182	0.18	0.177	0.179	0.176	0.152	0.156	0.145
Mn		0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.004	0.003	0.002	0.001
Mg	1.818	1.831	1.76	1.821	1.796	1.789	1.807	1.781	1.793	1.813	1.84	1.825	1.835
Ni	0.006	0.007	0.006	0.006	0.007	0.007	0.008	0.007	0.005	0.006	0.008	0.007	0.007
Kations	2.994	3	2.987	2.993	2.99	2.99	2.999	2.983	2.989	3	3.001	2.995	2.994
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	Spl	Spl	Spl
Mg#	0.917	0.92	0.895	0.921	0.911	0.908	0.909	0.91	0.909	0.912	0.924	0.921	0.927

				F3					C4				BW60
Sample	Line 1 F4-1-4	Line 2 F4-1-4	Line 2 F4-1-5	F3-1-Ol1	F3-1-Ol2	F3-2-ol1	F3-2-Ol2	F3-4-o1	C4-1-Ol1	C4-1-Ol2	C4-3-Ol1	C4-3-Ol2	Bw60-1-ol1
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	40.42	40.08	40.05	41.89	41.17	41.48	41.54	41.18	40.93	40.77	40.88	41.07	42.37
FeO	7.45	7.24	7.59	7.75	7.79	9.84	7.82	7.89	8.07	7.97	8.07	7.98	9.07
MnO	0.09	0.08	0.11	0.13	0.12	0.17	0.19	0.12	0.07	0.17	0.06	0.18	0.11
MgO	50.94	50.81	51.24	50.67	50.28	48.81	50.34	51.22	49.45	50.35	50.51	50.83	48.09
NiO	0.35	0.41	0.39	0.2	0.29		0.36	0.35	0.23	0.43	0.35	0.29	0.47
Total	99.24	98.62	99.38	100.64	99.65	100.3	100.25	100.76	98.75	99.69	99.87	100.35	100.11
Si	0.99	0.987	0.981	1.009	1.003	1.011	1.006	0.994	1.007	0.996	0.996	0.996	1.03
Fe	0.153	0.149	0.155	0.156	0.159	0.201	0.158	0.159	0.166	0.163	0.164	0.162	0.184
Mn	0.002	0.002	0.002	0.003	0.002	0.004	0.004	0.002	0.001	0.004	0.001	0.004	0.002
Mg	1.859	1.866	1.872	1.819	1.827	1.774	1.818	1.843	1.814	1.833	1.835	1.837	1.743
Ni	0.007	0.008	0.008	0.004	0.006		0.007	0.007	0.005	0.008	0.007	0.006	0.009
Kations	3.01	3.013	3.019	2.991	2.997	2.989	2.994	3.006	2.993	3.004	3.004	3.004	2.97
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl
Mg#	0.924	0.926	0.924	0.921	0.92	0.898	0.92	0.921	0.916	0.918	0.918	0.919	0.905

		BW76				I5						BW17	
Sample	Bw60-1-ol2	BW76-1-ol1	BW76-1-ol2	BW76-1-ol3	BW76-2-ol1	I5-1-ol1	I5-1-ol2	I5-1-ol3	I5-1-ol4	I5-1-ol1-1	I5-1-ol5	BW17-1-o1	BW17-1-o2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.69	41.85	41.91	41.82	42.18	42.3	42.58	42.59	43.04	41.55	42.05	41.18	41.1
FeO	8.87	7.86	7.84	7.67	7.66	6.98	7.67	7.03	7.09	9.24	7.37	9.18	9.16
MnO	0.13	0.1	0.1	0.1	0.06	0.09	0.16	0.11	0.01	0.13	0.11	0.11	0.15
MgO	47.26	50.31	49.96	51.54	51.31	49.17	50.17	50.2	49.81	47.53	48.93	49.72	49.53
NiO	0.51		0.31	0.28	0.45	0.41	0.37	0.38	0.22		0.25	0.3	0.31
Total	99.46	100.12	100.12	101.41	101.66	98.95	100.95	100.31	100.17	98.45	98.71	100.49	100.25
Si	1.043	1.012	1.015	1	1.006	1.031	1.021	1.024	1.034	1.027	1.029	1.001	1.002
Fe	0.181	0.159	0.159	0.153	0.153	0.142	0.154	0.141	0.142	0.191	0.151	0.187	0.187
Mn	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.002		0.003	0.002	0.002	0.003
Mg	1.721	1.814	1.803	1.838	1.825	1.786	1.794	1.8	1.784	1.752	1.785	1.802	1.8
Ni	0.01		0.006	0.005	0.009	0.008	0.007	0.007	0.004		0.005	0.006	0.006
Kations	2.957	2.988	2.985	3	2.994	2.969	2.979	2.976	2.966	2.973	2.971	2.999	2.998
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Por	Por
Mg#	0.905	0.919	0.919	0.923	0.923	0.926	0.921	0.927	0.926	0.902	0.922	0.906	0.906

									H2				H3
Sample	BW17-1-o3	BW17-1-o4	BW17-2-o2	BW17-2-o3	BW17-3-o1	BW17-3-o2	BW17-4-o1	BW17-6-o1	H2-4-ol1	H2-3-ol2	H2-1-ol1	H2-1-ol2	H3-1-ol1
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	41.07	40.82	41.17	41.18	41.05	41.77	40.67	40.72	42.15	41.58	42.21	40.9	41.07
FeO	9.29	9.31	9.21	9.26	9.34	9.35	9.1	9.32	9.47	9.39	9.65	9.62	8.92
MnO	0.13	0.02	0.2	0.1	0.09	0.11	0.1	0.12	0.15	0.12	0.06	0.15	0.1
MgO	49.31	47.99	48.91	49.04	49.49	49.12	48.64	48.55	47.82	47.65	47.65	47.19	48.07
NiO	0.28	0.33	0.15	0.5	0.31	0.37	0.36	0.3	0.31	0.32	0.27	0.46	0.45
Total	100.08	98.47	99.64	100.08	100.28	100.72	98.87	99.01	99.9	99.06	99.84	98.32	98.61
Si	1.003	1.013	1.009	1.006	1.001	1.013	1.005	1.006	1.029	1.024	1.031	1.018	1.016
Fe	0.19	0.193	0.189	0.189	0.19	0.19	0.188	0.193	0.193	0.193	0.197	0.2	0.185
Mn	0.003		0.004	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.001	0.003	0.002
Mg	1.796	1.775	1.787	1.786	1.799	1.775	1.792	1.788	1.74	1.75	1.735	1.751	1.773
Ni	0.006	0.007	0.003	0.01	0.006	0.007	0.007	0.006	0.006	0.006	0.005	0.009	0.009
Kations	2.997	2.987	2.991	2.994	2.999	2.987	2.995	2.994	2.971	2.976	2.969	2.982	2.984
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4	4
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por
Mg#	0.904	0.902	0.904	0.904	0.904	0.903	0.905	0.903	0.9	0.901	0.898	0.897	0.906

				H4			H6					
Sample	H3-1-ol2	H3-2-ol1	H3-2-ol2	H4-1-ol1	H4-1-ol2	H4-1-ol3	H6-1-ol1	H6-1-ol2	H6-1-ol2c	H6-1-ol3r	H6-2-ol1i	H6-2-ol2
Mineral	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol
SiO2	42.17	41.59	41.28	41.74	37.42	41.79	41.74	41.04	41.26	41.29	41.32	40.96
FeO	9.12	8.97	8.96	8.55	8.2	8.21	10.25	9.72	9.75	9.75	9.53	9.79
MnO	0.11	0.08	0.22	0.1	0.1	0.12	0.1	0.13	0.12	0.13	0.09	0.16
MgO	49.01	47.22	47.4	49.28	49.54	49.52	49.15	48.93	48.87	48.77	49.36	48.6
NiO	0.39	0.52	0.21	0.35	0.37	0.38	0.41	0.36	0.33	0.37	0.43	0.34
Total	100.8	98.38	98.07	100.01	95.62	100.01	101.65	100.18	100.34	100.31	100.72	99.84
Si	1.02	1.03	1.025	1.015	0.96	1.015	1.007	1.004	1.007	1.008	1.004	1.005
Fe	0.184	0.186	0.186	0.174	0.176	0.167	0.207	0.199	0.199	0.199	0.194	0.201
Mn	0.002	0.002	0.005	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.003
Mg	1.767	1.743	1.755	1.787	1.894	1.793	1.768	1.784	1.778	1.775	1.788	1.778
Ni	0.008	0.01	0.004	0.007	0.008	0.007	0.008	0.007	0.006	0.007	0.008	0.007
Kations	2.98	2.97	2.975	2.985	3.04	2.985	2.993	2.996	2.993	2.992	2.996	2.995
Oxgen	4	4	4	4	4	4	4	4	4	4	4	4
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por
Mg#	0.906	0.904	0.904	0.911	0.915	0.915	0.895	0.9	0.899	0.899	0.902	0.898

12.1.2 Orthopyroxene

	B3				BW1								
Sample	B3-1-opx1c	B3-1-opx2c	B3-1-opx2r	B3-3-opx1	BW1-2-opx1	BW1-2-opx2	BW1-1-opx1	BW1-1-opx2	BW1-1-opx3	BW1-3-opx1	BW1-4-opx1	BW1-4-opx2	BW1-4-opx3
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	57.75	57.60	57.69	58.08	57.29	58.64	58.70	58.42	58.27	58.95	58.55	58.73	58.62
TiO2	0.09	0.11	0.11	0.05		0.17	0.27	0.17	0.15	0.17	0.14	0.14	0.14
Al2O3	0.70	0.75	0.79	0.62	0.40	0.40	0.32	0.32	0.16	0.44	0.50	0.25	0.58
Cr2O3	0.13	0.11	0.14	0.09	0.26	0.13	0.10	0.21	0.14	0.17	0.25	0.21	0.21
FeO	7.84	7.75	7.75	7.84	5.93	6.00	6.03	5.91	5.83	5.90	5.98	6.06	5.73
MnO	0.17	0.14	0.17	0.11		0.15	0.14	0.10	0.09	0.09	0.15	0.10	0.10
MgO	33.30	33.32	33.08	33.62	34.35	34.87	34.16	34.70	33.63	34.58	34.48	34.28	34.40
CaO	0.37	0.40	0.45	0.39	0.60	0.54	0.56	0.51	0.52	0.58	0.51	0.56	0.57
Na2O	0.08	0.10	0.10	0.09	0.17	0.08	0.13	0.13	0.17	0.15	0.15	0.17	0.14
Total	100.51	100.45	100.37	101.00	99.00	100.98	100.40	100.48	98.96	101.03	100.72	100.50	100.50
Si	1.996	1.992	1.998	1.996	1.991	2.001	2.019	2.003	2.033	2.012	2.005	2.017	2.011
Ti	0.002	0.003	0.003	0.001		0.004	0.007	0.004	0.004	0.004	0.004	0.004	0.004
Al	0.028	0.031	0.032	0.025	0.016	0.016	0.013	0.013	0.006	0.018	0.020	0.010	0.024
Cr	0.003	0.003	0.004	0.002	0.007	0.003	0.003	0.006	0.004	0.005	0.007	0.006	0.006
Fe2+	0.227	0.224	0.224	0.225	0.166	0.171	0.173	0.170	0.170	0.168	0.171	0.174	0.164
Fe3+					0.006								
Mn	0.005	0.004	0.005	0.003		0.004	0.004	0.003	0.003	0.003	0.004	0.003	0.003
Mg	1.716	1.717	1.708	1.723	1.779	1.774	1.751	1.774	1.749	1.759	1.760	1.755	1.759
Ca	0.014	0.015	0.017	0.014	0.022	0.020	0.021	0.019	0.019	0.021	0.019	0.021	0.021
Na	0.005	0.007	0.007	0.006	0.011	0.005	0.009	0.009	0.012	0.010	0.010	0.011	0.009
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.883	0.884	0.884	0.884	0.912	0.912	0.910	0.913	0.911	0.913	0.911	0.910	0.914
Cr#	0.097	0.088	0.111	0.074	0.304	0.158	0.188	0.316	0.400	0.217	0.259	0.375	0.207

		BW4					BW5				BW6		
Sample	BW1-5-opx1	BW4-opx1	BW4-opx2	BW4-opx3	BW4-opx4	BW4-1-opx5	BW5-2-Opx1	BW5-2-Opx2	BW5-2-Opx3	BW5-3-Opx1	BW6-5-Opx2	BW6-4-opx1	BW6-2-1-opx1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.27	58.68	57.74	57.94	57.46	58.16	58.91	59.29	59.06	58.92	58.44	57.94	58.35
TiO2	0.15	0.11	0.12	0.13	0.12	0.14							
Al2O3	0.45	0.44	0.40	0.36	0.26	0.59	0.34	0.46	0.57	0.52	0.67	0.87	0.58
Cr2O3	0.09	0.22	0.20	0.14	0.16	0.18	0.05	0.11	0.20	0.23	0.28	0.19	0.24
FeO	5.70	4.95	4.97	4.82	5.04	4.78	4.59	4.68	4.73	4.76	5.46	5.32	5.31
MnO	0.12						0.14	0.15	0.16			0.16	0.16
MgO	33.53	34.74	35.53	35.11	35.17	33.53	34.12	34.37	33.34	34.80	35.91	34.71	35.20
CaO	0.46	0.53	0.50	0.51	0.48	0.51	0.45	0.44	0.35	0.40	0.26	0.29	0.23
Na2O	0.16	0.16	0.13	0.16	0.13	0.15	0.12	0.12	0.15	0.15	0.04	0.05	0.01
Total	98.93	99.82	99.60	99.16	98.81	98.05	98.73	99.62	98.57	99.78	101.05	99.53	100.07
Si	2.033	2.019	1.985	2.001	1.992	2.042	2.051	2.046	2.066	2.027	1.983	2.001	2.003
Ti	0.004	0.003	0.003	0.003	0.003	0.004							
Al	0.019	0.018	0.016	0.015	0.011	0.025	0.014	0.019	0.024	0.021	0.027	0.036	0.023
Cr	0.002	0.006	0.005	0.004	0.004	0.005	0.002	0.003	0.006	0.006	0.007	0.005	0.007
Fe2+	0.166	0.142	0.131	0.139	0.143	0.140	0.134	0.135	0.138	0.137	0.152	0.153	0.152
Fe3+			0.012		0.003						0.003		
Mn	0.004						0.004	0.004	0.005			0.005	0.005
Mg	1.744	1.782	1.821	1.808	1.818	1.755	1.771	1.768	1.739	1.784	1.816	1.786	1.801
Ca	0.017	0.020	0.018	0.019	0.018	0.019	0.017	0.016	0.013	0.015	0.009	0.011	0.008
Na	0.011	0.011	0.009	0.011	0.008	0.010	0.008	0.008	0.010	0.010	0.003	0.003	
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.913	0.926	0.927	0.928	0.926	0.926	0.930	0.929	0.926	0.929	0.921	0.921	0.922
Cr#	0.100	0.250	0.238	0.211	0.267	0.172	0.067	0.143	0.207	0.222	0.206	0.125	0.233

					BW7		BW10				BW44		
Sample	BW6-2-1-opx2	BW6-1-opx1	BW6-1-opx2	BW6-2-2-opx1	BW7-1-opx1	BW7-1-opx2	BW10-172-opx1	BW10-172-opx2	BW10-172-opx3	BW10-5-opx1	Bw44-3-opx1	Bw44-3-opx2	Bw44-4-opx1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.53	58.21	58.85	58.57	57.42	58.08	58.09	57.64	57.78	58.25	59.93	60.25	59.88
TiO2					0.11		0.20				0.14	0.13	
Al2O3	0.68	0.28	0.54	0.77	0.58	0.51	0.57	0.66	0.89	0.74	0.56	0.32	0.38
Cr2O3	0.26	0.22	0.23	0.22	0.20	0.19	0.20	0.20	0.13	0.14	0.21	0.15	0.19
FeO	5.29	5.30	5.41	5.44	5.17	4.97	5.87	6.04	6.02	5.88	4.69	4.67	4.66
MnO	0.11	0.13				0.12	0.16	0.12	0.14	0.13	0.14		
MgO	34.31	35.67	34.13	34.94	37.39	37.33	34.96	34.48	35.03	34.02	34.66	34.88	34.03
CaO	0.30	0.17	0.27	0.25	0.38	0.37	0.29	0.39	0.38	0.28	0.36	0.47	0.36
Na2O	0.05	0.03	0.03	0.05	0.16	0.08	0.11	0.12	0.14	0.11	0.12	0.11	0.09
Total	99.53	100.01	99.45	100.25	101.40	101.66	100.46	99.65	100.51	99.55	100.81	100.99	99.59
Si	2.025	1.996	2.040	2.008	1.928	1.947	1.990	1.991	1.976	2.018	2.045	2.051	2.071
Ti					0.003		0.005				0.004	0.003	
Al	0.028	0.011	0.022	0.031	0.023	0.020	0.023	0.027	0.036	0.030	0.023	0.013	0.016
Cr	0.007	0.006	0.006	0.006	0.005	0.005	0.006	0.006	0.004	0.004	0.006	0.004	0.005
Fe2+	0.153	0.152	0.157	0.156	0.025	0.054	0.168	0.175	0.154	0.170	0.134	0.133	0.135
Fe3+					0.120	0.085			0.019				
Mn	0.003	0.004				0.003	0.005	0.004	0.004	0.004	0.004		
Mg	1.769	1.823	1.763	1.786	1.872	1.866	1.785	1.776	1.786	1.756	1.764	1.771	1.754
Ca	0.011	0.006	0.010	0.009	0.014	0.013	0.010	0.015	0.014	0.010	0.013	0.017	0.013
Na	0.004	0.002	0.002	0.003	0.010	0.005	0.007	0.008	0.009	0.008	0.008	0.007	0.006
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.920	0.923	0.919	0.920	0.928	0.931	0.914	0.911	0.912	0.912	0.929	0.930	0.929
Cr#	0.200	0.353	0.214	0.162	0.179	0.200	0.207	0.182	0.100	0.118	0.214	0.235	0.250

			D1			D3		D4					E4
Sample	Bw44-4-opx2	Bw44-4-opx3	opxD1-1	opxD1-2	opxD1-2re	D3-1-Opx1	D3-1-Opx2	D4-4-opx1	D4-4-opx2	D4-4-opx3	D4-4-opx4	D4-2-opx1	E4-4-opx2
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	60.59	59.91	58.36	57.82	58.09	59.14	59.89	57.15	58.30	58.87	58.42	56.55	58.62
TiO2			0.04		0.04			0.06	0.05	0.06	0.05	0.12	0.02
Al2O3	0.89	0.16	0.55	0.56	0.54	0.34	0.28	0.62	0.53	0.33	0.56	2.11	0.72
Cr2O3	0.21	0.20	0.25	0.29	0.31	0.29	0.42	0.39	0.46	0.46	0.48	1.63	0.25
FeO	4.70	4.76	5.26	5.45	5.33	4.01	3.98	4.11	4.42	4.41	4.23	4.02	4.62
MnO	0.10		0.11	0.14	0.12	0.08	0.12	0.09	0.15	0.15	0.10	0.10	0.09
MgO	35.23	33.34	34.00	34.36	34.40	34.98	35.28	34.74	35.34	37.21	35.74	33.92	34.87
CaO	0.37	0.31	0.85	0.85	0.86	0.38	0.34	0.40	0.40	0.37	0.38	1.18	0.36
Na2O	0.11	0.13	0.04	0.03	0.02	0.15	0.10	0.18	0.19	0.14	0.13	0.31	0.08
Total	102.20	98.81	99.45	99.49	99.72	99.37	100.41	97.75	99.85	101.98	100.09	99.94	99.77
Si	2.037	2.092	2.023	2.001	2.006	2.039	2.045	2.000	1.999	1.969	1.996	1.945	2.017
Ti			0.001		0.001			0.002	0.001	0.001	0.001	0.003	
Al	0.035	0.007	0.023	0.023	0.022	0.014	0.011	0.026	0.021	0.013	0.023	0.085	0.029
Cr	0.006	0.005	0.007	0.008	0.009	0.008	0.011	0.011	0.013	0.012	0.013	0.044	0.007
Fe2+	0.132	0.139	0.152	0.158	0.154	0.116	0.114	0.120	0.127	0.080	0.121	0.116	0.133
Fe3+										0.043			
Mn	0.003		0.003	0.004	0.004	0.002	0.003	0.003	0.004	0.004	0.003	0.003	0.002
Mg	1.766	1.736	1.757	1.773	1.771	1.798	1.796	1.812	1.807	1.855	1.820	1.739	1.788
Ca	0.013	0.012	0.032	0.032	0.032	0.014	0.012	0.015	0.015	0.013	0.014	0.044	0.013
Na	0.007	0.009	0.003	0.002	0.001	0.010	0.007	0.012	0.013	0.009	0.009	0.021	0.006
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb
Mg#	0.930	0.926	0.920	0.918	0.920	0.939	0.940	0.938	0.934	0.938	0.938	0.937	0.931
Cr#	0.125	0.417	0.241	0.258	0.290	0.364	0.500	0.297	0.382	0.480	0.361	0.341	0.194

			G1										G2
Sample	E4-4-opx3	E4-4-opx4	G1-3-opx1	G1-5-opx2	G1-5-opx1	G1-12-opx2	G1-1-opx1	G1-1-opx2	G1-1-opx3	G1-45-opx1	G1-45-opx2	G1-45-opx3	G2-1-2-Opx1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.51	58.35	59.11	58.27	59.40	58.23	59.39	58.52	58.48	58.27	58.57	58.46	58.46
TiO2	0.10	0.08											0.10
Al2O3	0.74	0.73	0.61	0.83	0.95	0.72	0.68	0.44	0.58	0.71	0.54	0.85	0.86
Cr2O3	0.40	0.30	0.28	0.27	0.29	0.19	0.26	0.41	0.34	0.21	0.26	0.20	0.23
FeO	4.67	4.84	4.86	4.82	4.89	4.84	4.72	4.95	4.69	4.92	4.73	4.87	5.29
MnO	0.09	0.09	0.07	0.17	0.10	0.07	0.05	0.07	0.08	0.15	0.14	0.13	0.15
MgO	34.16	34.69	35.93	36.83	36.13	35.22	35.62	35.83	35.70	36.77	36.32	35.59	36.04
CaO	0.37	0.37	0.22	0.25	0.17	0.23	0.31	0.28	0.22	0.23	0.23	0.23	0.22
Na2O	0.07	0.03	0.02	0.01	0.01	0.01	0.01	0.03	0.01	0.01			
Total	99.22	99.57	101.09	101.43	101.93	99.52	101.04	100.52	100.11	101.27	100.79	100.33	101.34
Si	2.030	2.014	2.004	1.962	1.997	2.006	2.016	1.995	2.001	1.965	1.987	1.997	1.978
Ti	0.003	0.002											0.002
Al	0.030	0.030	0.024	0.033	0.038	0.029	0.027	0.018	0.024	0.028	0.022	0.034	0.034
Cr	0.011	0.008	0.008	0.007	0.008	0.005	0.007	0.011	0.009	0.006	0.007	0.005	0.006
Fe2+	0.135	0.140	0.138	0.099	0.138	0.139	0.134	0.141	0.134	0.103	0.134	0.139	0.150
Fe3+				0.037						0.036			
Mn	0.003	0.003	0.002	0.005	0.003	0.002	0.001	0.002	0.002	0.004	0.004	0.004	0.004
Mg	1.767	1.785	1.816	1.849	1.811	1.809	1.802	1.821	1.821	1.849	1.837	1.812	1.818
Ca	0.014	0.014	0.008	0.009	0.006	0.009	0.011	0.010	0.008	0.008	0.008	0.008	0.008
Na	0.004	0.002	0.001			0.001	0.001	0.002	0.001				
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	GrtSpl
Mg#	0.929	0.927	0.930	0.932	0.929	0.928	0.931	0.928	0.931	0.930	0.932	0.929	0.924
Cr#	0.268	0.211	0.250	0.175	0.178	0.147	0.206	0.379	0.281	0.176	0.241	0.128	0.150

			G5						BW80				BW82
Sample	G2-2-Opx1	G2-3-Opx1	Line 4 G5-1-3	Line 3 G5-1-3	G5-2-opx1	G5-2-Opx4	Line 2 G5-2-Opx2	Line 6 G5-1-3	BW80-6-opx1	BW80-6-opx2	BW80-6-opx3	BW80-8-opx1	BW82-1-opx1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.08	57.67	56.91	57.02	57.72	57.46	57.84	57.14	58.81	58.34	59.26	58.42	57.29
TiO2	0.09	0.01	0.04	0.12	0.12	0.16	0.08	0.12					
Al2O3	0.88	0.92	1.44	1.41	1.42	1.48	1.59	1.39	0.87	1.09	1.00	0.85	1.53
Cr2O3	0.23	0.24	0.25	0.21	0.20	0.19	0.24	0.21	0.21	0.42	0.21	0.33	0.32
FeO	5.16	5.17	5.23	5.16	5.19	5.06	5.14	5.28	5.25	5.17	5.13	5.01	5.84
MnO	0.16	0.11	0.11	0.07	0.08	0.07	0.08	0.10	0.18	0.11		0.14	
MgO	35.49	36.26	34.94	35.21	34.54	33.95	34.24	35.26	35.80	35.66	35.42	34.26	33.30
CaO	0.25	0.26	0.20	0.20	0.17	0.17	0.18	0.19	0.20	0.30	0.20	0.20	0.17
Na2O	0.02	0.01	0.04	0.04	0.03	0.03	0.04	0.02		0.02	0.03		
Total	100.37	100.64	99.23	99.52	99.45	98.66	99.42	99.80	101.32	101.11	101.27	99.22	98.45
Si	1.985	1.960	1.967	1.964	1.994	2.004	2.001	1.963	1.991	1.979	2.009	2.027	2.009
Ti	0.002		0.001	0.003	0.003	0.004	0.002	0.003					
Al	0.035	0.037	0.059	0.057	0.058	0.061	0.065	0.056	0.035	0.044	0.040	0.035	0.063
Cr	0.006	0.006	0.007	0.006	0.006	0.005	0.006	0.006	0.006	0.011	0.006	0.009	0.009
Fe2+	0.148	0.109	0.150	0.142	0.150	0.148	0.149	0.145	0.149	0.147	0.145	0.145	0.171
Fe3+		0.038	0.002	0.007				0.007					
Mn	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.005	0.003		0.004	
Mg	1.808	1.837	1.800	1.808	1.779	1.765	1.766	1.806	1.807	1.804	1.790	1.772	1.741
Ca	0.009	0.009	0.007	0.007	0.006	0.006	0.007	0.007	0.007	0.011	0.007	0.008	0.006
Na	0.002	0.001	0.003	0.002	0.002	0.002	0.002	0.002		0.001	0.002		
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl	GrtSpl
Mg#	0.925	0.926	0.923	0.924	0.922	0.923	0.922	0.922	0.924	0.925	0.925	0.924	0.910
Cr#	0.146	0.140	0.106	0.095	0.081	0.076	0.085	0.097	0.146	0.204	0.130	0.209	0.125

	H2			H3			H4				H6		
Sample	BW82-2-opx1	H2-2-opx1	H2-2-opx2	H2-3-opx1	H3-1-opx1	H3-2-opx1	H3-2-opx2	H4-2-opx1	H4-2-opx2	H4-2-opx3	H4-2-opx4	H6-1-opx1c	H6-1-opx1r
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.38	58.98	59.34	58.25	58.97	58.74	59.74	58.18	58.16	58.27	58.52	58.00	57.82
TiO2		0.24	0.12	0.23	0.15	0.08	-0.04	0.15	0.19	0.07	0.16	0.17	0.14
Al2O3	1.41	0.89	0.97	0.82	0.43	0.95	0.81	0.94	0.82	0.69	0.76	0.90	0.85
Cr2O3	0.21	0.22	0.22	0.20	0.24	0.21	0.26	0.39	0.24	0.36	0.30	0.08	0.10
FeO	5.75	5.68	5.67	5.70	5.39	5.25	5.27	4.90	4.91	5.13	4.92	5.74	6.01
MnO	0.13	0.15	0.17	0.08	0.18	0.11	0.05	0.10	0.18	0.14	0.17	0.14	0.12
MgO	35.13	33.52	33.12	32.00	32.54	32.63	32.74	32.54	32.62	31.87	32.62	33.39	33.60
CaO	0.16	1.36	1.35	1.46	1.39	1.43	1.55	1.32	1.36	1.36	1.31	1.00	1.01
Na2O	0.03	0.26	0.28	0.32	0.14	0.20	0.22	0.23	0.30	0.25	0.24	0.28	0.27
Total	101.20	101.31	101.23	99.07	99.45	99.60	100.67	98.73	98.77	98.14	99.00	99.88	100.07
Si	1.984	2.013	2.029	2.039	2.056	2.041	2.055	2.037	2.034	2.058	2.044	2.005	1.994
Ti		0.006	0.003	0.006	0.004	0.002	-0.001	0.004	0.005	0.002	0.004	0.004	0.004
Al	0.056	0.036	0.039	0.034	0.018	0.039	0.033	0.039	0.034	0.029	0.031	0.037	0.034
Cr	0.006	0.006	0.006	0.006	0.007	0.006	0.007	0.011	0.007	0.010	0.008	0.002	0.003
Fe2+	0.163	0.162	0.162	0.167	0.157	0.153	0.152	0.144	0.143	0.151	0.144	0.166	0.173
Fe3+													
Mn	0.004	0.004	0.005	0.002	0.005	0.003	0.001	0.003	0.005	0.004	0.005	0.004	0.003
Mg	1.779	1.705	1.688	1.670	1.691	1.690	1.679	1.699	1.701	1.678	1.699	1.721	1.728
Ca	0.006	0.050	0.049	0.055	0.052	0.053	0.057	0.049	0.051	0.052	0.049	0.037	0.037
Na	0.002	0.017	0.018	0.022	0.010	0.013	0.015	0.016	0.021	0.017	0.016	0.019	0.018
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	GrtSpl	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por
Mg#	0.916	0.913	0.912	0.909	0.915	0.917	0.917	0.922	0.922	0.917	0.922	0.912	0.909
Cr#	0.097	0.143	0.133	0.132	0.280	0.136	0.179	0.224	0.154	0.263	0.205	0.053	0.081

				BW17									
Sample	H6-1-opx2	H6-2-opx1	H6-2-opx2r	H6-2-opx2c	BW17-1-opx1	BW17-1-opx2	BW17-2-opx1	BW17-3-opx1	BW17-3-opx2	BW17-5-opx1	BW17-4-opx1	BW17-4-opx2	BW17-6-opx1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	58.26	58.18	57.54	58.12	58.89	58.53	58.79	57.88	58.11	57.50	58.25	58.36	57.89
TiO2	0.15	0.19	0.15	0.09									
Al2O3	0.85	0.88	0.87	0.75	0.44	0.37	0.48	0.52	0.31	0.40	0.47	0.40	0.49
Cr2O3	0.07	0.13	0.10	0.10	0.25	0.22	0.22	0.22	0.22	0.21	0.24	0.21	0.30
FeO	5.99	5.98	5.97	5.94	5.45	5.62	5.63	5.49	5.55	5.39	5.50	5.65	5.49
MnO	0.20	0.15	0.16	0.11	0.16	0.11	0.13	0.12		0.17			0.15
MgO	33.42	33.41	33.44	33.54	34.21	34.53	34.44	34.62	34.15	34.63	33.66	33.78	34.84
CaO	1.01	0.93	1.01	1.01	1.05	1.06	1.03	1.06	1.05	1.05	1.05	1.08	1.11
Na2O	0.26	0.24	0.29	0.20	0.04	0.10	0.07	0.05	0.07	0.07	0.04	0.05	0.06
Total	100.41	100.24	99.67	99.94	100.49	100.54	100.79	99.96	99.46	99.42	99.21	99.53	100.33
Si	2.006	2.007	1.993	2.009	2.022	2.006	2.011	1.992	2.013	1.988	2.027	2.024	1.985
Ti	0.004	0.005	0.004	0.002									
Al	0.034	0.036	0.036	0.030	0.018	0.015	0.019	0.021	0.013	0.016	0.019	0.016	0.020
Cr	0.002	0.003	0.003	0.003	0.007	0.006	0.006	0.006	0.006	0.006	0.007	0.006	0.008
Fe2+	0.173	0.173	0.173	0.172	0.156	0.161	0.161	0.158	0.161	0.150	0.160	0.164	0.151
Fe3+										0.006			0.006
Mn	0.006	0.004	0.005	0.003	0.005	0.003	0.004	0.003		0.005			0.004
Mg	1.715	1.718	1.726	1.728	1.751	1.764	1.756	1.777	1.764	1.785	1.746	1.747	1.781
Ca	0.037	0.034	0.037	0.038	0.039	0.039	0.038	0.039	0.039	0.039	0.039	0.040	0.041
Na	0.017	0.016	0.020	0.014	0.003	0.007	0.005	0.003	0.005	0.005	0.003	0.003	0.004
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por
Mg#	0.909	0.909	0.909	0.910	0.918	0.916	0.916	0.918	0.917	0.920	0.916	0.914	0.919
Cr#	0.056	0.077	0.077	0.091	0.280	0.286	0.240	0.222	0.316	0.273	0.269	0.273	0.286

	BW60			BW76						C4			
Sample	opxBw60-1	opxBw60-2	opxBw60-4	BW76-1-opx1	BW76-1-opx2	BW76-1-opx3	BW76-1-opx4	BW76-2-opx1	BW76-2-opx2	C4-1-Opx1	C4-1-2-Opx1	C4-1-2-Opx2	C4-2-Opx1
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	56.23	56.58	56.60	59.18	58.18	58.90	58.26	58.98	57.99	56.42	57.01	57.24	57.62
TiO2	0.06												
Al2O3	3.29	3.15	3.41	1.51	1.73	1.28	1.40	1.41	1.55	1.14	0.91	1.30	1.28
Cr2O3	0.24	0.36	0.27	0.37	0.39	0.33	0.23	0.13	0.39	0.38	0.58	0.40	0.31
FeO	6.08	5.93	6.05	5.32	5.41	5.25	5.43	5.44	5.14	5.32	5.27	5.36	5.28
MnO	0.13	0.13	0.10	0.13	0.08	0.10	0.12	0.16	0.14	0.10	0.15	0.15	0.13
MgO	33.11	33.14	32.99	34.66	34.74	35.56	36.25	35.36	34.74	35.35	34.60	34.14	35.73
CaO	0.26	0.30	0.29	0.32	0.36	0.15	0.22	0.17	0.34	0.32	0.16	0.24	0.12
Na2O	0.02	0.03	0.01							0.01	0.02	0.02	0.03
Total	99.42	99.61	99.70	101.49	100.89	101.57	101.91	101.65	100.29	99.03	98.70	98.86	100.51
Si	1.952	1.961	1.961	2.009	1.984	1.991	1.958	1.994	1.988	1.952	1.985	1.993	1.964
Ti	0.002												
Al	0.135	0.128	0.139	0.060	0.070	0.051	0.055	0.056	0.063	0.046	0.037	0.054	0.052
Cr	0.007	0.010	0.007	0.010	0.011	0.009	0.006	0.003	0.011	0.010	0.016	0.011	0.008
Fe2+	0.177	0.172	0.175	0.151	0.154	0.148	0.130	0.154	0.147	0.113	0.153	0.156	0.136
Fe3+							0.022			0.041			0.014
Mn	0.004	0.004	0.003	0.004	0.002	0.003	0.003	0.005	0.004	0.003	0.004	0.004	0.004
Mg	1.713	1.712	1.703	1.754	1.766	1.792	1.816	1.782	1.775	1.823	1.797	1.772	1.816
Ca	0.010	0.011	0.011	0.012	0.013	0.005	0.008	0.006	0.012	0.012	0.006	0.009	0.005
Na	0.002	0.002	0.001							0.001	0.001	0.002	0.002
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl
Mg#	0.907	0.909	0.907	0.921	0.919	0.923	0.922	0.921	0.923	0.922	0.921	0.919	0.923
Cr#	0.050	0.072	0.048	0.143	0.127	0.150	0.097	0.051	0.151	0.179	0.302	0.172	0.133

			F3					F4					
Sample	C4-2-Opx2	C4-3-Opx1	F3-1-Opx1	F3-1-Opx2	F3-1-Opx4	F3-1-Opx5	F3-4-Opx1	Line 5 F4-2-5	Line 1 F4-2-5	Line 4 F4-2-2	Line 1 F4-2-6	Line 2 F4-2-1	Line 2 F4-2-2
Mineral	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
SiO2	57.02	56.86	58.73	57.46	58.62	58.38	58.03	55.92	55.97	56.08	57.19	56.57	56.82
TiO2										0.12	0.06	0.11	
Al2O3	1.40	1.15	0.52	0.80	0.60	0.75	0.91	2.43	2.29	2.62	2.06	2.81	2.72
Cr2O3	0.46	0.41	0.20	0.35	0.20	0.23	0.29	0.35	0.30	0.40	0.24	0.43	0.37
FeO	5.32	5.13	4.93	5.13	4.91	4.83	5.02	5.08	5.38	4.87	5.06	4.98	4.81
MnO	0.09	0.20	0.08	0.13	0.17	0.10	0.15	0.10	0.13	0.11	0.07	0.11	0.07
MgO	35.53	34.53	35.13	35.85	35.99	35.89	35.65	34.96	35.29	34.90	35.06	34.63	35.21
CaO	0.23	0.32	0.24	0.23	0.21	0.24	0.24	0.17	0.18	0.21	0.22	0.24	0.24
Na2O	0.02	0.07	0.01	0.01	0.03		0.01	0.02	0.02		0.02	0.02	0.02
Total	100.07	98.69	99.85	99.96	100.72	100.42	100.29	99.13	99.73	99.40	100.03	99.90	100.41
Si	1.953	1.979	2.019	1.968	1.993	1.990	1.983	1.932	1.922	1.933	1.960	1.943	1.937
Ti										0.003	0.001	0.003	
Al	0.056	0.047	0.021	0.032	0.024	0.030	0.037	0.099	0.093	0.106	0.083	0.114	0.109
Cr	0.012	0.011	0.006	0.010	0.005	0.006	0.008	0.010	0.008	0.011	0.006	0.012	0.010
Fe2+	0.125	0.149	0.142	0.123	0.140	0.138	0.143	0.117	0.098	0.129	0.145	0.143	0.130
Fe3+	0.027			0.024				0.030	0.056	0.011			0.007
Mn	0.003	0.006	0.002	0.004	0.005	0.003	0.004	0.003	0.004	0.003	0.002	0.003	0.002
Mg	1.814	1.791	1.800	1.831	1.824	1.824	1.816	1.800	1.807	1.793	1.791	1.773	1.790
Ca	0.009	0.012	0.009	0.009	0.007	0.009	0.009	0.006	0.007	0.008	0.008	0.009	0.009
Na	0.001	0.005		0.001	0.002		0.001	0.002	0.001		0.001	0.001	0.001
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl
Mg#	0.922	0.923	0.927	0.926	0.929	0.930	0.927	0.925	0.921	0.928	0.925	0.925	0.929
Cr#	0.174	0.190	0.222	0.238	0.172	0.167	0.178	0.092	0.079	0.094	0.067	0.096	0.084

		I5			
Sample	Line 4 F4-2-1	I5-1-opx1	I5-1-opx1	I5-1-opx2	I5-1-opx3
Mineral	Opx	Opx	Opx	Opx	Opx
SiO2	56.44	59.58	59.56	59.54	58.99
TiO2	0.07	0.07	0.07	0.01	0.03
Al2O3	2.71	1.33	1.33	1.58	1.39
Cr2O3	0.36	0.34	0.34	0.37	0.21
FeO	4.86	4.65	4.65	4.55	4.56
MnO	0.16	0.17	0.17	0.10	0.18
MgO	34.88	34.71	34.63	35.14	34.32
CaO	0.25	0.29	0.29	0.20	0.19
Na2O	0.02	0.02			
Total	99.87	101.16	101.04	101.49	99.87
Si	1.937	2.027	2.029	2.015	2.032
Ti	0.002	0.002	0.002		0.001
Al	0.110	0.053	0.053	0.063	0.056
Cr	0.010	0.009	0.009	0.010	0.006
Fe2+	0.134	0.132	0.132	0.129	0.131
Fe3+	0.005				
Mn	0.005	0.005	0.005	0.003	0.005
Mg	1.784	1.760	1.759	1.773	1.762
Ca	0.009	0.010	0.011	0.007	0.007
Na	0.001	0.001			
Kations	4	4	4	4	4
Oxygen	6	6	6	6	6
Type	Spl	Spl	Spl	Spl	Spl
Mg#	0.928	0.930	0.930	0.932	0.931
Cr#	0.083	0.145	0.145	0.139	0.097

12.1.3 Clinopyroxene-core

	A1									B3			BW1
Sample	A1-1-gt-cpx2	A1-1-gt-cpx3	A1-1-gt-cpx8	A1-1-gt-cpx7	A1-1-gt-cpx6	Grid 6-4 A1-4-cpx1	Grid 2-1A 1-4-cpx1	Grid 3-2 A1-4-cpx1	Grid 6-2 A1-4-cpx1	B3-1-cpx1c	B3-1-cpx2c	B3-3-cpx1	BW1-2-c1
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	55.27	55.74	54.91	54.70	54.16	55.67	55.62	55.26	55.41	54.54	54.85	54.97	55.50
TiO2	0.47	0.44	0.47	0.41	0.32	0.49	0.46	0.38	0.50	0.24	0.20	0.26	0.30
Al2O3	2.67	2.67	2.68	2.67	2.58	2.58	2.63	2.65	2.66	2.90	2.70	2.75	2.22
Cr2O3	0.69	0.68	0.73	0.69	0.80	0.70	0.73	0.70	0.79	0.94	1.04	1.15	1.25
FeO	3.10	3.27	3.25	3.43	3.33	3.42	3.17	3.54	3.41	3.62	3.48	3.64	2.98
MnO	0.05	0.08	0.06	0.09	0.06	0.08	0.10	0.13	0.10	0.09	0.09	0.08	0.11
MgO	16.24	16.57	16.40	16.19	16.32	16.46	16.74	16.69	16.38	15.26	15.15	15.20	16.36
CaO	17.80	17.83	17.86	17.89	17.92	18.22	18.23	18.23	18.23	19.27	19.47	19.29	18.10
Na2O	2.03	2.09	2.13	1.96	2.01	2.03	1.98	2.05	1.97	2.61	2.41	2.47	2.05
Total	98.31	99.37	98.49	98.03	97.49	99.65	99.64	99.63	99.43	99.46	99.39	99.80	98.87
Si	2.025	2.019	2.006	2.012	2.000	2.014	2.010	1.997	2.011	1.976	1.992	1.989	2.024
Ti	0.013	0.012	0.013	0.011	0.009	0.013	0.013	0.010	0.014	0.007	0.005	0.007	0.008
Al	0.115	0.114	0.116	0.116	0.112	0.110	0.112	0.113	0.114	0.124	0.116	0.117	0.096
Cr	0.020	0.019	0.021	0.020	0.023	0.020	0.021	0.020	0.023	0.027	0.030	0.033	0.036
Fe2+	0.095	0.099	0.099	0.105	0.103	0.103	0.096	0.107	0.103	0.042	0.077	0.080	0.091
Fe3+										0.068	0.029	0.030	
Mn	0.002	0.002	0.002	0.003	0.002	0.003	0.003	0.004	0.003	0.003	0.003	0.002	0.003
Mg	0.887	0.895	0.893	0.888	0.899	0.888	0.902	0.899	0.886	0.824	0.821	0.820	0.889
Ca	0.699	0.692	0.699	0.705	0.709	0.706	0.706	0.706	0.709	0.748	0.758	0.748	0.707
Na	0.144	0.147	0.151	0.140	0.144	0.142	0.139	0.144	0.138	0.183	0.170	0.173	0.145
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.904	0.900	0.900	0.894	0.897	0.896	0.904	0.894	0.896	0.883	0.886	0.882	0.907
Cr#	0.148	0.143	0.154	0.148	0.170	0.154	0.158	0.150	0.163	0.179	0.205	0.219	0.275

						BW4							BW5
Sample	BW1-1-c1	BW1-3-c1	BW1-2-c3	BW1-2-c4	BW1-5-opx2	BW4-1-cpx1	BW4-1-cpx2	BW4-Cpx1k	BW4-cpx	BW4-cpx2	BW4-cpx5k	BW4-cpx8	BW5-1-Cpx1
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	54.87	55.29	55.77	55.32	55.14	54.80	54.38	56.99	56.32	56.69	56.95	56.54	55.31
TiO2	0.29	0.37	0.35	0.35	0.39	0.36	0.28	0.29	0.29	0.37	0.38	0.38	0.30
Al2O3	2.25	2.34	2.53	2.54	2.37	2.63	2.33	2.97	2.53	2.39	2.81	2.55	3.43
Cr2O3	1.31	1.52	1.15	1.17	1.34	1.28	1.33	1.75	1.28	1.61	1.55	1.61	1.54
FeO	2.97	2.96	2.98	3.03	2.96	2.63	2.36	2.36	2.64	2.46	2.43	2.52	2.36
MnO	0.16	0.08	0.15	0.13	0.03								
MgO	16.55	16.18	15.57	16.83	16.51	15.45	16.96	17.09	16.25	16.24	15.51	16.19	15.33
CaO	18.26	18.37	18.30	18.08	18.30	18.18	18.13	17.83	18.05	18.04	18.13	18.17	17.60
Na2O	2.07	1.98	1.96	2.09	2.00	2.21	2.17	2.36	2.23	2.25	2.26	2.27	2.55
Total	98.73	99.08	98.76	99.54	99.05	97.54	97.95	101.64	99.61	100.05	100.00	100.23	98.43
Si	2.002	2.016	2.043	2.000	2.007	2.026	1.990	2.013	2.036	2.043	2.057	2.033	2.022
Ti	0.008	0.010	0.010	0.010	0.011	0.010	0.008	0.008	0.008	0.010	0.010	0.010	0.008
Al	0.097	0.101	0.109	0.108	0.102	0.115	0.101	0.124	0.108	0.101	0.119	0.108	0.148
Cr	0.038	0.044	0.033	0.034	0.038	0.037	0.039	0.049	0.037	0.046	0.044	0.046	0.045
Fe2+	0.090	0.090	0.091	0.091	0.090	0.081	0.053	0.070	0.080	0.074	0.073	0.076	0.072
Fe3+							0.019						
Mn	0.005	0.002	0.005	0.004	0.001								
Mg	0.900	0.879	0.851	0.907	0.896	0.852	0.926	0.900	0.876	0.872	0.835	0.868	0.835
Ca	0.714	0.718	0.718	0.700	0.714	0.720	0.711	0.675	0.699	0.696	0.702	0.700	0.689
Na	0.146	0.140	0.139	0.146	0.141	0.159	0.154	0.162	0.157	0.157	0.158	0.159	0.181
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.909	0.907	0.903	0.909	0.909	0.913	0.928	0.928	0.917	0.921	0.920	0.920	0.920
Cr#	0.281	0.306	0.234	0.234	0.273	0.245	0.279	0.285	0.252	0.308	0.272	0.296	0.230

			BW6					BW7					
Sample	BW5-1-Cpx3	BW5-2-Cpx1	BW6-5-Cpx1	BW6-5-Cpx3	BW6-2-2-c3	BW6-2-c2	BW6-2-2-c2	BW7T-CPX1	BW7T-CPX3	BW7-6-c1	BW7-6-c2	BW7-5-c1	BW7-5-c2
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	55.72	55.67	54.85	54.39	54.92	54.88	55.65	56.43	56.02	54.80	54.83	54.10	54.61
TiO2	0.30	0.36	0.14	0.21	0.21	0.51	0.27	0.24	0.36	0.36	0.35	0.28	0.31
Al2O3	3.16	3.52	3.01	3.11	2.92	4.08	3.24	3.51	2.96	3.12	3.28	3.17	3.13
Cr2O3	1.55	1.66	1.53	1.50	1.42	1.76	1.72	1.75	1.48	1.68	1.83	1.58	1.52
FeO	2.34	2.23	2.05	1.92	1.99	2.80	2.04	2.49	2.56	2.46	2.41	2.48	2.40
MnO				0.11								0.20	0.12
MgO	15.16	16.11	15.86	15.45	15.47	14.81	15.21	15.69	15.84	15.72	16.20	16.53	15.70
CaO	17.74	17.59	19.56	19.60	19.83	16.95	19.76	17.94	17.88	17.47	17.41	17.43	17.31
Na2O	2.62	2.49	2.13	2.25	1.95	3.21	2.02	2.77	2.77	2.74	2.73	2.65	2.68
Total	98.59	99.63	99.11	98.54	98.71	99.01	99.91	100.82	99.88	98.35	99.04	98.42	97.77
Si	2.035	2.007	1.992	1.987	2.008	1.991	2.015	2.012	2.014	2.000	1.985	1.967	2.004
Ti	0.008	0.010	0.004	0.006	0.006	0.014	0.007	0.006	0.010	0.010	0.010	0.008	0.009
Al	0.136	0.150	0.129	0.134	0.126	0.174	0.138	0.148	0.126	0.134	0.140	0.136	0.135
Cr	0.045	0.047	0.044	0.043	0.041	0.050	0.049	0.049	0.042	0.048	0.052	0.045	0.044
Fe2+	0.071	0.067	0.062	0.059	0.061	0.085	0.062	0.074	0.077	0.075	0.062	0.020	0.074
Fe3+											0.011	0.056	
Mn				0.003								0.006	0.004
Mg	0.825	0.866	0.859	0.841	0.843	0.801	0.821	0.834	0.849	0.855	0.874	0.896	0.859
Ca	0.694	0.679	0.761	0.767	0.777	0.659	0.766	0.685	0.689	0.683	0.675	0.679	0.681
Na	0.185	0.174	0.150	0.159	0.139	0.226	0.142	0.191	0.193	0.194	0.192	0.187	0.191
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.920	0.928	0.933	0.934	0.932	0.904	0.930	0.918	0.917	0.919	0.923	0.922	0.921
Cr#	0.246	0.240	0.254	0.243	0.247	0.223	0.263	0.250	0.251	0.264	0.271	0.253	0.246

				BW10								BW44	
Sample	BW7-5-c3	BW7-1-c1	BW7-3-c1	BW10-172-Cpx1	BW10-172-Cpx2	BW10-4-c1	BW10-4-c3	BW10-4-c4	BW10-2-c1	BW10-0917-Cpx1	BW10-0917-Cpx2	Bw44-3-cpx1	Bw44-3-cpx2
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	54.41	55.22	54.40	54.90	54.50	55.91	54.97	55.93	55.44	55.13	54.29	56.59	56.09
TiO2	0.31	0.35	0.24	0.45	0.49	0.44	0.37	0.44	0.44	0.47	0.43	0.36	0.37
Al2O3	3.06	3.52	2.95	4.19	3.99	4.48	3.80	4.22	4.00	4.59	4.40	2.73	3.17
Cr2O3	1.70	1.59	1.59	1.65	1.67	1.85	1.70	1.63	1.51	1.71	1.73	1.74	1.66
FeO	2.55	2.51	2.50	2.89	3.09	2.90	3.04	2.89	2.84	3.06	3.09	2.22	2.26
MnO		0.16			0.11	0.13						0.11	0.12
MgO	15.78	16.47	15.79	14.27	14.72	13.84	14.40	13.86	14.34	13.99	14.17	15.30	14.83
CaO	17.31	17.41	17.37	17.26	16.94	16.84	17.00	16.44	17.05	16.45	16.62	18.19	17.77
Na2O	2.75	2.62	2.54	3.41	3.50	3.15	3.29	3.58	3.10	3.71	3.73	2.51	2.73
Total	97.88	99.85	97.38	99.01	99.00	99.55	98.58	98.99	98.73	99.11	98.47	99.75	99.01
Si	1.994	1.983	2.006	1.991	1.974	2.027	2.005	2.031	2.021	1.996	1.976	2.047	2.042
Ti	0.009	0.010	0.007	0.012	0.013	0.012	0.010	0.012	0.012	0.013	0.012	0.010	0.010
Al	0.132	0.149	0.128	0.179	0.170	0.191	0.164	0.181	0.172	0.196	0.189	0.117	0.136
Cr	0.049	0.045	0.046	0.047	0.048	0.053	0.049	0.047	0.044	0.049	0.050	0.050	0.048
Fe2+	0.070	0.071	0.077	0.081	0.041	0.088	0.093	0.088	0.086	0.093	0.044	0.067	0.069
Fe3+	0.008	0.004		0.007	0.053						0.050		
Mn		0.005			0.003	0.004						0.003	0.004
Mg	0.862	0.881	0.868	0.772	0.795	0.748	0.783	0.751	0.779	0.755	0.769	0.825	0.805
Ca	0.680	0.670	0.686	0.671	0.657	0.654	0.664	0.640	0.666	0.638	0.648	0.705	0.693
Na	0.195	0.183	0.182	0.240	0.246	0.221	0.233	0.252	0.219	0.261	0.263	0.176	0.193
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.917	0.922	0.918	0.898	0.895	0.895	0.894	0.896	0.900	0.890	0.891	0.924	0.922
Cr#	0.271	0.232	0.264	0.208	0.219	0.218	0.231	0.207	0.201	0.200	0.208	0.297	0.258

	G2	G5			BW80				BW82				
Sample	G2-3-Cpx1	cpxG5-1	cpxG5-2	cpxG5-3	BW80-6-cpx1	BW80-6-cpx2	BW80-6-cpx3	BW80-8-cpx1	BW82-1-cpx1	BW82-1-cpx2	BW82-2-Cpx2	BW82-2-cpx1	BW82-3-cpx1
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	54.31	54.46	54.13	54.56	55.30	54.66	55.26	55.63	54.99	54.53	54.65	54.40	55.28
TiO2	0.21	0.55	0.42	0.33	0.31	0.37	0.33	0.41	0.21	0.15	0.11	0.14	0.21
Al2O3	2.30	4.44	5.03	4.55	3.95	4.02	3.74	3.86	3.65	3.21	3.16	4.42	3.18
Cr2O3	1.57	0.91	0.94	0.65	1.39	1.36	1.64	1.65	0.84	1.13	1.00	0.83	1.04
FeO	1.71	1.53	1.58	1.52	1.68	1.55	1.58	1.39	1.77	1.62	1.77	1.73	1.69
MnO	0.05	0.02	0.02	0.02									
MgO	16.69	14.82	14.33	14.88	15.36	15.67	15.03	15.35	15.67	15.39	15.01	14.58	15.43
CaO	21.12	21.08	20.79	20.81	19.75	20.18	19.97	20.35	20.80	21.17	20.98	20.57	21.24
Na2O	1.38	2.15	2.25	2.03	2.10	2.08	2.20	2.19	1.72	1.64	1.61	1.94	1.65
Total	99.35	99.96	99.50	99.37	99.84	99.88	99.75	100.83	99.64	98.83	98.29	98.60	99.72
Si	1.973	1.963	1.960	1.977	1.996	1.969	1.998	1.989	1.989	1.992	2.011	1.990	2.003
Ti	0.006	0.015	0.011	0.009	0.008	0.010	0.009	0.011	0.006	0.004	0.003	0.004	0.006
Al	0.098	0.189	0.215	0.194	0.168	0.171	0.159	0.162	0.155	0.138	0.137	0.190	0.136
Cr	0.045	0.026	0.027	0.018	0.040	0.039	0.047	0.047	0.024	0.033	0.029	0.024	0.030
Fe2+	0.052	0.046	0.048	0.046	0.051	0.047	0.048	0.042	0.053	0.049	0.054	0.053	0.051
Fe3+													
Mn	0.002	0.001	0.001	0.001									
Mg	0.904	0.797	0.774	0.804	0.826	0.841	0.810	0.818	0.845	0.838	0.823	0.795	0.834
Ca	0.822	0.814	0.806	0.808	0.764	0.779	0.774	0.780	0.806	0.829	0.827	0.806	0.825
Na	0.097	0.150	0.158	0.143	0.147	0.145	0.154	0.152	0.121	0.117	0.115	0.137	0.116
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt
Mg#	0.946	0.945	0.941	0.946	0.943	0.947	0.945	0.952	0.941	0.945	0.938	0.937	0.942
Cr#	0.315	0.121	0.112	0.085	0.189	0.187	0.228	0.221	0.134	0.193	0.176	0.113	0.182

	H2				H3		H4		H6			BW17	
Sample	H2-2-cpx1	H2-2-cpx2	H2-1-cp1	H2-4-cpx1	H3-1-cpx1	H3-2-cpx1	H4-1-Cpx1	H4-1-Cpx2	H6-2-cpx1c	H6-2-cpx2c	H6-3-cpx1c	BW17-1-c1	BW17-1-c2
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	56.77	56.65	56.68	55.76	56.52	56.50	56.32	55.85	55.56	55.33	55.64	54.69	55.39
TiO2	0.22	0.23	0.21	0.53	0.12	0.12	0.21	0.20	0.32	0.33	0.30		
Al2O3	1.98	2.35	2.05	1.25	1.53	1.82	1.54	1.66	2.32	2.02	2.14	0.55	0.69
Cr2O3	0.69	0.70	0.65	0.66	0.59	0.75	0.66	0.70	0.45	0.24	0.27	0.42	0.49
FeO	3.92	4.04	4.10	3.61	3.75	3.80	3.21	3.42	3.83	3.72	3.71	3.11	3.16
MnO	0.17	0.10	0.08	0.28	0.14	0.11	0.10	0.16	0.07	0.14	0.11	0.10	0.12
MgO	19.51	20.18	19.62	19.05	20.41	19.67	19.62	19.00	18.41	18.52	18.52	19.47	19.53
CaO	14.12	14.05	14.22	17.87	15.02	15.52	16.25	16.04	16.83	17.46	17.62	19.10	18.95
Na2O	1.50	1.57	1.49	1.03	1.07	1.12	1.23	1.13	1.84	1.60	1.59	0.55	0.57
Total	98.87	99.87	99.10	100.04	99.14	99.41	99.15	98.16	99.71	99.49	99.96	97.98	98.91
Si	2.058	2.027	2.049	2.010	2.042	2.041	2.036	2.046	1.997	1.996	1.998	2.009	2.017
Ti	0.006	0.006	0.006	0.014	0.003	0.003	0.006	0.005	0.009	0.009	0.008		
Al	0.084	0.099	0.087	0.053	0.065	0.077	0.066	0.072	0.098	0.086	0.091	0.024	0.030
Cr	0.020	0.020	0.019	0.019	0.017	0.022	0.019	0.020	0.013	0.007	0.008	0.012	0.014
Fe2+	0.119	0.121	0.124	0.109	0.113	0.115	0.097	0.105	0.110	0.102	0.110	0.096	0.096
Fe3+									0.005	0.010	0.001		
Mn	0.005	0.003	0.002	0.008	0.004	0.003	0.003	0.005	0.002	0.004	0.003	0.003	0.004
Mg	1.054	1.076	1.057	1.024	1.099	1.059	1.058	1.038	0.986	0.996	0.991	1.066	1.060
Ca	0.549	0.539	0.551	0.690	0.581	0.601	0.629	0.629	0.648	0.675	0.678	0.752	0.739
Na	0.105	0.109	0.104	0.072	0.075	0.079	0.087	0.080	0.128	0.112	0.111	0.039	0.040
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por
Mg#	0.898	0.899	0.895	0.904	0.906	0.902	0.916	0.908	0.896	0.899	0.899	0.918	0.917
Cr#	0.184	0.168	0.171	0.264	0.210	0.214	0.226	0.220	0.116	0.075	0.081	0.333	0.318

										C4			BW76
Sample	BW17-1-c3	BW17-1-c4	BW17-2-c1	BW17-2-c3	BW17-2-c4	BW17-3-c1	BW17-3-c2	BW17-5-c1	BW17-6-c1	C4-2-Cpx1	C4-2-Cpx2	C4-3-Cpx1	BW76-6-cpx1
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	55.36	55.97	55.59	55.44	55.09	55.36	55.32	54.97	55.30	53.95	54.27	53.98	55.30
TiO2										0.09	0.03	0.11	0.31
Al2O3	0.81	0.78	0.96	0.93	0.74	0.76	0.76	0.91	0.82	4.14	4.86	4.46	3.95
Cr2O3	0.54	0.48	0.39	0.59	0.50	0.52	0.57	0.58	0.54	1.98	2.31	2.08	1.39
FeO	3.12	3.10	3.05	3.16	3.20	3.11	3.12	3.11	3.09	1.80	1.74	1.59	1.68
MnO	0.07	0.21	0.10	0.01	0.08	0.11	0.05	0.03	0.05	0.16	0.07	0.08	
MgO	19.27	20.15	19.33	20.04	19.97	19.09	19.02	19.61	19.67	14.52	13.50	14.28	15.36
CaO	18.78	18.88	18.95	19.12	18.91	18.79	19.03	18.86	18.75	18.59	18.70	18.70	19.75
Na2O	0.52	0.51	0.54	0.55	0.58	0.54	0.51	0.54	0.49	2.87	2.87	2.84	2.10
Total	98.47	100.08	98.90	99.84	99.08	98.27	98.38	98.61	98.72	98.11	98.35	98.12	99.84
Si	2.027	2.012	2.025	1.996	1.999	2.032	2.029	2.006	2.016	1.975	1.990	1.977	1.996
Ti										0.002	0.001	0.003	0.008
Al	0.035	0.033	0.041	0.039	0.032	0.033	0.033	0.039	0.035	0.179	0.210	0.193	0.168
Cr	0.016	0.014	0.011	0.017	0.014	0.015	0.017	0.017	0.016	0.057	0.067	0.060	0.040
Fe2+	0.096	0.093	0.093	0.095	0.097	0.095	0.096	0.095	0.094	0.043	0.053	0.049	0.051
Fe3+										0.013			
Mn	0.002	0.006	0.003		0.002	0.003	0.001	0.001	0.002	0.005	0.002	0.002	
Mg	1.051	1.080	1.049	1.076	1.080	1.044	1.040	1.067	1.069	0.793	0.738	0.780	0.826
Ca	0.737	0.727	0.740	0.738	0.735	0.739	0.748	0.737	0.732	0.729	0.735	0.734	0.764
Na	0.037	0.036	0.038	0.039	0.041	0.038	0.037	0.038	0.035	0.204	0.204	0.201	0.147
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Spl	Spl	Spl	Spl
Mg#	0.917	0.920	0.919	0.919	0.918	0.916	0.916	0.918	0.919	0.935	0.933	0.941	0.943
Cr#	0.314	0.298	0.212	0.304	0.304	0.313	0.327	0.304	0.314	0.242	0.243	0.237	0.189

				BW60			F3					F4	
Sample	BW76-6-cpx2	BW76-6-cpx3	BW76-8-cpx1	Bw60-1-cpx2	Bw60-2-cpx2	Bw60-2-cpx1	F3-1-Cpx1	F3-1-Cpx2	F3-1-Cpx3	F3-1-Cpx4	F3-1-Cpx5	Line 6 F4-2-4	Line 1 F4-1-Cpx3
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
SiO2	54.66	55.26	55.63	54.84	55.85	55.52	54.60	55.48	55.03	54.81	55.09	53.14	53.73
TiO2	0.37	0.33	0.41	0.13	0.04	0.15	0.10	0.17	0.10	0.15	0.09	0.31	0.26
Al2O3	4.02	3.74	3.86	4.26	3.40	4.10	2.33	2.64	1.93	2.56	2.13	3.82	3.83
Cr2O3	1.36	1.64	1.65	0.89	0.62	0.78	1.86	2.02	1.43	1.81	1.62	1.03	0.96
FeO	1.55	1.58	1.39	1.69	1.61	1.56	1.46	1.50	1.64	1.57	1.63	1.52	1.64
MnO						0.10	0.06	0.10	0.07	0.13	0.13	0.05	0.07
MgO	15.67	15.03	15.35	15.61	15.90	15.47	15.78	15.89	17.46	16.22	16.34	16.01	15.70
CaO	20.18	19.97	20.35	21.55	21.91	21.71	20.76	20.63	21.21	20.50	21.04	22.76	22.80
Na2O	2.08	2.20	2.19	1.38	1.28	1.39	1.63	1.59	1.40	1.59	1.38	1.41	1.45
Total	99.88	99.75	100.83	100.35	100.60	100.78	98.58	100.03	100.29	99.34	99.44	100.05	100.44
Si	1.969	1.998	1.989	1.974	2.006	1.992	2.002	2.008	1.975	1.993	2.004	1.915	1.931
Ti	0.010	0.009	0.011	0.004	0.001	0.004	0.003	0.005	0.003	0.004	0.003	0.008	0.007
Al	0.171	0.159	0.162	0.181	0.144	0.173	0.101	0.113	0.082	0.110	0.091	0.162	0.162
Cr	0.039	0.047	0.047	0.025	0.018	0.022	0.054	0.058	0.041	0.052	0.046	0.029	0.027
Fe2+	0.047	0.048	0.042	0.051	0.048	0.047	0.045	0.045	0.030	0.048	0.049		0.015
Fe3+									0.019			0.046	0.034
Mn						0.003	0.002	0.003	0.002	0.004	0.004	0.002	0.002
Mg	0.841	0.810	0.818	0.838	0.851	0.827	0.863	0.857	0.934	0.879	0.886	0.860	0.841
Ca	0.779	0.774	0.780	0.831	0.843	0.834	0.816	0.800	0.816	0.799	0.820	0.879	0.878
Na	0.145	0.154	0.152	0.096	0.089	0.097	0.116	0.111	0.098	0.112	0.097	0.099	0.101
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl
Mg#	0.947	0.945	0.952	0.942	0.946	0.947	0.950	0.950	0.950	0.949	0.947	0.949	0.944
Cr#	0.187	0.228	0.221	0.122	0.106	0.113	0.351	0.341	0.333	0.323	0.336	0.151	0.142

Sample	Line 4 F4-2-4	Line 5 F4-2-4
Mineral	Cpx	Cpx
SiO2	53.33	53.29
TiO2	0.27	0.27
Al2O3	3.82	3.81
Cr2O3	1.01	1.07
FeO	1.65	1.51
MnO	0.07	0.04
MgO	15.94	15.88
CaO	22.80	22.81
Na2O	1.34	1.42
Total	100.34	100.09
Si	1.919	1.921
Ti	0.007	0.007
Al	0.162	0.162
Cr	0.029	0.030
Fe2+		
Fe3+	0.050	0.046
Mn	0.002	0.001
Mg	0.855	0.853
Ca	0.879	0.881
Na	0.093	0.099
Kations	4	4
Oxygen	6	6
Type	Spl	Spl
Mg#	0.945	0.949
Cr#	0.151	0.161

12.1.4 Clinopyroxene-rim

	A1				B3			BW1				BW4	
Sample	Line 5 A1-4-cpxr	Line 15 A1-4-cpxr	Line 9 A1-4-cpxr	Line 7 A1-4-cpxr	B3-1-cpx1r	B3-1-cpx2r	B3-1-cpx2r	BW1-3-c2	BW1-4-c2	BW1-4-c3	BW1-1-c2	BW4-cpx3r	BW4-cpx6r
Mineral	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx
SiO2	54.19	54.57	54.46	54.20	54.12	54.96	54.54	55.12	55.60	55.16	55.75	55.97	55.58
TiO2	0.43	0.52	0.68	0.70	0.20	0.26	0.20	0.39	0.33	0.64	0.41	0.32	0.40
Al2O3	1.73	1.84	1.57	1.33	1.98	2.91	2.89	2.38	2.30	1.81	2.44	1.49	1.79
Cr2O3	0.85	0.85	0.70	0.68	1.04	1.08	0.97	1.34	1.24	1.92	1.23	1.71	1.33
FeO	3.56	3.42	3.73	3.28	3.42	3.62	3.51	2.88	3.09	2.53	3.05	2.64	2.67
MnO	0.06	0.10	0.08	0.13	0.10	0.10	0.09	0.08	0.12	0.05	0.08		
MgO	16.64	16.35	16.70	16.35	15.62	14.93	14.93	17.12	15.50	16.68	15.80	16.99	16.35
CaO	20.36	20.47	21.20	21.81	21.21	19.28	19.29	18.13	18.30	20.75	18.25	20.36	20.68
Na2O	1.17	1.30	0.94	0.91	1.45	2.53	2.36	2.09	2.11	1.22	2.02	1.22	1.20
Total	99.00	99.41	100.04	99.38	99.15	99.66	98.77	99.53	98.60	100.77	99.02	100.70	100.02
Si	1.986	1.992	1.981	1.986	1.982	1.992	1.995	1.991	2.040	1.989	2.036	2.016	2.018
Ti	0.012	0.014	0.019	0.019	0.005	0.007	0.005	0.011	0.009	0.017	0.011	0.009	0.011
Al	0.075	0.079	0.067	0.057	0.086	0.124	0.124	0.101	0.099	0.077	0.105	0.063	0.077
Cr	0.025	0.024	0.020	0.020	0.030	0.031	0.028	0.038	0.036	0.055	0.035	0.049	0.038
	0.109	0.104	0.113	0.100	0.093	0.085	0.093	0.083	0.095	0.076	0.093	0.079	0.081
Fe					0.012	0.024	0.014	0.004					
Mn	0.002	0.003	0.002	0.004	0.003	0.003	0.003	0.003	0.004	0.002	0.002		
Mg	0.909	0.890	0.905	0.893	0.853	0.807	0.814	0.922	0.848	0.897	0.860	0.912	0.885
Ca	0.799	0.801	0.826	0.856	0.833	0.749	0.756	0.702	0.719	0.802	0.714	0.786	0.805
Na	0.083	0.092	0.066	0.064	0.103	0.178	0.167	0.146	0.150	0.086	0.143	0.085	0.085
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.890	0.900	0.890	0.900	0.890	0.880	0.880	0.910	0.900	0.920	0.900	0.920	0.920
Cr#	0.250	0.230	0.230	0.260	0.260	0.200	0.180	0.270	0.270	0.420	0.250	0.430	0.330

		BW5			BW6						BW7		
Sample	BW4-cpx7r	BW5-1-Cpx2	BW5-1-Cpx4	BW5-2-Cpx2	BW6-7-Cpx1	BW6-4-c1	BW6-5-Cpx2	BW6-6-Cpx1	BW6-6-Cpx2	BW6-6-Cpx3	BW7T-CPX2	BW7T-CPX4	BW7T-CPX5
Mineral	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx
SiO2	56.94	55.16	53.28	54.08	49.11	54.89	53.40	54.40	54.27	54.45	54.95	54.95	54.75
TiO2	0.40	0.32	0.61	0.39	0.21	0.25	0.33	0.20	0.41	0.88	0.23	0.27	0.27
Al2O3	2.71	3.23	2.53	1.94	9.99	3.07	1.92	2.81	1.08	0.33	1.20	1.73	0.90
Cr2O3	1.43	1.59	1.64	1.53	1.20	1.53	1.92	1.50	1.71	0.70	1.96	1.88	1.89
FeO	2.35	2.42	2.76	2.26	4.95	2.02	2.79	2.21	2.44	3.52	2.43	2.44	2.44
MnO			0.17		0.43					0.18	0.15		
MgO	15.86	15.71	16.22	16.67	15.25	15.60	16.59	15.88	16.72	19.84	17.18	17.31	17.12
CaO	18.26	17.61	20.06	20.91	18.06	19.53	20.89	19.68	21.41	18.70	20.06	20.31	20.43
Na2O	2.15	2.70	1.20	1.24	0.77	1.85	1.03	1.98	1.02	0.62	1.30	1.29	1.10
Total	100.10	98.73	98.48	99.02	99.96	98.74	98.87	98.66	99.06	99.21	99.46	100.19	98.90
Si	2.054	2.006	1.965	1.977	1.785	2.007	1.962	1.987	1.990	1.981	2.000	1.984	2.007
Ti	0.011	0.009	0.017	0.011	0.006	0.007	0.009	0.006	0.011	0.024	0.006	0.007	0.007
Al	0.115	0.139	0.110	0.084	0.428	0.132	0.083	0.121	0.047	0.014	0.051	0.074	0.039
Cr	0.041	0.046	0.048	0.044	0.034	0.044	0.056	0.043	0.050	0.020	0.056	0.054	0.055
	0.071	0.074	0.085	0.069	0.139	0.062	0.086	0.068	0.075	0.106	0.074	0.074	0.075
Fe					0.011					0.001			
Mn			0.005		0.013					0.006	0.005		
Mg	0.853	0.852	0.892	0.909	0.826	0.851	0.909	0.865	0.914	1.076	0.932	0.932	0.936
Ca	0.706	0.686	0.793	0.819	0.703	0.765	0.822	0.770	0.841	0.729	0.783	0.786	0.803
Na	0.150	0.190	0.086	0.088	0.055	0.131	0.073	0.140	0.073	0.044	0.092	0.090	0.078
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.920	0.920	0.910	0.930	0.850	0.930	0.910	0.930	0.920	0.910	0.930	0.930	0.930
Cr#	0.260	0.250	0.300	0.350	0.070	0.250	0.400	0.260	0.520	0.590	0.520	0.420	0.590

		BW10			BW44		BW80				BW82		H2
Sample	BW7-6-c3	BW10-4-c2	BW10-172-Cpx3	BW10-0917-Cpx3	Bw44-3-cpx3r	Bw44-4-cpx1	BW80-6-cpx4	BW80-6-cpx5	BW80-6-cpx6	BW80-6-cpx7	BW82-2-cpx3	BW82-2-cpx4	H2-2-cpx3
Mineral	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx
SiO2	52.69	54.44	53.47	52.08	54.29	55.43	54.52	54.73	53.01	53.11	55.00	55.08	55.71
TiO2	0.35	0.35	0.49	0.39	0.91	1.07	0.38	0.40	0.98	0.86	0.21	0.11	0.55
Al2O3	3.78	2.45	2.33	3.73	3.56	2.43	3.62	3.63	2.37	2.27	3.26	4.10	2.50
Cr2O3	1.59	1.98	1.91	1.78	1.84	0.58	1.78	1.55	1.97	1.73	0.99	0.78	0.70
FeO	2.74	2.99	3.03	3.02	3.00	3.21	1.57	1.57	2.21	2.27	1.78	2.07	3.69
MnO	0.11	0.18	0.11	0.16									0.09
MgO	15.60	16.25	15.33	15.02	16.04	17.38	15.06	15.43	15.65	15.90	14.87	15.73	18.12
CaO	21.26	19.55	19.45	19.76	19.09	19.59	20.05	20.19	21.88	21.95	21.04	20.49	16.33
Na2O	0.91	1.62	2.03	1.79	1.41	1.06	2.29	2.20	0.94	0.98	1.64	1.68	1.67
Total	99.03	99.81	98.13	97.73	100.13	100.77	99.27	99.71	99.01	99.07	98.79	100.05	99.38
Si	1.936	1.977	1.974	1.931	1.970	1.994	1.996	1.999	1.979	1.977	1.953	1.952	2.015
Ti	0.010	0.009	0.014	0.011	0.025	0.029			0.010	0.011	0.027	0.024	0.006
Al	0.164	0.105	0.101	0.163	0.152	0.103	0.039	0.032	0.155	0.155	0.103	0.099	0.141
Cr	0.046	0.057	0.056	0.052	0.053	0.017	0.017	0.014	0.051	0.044	0.057	0.050	0.029
	0.084	0.091	0.081	0.065	0.091	0.096	0.095	0.097	0.048	0.048	0.068	0.070	0.055
Fe			0.013	0.029									
Mn	0.003	0.006	0.003	0.005				0.002					
Mg	0.854	0.880	0.844	0.831	0.868	0.932	1.076	1.080	0.815	0.831	0.860	0.871	0.812
Ca	0.837	0.761	0.769	0.785	0.742	0.755	0.738	0.735	0.780	0.781	0.864	0.865	0.826
Na	0.065	0.114	0.145	0.128	0.099	0.074	0.039	0.041	0.161	0.154	0.067	0.070	0.116
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	Por
Mg#	0.910	0.910	0.900	0.900	0.910	0.910	0.940	0.950	0.930	0.930	0.940	0.930	0.900
Cr#	0.220	0.350	0.360	0.240	0.260	0.140	0.250	0.220	0.360	0.340	0.170	0.110	0.160

		H3		H4	H6				BW17		F3		
Sample	H2-3-cpx1	H3-1-cpx2	H3-2-cpx2	H4-1-Cpx3	H6-2-cpx1r	H6-2-cpx2r	H6-3-cpx1r	H6-3-cpx2r	BW17-2-c3	BW17-2-c4	F3-2-Cpx1	F3-2-Cpx2	F3-4-Cpx1
Mineral	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx	cpx
SiO2	55.14	54.19	53.43	56.02	55.39	54.17	55.36	55.54	55.44	55.09	53.80	53.68	55.17
TiO2	0.62	0.70	0.70	0.20	0.34	0.56	0.31	0.26			0.60	0.17	0.15
Al2O3	0.57	3.13	1.51	1.64	2.43	2.41	1.77	1.57	0.93	0.74	0.76	2.16	2.82
Cr2O3	0.57	1.12	1.07	0.91	0.53	0.49	0.61	0.22	0.59	0.50	1.62	1.90	2.05
FeO	3.78	3.27	2.76	3.41	3.97	3.56	3.77	3.64	3.16	3.20	3.66	1.62	1.54
MnO	0.06	0.10	0.07	0.12	0.12	0.15	0.10	0.12	0.01	0.08	0.12	0.09	0.07
MgO	17.85	16.48	16.67	19.48	18.08	17.65	18.21	18.67	20.04	19.97	18.52	16.51	15.48
CaO	18.84	18.30	20.82	15.11	16.62	19.01	17.94	18.34	19.12	18.91	18.12	20.48	20.64
Na2O	0.94	1.34	0.97	1.26	1.81	1.36	1.58	1.41	0.55	0.58	0.99	1.79	1.66
Total	98.38	98.63	98.00	98.16	99.29	99.36	99.64	99.76	99.84	99.08	98.20	98.40	99.56
Si	1.985	1.983	1.964	2.007	2.016	2.032	1.991	1.979	2.047	2.003	1.965	1.998	1.999
Ti	0.003	0.017	0.005	0.004	0.015	0.017	0.019	0.020	0.006	0.009	0.015	0.008	0.007
Al	0.174	0.033	0.093	0.121	0.107	0.025	0.136	0.066	0.071	0.103	0.103	0.075	0.067
Cr	0.022	0.047	0.055	0.059	0.020	0.017	0.033	0.031	0.026	0.015	0.014	0.017	0.006
Fe2+	0.062	0.113	0.009	0.047	0.112	0.116	0.100	0.085	0.104	0.120	0.091	0.109	0.096
Fe3+			0.040								0.017	0.005	0.013
Mn		0.004	0.003	0.002	0.003	0.002	0.003	0.002	0.004	0.004	0.005	0.003	0.004
Mg	0.845	1.018	0.901	0.839	0.977	0.980	0.903	0.920	1.061	0.975	0.955	0.980	1.002
Ca	0.791	0.716	0.803	0.804	0.633	0.744	0.720	0.826	0.592	0.644	0.739	0.694	0.707
Na	0.117	0.071	0.127	0.117	0.117	0.067	0.095	0.070	0.090	0.127	0.096	0.111	0.099
Kations	4	4	4	4	4	4	4	4	4	4	4	4	4
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Spl	Spl	Spl
Mg#	0.890	0.900	0.920	0.910	0.890	0.900	0.900	0.900	0.920	0.920	0.900	0.950	0.950
Cr#	0.390	0.190	0.320	0.270	0.130	0.120	0.180	0.080	0.300	0.300	0.590	0.370	0.330

12.1.5 Garnet

	A1				B3					BW1			
Sample	A1-1-gt-r1	A1-1-gt-r2	A1-1-gt-g3	A1-1-gt-g4	B3-2-g1c	B3-2-g1r	B3-2-g1m	B3-3-g1c	B3-3-g1r	BW1-1-g1	BW1-1-g2	BW1-2-g1	BW1-2-g2
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	41.07	40.88	40.93	40.65	42.18	42.27	42.30	42.55	42.21	40.99	41.84	40.97	41.32
TiO2	0.85	0.76	0.87	0.79	0.16	0.15	0.16	0.16	0.15	0.23	0.27	0.26	0.46
Al2O3	22.35	22.22	22.45	22.39	21.97	22.18	22.12	22.17	22.66	20.04	20.94	20.46	20.40
Cr2O3	1.56	1.53	1.12	1.20	2.34	2.00	2.39	2.01	1.94	4.60	3.83	3.77	3.06
FeO	8.88	8.77	8.85	8.55	11.01	11.67	11.21	11.39	11.52	8.11	8.19	7.95	8.38
MnO	0.30	0.27	0.24	0.28	0.44	0.46	0.49	0.49	0.51	0.26	0.26	0.32	0.38
MgO	19.98	19.91	20.03	19.77	17.94	17.92	17.69	17.98	18.02	19.92	20.61	20.06	20.25
CaO	5.15	5.04	5.11	5.13	4.64	4.59	4.73	4.63	4.56	4.74	4.54	4.38	4.35
Total	100.14	99.37	99.59	98.76	100.66	101.24	101.07	101.37	101.58	98.89	100.48	98.17	98.60
Si	2.927	2.933	2.927	2.931	3.031	3.022	3.032	3.037	3.005	2.976	2.978	2.986	2.997
Ti	0.046	0.041	0.047	0.043	0.008	0.008	0.009	0.009	0.008	0.013	0.014	0.014	0.025
Al	1.877	1.879	1.892	1.903	1.860	1.869	1.869	1.865	1.901	1.715	1.756	1.757	1.744
Cr	0.088	0.087	0.063	0.068	0.133	0.113	0.136	0.113	0.109	0.264	0.216	0.217	0.175
Fe2+	0.439	0.441	0.432	0.436	0.662	0.698	0.672	0.680	0.686	0.448	0.444	0.459	0.471
Fe3+	0.090	0.086	0.097	0.080						0.045	0.044	0.026	0.037
Mn	0.018	0.017	0.014	0.017	0.027	0.028	0.030	0.030	0.030	0.016	0.016	0.020	0.023
Mg	2.123	2.130	2.136	2.125	1.922	1.910	1.890	1.913	1.913	2.156	2.187	2.179	2.189
Ca	0.393	0.387	0.391	0.396	0.357	0.352	0.363	0.354	0.348	0.369	0.346	0.342	0.338
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.801	0.802	0.801	0.805	0.744	0.732	0.738	0.738	0.736	0.814	0.818	0.818	0.812
Cr#	0.045	0.044	0.033	0.035	0.067	0.057	0.068	0.057	0.054	0.134	0.109	0.11	0.092

			BW4								
Sample	BW1-1-g3	BW1-2-g3	BW4-1-grt1	BW4-1-grt2	BW4-1-grt3	BW4-2-grt4r	BW4-2-grt2	BW4-2-grt4r	BW4-2-grt2	BW4-2-grt4	BW4-2-grt1
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	41.91	42.06	42.28	42.13	41.86	41.88	41.98	43.20	43.30	43.71	43.68
TiO2	0.54	0.37	0.33	0.36	0.45	0.40	0.38	0.40	0.38	0.34	0.74
Al2O3	20.25	20.04	21.70	22.62	22.08	20.96	22.46	20.74	22.22	22.22	22.50
Cr2O3	3.76	4.10	2.30	2.12	2.14	3.25	2.24	3.25	2.25	2.16	1.19
FeO	8.58	8.25	7.59	7.48	7.37	7.55	7.35	7.36	7.17	7.55	6.38
MnO	0.32	0.30	0.30	0.34	0.33	0.46	0.33	0.46	0.33	0.33	0.23
MgO	19.70	20.48	21.72	22.10	21.21	22.21	22.68	20.38	20.81	20.91	22.07
CaO	4.74	4.72	4.17	4.04	4.13	4.40	4.16	4.40	4.16	4.10	4.66
Total	99.80	100.32	100.38	101.19	99.58	101.11	101.59	100.19	100.61	101.31	101.45
Si	3.019	3.006	2.984	2.942	2.979	2.940	2.915	3.082	3.057	3.067	3.035
Ti	0.029	0.020	0.018	0.019	0.024	0.021	0.020	0.022	0.020	0.018	0.039
Al	1.719	1.688	1.805	1.862	1.852	1.734	1.838	1.743	1.849	1.837	1.843
Cr	0.214	0.232	0.128	0.117	0.120	0.180	0.123	0.183	0.125	0.120	0.065
Fe2+	0.517	0.464	0.383	0.337	0.417	0.279	0.258	0.439	0.423	0.443	0.371
Fe3+		0.029	0.064	0.100	0.021	0.164	0.169				
Mn	0.020	0.018	0.018	0.020	0.020	0.027	0.019	0.028	0.020	0.019	0.014
Mg	2.116	2.182	2.285	2.301	2.250	2.324	2.348	2.167	2.191	2.187	2.287
Ca	0.366	0.361	0.315	0.303	0.315	0.331	0.309	0.336	0.315	0.308	0.347
Kations	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.804	0.816	0.836	0.84	0.837	0.84	0.846	0.831	0.838	0.831	0.86
Cr#	0.111	0.121	0.067	0.059	0.061	0.094	0.063	0.095	0.064	0.061	0.034

	BW5		BW6						BW7				
Sample	BW5-1-grt1	BW5-1-grt2	BW6-4-g1	BW6-4-g2	BW6-4-g3	BW6-3-g1	BW6-3-g2	BW6-3-g3	BW7-6-grt3	BW7-6-grt2	BW7-4-g1	BW7-4-g2	BW7-3-g1
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	42.83	42.68	41.93	41.97	42.48	42.18	42.36	42.72	42.49	42.49	42.05	41.59	42.49
TiO2	0.28	0.33	0.16	0.16	0.12	0.18	0.04	0.05	0.25	0.33	0.30	0.27	0.30
Al2O3	22.25	22.13	22.05	21.90	22.03	22.43	21.57	22.25	21.74	21.63	21.56	21.17	20.89
Cr2O3	2.82	2.25	2.22	2.16	2.15	2.00	2.04	2.02	2.67	2.84	2.66	2.72	2.66
FeO	7.10	7.21	8.62	8.39	8.61	8.53	8.63	8.53	7.79	7.89	7.56	7.85	7.45
MnO	0.36	0.40	0.41	0.39	0.43	0.35	0.53	0.28	0.36	0.27	0.32	0.31	0.37
MgO	21.09	21.52	20.41	19.97	20.35	20.22	19.66	19.81	20.93	21.03	21.81	21.14	20.93
CaO	4.05	3.89	4.32	4.34	4.43	4.42	4.46	4.32	4.32	4.30	4.19	4.32	4.34
Total	100.78	100.41	100.12	99.28	100.60	100.31	99.29	99.98	100.55	100.78	100.46	99.37	99.43
Si	3.018	3.011	2.984	3.015	3.011	2.996	3.048	3.048	3.006	3.002	2.967	2.975	3.039
Ti	0.015	0.018	0.009	0.009	0.006	0.010	0.002	0.003	0.013	0.018	0.016	0.015	0.016
Al	1.848	1.840	1.850	1.854	1.840	1.877	1.829	1.871	1.813	1.800	1.793	1.784	1.762
Cr	0.157	0.125	0.125	0.123	0.120	0.112	0.116	0.114	0.149	0.158	0.149	0.154	0.150
Fe2+	0.418	0.425	0.473	0.504	0.505	0.507	0.519	0.509	0.461	0.463	0.353	0.385	0.446
Fe3+			0.040		0.006					0.003	0.093	0.084	
Mn	0.021	0.024	0.025	0.024	0.026	0.021	0.032	0.017	0.021	0.016	0.019	0.019	0.023
Mg	2.216	2.263	2.166	2.138	2.150	2.141	2.109	2.107	2.208	2.214	2.294	2.254	2.232
Ca	0.306	0.294	0.329	0.334	0.336	0.336	0.344	0.330	0.328	0.325	0.317	0.331	0.332
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz
Mg#	0.841	0.842	0.808	0.809	0.808	0.809	0.803	0.806	0.827	0.826	0.837	0.828	0.834
Cr#	0.079	0.064	0.063	0.062	0.061	0.056	0.06	0.058	0.076	0.081	0.076	0.079	0.079

		BW10						BW44		D1			
Sample	BW7-3-g2	BW10-4-g1	BW10-4-g2	BW10-4-g3	BW10-2-g1	BW10-1-g1	BW10-1-g2	Bw44-1-g1	Bw44-1-g2	Line 3 D1-2-1	Line 4 D1-2-1	Line 9 D1-2-3	Line 10 D1-2-3
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	42.47	42.13	42.28	42.30	42.48	42.35	42.16	43.41	43.62	40.92	40.87	40.93	40.82
TiO2	0.28	0.31	0.18	0.25	0.25	0.24	0.23	0.37	0.33	0.05	0.07	0.07	0.01
Al2O3	22.02	21.19	21.67	21.62	20.99	22.12	21.15	22.23	21.75	17.30	17.12	17.36	17.43
Cr2O3	2.75	2.85	2.20	2.66	3.03	2.07	2.05	2.67	2.65	8.39	8.45	8.50	8.64
FeO	7.68	8.78	9.01	9.01	9.08	9.06	9.17	7.23	7.12	6.74	6.89	6.94	7.24
MnO	0.31	0.41	0.43	0.49	0.52	0.41	0.44	0.39	0.36	0.32	0.34	0.32	0.38
MgO	21.22	19.49	19.87	19.78	19.91	20.46	20.45	20.67	20.40	18.72	18.78	19.06	19.37
CaO	4.41	4.03	3.82	3.97	4.14	3.90	3.73	4.16	4.12	7.22	7.12	7.19	7.23
Total	101.14	99.19	99.46	100.08	100.40	100.61	99.38	101.13	100.35	99.66	99.63	100.35	101.12
Si	2.984	3.046	3.039	3.028	3.036	3.002	3.028	3.056	3.097	2.989	2.987	2.967	2.936
Ti	0.015	0.017	0.010	0.013	0.013	0.013	0.012	0.020	0.018	0.003	0.004	0.004	0.001
Al	1.824	1.806	1.836	1.824	1.768	1.848	1.790	1.844	1.820	1.489	1.475	1.483	1.478
Cr	0.153	0.163	0.125	0.151	0.171	0.116	0.116	0.149	0.149	0.484	0.488	0.487	0.492
Fe2+	0.425	0.531	0.542	0.539	0.543	0.532	0.537	0.426	0.423	0.368	0.367	0.333	0.279
Fe3+	0.026					0.005	0.014			0.044	0.054	0.088	0.157
Mn	0.019	0.025	0.026	0.030	0.031	0.025	0.027	0.023	0.022	0.020	0.021	0.020	0.023
Mg	2.223	2.101	2.129	2.111	2.121	2.162	2.189	2.169	2.159	2.039	2.046	2.060	2.078
Ca	0.332	0.312	0.294	0.304	0.317	0.296	0.287	0.314	0.313	0.565	0.558	0.559	0.557
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Hzb	Hzb	Hzb	Hzb
Mg#	0.831	0.798	0.797	0.797	0.796	0.801	0.799	0.836	0.836	0.832	0.829	0.83	0.827
Cr#	0.077	0.083	0.064	0.076	0.088	0.059	0.061	0.075	0.076	0.245	0.249	0.247	0.25

			D3				D4		E4				
Sample	Line 6 D1-2-6	Line 7 D1-2-6	D3-1-Grt1	D3-1-Grt2r	D3-2-Grt1	D3-2-Grt2	D4-4-g1	D4-4-g2	E4-3-grt1	Line 13 E4-1-grt1	Line 14 E4-1-grt1	Line 2 E4-1-grt3	Line 3 E4-1-grt3
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	40.24	40.09	40.67	40.86	40.97	41.32	41.48	41.23	40.78	40.97	41.14	41.20	40.80
TiO2	0.05	0.04	0.11	0.25	0.13	0.11	0.13	0.11	0.16	0.20	0.18	0.13	0.16
Al2O3	17.20	17.08	17.23	17.84	17.29	17.08	19.32	19.32	21.52	20.30	20.23	21.60	21.26
Cr2O3	8.72	8.67	7.85	8.13	9.01	8.28	6.86	6.91	3.54	3.98	3.77	3.65	3.73
FeO	6.92	7.09	6.00	6.04	6.01	6.19	6.62	6.66	7.22	7.43	7.21	7.37	7.01
MnO	0.31	0.32	0.31	0.36	0.47	0.26	0.43	0.42	0.34	0.38	0.35	0.36	0.34
MgO	18.91	18.91	22.60	22.60	22.27	21.87	19.87	20.43	20.82	21.69	21.31	21.17	20.91
CaO	7.22	7.23	4.29	4.39	4.27	4.37	5.36	5.29	4.80	4.81	4.79	4.78	4.80
Total	99.56	99.44	99.07	100.47	100.42	99.47	100.07	100.37	99.17	99.77	98.98	100.26	99.00
Si	2.942	2.935	2.936	2.912	2.932	2.985	2.989	2.956	2.924	2.921	2.956	2.922	2.930
Ti	0.003	0.002	0.006	0.013	0.007	0.006	0.007	0.006	0.008	0.011	0.010	0.007	0.009
Al	1.482	1.474	1.465	1.499	1.459	1.454	1.641	1.632	1.819	1.705	1.713	1.805	1.800
Cr	0.504	0.502	0.448	0.458	0.510	0.473	0.391	0.392	0.201	0.224	0.214	0.205	0.212
Fe2+	0.299	0.285	0.159	0.168	0.206	0.281	0.399	0.346	0.318	0.236	0.293	0.305	0.311
Fe3+	0.124	0.149	0.203	0.192	0.154	0.093		0.053	0.115	0.207	0.140	0.132	0.111
Mn	0.019	0.020	0.019	0.022	0.029	0.016	0.026	0.026	0.020	0.023	0.021	0.022	0.021
Mg	2.061	2.065	2.432	2.401	2.377	2.355	2.134	2.183	2.226	2.305	2.283	2.239	2.239
Ca	0.566	0.568	0.332	0.335	0.327	0.338	0.414	0.406	0.369	0.368	0.369	0.363	0.369
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb
Mg#	0.83	0.826	0.87	0.87	0.869	0.863	0.842	0.845	0.837	0.839	0.84	0.837	0.842
Cr#	0.254	0.254	0.234	0.234	0.259	0.246	0.192	0.194	0.1	0.116	0.111	0.102	0.105

	G1									G2			
Sample	G1-3-g1	G1-3-g2	G1-3-g3	G1-3-g4	G1-5-g1	G1-5-g2	G1-5-g3	G1-5-g4	G1-5-g5	G2-1-2-Grt1	G2-1-Grt2	G2-2-Grt1	G2-3-grt1
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	41.93	42.00	41.69	41.73	42.46	41.94	41.62	42.67	42.24	41.93	41.26	41.97	42.17
TiO2										0.10	0.15	0.08	0.04
Al2O3	21.59	21.94	20.68	21.58	21.51	21.76	21.77	21.41	21.77	22.23	21.63	22.48	22.43
Cr2O3	3.43	3.31	3.34	3.02	2.99	2.85	2.92	3.22	2.64	2.71	2.42	2.17	2.82
FeO	8.09	8.07	7.77	7.89	7.92	7.98	7.81	8.07	7.90	8.39	8.30	8.40	8.41
MnO	0.47	0.53	0.58	0.45	0.51	0.58	0.42	0.52	0.50	0.46	0.56	0.52	0.50
MgO	19.49	19.59	19.34	19.56	19.49	19.38	19.75	19.63	19.55	19.22	19.26	19.39	19.99
CaO	5.55	5.38	5.24	5.44	5.45	5.28	5.35	5.54	5.36	5.03	5.02	4.73	5.05
Total	100.55	100.82	98.64	99.67	100.33	99.77	99.64	101.06	99.96	100.07	98.60	99.74	101.41
Si	2.988	2.983	3.028	2.994	3.029	3.008	2.982	3.025	3.020	3.000	2.993	3.006	2.971
Ti										0.005	0.008	0.004	0.002
Al	1.813	1.836	1.770	1.825	1.809	1.839	1.838	1.789	1.834	1.875	1.849	1.898	1.863
Cr	0.193	0.186	0.192	0.171	0.169	0.162	0.165	0.180	0.149	0.153	0.139	0.123	0.157
Fe2+	0.465	0.468	0.472	0.456	0.473	0.479	0.436	0.478	0.472	0.502	0.494	0.503	0.463
Fe3+	0.017	0.012		0.017			0.032				0.010		0.033
Mn	0.028	0.032	0.036	0.027	0.031	0.035	0.025	0.031	0.030	0.028	0.034	0.032	0.030
Mg	2.071	2.074	2.094	2.092	2.073	2.072	2.110	2.075	2.084	2.050	2.083	2.071	2.100
Ca	0.424	0.409	0.408	0.418	0.417	0.406	0.411	0.421	0.411	0.386	0.390	0.363	0.381
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	Hzb	SplGrt	SplGrt	SplGrt	SplGrt
Mg#	0.811	0.812	0.816	0.815	0.814	0.812	0.818	0.813	0.815	0.803	0.805	0.805	0.809
Cr#	0.096	0.092	0.098	0.086	0.085	0.081	0.083	0.091	0.075	0.076	0.07	0.061	0.078

	G5											BW80	
Sample	Line 1 G5-1-1	Line 2 G5-1-1	Line 3 G5-1-1	Line 4 G5-1-1	Line 5 G5-1-1	Line 6 G5-1-1	G5-2-cpx1	G5-2-cpx2	G5-2-cpx3	G5-2-cpx7	G5-2-cpx8	BW80-1-g1	BW80-1-g2
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	41.40	41.45	41.62	41.84	41.96	41.62	41.99	42.96	42.54	43.14	43.05	42.61	42.49
TiO2	0.09	0.08	0.07	0.09	0.10	0.06	0.04	0.08	0.15	0.07	0.05	0.09	0.14
Al2O3	23.43	23.37	23.44	23.48	23.56	23.25	23.04	23.20	23.42	23.49	23.61	22.63	22.69
Cr2O3	1.34	1.29	1.32	1.26	1.32	1.22	0.86	1.10	1.08	0.93	1.14	1.83	2.01
FeO	8.87	9.19	9.17	9.01	8.98	8.84	9.29	9.15	9.07	9.08	9.33	8.41	9.01
MnO	0.44	0.44	0.43	0.38	0.49	0.37	0.39	0.38	0.49	0.37	0.43	0.46	0.44
MgO	19.44	19.71	19.53	19.69	19.81	19.81	19.57	19.50	19.60	19.61	19.69	19.30	19.75
CaO	5.02	4.86	4.91	4.99	4.90	4.91	4.77	4.79	4.87	4.76	4.87	4.69	4.66
Total	100.03	100.38	100.49	100.74	101.11	100.09	99.95	101.14	101.22	101.44	102.17	100.02	101.19
Si	2.950	2.942	2.954	2.959	2.956	2.959	2.993	3.031	2.997	3.031	3.006	3.043	3.001
Ti	0.005	0.004	0.004	0.005	0.005	0.003	0.002	0.004	0.008	0.004	0.003	0.005	0.007
Al	1.967	1.955	1.960	1.957	1.957	1.948	1.935	1.929	1.944	1.945	1.943	1.905	1.889
Cr	0.075	0.072	0.074	0.070	0.073	0.069	0.049	0.061	0.060	0.052	0.063	0.103	0.112
Fe2+	0.480	0.465	0.493	0.487	0.483	0.466	0.527	0.540	0.535	0.533	0.545	0.502	0.532
Fe3+	0.049	0.081	0.051	0.046	0.046	0.059	0.027						
Mn	0.027	0.026	0.026	0.023	0.029	0.022	0.023	0.023	0.029	0.022	0.025	0.028	0.026
Mg	2.065	2.086	2.065	2.075	2.081	2.099	2.080	2.051	2.059	2.054	2.050	2.055	2.079
Ca	0.383	0.369	0.373	0.378	0.370	0.374	0.365	0.362	0.368	0.358	0.365	0.359	0.353
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt
Mg#	0.796	0.793	0.792	0.796	0.797	0.8	0.79	0.792	0.794	0.794	0.79	0.804	0.796
Cr#	0.037	0.036	0.036	0.034	0.036	0.034	0.025	0.031	0.03	0.026	0.031	0.052	0.056

					BW82					H2			
Sample	BW80-1-g3	BW80-3-g1	BW80-5-g1	BW80-6-g2r	BW82-1-g4	BW82-3-g1	BW82-1-g1	BW82-1-g2	BW82-1-g3	H2-2-g1	H2-2-g2	H2-1-g1	H2-1-g2
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	42.46	42.38	41.99	42.13	41.95	41.84	41.93	42.18	41.41	42.82	43.64	43.48	43.59
TiO2	0.10	0.04	0.07	0.06		0.01	0.06	0.03	0.05	1.02	1.01	0.88	0.98
Al2O3	22.66	22.28	22.80	23.15	22.71	22.84	23.09	22.65	23.05	20.23	20.46	19.99	20.51
Cr2O3	1.86	2.23	2.10	1.30	1.55	1.11	0.97	1.10	1.11	2.40	2.48	2.47	2.41
FeO	8.46	8.44	8.42	8.58	9.89	9.93	9.79	10.02	9.96	7.27	7.45	7.03	7.03
MnO	0.44	0.40	0.49	0.52	0.45	0.49	0.47	0.55	0.51	0.22	0.30	0.24	0.26
MgO	19.98	19.89	19.30	20.30	19.24	19.24	18.63	17.57	17.87	20.52	21.54	21.18	21.54
CaO	4.82	4.73	4.77	4.39	4.73	4.62	4.69	4.79	4.68	4.34	4.40	4.40	4.36
Total	100.78	100.39	99.94	100.43	100.52	100.08	99.63	98.89	98.64	98.82	101.28	99.67	100.68
Si	3.003	3.012	3.002	2.981	2.987	2.989	3.013	3.069	3.014	3.091	3.068	3.105	3.078
Ti	0.005	0.002	0.004	0.003		0.001	0.003	0.002	0.003	0.055	0.053	0.047	0.052
Al	1.889	1.866	1.921	1.930	1.906	1.923	1.955	1.943	1.977	1.721	1.695	1.682	1.707
Cr	0.104	0.125	0.119	0.073	0.087	0.063	0.055	0.063	0.064	0.137	0.138	0.139	0.135
Fe2+	0.500	0.502	0.503	0.479	0.557	0.557	0.588	0.610	0.606	0.439	0.438	0.420	0.415
Fe3+				0.029	0.032	0.036							
Mn	0.026	0.024	0.030	0.031	0.027	0.030	0.029	0.034	0.031	0.013	0.018	0.015	0.016
Mg	2.107	2.108	2.057	2.141	2.042	2.049	1.996	1.906	1.939	2.208	2.258	2.255	2.268
Ca	0.365	0.360	0.365	0.333	0.361	0.354	0.361	0.373	0.365	0.336	0.331	0.337	0.330
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	Por	Por	Por	Por
Mg#	0.808	0.808	0.803	0.808	0.776	0.776	0.772	0.758	0.762	0.834	0.837	0.843	0.845
Cr#	0.052	0.063	0.058	0.036	0.044	0.032	0.027	0.032	0.031	0.074	0.075	0.077	0.073

	H3			H4			H6						BW17
Sample	H3-1-g1	H3-2-g1	H3-2-g2	H4-1-grt1	H4-1-grt2	H4-1-grt12	H6-1-g1c	H6-1-g1r	H6-1-g2c	H6-1-g2r	H6-2-g1c	H6-2-g1r	BW17-1-g1
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	42.45	43.41	42.99	43.27	42.48	41.57	42.46	42.72	42.85	42.30	42.95	42.49	42.43
TiO2	0.40	0.49	0.43		0.32		0.14	0.30	0.84	0.35	0.12	0.27	0.13
Al2O3	20.56	20.69	20.32	18.46	18.58	19.29	20.80	20.83	20.69	20.80	20.71	21.01	19.07
Cr2O3	2.87	3.01	2.93	5.50	4.75	5.53	2.94	3.16	2.89	3.28	3.16	3.48	4.29
FeO	6.59	6.78	6.78	6.61	6.34	6.50	7.64	7.89	8.01	7.78	7.77	7.86	7.56
MnO	0.23	0.20	0.23	0.19	0.26	0.24	0.25	0.34	0.33	0.36	0.30	0.28	0.21
MgO	20.92	21.21	21.06	20.38	20.41	21.42	19.79	19.93	20.20	19.79	19.69	19.74	20.71
CaO	4.36	4.38	4.47	5.38	4.97	5.67	5.36	5.17	4.61	5.26	5.44	5.33	5.21
Total	98.38	100.17	99.21	99.79	98.11	100.22	99.37	100.34	100.41	99.91	100.13	100.46	99.61
Si	3.065	3.082	3.081	3.113	3.099	2.960	3.053	3.048	3.056	3.032	3.071	3.031	3.048
Ti	0.022	0.026	0.023		0.018		0.008	0.016	0.045	0.019	0.007	0.014	0.007
Al	1.749	1.731	1.716	1.565	1.598	1.619	1.763	1.751	1.739	1.757	1.746	1.766	1.615
Cr	0.164	0.169	0.166	0.313	0.274	0.312	0.167	0.178	0.163	0.186	0.178	0.196	0.244
Fe2+	0.398	0.403	0.406	0.398	0.387	0.239	0.459	0.471	0.478	0.466	0.464	0.469	0.423
Fe3+						0.148							0.031
Mn	0.014	0.012	0.014	0.012	0.016	0.014	0.015	0.020	0.020	0.022	0.018	0.017	0.013
Mg	2.251	2.245	2.250	2.186	2.220	2.275	2.122	2.119	2.147	2.115	2.099	2.099	2.218
Ca	0.337	0.333	0.343	0.415	0.389	0.432	0.413	0.396	0.352	0.404	0.417	0.407	0.401
Kations	8	8	8	8	8	8	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12	12	12	12	12	12	12
Type	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por	Por
Mg#	0.85	0.848	0.847	0.846	0.852	0.854	0.822	0.818	0.818	0.819	0.819	0.817	0.83
Cr#	0.086	0.089	0.088	0.166	0.146	0.162	0.087	0.092	0.086	0.095	0.093	0.1	0.131

Sample	BW17-1-g2	BW17-1-g3	BW17-2-g1	BW17-2-g2	BW17-4-g1	BW17-4-g2	BW17-6-g1
Mineral	Grt	Grt	Grt	Grt	Grt	Grt	Grt
SiO2	41.92	41.86	42.11	42.31	41.62	42.24	41.68
TiO2	0.20	0.21	0.17	0.18	0.25	0.22	0.14
Al2O3	19.47	19.48	19.43	20.00	19.83	19.89	19.43
Cr2O3	4.25	4.13	4.16	4.19	4.03	4.16	4.20
FeO	7.48	7.64	7.61	7.62	7.46	7.48	7.64
MnO	0.25	0.28	0.38	0.36	0.29	0.26	0.24
MgO	20.37	20.75	20.77	21.07	20.51	20.44	20.90
CaO	5.21	5.24	5.27	5.27	5.21	5.30	5.34
Total	99.15	99.59	99.90	101.00	99.20	99.99	99.57
Si	3.027	3.006	3.015	2.994	2.999	3.024	2.991
Ti	0.011	0.011	0.009	0.010	0.014	0.012	0.008
Al	1.657	1.648	1.640	1.668	1.684	1.678	1.643
Cr	0.243	0.234	0.236	0.234	0.230	0.235	0.238
Fe2+	0.427	0.376	0.380	0.360	0.389	0.432	0.338
Fe3+	0.025	0.083	0.076	0.091	0.060	0.016	0.121
Mn	0.015	0.017	0.023	0.022	0.018	0.016	0.015
Mg	2.193	2.221	2.217	2.222	2.203	2.181	2.236
Ca	0.403	0.403	0.404	0.400	0.402	0.406	0.411
Kations	8	8	8	8	8	8	8
Oxygens	12	12	12	12	12	12	12
Type	Por	Por	Por	Por	Por	Por	Por
Mg#	0.829	0.829	0.83	0.831	0.83	0.83	0.83
Cr#	0.128	0.124	0.125	0.123	0.12	0.123	0.127

12.1.6 Spinel

	Bw4	Bw44	D4		G2		G5		BW80				
Sample	BW4-3-spl1	Bw44-2-spl1	D4-4-spl1	D4-2-spl1	G2-1-Spl1	G2-2-Spl1	G5-1-spl1	G5-1-spl2	BW80-2-spl1	BW80-2-spl2	BW80-2-spl3	BW80-2-spl4	BW80-3-spl1
Mineral	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl	Spl
SiO2	0.35			0.23	0.10	0.16	0.05	0.02	0.19	0.27		0.16	
TiO2	2.27	1.53	0.52	1.49	1.01	0.99	0.29	0.20	0.61	0.56	0.53	0.72	0.18
Al2O3	19.66	31.49	27.71	13.84	16.15	15.78	36.46	35.89	25.32	25.63	24.99	25.31	51.10
Cr2O3	41.71	33.52	40.80	55.16	50.97	50.53	33.32	33.39	44.35	43.04	44.29	42.24	15.47
FeO	19.55	16.72	12.86	14.33	18.67	19.07	14.36	14.24	15.14	15.92	15.74	15.61	14.48
MnO	0.42		0.11	0.46	0.24	0.32	0.13	0.10	0.27	0.18	0.43	0.33	0.12
MgO	12.08	16.00	15.37	14.72	11.28	12.08	15.14	15.12	13.72	13.68	12.74	13.90	17.85
NiO					0.12	0.10	0.07	0.23					
Total	96.04	99.26	97.48	100.23	98.62	99.22	99.83	99.19	99.60	99.28	98.72	98.27	99.20
Si	0.011			0.007	0.006	0.008		0.005		0.004		0.003	0.005
Ti	0.055	0.034	0.012	0.035	0.014	0.013	0.012	0.017	0.004	0.003	0.004	0.025	0.024
Al	0.748	1.085	0.988	0.512	0.905	0.917	0.907	0.913	1.622	1.256	1.189	0.614	0.594
Cr	1.065	0.775	0.976	1.369	1.064	1.033	1.079	1.023	0.329	0.729	0.765	1.300	1.276
Fe2+	0.474	0.336	0.312	0.341	0.384	0.397	0.405	0.378	0.284	0.373	0.346	0.473	0.436
Fe3+	0.054	0.073	0.013	0.035		0.007		0.021	0.042	0.002	0.038	0.031	0.073
Mn	0.011		0.003	0.012	0.007	0.005	0.011	0.009	0.003	0.002	0.004	0.007	0.009
Mg	0.581	0.697	0.693	0.689	0.620	0.619	0.585	0.634	0.717	0.631	0.650	0.542	0.575
Ni											0.004	0.003	0.003
Kations	3	3	3	3	3	3	3	3	3	3	3	3	3
Oxygen	4	4	4	4	4	4	4	4	4	4	4	4	4
Location	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Type	Lhz	Lhz	Hzb	Hzb	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt	SplGrt
Mg#	0.524	0.63	0.68	0.647	0.518	0.53	0.653	0.654	0.618	0.605	0.59	0.613	0.687
Cr#	0.587	0.417	0.497	0.728	0.679	0.682	0.38	0.384	0.54	0.53	0.543	0.528	0.169

	BW82		H4	H6	C4			F3			Bw60		BW76
Sample	BW82-1-spl1	BW82-1-spl2	H4-1-Spl1	H6-1-spl1	C4-1-Spl1	C4-1-2-Spl1	C4-1-2-Spl2		F3-1-Spl2	F3-1-Spl3	Bw60-1-spl1	Bw60-1-spl2	BW76-1-spl1
Mineral	Spl	Spl	Spl	Spl	Spl	Spl	Spl		Spl	Spl	Spl	Spl	Spl
SiO2	0.14		0.26	0.12	0.06	0.34	0.13		0.34	0.26			
TiO2	0.12	0.18	1.97	0.6	0.12		0.13		0.6	0.66			0.1
Al2O3	36.55	34.26	31.59	50.64	28.55	29.28	22.9		15.67	14.22	56.73	56.12	32.26
Cr2O3	31.63	32.86	34.07	16.09	40.64	40.22	45.45		50.47	53.19	12.88	13.79	35.97
FeO	15.4	15.59	15.24	12.98	15.43	15.73	15.29		18.03	17.87	11.28	11.23	15.8
MnO	0.1	0.15	0.21	0.23	0.25	0.27	0.3		0.45	0.39			0.22
MgO	14.52	14.81	16.97	19.85	13.22	13.68	15.43		12.2	11.94	19.58	18.49	14.91
NiO		0.16	0.15	0.26							0.39	0.27	
Total	98.46	98.01	100.46	100.82	98.27	99.52	99.63		98.16	98.59	100.86	99.9	99.26
Si	0.001	0.001	0.007	0.003	0.002	0.010	0.004		0.011	0.008			
Ti	0.006	0.004	0.043	0.012	0.003		0.003		0.015	0.016			0.002
Al	1.236	1.225	1.071	1.572	1.022	1.031	0.816		0.594	0.542	1.729	1.737	1.116
Cr	0.757	0.765	0.775	0.335	0.976	0.950	1.087		1.284	1.361	0.263	0.286	0.835
Fe2+	0.345	0.344	0.314	0.223	0.392	0.393	0.304		0.414	0.436	0.237	0.247	0.344
Fe3+		0.001	0.053	0.063			0.083		0.071	0.048	0.007		0.044
Mn	0.003	0.002	0.005	0.005	0.006	0.007	0.008		0.012	0.011			0.005
Mg	0.649	0.653	0.728	0.780	0.599	0.609	0.696		0.585	0.576	0.755	0.724	0.653
Ni	0.002	0.005	0.003	0.006							0.008	0.006	
Kations	3	3	3	3	3	3	3		3	3	3	3	3
Oxygen	4	4	4	4	4	4	4		4	4	4	4	4
Location	Grt	Grt	Keliphite	Keliphite	Matrix	Matrix	Matrix		Exsolution cpx	Matrix	Matrix	Matrix	Matrix
Type	SplGrt	SplGrt	Por	Por	Spl	Spl	Spl		Spl	Spl	Spl	Spl	Spl
Mg#	0.627	0.628	0.665	0.732	0.604	0.608	0.643		0.547	0.543	0.756	0.746	0.627
Cr#	0.367	0.392	0.42	0.176	0.488	0.48	0.571		0.683	0.715	0.132	0.142	0.428

		I5
Sample	BW76-1-spl2	I5-1-spl1
Mineral	Spl	Spl
SiO2		0.11
TiO2	0.12	0.66
Al2O3	33.49	27.07
Cr2O3	34.06	39.78
FeO	15.18	14.38
MnO	0.2	0.25
MgO	14.45	16.34
NiO		0.13
Total	97.5	98.72
Si		0.003
Ti	0.003	0.015
Al	1.174	0.951
Cr	0.801	0.937
Fe2+	0.357	0.283
Fe3+	0.020	0.076
Mn	0.005	0.006
Mg	0.641	0.726
Ni		0.003
Kations	3	3
Oxygen	4	4
Location	Matrix	Matrix
Type	Spl	Spl
Mg#	0.629	0.669
Cr#	0.406	0.496

12.1.7 Phlogopite

	BW4		BW5	BW6		BW10						BW80	C4
Sample	BW4-2-p1	BW4-1-p1	BW5-2-p1	BW6-2-p1	BW6-2-p2	BW10-0917-p1	BW10-172-P1	BW10-4-p1	BW10-4-p2	BW10-4-p3	BW10-4-p5	BW80-7-p1	C4-1-P1
Mineral	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl
SiO2	38.80	38.51	40.40	41.43	41.46	41.33	40.56	41.63	41.04	41.61	41.70	38.78	37.75
TiO2	2.78	2.85	3.08	0.92	0.99	1.00	1.07	0.92	0.93	0.99	0.92	1.99	2.72
Al2O3	13.58	13.59	13.48	12.25	12.66	13.08	12.84	12.82	12.52	12.15	12.93	15.90	14.95
Cr2O3	1.81	2.28	1.41	0.34	0.49	0.43	0.39	0.39	0.42	0.41	0.43	1.55	1.23
FeO	4.01	4.35	3.72	3.34	3.36	3.24	3.51	3.35	3.38	3.08	3.05	3.83	2.96
MgO	20.52	21.39	21.58	25.60	24.05	25.58	25.04	24.24	24.35	24.67	24.05	21.79	22.51
Na2O	0.20	0.35	0.24	0.47	0.62	0.58	0.56	0.58	0.52	0.54	0.55	0.65	0.12
K2O	10.05	10.08	10.53	9.97	9.93	10.79	10.58	10.03	9.96	9.97	9.83	9.58	10.78
NiO	0.28		0.14	0.17				0.14	0.11	0.16	0.13	0.11	0.15
Total	92.02	93.39	94.59	94.49	93.57	96.04	94.54	94.10	93.23	93.60	93.58	94.18	93.18
Si	2.944	2.868	2.977	2.966	3.018	2.932	2.925	3.014	2.994	3.023	3.029	2.83	2.799
Ti	0.158	0.16	0.171	0.049	0.054	0.053	0.058	0.05	0.051	0.054	0.05	0.109	0.152
Al	1.214	1.193	1.171	1.033	1.086	1.094	1.091	1.094	1.077	1.041	1.107	1.367	1.306
Cr	0.109	0.134	0.082	0.019	0.028	0.024	0.022	0.022	0.024	0.023	0.024	0.089	0.072
Fe	0.254	0.271	0.229	0.2	0.204	0.192	0.212	0.203	0.206	0.187	0.185	0.234	0.183
Mg	2.321	2.375	2.371	2.732	2.61	2.705	2.692	2.616	2.648	2.671	2.604	2.371	2.488
Na	0.029	0.05	0.034	0.065	0.088	0.08	0.079	0.082	0.073	0.076	0.077	0.092	0.018
K	0.973	0.957	0.99	0.911	0.922	0.976	0.973	0.927	0.927	0.924	0.911	0.892	1.02
Ni	0.017		0.008	0.01				0.008	0.006	0.01	0.008	0.007	0.009
Kations	8.019	8.008	8.033	7.985	8.01	8.057	8.052	8.016	8.006	8.01	7.996	7.99	8.047
Oxygen	11	11	11	11	11	11	11	11	11	11	11	11	11
F	0.12					0.20	0.21	0.27	0.24	0.33	0.30	0.13	0.06
Location	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Keliphite	Matrix
Type	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Lhz	Spl	Spl
Mg#	0.901	0.898	0.912	0.932	0.927	0.934	0.927	0.928	0.928	0.935	0.934	0.91	0.931
Cr#	0.082	0.101	0.066	0.018	0.025	0.022	0.02	0.02	0.022	0.022	0.022	0.061	0.052

			F3	I5	D3		D4-1-p1	
Sample	C4-1-P2	C4-2-P1	F3-2-p1	I5-1-p1-2	D3-1-p1	D3-2-p1	D4-1-p1	D4-2-p1
Mineral	Phl	Phl	Phl	Phl	Phl	Phl	Phl	Phl
SiO2	38.09	38.48	38.94	42.18	38.35	38.61	40.09	39.73
TiO2	2.78	2.60	4.64	0.71	3.13	3.62	1.70	1.44
Al2O3	14.79	15.08	14.03	11.57	14.29	13.76	15.12	15.31
Cr2O3	1.41	1.36	2.05	1.56	2.12	2.26	2.28	2.32
FeO	3.15	2.92	3.86	3.31	4.33	4.72	2.88	2.98
MgO	22.59	22.40	20.85	23.57	21.81	22.45	23.74	23.72
Na2O	0.13	0.19	0.51	0.67	0.50	0.37	0.43	0.40
K2O	10.92	10.98	9.66	9.75	9.36	9.82	10.58	10.26
NiO	0.14	0.16	0.12		0.10	0.03	0.06	0.08
Total	94.00	94.16	94.65	93.31	94.00	95.64	96.88	96.26
Si	2.805	2.832	2.815	2.793	2.841	2.822	2.873	3.092
Ti	0.154	0.144	0.173	0.197	0.091	0.077	0.257	0.039
Al	1.284	1.308	1.236	1.173	1.263	1.282	1.22	1
Cr	0.082	0.079	0.123	0.129	0.128	0.13	0.119	0.09
Fe	0.194	0.179	0.266	0.286	0.171	0.177	0.238	0.203
Mg	2.481	2.457	2.387	2.421	2.508	2.512	2.293	2.576
Na	0.018	0.028	0.071	0.052	0.059	0.055	0.072	0.096
K	1.027	1.031	0.877	0.906	0.956	0.93	0.909	0.912
Ni	0.008	0.009	0.006	0.002	0.003	0.004	0.007	
Kations	8.053	8.068	7.954	7.96	8.019	7.991	7.989	8.007
Oxygen	11	11	11	11	11	11	11	11
F	0.07			0.46	0.04		0.10	0.13
Location	Matrix	Matrix	Matrix	Matrix	Keliphite	Keliphite	Keliphite	Keliphite
Type	Spl	Spl	Spl	Spl	Hzb	Hzb	Hzb	Hzb
Mg#	0.927	0.932	0.906	0.927	0.9	0.894	0.936	0.934
Cr#	0.06	0.057	0.089	0.083	0.091	0.099	0.092	0.092

12.2 Trace Element and Rare Earth Element Chemistry

12.2.1 Olivine

Sample	098BL22	109BL29	112BL32	037XB3	040XB6	046XB12	047XB13	019L13	020L14	022L16	024L18	026L20	111XA53
Locality	A1	A1	A1	BW1	BW1	BW1	BW1	BW4	BW4	BW4	BW5	BW5	BW6
Petrology	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol
Li	1.445	1.217	1.268	1.687	1.674	1.747	1.589	1.59	1.65	1.57	1.95	1.77	1.62
Be	<0.113	<0.076	<0.091	<0.046	<0.049	<0.031	<0.031	0.031	<0.037	0.0302	<0.048	<0.060	<0.042
B	0.45	0.43	0.38	0.53	0.69	0.523	0.75	1.55	1.36	2.25	1.39	1.4	0.48
Al	73.61	80.01	76.2	44	43.41	42.95	48.54	51.77	46.96	83.16	39.17	39.65	15.93
Si	188845.5	188845.5	188845.47	193145.92	193052.44	192584.98	192585	197259.42	197259.42	196324.56	196324.55	196324.55	191650.14
P	26.97	37.47	36.68	23.45	<6.48	71.4	57.68	49.41	53.78	61.28	76.6	61.75	55.49
Ca	283.92	266.88	291.56	159.79	153.26	154.02	162.1	168.07	153.18	375.78	141.87	152.67	79.99
Ti	184.33	193.43	195.05	215.78	219.8	210.53	209.67	178.07	177.85	191.35	148.09	153.4	92.44
V	8.33	8.89	8.72	5.58	5.75	5.73	5.76	4.38	4.51	4.73	3.94	4.03	2.58
Cr	124	90.78	91.21	104.87	106.73	106.24	105.92	116.08	110.3	115.34	92.03	95.15	44.4
Mn	839.03	864.39	853.5	716.07	710.08	711.28	706.82	736.08	724.64	717.79	706.33	718.21	681.69
Co	148.57	149.65	150.44	165.73	166.04	164.45	164.25	139.63	138.44	136.51	139.64	139.26	142.52
Ni	2988.31	3015.19	3073.3	3120.41	3150.73	3111.11	3106.31	3023.51	3000.4	3009.74	3172.62	3171.33	3082.85
Cu	7.31	6.94	7.56	2.64	2.72	2.88	2.89	2.72	2.49	4.03	2.67	2.54	1.14
Zn	92.29	96.41	90.88	78.41	75.44	88.16	85.77	67.35	64.59	68.02	59.69	60.86	65.76
Ga	0.257	0.282	0.254	0.12	0.123	0.112	0.12	0.227	0.195	0.241	0.134	0.108	<0.033
Rb	<0.109	<0.119	<0.114	<0.049	<0.042	<0.046	<0.046	<0.070	<0.061	0.115	<0.071	<0.072	<0.057
Sr	<0.0071	0.0098	<0.0074	<0.0027	<0.0037	<0.0040	<0.0040	0.0073	<0.0060	3	0.0027	0.0086	0.0036
Y	0.008	<0.0108	<0.0091	<0.0047	<0.0057	0.0041	0.006	<0.0053	0.0058	0.0522	0.0055	<0.0073	<0.0043
Zr	0.058	0.0458	0.051	0.162	0.18	0.164	0.17	0.263	0.252	0.755	0.337	0.326	0.056
Nb	0.0598	0.0554	0.046	0.177	0.169	0.18	0.205	0.216	0.208	0.731	0.549	0.55	0.924
Cs	<0.064	<0.069	<0.064	<0.0202	<0.0195	<0.0219	<0.0195	<0.038	<0.035	<0.040	<0.039	<0.040	<0.026
Ba	<0.082	<0.070	<0.046	<0.031	<0.030	<0.046	0.022	<0.026	<0.044	3.22	<0.027	0.443	<0.0203
La	<0.0101	<0.0073	<0.0065	<0.0044	<0.0039	<0.00190	<0.0027	<0.0032	<0.0045	0.37	<0.0047	<0.0071	<0.0033
Ce	<0.0072	<0.0091	<0.0066	<0.0032	<0.0036	0.0035	<0.0039	<0.0062	<0.0044	0.633	<0.0046	<0.0049	<0.0041
Pr	<0.0061	<0.0076	<0.0056	<0.0037	<0.0033	<0.0028	<0.0023	<0.00264	<0.00	0.0654	<0.0048	<0.0029	0.00187
Nd	<0.035	<0.031	<0.026	<0.0214	<0.0121	<0.0160	<0.0230	0.0061	<0.0204	0.229	0.003	<0.0230	<0.026
Sm	<0.042	<0.048	<0.054	<0.0231	<0.0143	<0.0189	<0.0111	0.0074	<0.0174	0.03	<0.041	<0.0196	<0.0235
Eu	<0.0138	<0.0162	<0.0132	0.0035	<0.0071	<0.0050	<0.0041	<0.0081	<0.0047	0.0166	<0.0049	<0.0074	<0.0080
Gd	<0.049	<0.041	<0.047	<0.0164	0.0155	<0.0141	<0.0176	<0.0166	<0.0233	0.038	0.0173	<0.0185	<0.0175
Tb	<0.0083	<0.0093	<0.0043	<0.0036	<0.0032	0.00081	<0.0022	<0.0053	<0.0037	<0.0048	<0.0039	0.00277	<0.0033
Dy	<0.0244	<0.028	<0.0221	<0.0083	<0.0152	<0.0088	<0.0167	<0.0150	<0.0105	<0.0192	<0.0156	<0.0205	<0.0170
Ho	<0.0052	0.0041	<0.0084	<0.0042	<0.0032	<0.0027	<0.0028	<0.0040	<0.0062	<0.0059	<0.0029	0.0033	<0.0047
Er	<0.0207	<0.0187	<0.0193	<0.0075	<0.0095	<0.0092	<0.0115	0.0025	<0.0079	<0.0118	<0.0144	0.0052	0.0032
Tm	<0.0051	<0.0066	<0.0086	<0.00139	<0.00136	<0.00147	<0.00212	<0.0027	<0.0053	<0.0028	<0.0039	<0.0051	<0.0036
Yb	<0.023	<0.036	<0.0197	<0.0131	0.0096	<0.0069	<0.0099	<0.0200	0.0141	0.017	<0.0208	<0.0183	<0.0170
Lu	0.0115	<0.0043	<0.0054	<0.0038	<0.0028	<0.00154	<0.00221	0.00202	<0.0038	<0.0050	0.00228	<0.0043	<0.0032
Hf	<0.0206	<0.0148	<0.036	<0.0098	0.0108	<0.0138	<0.0092	<0.0127	<0.0179	0.0156	<0.0132	<0.0142	<0.0062
Ta	<0.0063	<0.0111	<0.0074	0.0087	0.0112	0.0141	0.0142	0.0157	0.0168	0.0441	0.0275	0.032	0.0272
Pb	<0.0205	0.0109	<0.0226	<0.0163	0.0199	<0.0204	<0.0188	<0.0141	<0.0128	0.0228	<0.0198	<0.0128	<0.0155
Th	<0.01	<0.0100	<0.0077	<0.0031	<0.0034	0.0027	<0.0041	<0.0029	<0.0051	0.0541	<0.0043	<0.0047	<0.0040
U	<0.01	<0.0084	<0.0057	<0.0030	<0.0049	<0.0032	<0.0046	<0.0037	<0.0045	0.0112	<0.0027	<0.0065	0.0029

Sample	112XA54	113XA55	114XA56	115XA57	065XA15	066XA16	067XA17	070XA20	048XB14	049XB15	055XB21	080BL4	083BL7
Locality	BW6	BW6	BW6	BW6	BW7	BW7	BW7	BW7	BW10	BW10	BW10	Bw44	Bw44
Petrology	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol
Li	1.58	1.65	1.68	1.59	1.85	1.8	1.84	1.76	2.97	2.89	2.77	1.62	1.82
Be	<0.066	<0.066	<0.033	<0.047	0.0169	0.03	0.066	0.032	<0.040	<0.043	<0.032	<0.086	<0.066
B	0.4	0.38	0.52	0.44	1.67	0.75	3.27	0.49	0.59	0.91	0.71	<0.38	<0.49
Al	15.82	15.59	15.67	15.22	34.16	33.74	38.82	32.48	25.23	26.52	25.67	35.12	32.94
Si	193052.45	193052.45	194922.23	194922.22	192585.02	192585.02	192585.02	186975.75	192585	192585	192584.98	196324.55	198661.75
P	58.44	56.41	52.03	56.19	58.33	67.59	72.46	60.91	95.37	102.54	95.15	52.96	80.67
Ca	94.8	74.88	94.93	50.93	135.23	150.91	189.69	101.85	83.43	100.7	89.06	154.83	119.45
Ti	92.68	93.23	96.72	94.83	198.59	201.02	202.31	182.81	164.35	171.21	164.36	152.61	158
V	2.63	2.7	2.72	2.7	4.59	4.64	4.68	4.31	2.585	2.58	2.56	4.85	4.52
Cr	44.67	43.75	43.86	44.75	104.76	106.49	104.71	99.89	66.28	66.81	58.48	121.27	113.02
Mn	678.48	682.45	686.75	686.78	765.58	749.91	741.79	714.68	854.43	832.6	874.98	740.67	736.81
Co	146.27	144.71	146.3	150.52	146.03	144.18	144.25	139.38	140.49	136.35	138.75	135.25	133.17
Ni	3250.21	3165.86	3218.69	3290.15	3150.33	3117.14	3164.07	2886.38	2695.39	2767.34	2737.92	3023.44	2916.56
Cu	1.23	1.31	1.19	1.34	2.1	1.96	1.98	1.82	1.17	1.24	1.23	1.8	1.78
Zn	68.01	67.98	68.64	68.58	66.42	67.47	68.9	62.29	90.17	89.58	91.29	62.19	56.98
Ga	0.039	0.043	0.043	<0.038	<0.039	0.06	0.054	0.039	0.076	0.083	0.071	<0.077	0.073
Rb	<0.063	<0.058	<0.062	<0.065	<0.067	<0.063	0.172	<0.063	<0.040	<0.043	<0.046	<0.117	<0.125
Sr	<0.0067	<0.0087	<0.0055	<0.0078	0.1034	0.0356	2.74	0.0307	<0.0058	<0.0048	<0.0060	2.034	0.008
Y	<0.0048	<0.0034	<0.0033	<0.0034	0.0054	0.0089	0.0307	0.0051	0.0041	0.007	<0.0047	0.0204	<0.0067
Zr	0.079	0.078	0.054	0.069	0.321	0.291	0.52	0.29	0.315	0.275	0.282	0.495	0.318
Nb	0.98	0.949	1.012	0.961	0.536	0.575	0.836	0.509	1.123	1.143	1.106	0.818	0.575
Cs	<0.029	<0.030	<0.027	<0.029	<0.033	<0.029	<0.032	<0.030	<0.0179	<0.0218	<0.0210	<0.066	<0.074
Ba	<0.050	<0.059	<0.031	<0.032	0.048	<0.039	2.51	0.041	0.041	<0.0229	<0.0174	1.54	<0.048
La	<0.0045	<0.0037	<0.0052	<0.0037	<0.0052	0.0122	0.205	0.0059	<0.0035	<0.0027	<0.0045	0.14	<0.0103
Ce	<0.0059	<0.0037	<0.0078	<0.0059	<0.0059	0.013	0.327	0.0096	<0.0035	<0.0019	<0.0029	0.335	<0.0079
Pr	<0.0031	<0.0043	<0.0022	<0.0031	<0.0038	<0.0044	0.0311	<0.0037	0.00152	<0.00159	<0.0034	0.0382	<0.0073
Nd	<0.028	<0.0219	<0.0177	0.0197	0.0219	<0.0182	0.154	<0.0246	<0.0085	<0.0159	<0.0171	0.149	<0.027
Sm	<0.033	<0.0259	<0.026	<0.033	<0.040	<0.0216	<0.027	<0.033	<0.0201	<0.0187	0.0042	0.06	<0.052
Eu	<0.0069	<0.0097	<0.0068	<0.0119	0.0042	<0.0090	<0.0093	0.0039	<0.0053	<0.0050	<0.0053	<0.0114	<0.0163
Gd	<0.0193	<0.0136	<0.0303	<0.0136	<0.041	<0.0196	<0.035	<0.0133	<0.0160	<0.0199	<0.0239	0.034	<0.044
Tb	<0.0051	<0.0021	<0.0046	<0.0042	<0.0042	<0.0043	<0.0049	<0.0020	<0.0035	<0.0034	<0.0033	<0.0066	<0.0072
Dy	<0.0205	<0.0145	<0.0166	<0.0187	<0.0149	0.0161	<0.0155	<0.0117	<0.0057	0.0104	<0.0133	<0.033	<0.033
Ho	<0.0060	<0.0047	<0.0036	<0.0047	<0.0031	<0.0054	<0.0032	<0.0042	<0.0025	<0.0035	<0.0029	<0.0081	<0.0074
Er	0.0095	0.0123	<0.0139	<0.0108	<0.0111	<0.0129	<0.0199	<0.0151	<0.0043	<0.0122	<0.0070	<0.0163	<0.0270
Tm	<0.0035	<0.0056	<0.0049	<0.00283	<0.0045	<0.0029	<0.0030	<0.0034	<0.0033	<0.00207	<0.00224	<0.0066	<0.0056
Yb	<0.0266	<0.0133	<0.0209	<0.0163	<0.0192	<0.0136	<0.0099	<0.0130	<0.0143	<0.0137	<0.0245	<0.038	<0.0147
Lu	<0.0054	0.0048	<0.0020	<0.0041	<0.0036	<0.0047	0.0041	<0.0020	<0.0028	<0.00217	<0.0029	<0.0043	<0.0057
Hf	<0.0137	<0.0137	<0.0167	<0.0119	0.0113	0.0153	<0.0127	0.0148	<0.0127	<0.0116	<0.0138	<0.0208	<0.0251
Ta	0.0217	0.0208	0.0235	0.0158	0.0355	0.0377	0.0399	0.0303	0.0604	0.0605	0.0626	0.0513	0.0251
Pb	<0.0171	<0.0183	<0.0194	<0.01	<0.0186	<0.0181	<0.0229	<0.0139	<0.0168	<0.0180	<0.0186	0.0223	<0.0239
Th	<0.0059	<0.0054	<0.0054	0.0047	<0.0054	<0.0074	0.0256	<0.0048	<0.0031	<0.00234	<0.0031	0.0195	<0.0073
U	<0.0038	<0.0031	<0.0038	<0.0058	<0.0037	<0.0048	0.0065	<0.0041	<0.0025	<0.0027	<0.0048	0.0101	<0.0060

Sample	088BL12	078L62	079L63	080L64	012LX6	013LX7	016LX10	093L72	094L73	091BL15	092BL16	097BL21	084XA30
Locality	Bw44	D1	D1	D1	D3	D3	D3	D4	D4	E4	E4	E4	G1
Petrology	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol
Li	1.69	1.52	1.48	1.43	1.073	1.11	1.05	1.5	1.56	1.042	1.082	1.132	1.49
Be	<0.06	<0.048	<0.032	<0.058	<0.135	<0.087	<0.115	<0.048	<0.056	<0.090	<0.073	<0.075	<0.055
B	<0.42	0.737	0.773	0.768	<0.41	0.56	0.49	0.926	0.89	0.58	0.65	<0.35	0.31
Al	34.25	65.02	71.91	66.11	37.95	37.89	40.21	40.15	42.74	24.55	24.47	24.93	19.02
Si	198661.73	191650.16	191650.16	191650.16	197259.42	197259.42	197259.42	198661.75	198661.75	188845.5	188845.5	188845.5	193987.33
P	38.42	18.61	18.37	19.14	58.88	68.62	51.1	75.83	73.5	55.6	46.13	56.97	58.24
Ca	100.99	351.91	383.53	311.42	143.09	101.57	134.45	289.12	178.16	110.05	99.88	96	64.15
Ti	169.19	4.76	4.91	4.52	28.17	30.39	33.48	113.87	152.45	126.59	133.77	130.45	56.94
V	4.94	7.95	8.64	7.93	5.97	6.01	6.53	5.3	5.31	4.81	5.34	5.28	2.54
Cr	119.66	309.32	311.97	306.56	312.05	305.82	331.47	234.56	233	106.33	109.08	110.76	40.59
Mn	734.17	909.91	891.38	909.56	689.49	689.89	695.93	722.48	717.97	670.88	685.76	697.81	714.1
Co	134.16	153.43	149.26	148.41	122.87	127.75	131.18	148.19	149.56	126.26	134.78	134.44	132.77
Ni	3018.64	3273	3264.69	3183.29	2891.17	3031.9	3194.51	3765.73	3693.51	2957.65	3160.46	3165.14	3014.16
Cu	1.34	7.9	7.67	7.98	2.05	1.95	2.01	2.16	2.22	1.51	2.07	1.75	1.1
Zn	60	72.84	68.54	71.29	49.28	49.11	53.58	58.11	59.16	52.25	55.31	56.02	50
Ga	0.079	0.217	0.193	0.197	0.044	<0.038	0.041	0.151	0.105	0.043	0.069	0.048	0.042
Rb	<0.120	<0.096	<0.081	<0.083	<0.142	<0.145	<0.159	0.234	0.139	<0.105	<0.111	0.131	<0.064
Sr	<0.0076	0.0029	0.0034	<0.0053	<0.0082	0.0083	0.012	3.62	1.96	<0.0094	<0.0070	0.0065	<0.0053
Y	<0.0066	0.0021	<0.0065	<0.0047	<0.0075	<0.0076	<0.0083	0.0464	0.0208	0.0053	<0.0085	<0.0044	<0.0033
Zr	0.351	<0.0186	<0.0125	<0.0158	0.144	0.179	0.122	0.935	0.508	0.223	0.283	0.234	0.093
Nb	0.553	0.0058	0.005	0.0092	0.467	0.517	0.541	1.222	0.895	0.854	0.881	0.88	0.671
Cs	<0.068	<0.053	<0.051	<0.052	<0.077	<0.087	<0.093	<0.049	<0.047	<0.062	<0.063	<0.064	<0.027
Ba	<0.058	<0.047	<0.083	0.0148	<0.069	<0.061	<0.085	4.49	2.97	<0.058	<0.061	<0.062	<0.049
La	<0.0067	<0.0041	<0.0077	<0.0056	<0.0040	<0.0058	<0.0118	0.436	0.131	<0.0048	0.0155	<0.0072	<0.0056
Ce	<0.0087	0.00215	<0.0053	<0.0039	0.036	<0.0082	<0.0077	0.778	0.208	<0.0059	<0.0050	<0.0052	<0.0063
Pr	<0.0072	<0.0048	<0.0055	<0.0047	<0.0059	<0.0059	<0.0074	0.0831	0.0238	0.0056	0.0337	<0.0061	<0.0021
Nd	<0.042	<0.0263	<0.0249	<0.0258	0.035	<0.029	<0.031	0.274	0.066	<0.047	<0.0245	<0.047	<0.0174
Sm	<0.051	<0.032	<0.048	<0.0220	<0.041	<0.042	<0.026	<0.039	<0.021	<0.049	<0.036	0.024	<0.0292
Eu	<0.0122	<0.0085	0.00123	<0.0102	<0.0109	<0.0111	<0.0196	0.0122	<0.0081	<0.0092	<0.0097	<0.0150	<0.0077
Gd	<0.048	<0.0212	<0.035	<0.036	<0.039	<0.056	<0.056	<0.036	<0.029	<0.033	<0.040	<0.0202	0.0164
Tb	<0.0083	<0.0034	<0.0045	<0.0047	<0.0083	<0.0084	<0.0074	0.0042	<0.0079	<0.0083	<0.0076	<0.0083	<0.0035
Dy	<0.03	<0.0235	<0.0223	<0.0133	0.0181	<0.025	<0.0270	<0.0134	<0.0259	<0.028	<0.0242	<0.030	<0.0116
Ho	<0.0080	<0.0072	<0.0059	<0.0061	<0.0061	<0.0080	<0.0055	<0.0050	<0.0034	<0.0028	<0.0052	<0.0053	<0.0042
Er	<0.0174	<0.0204	<0.0137	0.0057	<0.0212	<0.0152	<0.029	<0.0143	<0.0258	<0.0196	<0.0205	<0.0132	<0.0106
Tm	<0.0055	<0.0034	0.00139	<0.0033	<0.0058	<0.0076	<0.0082	<0.0034	0.0032	<0.0078	<0.0071	<0.0072	<0.0039
Yb	<0.025	0.0096	<0.0280	<0.0145	<0.0269	<0.027	<0.0171	<0.0207	0.0212	0.0188	<0.035	<0.0270	<0.0243
Lu	<0.0086	0.003	0.00108	<0.0034	<0.0085	<0.0050	0.0028	<0.0069	<0.0033	<0.0056	<0.0094	<0.0068	<0.0035
Hf	<0.0192	<0.0115	0.0082	<0.0113	<0.0206	<0.027	<0.035	0.018	<0.0220	<0.0237	<0.0269	<0.0207	<0.0135
Ta	0.0285	<0.0034	<0.0065	<0.0068	0.0318	0.0139	0.021	0.0602	0.055	0.0465	0.036	0.0484	0.0122
Pb	<0.0207	<0.0147	<0.0099	<0.0102	<0.0286	<0.029	<0.031	0.0216	<0.0199	<0.0167	<0.0215	<0.0193	<0.0196
Th	<0.0113	<0.0065	<0.0071	<0.0082	<0.0072	<0.0096	<0.0119	0.0388	0.0092	<0.0062	<0.0080	<0.0115	<0.0043
U	<0.0090	<0.0047	<0.0045	<0.0057	<0.0067	<0.0067	<0.0104	0.0138	<0.0072	<0.0066	<0.0062	<0.0078	0.0034

Sample	085XA31	086XA32	089XA35	119BL39	120BL40	124BL44	106L85	107L86	063LX51	065LX53	068LX56	069LX57	036LX27
Locality	G1	G1	G1	G5	G5	G5	BW80	BW80	BW82	BW82	BW82	BW82	H2
Petrology	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol
Li	1.39	1.24	1.37	1.39	1.48	1.51	1.58	1.6	1.73	1.99	1.69	2.51	2.3
Be	<0.078	<0.033	<0.066	<0.149	<0.110	<0.065	<0.059	<0.034	<0.120	<0.104	0.083	<0.16	<0.117
B	0.51	0.44	0.61	0.56	<0.40	0.47	0.502	0.677	<0.39	0.43	<0.43	0.87	<0.40
Al	12	12.88	12.21	5.95	15.04	5.37	9.53	7.49	5.76	5.65	6.14	7.62	206.2
Si	196324.53	196324.55	196324.53	188378.03	188378.03	188378.03	194454.8	194454.8	193987.38	193987.38	193987.38	275321.84	197726.89
P	61.88	53.46	51.1	31.64	39.03	19.7	34.51	27.05	25.49	30.4	29.95	34.38	54.15
Ca	63.47	76.21	71.52	55.96	51.29	43.79	55.08	64.68	<54.65	<44.04	78.42	<62.96	570.43
Ti	59.28	56.53	57.11	11.08	9.89	11.64	10.54	10.8	5.46	5.43	5.8	7.46	128.46
V	2.44	2.49	2.42	0.802	0.728	0.801	1.017	1.046	0.626	0.59	0.66	0.834	12.24
Cr	44.31	41.82	42.18	53.82	12.15	11.87	18.65	18.87	12.12	14.01	12.16	16.43	267.58
Mn	720.79	740.2	724.63	622.35	610.38	614.26	666.17	654.1	687.18	677.17	682.64	957.01	871.49
Co	138.53	140.48	133.82	134.97	135.98	134.24	154.24	153.05	163.78	159.66	156.64	205.71	145.79
Ni	3206.51	3138.06	3048.46	3014.8	3042.41	2940.68	3308.13	3327.55	3522.77	3748.01	3575.93	4484.29	3033.97
Cu	1.19	1.34	1.28	0.71	0.42	0.78	0.79	0.671	0.74	0.84	0.78	1.27	6.13
Zn	51.47	51.92	51.45	52.78	48.92	49.45	72.32	69.38	57.27	58.35	54.23	72.12	81.2
Ga	0.027	0.044	0.033	<0.034	<0.033	<0.042	0.1	0.127	<0.037	0.05	0.033	<0.039	0.33
Rb	<0.068	<0.061	<0.065	<0.124	<0.113	<0.115	<0.087	<0.083	<0.131	<0.136	<0.141	<0.193	<0.133
Sr	<0.0071	<0.0056	<0.0055	<0.0077	<0.0115	0.0057	<0.0054	<0.0054	0.003	<0.0056	<0.0117	0.0361	<0.0123
Y	<0.0036	<0.0048	0.0024	0.0043	<0.0045	<0.0065	<0.0068	<0.0048	<0.0051	<0.0124	<0.0074	<0.0068	0.0186
Zr	0.094	0.0654	0.085	<0.0094	<0.0178	0.0141	<0.0092	<0.0130	<0.0173	<0.0198	<0.0146	<0.02	0.077
Nb	0.692	0.648	0.712	<0.0056	<0.0053	<0.0077	<0.0053	<0.0053	<0.0079	0.0098	0.009	0.0163	0.011
Cs	<0.029	<0.031	<0.028	<0.073	<0.067	<0.066	<0.053	<0.051	<0.078	<0.078	<0.081	<0.114	<0.078
Ba	<0.024	<0.05	<0.039	<0.06	<0.055	<0.086	<0.046	<0.065	<0.067	<0.075	<0.070	<0.111	<0.081
La	<0.0068	<0.0046	<0.0052	0.0987	<0.0083	<0.0076	0.00134	<0.0098	<0.0055	<0.0077	<0.0081	<0.0091	<0.0054
Ce	<0.0039	<0.0060	0.0056	0.0097	<0.0084	<0.0103	0.0026	<0.0068	<0.0056	<0.0039	<0.0082	<0.0092	<0.0039
Pr	<0.0052	<0.0044	<0.0054	<0.0074	<0.0063	<0.0073	<0.0033	0.00215	<0.0047	<0.0033	<0.0076	0.0048	<0.0032
Nd	<0.0190	<0.0128	<0.0254	<0.033	<0.044	<0.041	<0.0260	<0.032	<0.039	<0.038	0.03	<0.026	<0.0189
Sm	<0.039	<0.026	0.0185	<0.032	<0.053	0.017	<0.054	<0.0221	<0.046	<0.032	0.033	<0.069	<0.046
Eu	<0.0084	<0.0070	<0.0080	<0.0086	<0.0082	<0.0189	<0.0084	<0.0059	<0.0104	<0.0060	<0.0139	<0.0229	<0.0103
Gd	<0.035	<0.034	<0.031	<0.061	<0.041	<0.052	<0.0210	<0.036	<0.049	<0.048	<0.032	<0.041	0.0264
Tb	<0.0031	0.0037	<0.0047	<0.0070	<0.0042	<0.0053	<0.0033	<0.0057	<0.0032	<0.0091	<0.0082	<0.0097	<0.0055
Dy	<0.0201	<0.0171	<0.0147	<0.026	<0.0177	<0.029	<0.0190	<0.0267	<0.036	<0.030	<0.028	<0.032	<0.023
Ho	<0.0039	<0.0031	0.00189	<0.0057	<0.0062	<0.01	<0.0050	<0.0100	<0.0113	<0.0083	<0.0105	<0.0121	<0.0058
Er	<0.0150	<0.0111	<0.0109	<0.0243	<0.0211	<0.0238	<0.0143	<0.0142	<0.0271	<0.0249	<0.030	<0.0194	<0.0226
Tm	<0.0037	<0.0041	<0.0045	<0.0063	<0.0079	<0.0061	<0.0034	<0.0047	<0.0065	<0.0055	<0.0058	<0.0097	<0.0078
Yb	0.0133	<0.0192	<0.0134	<0.032	<0.0193	<0.031	<0.0254	0.0079	<0.030	<0.0256	<0.031	0.0277	<0.029
Lu	<0.0044	<0.0021	0.0041	<0.0046	<0.0053	<0.0077	<0.0035	<0.0077	<0.0088	<0.0066	<0.0049	<0.0077	<0.0087
Hf	0.0093	<0.0122	<0.0139	<0.031	<0.0150	<0.0267	0.0063	<0.0113	<0.0159	<0.0223	<0.0232	<0.0151	<0.0194
Ta	0.0057	0.0077	0.0071	<0.0097	<0.0033	<0.0058	<0.0034	<0.0034	<0.0074	<0.0046	<0.0059	<0.0099	<0.0086
Pb	<0.0226	0.036	<0.0143	0.0179	<0.0165	<0.0263	<0.0073	<0.0102	<0.025	<0.028	<0.0224	0.04	<0.0282
Th	<0.0041	<0.0039	<0.0050	<0.0061	<0.0089	<0.0060	0.0047	0.0041	<0.0085	<0.0103	<0.0071	<0.0154	<0.0084
U	0.0048	<0.0053	<0.0057	<0.0076	<0.0056	<0.0074	<0.0033	<0.0057	<0.0072	<0.0064	<0.0058	<0.0087	<0.0055

Sample	037LX28	048LX39	049LX40	040L29	051L40	053L42	064L48	070L54	071L55	090XA36	091XA37	070LX58	072LX60
Locality	H2	H2	H2	H3	H4	H4	H6	H6	H6	BW17	BW17	C4	C4
Petrology	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol
Li	2.23	2.36	2.34	2.76	1.83	1.92	2.19	2.32	2.3	1.92	1.72	1.93	1.48
Be	0.1	<0.114	<0.120	<0.045	<0.061	<0.056	<0.046	<0.074	<0.056	0.045	<0.034	<0.10	<0.079
B	0.84	0.9	0.52	1.046	0.841	0.88	0.775	0.735	0.713	0.49	0.32	0.4	<0.41
Al	214.2	219.45	213.12	184.34	191.31	199.37	151.63	205.48	212.27	90.16	87.92	6.4	8
Si	197726.89	197726.89	197726.89	194454.8	194922.23	194922.23	191650.14	191650.16	191650.16	192585.02	192585.02	194922.25	194922.27
P	55.06	59.03	56.79	40.93	16.53	23.57	21.71	18.61	24.64	26.68	28.33	155.02	145.97
Ca	530.56	506.4	516.43	404.64	561.44	576.68	403.67	400.21	520	392.89	379.49	<45.44	<44.87
Ti	143.8	136.47	137.96	170.18	109.8	112.53	164.67	175.06	174.22	28.74	27.73	0.57	1.07
V	12.54	12.52	12.42	10.61	11.69	11.51	9.77	10.9	10.83	10.42	10.14	0.507	0.441
Cr	275.78	273.21	263.87	196.88	423.71	474.01	226.4	246.53	256.84	219.99	214.53	17.66	11.18
Mn	888.94	894.79	877.73	961.37	826.46	907.01	881.08	894.47	970.45	902.59	884.03	861.74	827.39
Co	147.09	148.63	149.36	161.53	142.89	147.45	140.62	142.22	147.33	150.59	145.36	142.54	134.83
Ni	3153.31	3178.45	3091.13	3048.31	3221.64	3305.05	2924	3033.99	3055.73	3242.22	3084.81	3367.89	3148.47
Cu	5.4	7.41	6.34	7.52	6.3	7.04	8.4	3.54	4.33	12.29	11.67	0.63	0.88
Zn	82.93	80.87	78.45	116.61	67.53	71.88	77.95	79.06	84.88	73.11	71.04	35.63	31.11
Ga	0.365	0.292	0.291	0.433	0.294	0.375	0.289	0.312	0.354	0.169	0.131	0.04	<0.035
Rb	<0.142	<0.143	<0.135	<0.069	<0.078	<0.081	<0.082	<0.077	<0.080	<0.061	<0.062	<0.133	<0.132
Sr	<0.0060	0.0104	0.0096	0.0051	0.0093	<0.0073	0.0058	0.0607	0.0231	0.0022	0.0098	<0.0078	<0.0052
Y	0.0123	0.0221	0.0237	0.0141	0.0087	0.0079	0.0164	0.0202	0.0117	<0.0035	0.0069	<0.0099	<0.0081
Zr	0.083	0.092	0.08	0.117	2.72	0.097	0.1	0.1	0.109	<0.0139	0.0147	<0.0217	<0.0159
Nb	<0.0146	0.0132	0.0095	0.0229	0.0153	0.0142	0.0215	0.0245	0.0146	0.0346	0.0402	<0.0077	<0.0052
Cs	<0.085	<0.088	<0.079	<0.042	<0.045	<0.047	<0.048	<0.044	<0.046	<0.030	<0.029	<0.077	<0.071
Ba	<0.062	<0.091	<0.048	0.0136	<0.042	0.0268	<0.031	<0.029	<0.031	<0.040	<0.051	<0.073	<0.076
La	<0.0059	<0.0136	<0.0088	<0.0038	0.00154	<0.0038	<0.0039	0.0088	<0.0067	0.0042	<0.0053	<0.0093	<0.0080
Ce	<0.0103	<0.0115	<0.0069	<0.0064	<0.0036	<0.0053	<0.0038	0.0341	0.0038	<0.0048	<0.0047	0.0077	<0.0073
Pr	<0.0035	0.0067	<0.0074	<0.0054	<0.0074	0.00206	<0.0055	<0.0043	<0.0032	<0.0039	<0.0039	<0.0045	<0.0043
Nd	<0.020	<0.030	<0.043	<0.0244	<0.0289	<0.0175	<0.0249	0.0258	<0.0304	<0.0264	<0.0226	<0.046	<0.031
Sm	<0.043	<0.044	<0.040	<0.036	<0.040	0.0114	<0.043	<0.020	<0.021	0.017	<0.031	<0.032	<0.052
Eu	<0.0091	<0.0095	<0.0105	<0.0079	<0.0076	<0.0098	<0.0081	<0.0054	0.0085	<0.0101	<0.0082	<0.0083	<0.0136
Gd	<0.061	0.037	<0.044	<0.0198	<0.038	<0.035	<0.0201	<0.0189	<0.028	<0.038	<0.028	0.023	<0.028
Tb	<0.0091	<0.0080	0.0035	0.00139	<0.0052	<0.0032	0.00164	<0.0030	<0.0045	<0.00219	<0.0037	<0.0063	<0.0079
Dy	<0.029	0.0167	<0.027	<0.0178	<0.0172	<0.0221	0.0092	<0.0210	<0.0128	<0.0153	0.0111	<0.03	<0.033
Ho	<0.0072	<0.0092	<0.0059	0.00222	<0.0045	<0.0034	<0.0048	<0.0078	0.0017	<0.0022	<0.0044	<0.01	<0.0044
Er	<0.0189	0.019	<0.0179	<0.0095	<0.0205	<0.0136	<0.0193	<0.0129	<0.0167	0.0119	<0.0092	<0.0173	<0.0189
Tm	<0.0069	<0.0071	<0.0046	<0.0032	0.00193	<0.0045	<0.0046	<0.0061	<0.0064	<0.0036	<0.0046	<0.0070	<0.0060
Yb	<0.032	<0.023	<0.026	<0.0195	<0.0133	<0.0197	<0.0243	<0.0187	<0.0279	0.0089	<0.0137	<0.036	<0.0275
Lu	<0.0100	<0.0090	<0.0089	<0.0046	<0.0031	<0.0047	<0.0033	<0.0070	<0.0047	<0.0031	<0.0052	<0.0056	<0.0043
Hf	<0.030	<0.031	<0.0279	<0.0151	<0.0253	<0.0153	0.0078	<0.0145	0.038	<0.0177	<0.0101	<0.0244	<0.0253
Ta	<0.0061	<0.0036	<0.0057	<0.0045	0.00261	<0.0032	<0.0046	0.0063	0.0033	0.0053	<0.0037	<0.0064	<0.0068
Pb	<0.028	<0.028	<0.029	<0.0068	<0.0132	0.006	0.0157	<0.0113	<0.0098	<0.0186	<0.0213	<0.0183	<0.0200
Th	<0.0097	<0.0094	<0.0098	<0.0070	<0.0034	<0.0050	<0.0036	0.0116	<0.0036	<0.0065	<0.0040	<0.0082	<0.0071
U	<0.0034	<0.0101	<0.0086	<0.0054	<0.0043	<0.0063	<0.0055	<0.0067	<0.0032	<0.0045	<0.0038	<0.0077	<0.0030

Sample	080LX65	090LX75	091LX76	092LX77	097LX82	103LX85	104LX86	105LX87	106LX88	107LX89	108LX90	111LX93	112LX94
Locality	C4	F3	F3	F3	F3	F4	F4	F4	F4	F4	F4	F4	F4
Petrology	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol	Ol
Li	2.02	1.79	1.98	1.84	2.43	1.49	1.57	1.5	1.35	1.76	1.63	1.98	1.89
Be	<0.106	<0.116	<0.165	<0.090	<0.211	<0.088	<0.060	0.072	<0.083	<0.175	<0.081	<0.082	<0.209
B	<0.44	<0.36	0.58	<0.41	<0.57	<0.39	0.52	0.36	0.57	0.49	0.63	<0.56	0.71
Al	8.19	10.22	10.19	11.71	19.16	2.53	3.76	3.92	4.58	6.34	6.3	6.14	4.24
Si	194922.23	193987.39	193987.39	193987.39	254754.52	191650.19	191650.19	191650.19	191650.17	250547.53	250547.56	250547.56	250547.55
P	241.62	45.22	45.26	43.67	66.15	36.85	34.43	28.77	31.83	35.05	39.71	38.26	36.48
Ca	<46.22	99.49	113.76	68.81	161.69	<43.37	53.87	<44.40	50.19	<53.65	91.73	64.94	61.21
Ti	1.07	66.13	64.6	62.13	81.55	8.56	8.2	9.06	17.69	22.77	17.35	16.39	9.3
V	0.568	1.8	1.85	1.93	2.15	0.517	0.477	0.484	0.483	0.829	0.723	0.85	0.629
Cr	13.9	42.66	43.37	52.73	49.86	9.89	7.51	11.45	11.26	30.09	12.91	10.04	8.29
Mn	872.14	783.07	784.98	774.63	1015.18	828.16	815.39	827.38	834.67	1089.71	1088.52	1084.84	1076.15
Co	146.23	146.83	143.65	137.36	188.84	121.12	123.92	121.67	123.76	156.7	164.32	165.84	157.68
Ni	3448.95	3242.61	3379.63	3104.23	4267.79	2837.19	2871.83	2852.23	2765.83	3595.08	3753.52	3844.84	3599.95
Cu	0.51	1.41	1.11	1.22	1.58	0.65	1.14	1	0.82	1.08	1	0.91	1.51
Zn	36.71	59.09	62.09	62.02	79.38	29.22	30.35	29.92	30.79	38.32	34.66	38.73	39.07
Ga	<0.029	<0.056	<0.046	0.047	<0.067	<0.052	0.043	<0.048	<0.051	<0.043	<0.050	<0.051	<0.054
Rb	<0.137	<0.158	<0.163	<0.143	<0.199	<0.137	<0.134	<0.134	<0.131	<0.173	<0.174	<0.190	<0.170
Sr	<0.0081	<0.0124	<0.0088	0.0096	0.09	<0.0100	<0.0078	<0.0056	0.0216	<0.0161	<0.0074	<0.0075	<0.0103
Y	<0.0051	<0.0096	<0.0096	<0.0105	<0.0158	<0.0073	<0.0049	<0.0050	<0.0068	<0.0111	<0.0093	<0.0134	<0.0091
Zr	4.7	0.043	0.069	0.032	0.097	0.0162	<0.0136	<0.0170	<0.0134	0.05	<0.023	0.029	<0.0221
Nb	<0.0098	0.388	0.484	0.485	0.58	<0.0081	<0.0122	0.0124	0.0405	0.054	0.0303	0.0282	0.015
Cs	<0.087	<0.083	<0.090	<0.087	<0.110	<0.079	<0.080	<0.081	<0.077	<0.101	<0.106	<0.109	<0.105
Ba	<0.048	<0.052	<0.105	<0.092	<0.082	<0.084	<0.080	<0.074	<0.072	<0.074	<0.088	<0.100	<0.097
La	<0.0079	<0.0095	<0.0113	0.0127	<0.0154	<0.0097	<0.0065	<0.0054	0.0165	<0.0110	<0.0088	<0.0052	<0.0070
Ce	<0.0080	<0.0087	<0.0062	0.011	<0.0125	<0.0081	<0.0054	<0.0055	0.0128	<0.0071	0.0112	<0.0118	<0.0144
Pr	<0.0082	<0.0072	<0.0081	<0.0048	<0.0122	<0.0067	<0.0071	<0.0046	<0.0031	<0.0094	<0.0106	<0.0088	<0.0095
Nd	<0.043	<0.052	<0.030	<0.035	0.0166	<0.039	<0.046	<0.033	<0.026	<0.035	<0.050	<0.026	<0.060
Sm	<0.040	<0.057	<0.072	<0.034	0.045	<0.053	<0.039	<0.056	<0.049	<0.077	<0.043	<0.043	<0.059
Eu	<0.0172	<0.0093	<0.0147	<0.0139	<0.0188	<0.0105	<0.01	<0.0118	0.0088	<0.0131	<0.0111	0.0161	<0.0171
Gd	<0.044	<0.053	<0.041	<0.045	<0.081	<0.022	<0.056	<0.030	<0.051	0.039	<0.028	<0.029	<0.056
Tb	<0.0046	<0.0061	<0.0035	<0.0088	<0.0100	<0.0046	<0.0054	<0.0045	<0.0096	<0.0091	<0.0072	<0.0073	<0.0082
Dy	<0.033	<0.033	<0.039	<0.028	<0.046	<0.033	<0.03	<0.0229	<0.0221	<0.024	<0.043	<0.040	<0.034
Ho	<0.0069	<0.0053	<0.0065	<0.0070	<0.0082	<0.0060	<0.0046	<0.0047	<0.0056	<0.0096	<0.0089	<0.0100	<0.0087
Er	<0.0231	<0.0225	<0.0112	<0.0212	<0.029	<0.0233	<0.0242	<0.0143	0.0135	<0.0225	<0.023	<0.0235	<0.0262
Tm	<0.0065	<0.0061	<0.0071	<0.0088	<0.0078	<0.0093	<0.0054	0.0024	<0.0075	<0.0081	<0.0103	<0.0085	<0.0071
Yb	<0.026	<0.043	<0.0163	<0.0217	<0.055	<0.040	<0.029	<0.0207	<0.037	<0.033	<0.027	<0.059	<0.042
Lu	0.0059	<0.0063	<0.0073	<0.0084	<0.0122	<0.0067	<0.0071	<0.0086	<0.0063	<0.0083	<0.0105	<0.0076	<0.0084
Hf	<0.0159	<0.0211	<0.0244	<0.0257	<0.035	<0.0252	<0.028	<0.0267	<0.0258	<0.028	<0.029	<0.033	<0.037
Ta	<0.0058	<0.0051	<0.0108	0.0147	<0.0103	<0.0082	<0.0064	<0.0056	<0.0070	<0.0093	<0.0122	<0.0098	<0.0084
Pb	<0.028	<0.027	<0.0206	<0.0194	<0.032	<0.0246	<0.0222	<0.0261	<0.0230	0.05	<0.032	<0.037	<0.0219
Th	<0.0070	<0.0093	0.0138	<0.0087	<0.0160	<0.0105	<0.01	<0.0112	0.0091	0.0193	<0.0064	<0.0079	<0.0098
U	<0.0073	<0.0071	0.0068	0.0089	<0.0101	<0.0046	<0.0076	<0.0064	<0.0081	<0.0092	0.0077	<0.0135	<0.0101

Sample	023LX17	024LX18	025LX19	027LX21
Locality	I5	I5	I5	I5
Petrology	Ol	Ol	Ol	Ol
Li	1.36	1.29	1.26	1.49
Be	<0.175	<0.109	<0.121	<0.124
B	<0.47	0.85	<0.45	0.8
Al	7.7	6.93	6.4	6.96
Si	197726.88	197726.88	197726.89	197726.89
P	22.08	27.76	24.98	21.84
Ca	52.17	<53.16	<50.66	<56.38
Ti	1.86	2.38	1.7	1.57
V	0.603	0.525	0.5	0.754
Cr	42.61	34.22	39.9	243.43
Mn	730.58	736.68	719.2	742.67
Co	134.84	135.41	135.8	136.85
Ni	3534.68	3499.25	3499.2	3672.92
Cu	2.71	2.24	2.48	3.16
Zn	39.37	36.61	35.98	40.49
Ga	<0.028	0.05	<0.038	<0.049
Rb	<0.160	<0.148	<0.137	<0.149
Sr	0.0059	0.0179	<0.0128	0.0185
Y	0.0054	<0.0145	<0.0091	<0.0076
Zr	<0.0121	<0.0185	<0.0145	0.0109
Nb	<0.0096	0.0036	<0.0057	<0.0117
Cs	<0.093	<0.085	<0.084	<0.083
Ba	0.024	<0.062	<0.07	0.058
La	<0.0047	0.0044	<0.0080	<0.0071
Ce	<0.0068	<0.0073	<0.0081	<0.0041
Pr	<0.0089	0.0047	<0.0082	<0.0034
Nd	<0.023	<0.041	<0.034	<0.035
Sm	<0.049	<0.050	<0.041	<0.042
Eu	<0.0165	<0.0146	<0.0088	<0.0110
Gd	<0.070	<0.052	<0.039	<0.040
Tb	0.0063	<0.0070	0.0041	<0.0076
Dy	<0.041	<0.0254	<0.024	<0.029
Ho	<0.0093	<0.0082	<0.0099	<0.0080
Er	<0.0278	<0.0220	<0.0182	0.0159
Tm	<0.0079	<0.0049	<0.0058	<0.0090
Yb	<0.032	<0.0278	<0.0218	<0.031
Lu	<0.0108	<0.0072	<0.0084	<0.0111
Hf	<0.0241	<0.027	<0.031	0.0213
Ta	<0.0090	<0.0079	<0.01	<0.0077
Pb	0.034	<0.028	<0.028	0.031
Th	<0.0119	<0.0098	<0.0101	<0.0073
U	<0.0087	0.0036	<0.0087	<0.0083

12.2.2 Orthopyroxene

Sample	118BL38	121BL41	059LX47	060LX48	066LX54	102L81	108L87	109L88	043XB9	044XB10	045XB11	069XA19	087BL11
Locality	G5	G5	BW82	BW82	BW82	BW80	BW80	BW80	BW1	BW1	BW1	BW7	Bw44
Petrology	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
Li	0.968	0.939	1.19	0.9	1.26	0.746	0.898	1.078	1.007	0.81	1.033	1.67	0.9
Be	<0.114	<0.101	0.114	<0.138	<0.118	<0.033	<0.033	0.039	0.159	0.086	0.255	0.183	0.149
B	0.44	<0.41	<0.44	0.4	<0.41	0.501	0.674	0.56	0.455	0.71	0.63	0.42	<0.48
Al	9153.32	8968.98	12089.85	9913.48	11391.68	6359.54	8229.78	8728.32	3451.31	3270.34	3372.88	3408.21	3373.78
Si	268310.19	268310.19	275321.78	275321.78	271114.88	194454.8	274854.34	274854.38	271114.81	271114.81	271114.81	270179.97	280463.59
P	17.87	20.95	20.78	19.8	17.55	12.74	16.86	12.7	34.01	37.41	36.15	34.73	21.77
Ca	1183.36	1527	1750.92	1232.91	1649.44	1088.72	1673.31	1878.79	3683.65	3464.07	3583.32	2792.73	2660.6
Ti	530.52	586.12	217.41	197.04	269.69	411.79	657.82	623.06	955.22	881.39	901.34	615.38	683.15
V	63.84	63.11	59.48	47.42	66.51	48.68	66.76	70.52	40.33	37.17	38.7	35.65	37.84
Cr	1992.97	1867.08	2457.76	1950.77	2634.73	1885.45	2290.99	2614.01	1278.37	1165.38	1147.72	1214.67	1252.37
Mn	772.68	787.14	885.05	871.07	881.14	581.27	793.36	801.76	844.72	802.57	820.37	864.56	807.17
Co	48.47	48.89	61.76	55.09	55.14	38.72	55.9	55.71	70.11	66.22	65.94	56.9	53.77
Ni	558.26	567.66	664.64	614.84	696.04	440.61	617.35	628.43	914.86	866.16	866.88	828.62	788.11
Cu	0.43	0.44	0.64	0.72	0.75	0.463	0.688	0.608	1.99	2.02	2.09	1.42	1.19
Zn	35.65	35.26	37.37	35.31	46.12	39.27	53.78	54.41	53.17	50.91	50.99	40.16	35.86
Ga	4.54	4.16	3.65	3.33	4.34	4.17	5.82	5.92	2.62	2.6	2.6	1.69	2.75
Rb	<0.116	<0.120	<0.143	<0.139	<0.167	<0.061	0.086	<0.092	<0.041	<0.047	<0.046	<0.066	<0.119
Sr	0.0173	0.0363	0.0652	<0.0128	<0.0098	0.0251	<0.0077	0.117	0.297	0.28	0.34	0.296	0.228
Y	0.0247	0.0337	0.0143	0.016	<0.0121	0.0119	0.0187	0.0188	0.056	0.0519	0.0469	0.1085	0.0697
Zr	0.152	0.169	0.089	0.065	0.084	0.1061	0.107	0.113	0.302	0.255	0.245	0.46	0.448
Nb	<0.0059	0.0111	0.0134	0.0106	0.0199	0.0025	0.0035	0.0059	0.0649	0.0628	0.0577	0.095	0.124
Cs	<0.075	<0.070	<0.090	<0.081	<0.099	<0.036	<0.054	<0.049	<0.0199	<0.0214	<0.0222	<0.031	0.183
Ba	<0.077	<0.047	<0.080	<0.076	<0.071	<0.0239	<0.048	<0.058	<0.0156	<0.040	0.05	<0.046	<0.074
La	<0.0069	<0.0109	<0.0072	0.0048	<0.0067	<0.0028	<0.0056	0.006	<0.0048	0.0073	0.0121	0.0084	<0.0086
Ce	<0.0081	<0.0096	<0.0074	<0.0071	<0.0098	<0.0040	<0.0040	<0.0079	0.0272	0.0299	0.0312	0.0396	0.0368
Pr	<0.0068	<0.0066	<0.0062	<0.0048	<0.0071	<0.00232	<0.0047	<0.0046	<0.0040	0.0041	<0.0038	0.0096	0.006
Nd	<0.045	<0.027	<0.029	<0.044	<0.041	<0.0134	<0.0268	<0.033	0.0306	0.034	0.0336	0.046	<0.042
Sm	<0.033	<0.032	<0.035	<0.023	<0.040	<0.0160	0.012	0.0195	<0.0179	0.0241	<0.0184	<0.022	0.0275
Eu	<0.0107	<0.0084	<0.0215	<0.0087	<0.0181	<0.0043	<0.0122	<0.0105	<0.0067	<0.0065	<0.0075	0.0094	<0.0119
Gd	<0.061	<0.036	<0.039	<0.043	<0.057	<0.0208	<0.029	<0.021	0.0166	<0.0141	<0.026	0.051	<0.051
Tb	<0.0074	<0.0064	<0.0104	<0.0074	<0.0056	<0.0040	<0.0056	<0.0032	0.0037	0.0046	<0.0021	0.0061	0.0064
Dy	<0.027	0.026	<0.0199	<0.0232	<0.039	<0.0094	<0.0188	<0.0228	0.0133	0.0167	0.0149	0.0209	<0.026
Ho	<0.0049	<0.0047	<0.0087	<0.0076	<0.0057	<0.0024	<0.0068	<0.0058	<0.0036	<0.0038	<0.0046	<0.0039	0.0106
Er	<0.0249	<0.0260	<0.0182	<0.0141	<0.029	<0.0100	<0.0100	<0.0141	0.0084	0.0102	<0.0101	<0.0161	0.0194
Tm	<0.0079	<0.0062	<0.0047	<0.0055	<0.0066	<0.0039	<0.0055	<0.0055	<0.0024	<0.00255	<0.0035	<0.0030	<0.0069
Yb	<0.026	<0.025	<0.028	<0.034	<0.041	<0.0105	<0.0211	<0.0257	<0.0161	<0.0154	0.0074	0.0246	<0.029
Lu	<0.0048	<0.0046	0.0056	<0.0075	<0.0057	<0.0033	<0.0047	<0.0067	0.00162	<0.0022	<0.00212	<0.0031	<0.0079
Hf	<0.0163	<0.0223	0.0174	0.027	<0.032	<0.0138	<0.0113	<0.0194	<0.0140	0.0177	0.0192	0.0176	0.0201
Ta	<0.0051	<0.0098	<0.0070	<0.0087	<0.0056	<0.0034	<0.0034	<0.0048	0.0117	0.0089	0.0059	0.0149	0.0194
Pb	0.039	<0.0243	<0.0246	<0.0258	<0.0229	<0.0095	<0.0190	<0.0109	<0.0133	<0.0219	<0.0153	<0.0157	<0.0108
Th	<0.0111	<0.0124	<0.0089	<0.0091	<0.0093	<0.0045	<0.0053	<0.0052	<0.0045	<0.0037	0.0031	0.0037	<0.0070
U	<0.0085	<0.0089	<0.0070	<0.0047	<0.0113	<0.0048	0.00145	<0.0048	<0.0037	<0.0042	<0.0035	<0.0054	<0.0048

Sample	016L10	017L11	018L12	021L15	023L17	039L28	010LX4	011LX5	017LX11	080XA26	081XA27	082XA28	083XA29
Locality	BW4	BW4	BW4	BW4	BW5	BW5	D3	D3	D3	G1	G1	G1	G1
Petrology	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
Li	0.829	0.848	0.605	0.911	0.975	1.159	0.552	0.553	0.397	0.79	0.612	0.737	0.652
Be	0.263	0.279	0.111	0.24	0.226	0.22	<0.093	0.151	0.176	<0.070	<0.078	0.055	<0.047
B	1.43	1.33	1.026	1.231	1.21	1.086	<0.40	0.4	0.57	<0.35	<0.31	0.38	0.5
Al	3284.65	3214.39	2408.68	3234.44	3464.13	3417.51	2964.99	3291.8	3410.1	5030.97	4942.47	4763.62	4705.38
Si	271582.31	271582.31	197259.42	271582.31	275321.81	275321.81	278126.41	278126.41	278126.41	271114.84	271114.84	271114.84	271114.84
P	20.17	16.61	13.48	17.81	17.47	18.76	18.61	29.26	21.58	33.69	30.42	31.71	28.93
Ca	3283.67	3398.16	2406.5	3273.28	2758.57	2854.83	2412.93	2536.71	2647.34	1695.19	1683.69	1574.82	1616.12
Ti	766.95	702.46	569.89	778.11	227.3	212	115.79	123.53	130.93	253.65	253	243.18	247.14
V	28.75	30.74	21.68	28.78	28.09	28.49	35.71	40.79	38.48	49.27	49.66	47.88	48.71
Cr	1292.28	1343.88	998.16	1399.25	1003.8	1029.27	2782.38	3332.14	3067.87	1997.09	1772.71	1755.58	1757.78
Mn	794.02	794.73	575.73	791.33	779.49	801.53	796.92	828.6	819.05	867.06	847.73	840.43	855.47
Co	56.22	55.09	40.57	54.58	55.07	55.62	53	52.1	51.24	50.5	49.45	50.69	50.17
Ni	805.17	811.51	585.81	814.8	805.69	828.77	808.4	815.32	811.92	690.51	673.13	659.77	665.72
Cu	1.84	2	1.373	1.84	1.76	1.85	1.1	1.45	1.37	0.79	0.89	0.92	0.67
Zn	42.44	43.57	30.88	42.73	37.6	39.3	29.76	32.26	30.78	34.63	32.82	32.83	32.28
Ga	2.74	2.57	1.977	2.67	1.641	1.73	0.843	0.881	0.843	1.93	1.86	1.76	1.92
Rb	<0.066	<0.062	<0.049	<0.066	<0.061	<0.076	<0.133	0.443	<0.139	0.106	<0.067	<0.063	<0.062
Sr	0.241	0.477	0.192	0.239	0.238	0.206	0.651	15.04	2.227	0.459	0.074	0.0742	0.0673
Y	0.079	0.0869	0.0639	0.0911	0.0869	0.0872	0.0221	0.0405	0.018	0.0273	0.0251	0.0231	0.0227
Zr	0.382	0.418	0.28	0.386	0.565	0.503	0.133	0.339	0.181	0.318	0.248	0.202	0.175
Nb	0.0563	0.0687	0.0381	0.0674	0.0931	0.105	0.218	2.032	0.45	0.19	0.127	0.104	0.09
Cs	<0.035	<0.033	<0.0255	<0.034	<0.036	<0.044	<0.078	<0.087	<0.088	<0.031	<0.031	<0.031	<0.029
Ba	<0.035	0.068	<0.0184	<0.0247	<0.035	<0.040	<0.057	16.9	3.29	0.546	<0.063	<0.057	<0.039
La	0.0049	0.0054	<0.0030	0.0043	<0.0050	<0.0067	0.017	1.358	0.187	0.054	0.0288	0.0258	0.0242
Ce	0.0236	0.0241	0.0157	0.0252	0.0349	0.0315	0.0842	2.63	0.324	0.119	0.0355	0.0331	0.0341
Pr	0.0052	0.0059	0.00368	<0.0048	0.0074	0.0076	0.012	0.292	0.0438	0.0126	0.0052	0.0046	<0.0059
Nd	0.0204	0.034	<0.0146	0.0303	0.0569	0.041	0.096	1.12	0.252	0.069	0.036	<0.030	<0.022
Sm	<0.040	<0.0162	0.008	<0.033	0.0233	0.0243	0.034	0.073	0.071	0.025	<0.036	<0.031	0.032
Eu	0.0066	0.0065	0.004	0.0062	0.0084	0.014	<0.0086	<0.0171	<0.0162	<0.0103	<0.0042	<0.0102	<0.0057
Gd	<0.0212	<0.0210	0.0234	0.0226	<0.0215	0.0223	<0.059	0.059	0.044	<0.046	<0.029	<0.032	<0.031
Tb	<0.0033	<0.0033	<0.0025	<0.0033	0.0052	<0.0047	<0.0055	<0.0068	<0.0070	0.0058	<0.0039	<0.0054	<0.0042
Dy	0.022	<0.0164	0.0157	<0.0137	0.021	0.0247	<0.029	<0.024	<0.024	<0.0180	<0.0201	<0.0153	<0.0192
Ho	<0.0042	<0.0034	0.0028	<0.0035	0.0047	<0.0040	<0.0057	<0.0061	<0.0080	<0.0032	0.003	<0.0050	<0.0031
Er	0.0144	0.0114	0.01	<0.0127	0.0102	<0.0119	0.0176	<0.0148	<0.0107	<0.0134	<0.0095	<0.0132	<0.0111
Tm	<0.0033	<0.0032	<0.00245	<0.0023	0.00303	<0.0054	<0.0044	<0.0067	<0.0059	<0.0030	<0.0030	<0.0047	<0.0029
Yb	<0.0153	0.0127	0.0088	<0.0244	0.0174	<0.0126	<0.039	<0.027	<0.023	<0.0201	<0.0101	<0.0140	<0.0192
Lu	<0.0024	<0.0034	0.002	<0.0035	<0.0035	<0.0063	<0.0046	<0.0077	<0.0062	<0.0038	<0.0022	<0.0031	<0.0036
Hf	0.0188	0.0193	0.0162	0.0238	0.0123	<0.0165	<0.0185	<0.028	<0.0202	<0.0195	<0.0165	<0.0162	0.017
Ta	0.0131	0.0092	0.0075	0.012	0.0127	0.0122	0.0286	0.0588	0.0271	<0.0062	<0.0049	0.0076	0.0066
Pb	<0.0056	0.0078	<0.0112	<0.0098	<0.0127	0.0124	<0.025	0.07	<0.028	<0.0175	<0.0175	<0.0179	<0.0199
Th	<0.0066	<0.0046	<0.00202	<0.0038	<0.0054	<0.0044	<0.0090	0.226	0.0318	0.0381	0.0235	0.0182	0.0258
U	<0.0043	<0.0035	<0.00187	<0.0043	<0.0043	<0.0029	<0.0065	0.0517	<0.0087	0.0151	0.0141	0.0145	0.0171

Sample	087XA33	088XA34	093BL17	096BL20	075L59	076L60	077L61	092L71	095L74	096L75	092XA38	095XA41	097XA43
Locality	G1	G1	E4	E4	D1	D1	D1	D4	D4	D4	BW17	BW17	BW17
Petrology	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
Li	0.94	0.647	0.676	0.625	0.622	0.617	0.7	0.722	0.811	1.061	0.94	0.74	0.83
Be	0.078	0.064	0.145	0.164	<0.063	<0.071	0.033	0.201	0.156	0.276	0.069	0.095	0.064
B	0.42	<0.36	<0.37	<0.39	0.805	0.816	0.721	0.603	0.631	0.859	<0.34	<0.31	<0.36
Al	4735.19	4806.17	3566.79	3428.8	2934.25	2939.09	2959.65	2881.13	3458.69	3922.88	3481.99	3632.34	3564.93
Si	273452.03	273452.03	273452	271114.81	271114.84	271114.88	271114.88	198661.77	273452.06	273452.06	271114.84	271114.84	271114.84
P	29.09	30.01	23.37	16.73	16.19	16.17	15.22	15.42	18.77	27.48	27.43	29.08	29.82
Ca	1650.68	1615.6	2454.02	2420.75	6456.62	6634.86	6528.63	2000.08	2696.05	2819.03	7118.72	7440.74	7410.48
Ti	245.47	250.01	507.08	493.08	31.41	30.34	34.61	257.77	188.39	359.7	156.14	162.87	164.2
V	48.97	49.19	48.66	46.22	37.29	37.8	37.82	31.87	43.86	44.49	46.75	48.93	48.61
Cr	1799.96	1839.11	1724.11	1673.58	1977.06	2013.34	1983.62	2121.42	2658.55	2940.72	1375.46	1406.9	1396.99
Mn	862.82	859.12	789.86	782.09	981.92	1005.84	973.13	575.02	770.93	777.4	955.26	980.51	970.15
Co	51.76	51.36	54.06	53.36	64.68	64.45	64.79	42.09	57.52	58.67	63.86	65.79	64.57
Ni	686.62	669.21	795.87	784.69	967.24	966.74	968.62	661.85	898.4	909.42	1012.99	1032.04	1024.7
Cu	0.65	0.67	1.18	1	4.65	4.49	4.3	1.033	1.61	1.53	7.16	7.42	7.01
Zn	33.99	33.79	33.35	33.45	47.68	46.77	45.84	28.37	38.31	39.12	40.64	43.52	42.46
Ga	1.95	1.81	1.409	1.359	1.819	1.848	1.899	0.938	1.172	1.183	2.35	2.61	2.38
Rb	<0.065	<0.065	<0.109	<0.113	<0.082	<0.086	<0.088	0.151	<0.085	0.209	<0.061	<0.067	<0.066
Sr	0.0769	0.0935	0.291	0.265	0.646	0.767	0.415	0.422	0.252	2.65	0.286	0.271	0.276
Y	0.0193	0.0241	0.0177	0.035	<0.0102	<0.0103	0.0109	0.0822	0.0693	0.124	0.0266	0.0215	0.0225
Zr	0.199	0.223	0.216	0.344	0.0029	<0.0091	0.0311	0.421	0.528	0.779	0.0272	0.0221	0.0188
Nb	0.115	0.114	0.16	0.164	<0.0076	0.0133	0.0539	0.1187	0.113	0.426	0.0529	0.0576	0.0515
Cs	<0.029	<0.032	<0.065	<0.069	<0.046	<0.050	<0.050	<0.037	<0.050	<0.049	<0.028	<0.031	<0.030
Ba	<0.033	<0.068	<0.044	<0.082	0.373	0.266	0.475	0.216	<0.032	3.52	<0.043	<0.033	<0.042
La	0.0215	0.026	0.0151	0.0126	0.0046	<0.0055	0.0406	0.0513	0.0125	0.228	0.0126	0.0098	<0.0074
Ce	0.0416	0.0384	0.0767	0.0487	<0.0078	0.0112	0.0674	0.0798	0.0242	0.455	0.0414	0.0372	0.0333
Pr	<0.0061	0.0059	0.0129	0.0127	<0.0045	<0.0046	0.011	0.0128	0.0057	0.0535	<0.0036	0.0055	0.0119
Nd	0.03	0.028	0.051	<0.036	<0.0185	0.0172	0.0271	0.0618	0.039	0.194	<0.024	<0.038	0.036
Sm	<0.027	<0.040	<0.055	<0.042	<0.044	<0.039	<0.022	0.021	<0.030	0.068	<0.025	<0.032	<0.028
Eu	<0.0072	0.0092	0.0074	<0.0097	<0.0084	<0.0060	<0.0059	0.0104	<0.0114	0.0141	<0.0085	<0.0059	0.0075
Gd	<0.032	0.0188	<0.034	<0.044	<0.035	<0.029	<0.035	0.0353	0.039	0.043	<0.026	<0.0249	0.026
Tb	<0.0054	<0.0051	<0.0079	0.0045	<0.0055	<0.0055	<0.0031	<0.0031	0.0057	0.0074	<0.0045	<0.0049	<0.0039
Dy	<0.0126	<0.0204	<0.034	0.0314	<0.0129	<0.01	0.0067	0.0161	<0.030	<0.025	<0.0230	<0.0177	<0.0128
Ho	<0.0032	<0.0033	<0.0061	<0.0069	<0.0057	<0.0033	<0.0046	<0.0039	<0.0055	<0.0044	<0.0036	<0.0032	<0.0051
Er	<0.0133	<0.0167	<0.0182	0.0151	<0.0097	0.0081	<0.0167	<0.0165	0.0078	<0.0132	0.0098	<0.0114	<0.0095
Tm	<0.0037	<0.0038	<0.0041	<0.0041	0.00168	<0.0054	<0.0043	<0.0030	<0.0051	<0.0051	<0.0039	<0.0052	<0.0048
Yb	<0.0141	<0.0177	<0.047	<0.0239	<0.0145	<0.0146	<0.0144	<0.0201	<0.031	<0.028	<0.0128	<0.0222	<0.0175
Lu	<0.0038	<0.0059	<0.0061	<0.0053	<0.0057	<0.01	<0.0032	0.0024	0.0021	<0.0054	<0.0034	<0.0061	<0.0038
Hf	<0.0127	<0.0183	<0.025	<0.0146	<0.0156	<0.0221	<0.0154	0.0186	0.0318	0.0341	<0.0176	<0.0192	<0.0105
Ta	0.0071	<0.0055	0.0154	0.0164	<0.0033	<0.0058	0.0049	0.0221	0.0287	0.0432	0.0106	<0.0038	0.0061
Pb	<0.0181	<0.0178	<0.0189	<0.0191	<0.0076	<0.0170	<0.0106	<0.0104	0.006	0.0257	<0.0145	<0.0173	<0.0222
Th	0.0173	0.0268	<0.0087	<0.0094	<0.0036	<0.0051	0.0075	0.0066	<0.0035	0.0269	<0.0056	<0.0052	<0.0053
U	0.0203	0.0149	<0.0077	<0.0095	<0.0047	0.0107	<0.0047	0.0114	<0.0045	0.0092	<0.0029	<0.0060	<0.0062

Sample	098XA44	032LX23	033LX24	044LX35	045LX36	050LX41	047L36	048L37	050L39	073L57	074L58	071LX59	075LX63
Locality	BW17	H2	H2	H2	H2	H2	H3	H3	H4	H6	H6	C4	C4
Petrology	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
Li	0.653	1.28	1.57	1.29	1.35	1.38	1.72	1.112	1.001	1.4	1.42	0.464	0.467
Be	<0.042	0.12	0.167	<0.132	<0.128	0.146	0.146	0.179	0.182	0.23	0.189	0.135	0.251
B	<0.24	0.62	0.76	<0.41	0.66	0.46	1.18	0.781	0.966	0.788	0.78	0.26	<0.40
Al	2610.8	5598.3	5772.06	5799.82	5494.53	5672.27	5128.41	3527.07	5099.32	3912.99	4496.38	6287.83	9090.65
Si	196324.53	273452.03	273452.03	273452.03	273452.03	273452.03	274854.38	194454.81	272049.75	271114.88	271114.88	194922.25	266907.91
P	20.49	22.39	20.66	25.81	29.42	22.53	22.57	14.3	23.04	15.81	14.03	17.15	26.78
Ca	5333.73	9056.02	10092	9623.76	9375.27	9891.16	7870.67	5407.37	9981.01	7981.89	7628.46	1403.62	1599.34
Ti	117.13	995.46	1135.47	1049.74	1017.8	1068.8	1167.09	807.99	854.06	633.34	957.99	75.01	102.65
V	35.59	53.09	58.37	54.14	53.66	55.14	56.65	39.52	50.85	40.47	49.72	30.22	43.38
Cr	1029.21	1506.1	1525.4	1491.71	1456.86	1505.9	1208.18	874.64	2369.93	1157.03	1355.64	2018.42	2920.91
Mn	714.59	950.21	941.66	952.61	948.37	950.49	1040.5	716.23	918.98	970.62	966.85	764.17	1078.93
Co	46.45	64.03	66.8	67.13	65.64	66.58	70.67	49.7	65.89	64.59	64.9	36.04	51.71
Ni	730.58	976.46	1090.7	1009.98	996.11	1052.35	955.13	678.4	1030.85	957.04	944.87	447.41	647.74
Cu	4.39	3.52	2.97	4.31	4.29	4.22	5.27	3.63	3.94	6.17	6.18	0.288	0.54
Zn	31.17	43.47	51.03	47.15	44.86	46.94	75.79	53.65	44.88	49.41	51.38	19.19	26.43
Ga	1.86	3.33	3.4	3.24	2.94	3.24	3.7	2.65	2.33	2.39	2.71	0.877	1.347
Rb	<0.045	<0.144	0.212	<0.149	<0.143	<0.136	<0.079	<0.062	0.151	0.103	<0.087	<0.099	<0.145
Sr	0.222	2.737	2.381	1.889	1.745	1.876	1.161	0.709	1.793	2.21	0.167	0.467	0.28
Y	0.0221	0.222	0.222	0.214	0.232	0.231	0.206	0.1393	0.1136	0.1036	0.1301	0.111	0.127
Zr	0.0176	0.502	0.523	0.44	0.412	0.476	0.451	0.311	0.271	0.28	0.323	0.571	0.756
Nb	0.0322	0.115	0.0852	0.0375	0.028	0.0335	0.0484	0.0331	0.0519	0.052	0.0453	<0.0071	0.0103
Cs	<0.0220	0.107	0.091	<0.085	<0.081	<0.083	<0.044	<0.034	<0.043	<0.050	<0.049	<0.057	<0.087
Ba	0.044	2.23	0.26	<0.062	<0.049	<0.085	0.104	<0.031	<0.042	0.091	<0.046	<0.049	<0.061
La	0.0082	0.0693	0.0328	0.0185	0.0222	0.0262	0.0284	0.0104	0.0171	0.0078	0.0082	0.0625	0.0551
Ce	0.0243	0.192	0.115	0.0872	0.0999	0.0989	0.0798	0.045	0.1017	0.0333	0.0443	0.161	0.0842
Pr	0.0045	0.0276	0.0178	0.0258	0.0148	0.0148	0.0162	0.0077	0.0133	<0.0069	0.0091	0.0209	0.0087
Nd	<0.019	0.121	0.15	0.122	0.135	0.13	0.076	0.055	0.111	<0.040	0.052	0.086	0.063
Sm	<0.030	0.062	0.101	<0.065	<0.067	0.072	0.036	<0.026	<0.035	0.0276	<0.031	0.023	<0.042
Eu	<0.0078	<0.0171	<0.0212	0.0209	0.0215	<0.0109	0.0096	<0.0089	0.0104	<0.0090	0.0132	<0.0116	<0.0156
Gd	0.0139	0.083	0.067	0.075	0.061	0.055	0.045	0.0304	0.043	<0.043	0.043	<0.037	<0.054
Tb	<0.0035	0.0138	0.0142	0.0078	0.0104	0.0102	0.006	0.0045	0.00321	<0.0059	<0.0044	<0.0041	<0.0048
Dy	0.0086	<0.034	0.069	0.06	0.04	0.031	0.033	0.0258	0.0275	0.0304	0.0379	0.0221	0.022
Ho	<0.0039	0.0093	0.0107	0.0086	<0.0069	<0.0077	0.0098	0.0066	0.0064	<0.0061	0.0067	<0.0059	0.0083
Er	<0.0104	0.0233	0.03	0.0252	<0.027	<0.0144	0.0271	0.0174	<0.0153	0.0143	0.0286	0.023	<0.0179
Tm	<0.0033	<0.0111	<0.0049	<0.0058	<0.0086	<0.0046	<0.0041	0.00231	<0.0049	<0.0033	<0.0075	<0.0032	0.0056
Yb	<0.0099	<0.031	<0.033	<0.032	0.034	<0.038	0.0237	0.02	<0.0131	0.0181	0.0162	0.0394	<0.042
Lu	<0.0022	<0.0060	0.0094	<0.0070	0.0097	<0.0083	<0.0053	<0.0031	<0.0051	<0.0093	<0.0032	0.0058	0.0136
Hf	<0.0126	0.0376	0.031	<0.031	0.02	<0.0194	0.021	0.0278	0.0275	<0.0205	0.0223	0.0227	0.028
Ta	0.0034	<0.0059	<0.0062	<0.0060	0.007	<0.0058	0.0076	<0.0050	0.0065	0.0049	0.0061	<0.0033	<0.0077
Pb	<0.0106	<0.0245	<0.0224	<0.027	<0.0239	<0.028	<0.0141	<0.0088	<0.0118	<0.0141	<0.0105	<0.0135	<0.025
Th	<0.0044	0.0124	<0.0106	<0.0089	<0.0061	<0.0050	<0.0075	<0.0024	<0.0046	<0.0067	<0.0050	0.0737	0.0147
U	<0.0032	<0.0104	<0.0080	<0.0070	<0.0068	<0.0068	<0.0044	<0.0050	0.00155	<0.0062	<0.0057	0.0091	<0.0077

Sample	079LX64	081LX66	082LX67	084LX69	087LX72	089LX74	098LX83	109LX91	110LX92	113LX95	022LX16	026LX20
Locality	C4	C4	C4	C4	F3	F3	F4	F4	F4	F3	I5	I5
Petrology	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx	Opx
Li	0.408	0.388	0.652	0.394	1.16	0.98	1.2	1.12	1.3	0.87	1.27	0.934
Be	0.154	<0.104	<0.148	0.123	<0.109	<0.139	<0.119	0.112	<0.128	0.128	0.112	0.145
B	<0.37	<0.41	<0.36	<0.31	0.57	<0.38	0.52	<0.37	0.4	<0.37	1.61	0.7
Al	8557.49	7409.11	7662.67	7712.82	5798.18	5068.79	13439.76	12930.82	13213.21	3883.61	7182.92	8269.43
Si	266907.91	254754.48	254754.47	254754.47	271114.88	271114.88	264103.28	264103.28	264103.28	254754.48	271114.84	271114.84
P	26.82	24.55	24.31	21.34	20.57	14.3	13.79	14.5	13.03	15.01	20.62	12.21
Ca	2105.05	1979.43	1631.75	1462.68	1703.23	1564.2	2240.59	2102.02	1857.74	1615.6	1479.76	1580.88
Ti	102.77	93.61	93.81	85.16	400.1	388.19	459.45	474.44	524.28	323.04	91.63	73.9
V	43.61	35.04	35.19	34.96	40.7	40.2	60.87	62.95	68.63	30.39	35.76	37.99
Cr	2731.09	2209.11	2442.78	2287.38	2455.66	1853.43	2936.01	2546.46	2832.6	1436.49	1800.08	2031.05
Mn	1084.42	1015.64	1029.08	1027.29	906.2	914.38	982.79	986.69	1004.51	842.55	936.63	932.68
Co	49.63	49.88	46.78	47.18	52.25	52.3	44.51	45.76	46.06	52.21	52.17	47.55
Ni	586.89	626.75	557.94	543.77	705.16	692.05	556.27	564.4	604.82	635.23	702.32	625.08
Cu	0.63	<0.28	0.66	0.4	0.76	1.03	0.84	0.54	0.75	0.84	2.9	2.53
Zn	25.34	25.91	23.15	23.26	39.33	40.17	19.61	19.4	22.49	34.52	29.56	27.18
Ga	1.214	0.84	1.122	1.083	2.6	2.23	1.42	1.407	1.52	1.72	1.132	1.284
Rb	<0.136	<0.144	<0.122	<0.129	0.172	<0.146	<0.149	<0.141	<0.154	<0.131	0.581	<0.152
Sr	0.108	0.37	0.324	0.0774	0.141	0.0814	0.189	0.213	0.0279	0.0679	8.68	0.393
Y	0.126	0.136	0.139	0.093	0.0262	0.0414	0.255	0.232	0.23	0.0653	0.063	0.0656
Zr	0.694	0.835	0.553	0.42	0.152	0.156	0.366	0.396	0.344	0.116	0.522	0.147
Nb	<0.0078	<0.0105	0.0049	<0.0108	0.0692	0.078	0.0341	<0.0108	0.018	0.0616	0.395	<0.0129
Cs	<0.082	<0.086	<0.076	<0.076	<0.092	<0.089	<0.087	<0.088	<0.092	<0.082	<0.101	<0.088
Ba	<0.073	<0.051	<0.077	<0.032	<0.106	<0.091	<0.050	<0.052	<0.085	<0.033	67.95	<0.066
La	<0.0066	0.114	0.0866	0.0124	0.0112	<0.0087	<0.0071	<0.0105	<0.0088	0.0277	0.175	<0.0088
Ce	0.0351	0.271	0.171	0.0306	0.0507	0.0344	0.0092	<0.0109	<0.0065	0.0518	0.348	<0.0045
Pr	<0.0087	0.0261	0.0178	<0.0032	<0.0084	0.0075	<0.0062	<0.0074	<0.0101	<0.0066	0.0361	0.0047
Nd	0.047	0.087	0.041	<0.041	<0.058	0.037	<0.046	<0.048	<0.044	<0.019	0.071	<0.038
Sm	0.029	0.043	0.032	<0.058	<0.072	<0.044	<0.042	<0.025	<0.036	<0.044	<0.043	<0.074
Eu	<0.0118	<0.0170	<0.0113	<0.0115	<0.0135	0.0102	<0.0109	<0.0146	<0.0190	<0.0083	<0.0139	<0.0139
Gd	0.037	<0.067	<0.059	<0.056	<0.057	<0.046	<0.038	<0.056	<0.033	<0.029	<0.068	<0.041
Tb	0.0078	0.0075	<0.0074	0.0052	<0.0063	<0.0051	0.0084	<0.0061	<0.0063	<0.0045	<0.0074	<0.0097
Dy	0.0192	0.047	0.0339	<0.028	<0.030	<0.033	<0.034	<0.029	<0.045	<0.034	<0.034	<0.021
Ho	<0.0079	<0.0071	0.0077	<0.0045	<0.0052	<0.0052	0.0097	<0.0096	0.0134	<0.0065	<0.0087	<0.0100
Er	<0.0233	<0.0208	0.026	<0.0262	<0.0243	<0.030	0.039	<0.0211	0.047	<0.028	<0.037	<0.0195
Tm	<0.0052	0.007	<0.0065	<0.0098	<0.0060	<0.0048	<0.0079	0.0073	0.0108	<0.0079	<0.0072	<0.0080
Yb	0.059	<0.036	0.05	<0.028	<0.037	<0.037	0.092	0.049	0.067	<0.025	<0.039	<0.053
Lu	<0.0064	<0.0092	0.0084	0.0075	0.0056	<0.0089	0.0185	0.0175	<0.0090	<0.0071	<0.0061	<0.0099
Hf	<0.028	<0.023	<0.025	<0.0206	<0.027	<0.0120	<0.0197	<0.029	0.029	<0.02	<0.038	<0.0212
Ta	<0.0055	<0.0070	<0.0043	<0.0044	<0.0089	<0.0102	<0.0069	<0.0087	<0.0082	<0.0071	0.0196	<0.0082
Pb	<0.0181	<0.024	<0.0201	<0.0191	<0.0189	0.044	0.0257	<0.025	<0.0239	<0.0243	<0.043	<0.033
Th	0.007	0.171	0.0798	0.0088	0.0187	0.0229	<0.0093	<0.0082	<0.0099	0.01	0.0298	<0.0087
U	<0.0071	0.0156	<0.0101	<0.0054	<0.0096	<0.0125	<0.0077	<0.0071	<0.0110	0.0073	<0.0129	<0.0091

12.2.3 Clinopyroxene

Sample	057LX45	058LX46	064LX52	067LX55	115BL35	116BL36	117BL37	123BL43	100L79	101L80	103L82	104L83	105L84
Locality	BW82	BW82	BW82	BW82	G5	G5	G5	G5	BW80	BW80	BW80	BW80	BW80
Petrology	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
Li	1.16	1.22	1.46	0.98	0.564	0.722	0.889	0.714	0.537	0.785	0.499	0.82	0.814
Be	0.137	<0.140	<0.141	0.153	0.195	0.246	0.176	<0.110	<0.058	0.088	0.076	0.111	<0.054
B	0.39	0.55	<0.43	<0.48	0.48	0.38	0.57	0.54	0.591	0.735	0.583	0.656	0.548
Al	27976.6	24666.55	26460.22	22670.31	23152.91	21184.31	23228.87	21336.04	23561.87	22894.08	23463.34	22806.54	22630.1
Si	258026.53	258026.55	258026.55	258026.55	234654.56	234654.56	234654.56	234654.56	257091.67	257091.67	257091.69	257091.67	257091.67
P	17.36	23.1	19.06	9.95	15.33	19.05	21.99	20.41	22.67	17.86	19.51	19.05	22.35
Ca	159529.16	147114.36	168943.25	159650.7	138976.53	134815.67	136646.36	137329.45	163333.69	159271.12	156663.39	158079.22	151152.44
Ti	1153.01	1088.92	1093.66	970.01	2500.29	2573.98	2995.51	2575.81	2751.84	2797.88	2768.14	2748.15	2536.79
V	210.38	248.77	221.91	244.66	291.89	322.09	337.85	328.33	425.59	428.82	428.27	413.2	399.75
Cr	6018.27	6564.86	5986.82	6691.29	5255.36	5453.51	6466.92	6063.97	10589.14	9735.48	9601.76	9462.06	9346.96
Mn	450.73	410.89	426.51	400.53	361.32	348.37	334.99	346.92	448.76	406.07	432.13	412.32	462.74
Co	16.16	14.53	14.89	15.9	13.19	12.43	12.18	12.96	16.59	15	15.73	14.78	16.03
Ni	296.44	266.25	309.54	279.32	235.27	233.08	226.96	225.12	253.17	257.76	255.38	258.53	257.33
Cu	1.04	0.34	1.4	0.65	0.61	<0.27	0.62	0.38	0.934	0.909	0.855	1.053	0.938
Zn	6.36	6.69	5.88	5.96	6.05	5.78	5.79	5.85	10.73	10.78	10.82	10.39	10.83
Ga	4.37	4.81	4.2	4.81	5.4	5.88	6.18	5.7	9.24	9.21	9.23	9.02	9.23
Rb	<0.154	<0.153	<0.150	<0.151	<0.120	<0.113	<0.124	<0.117	<0.094	<0.091	<0.087	<0.091	<0.091
Sr	35.27	35.03	33.24	37.47	154.98	145.77	146.27	150.49	43.61	42.5	42.47	43.28	41.17
Y	1.62	1.315	1.81	1.487	3.59	2.68	2.5	2.41	2.261	2.02	2.13	2.045	2.175
Zr	9.28	9.23	9.69	8.77	30.3	30.68	34.41	31.99	17.47	18.54	17.32	16.3	14.33
Nb	1.275	0.929	1.007	0.667	0.0212	0.0181	0.0172	0.0199	0.0604	0.0455	0.441	0.192	0.125
Cs	<0.094	<0.089	<0.088	<0.085	<0.072	<0.070	<0.074	<0.072	<0.054	<0.050	<0.056	<0.054	<0.050
Ba	0.765	0.085	0.095	<0.099	<0.048	<0.071	<0.068	0.11	0.0212	0.043	0.142	0.039	0.073
La	2.313	2.114	2.161	2.221	3.87	3.78	3.72	3.81	1.811	1.658	1.838	1.684	1.773
Ce	5.16	4.65	5.05	4.77	14.57	13.89	14.38	13.97	2.6	2.66	2.67	2.67	2.6
Pr	0.667	0.659	0.666	0.62	2.212	2.175	2.165	2.176	0.327	0.322	0.316	0.333	0.313
Nd	2.61	2.86	2.37	2.67	11.03	10.27	11.24	10.71	1.856	1.864	1.803	1.973	1.82
Sm	0.543	0.582	0.62	0.595	2.12	2.11	2.11	2.15	1.026	1.082	1.055	1.027	0.966
Eu	0.19	0.173	0.233	0.186	0.587	0.566	0.606	0.584	0.371	0.402	0.384	0.405	0.38
Gd	0.509	0.633	0.612	0.43	1.56	1.51	1.52	1.51	1.248	1.156	1.19	1.235	1.167
Tb	0.0787	0.0815	0.0943	0.0655	0.189	0.184	0.182	0.15	0.155	0.1524	0.1479	0.1621	0.1553
Dy	0.396	0.379	0.445	0.368	0.917	0.768	0.819	0.746	0.67	0.654	0.626	0.675	0.683
Ho	0.0724	0.0496	0.0723	0.0625	0.157	0.1201	0.1138	0.1048	0.0864	0.091	0.0851	0.0936	0.086
Er	0.128	0.129	0.159	0.126	0.335	0.228	0.207	0.175	0.166	0.144	0.161	0.161	0.166
Tm	0.0121	<0.0086	0.0141	0.0178	0.0278	0.0193	0.0116	0.0152	0.0129	0.0186	0.0152	0.0204	0.0196
Yb	0.059	0.075	0.043	0.065	0.152	0.09	0.098	0.076	0.081	0.059	0.075	0.063	0.082
Lu	0.0132	<0.0090	<0.0091	<0.0082	<0.0112	0.0095	<0.0067	<0.0073	0.0084	0.0081	0.0083	0.0083	0.0068
Hf	0.23	0.231	0.187	0.186	1.117	1.105	1.237	1.181	0.812	0.757	0.724	0.777	0.789
Ta	0.263	0.197	0.215	0.136	<0.0071	<0.0066	<0.0079	0.0082	0.0136	<0.0067	0.0286	0.012	0.0161
Pb	0.117	0.129	0.185	0.144	0.767	0.77	0.839	0.871	0.341	0.339	0.36	0.345	0.348
Th	0.0765	0.0533	0.0685	0.0399	0.0175	0.0201	0.0162	0.0153	0.1225	0.0995	0.1346	0.1183	0.1471
U	0.0211	0.02	0.0239	0.0108	0.0082	<0.0097	<0.0091	<0.0075	0.0124	0.0082	0.0176	0.0114	0.0172

Sample	106BL26	107BL27	108BL28	110BL30	035XB1	036XB2	108XA50	109XA51	110XA52	055XA5	056XA6	057XA7	060XA10
Locality	A1	A1	A1	A1	BW1	BW1	BW6	BW6	BW6	BW7	BW7	BW7	BW7
Petrology	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
Li	0.58	0.525	0.484	0.505	0.68	0.691	0.82	0.84	0.83	1.15	0.99	1.2	1.02
Be	0.277	0.331	0.311	0.282	0.527	0.474	0.256	0.238	0.31	0.557	0.611	0.596	0.519
B	0.62	0.62	<0.38	<0.37	0.6	0.6	<0.30	<0.29	<0.29	0.52	0.57	0.66	0.56
Al	13744.4	13444.42	13524.28	13707.32	13270.07	13665.29	17169.69	17002.05	17057.97	17596.29	17388.35	17515.71	17963.26
Si	257559.06	257559.06	257559.06	257559.09	258961.38	258961.38	257091.66	257091.67	259428.84	257091.64	257091.66	257091.66	257091.66
P	33.95	26.15	26.08	21.52	47.88	61.48	42.4	44	40.01	57.16	61.02	63.63	54.88
Ca	136640.91	133100.02	134009.22	132420.69	137132.69	136427.08	140277.25	142539.55	145609.33	133031.73	131874.84	134125.53	136912.47
Ti	2652.8	2608.27	2552.79	2626.69	2061.81	2156.66	1180.53	1214.45	1219.92	2125.26	2114.72	2128.17	1841.48
V	329.36	323.88	321.56	328.81	301.06	300.01	419.6	428.29	422.95	380.24	374.17	375.45	384.22
Cr	4779.25	4987.76	5113.19	5309.13	9668.65	9525.84	9829.7	9988.18	10453.21	10033.38	10493.67	11422.93	10308.5
Mn	660.33	652.27	664.81	658.04	604.76	614.13	456.7	452.94	455.31	626.68	609.28	615.1	621.84
Co	26.1	25.98	26.91	25.95	26.34	25.87	17.37	16.91	17.38	20.23	19.41	20.21	20.11
Ni	459.65	462.84	468.5	454.64	418.81	420.93	310.5	315.87	315.24	360.57	355.97	365.54	365.5
Cu	4.29	4.37	4.43	4.03	1.8	1.95	0.88	0.81	0.93	1.43	1.2	1.5	1.24
Zn	17.62	17.25	17.99	17.97	16.05	14.25	9.37	9.8	8.96	10.49	10.86	10.37	10.98
Ga	9.88	9.89	10.36	9.91	6.57	6.82	7.85	7.74	7.7	4.62	4.82	4.85	5.95
Rb	<0.117	<0.120	<0.117	<0.118	<0.047	<0.045	<0.067	<0.065	<0.066	<0.066	<0.065	0.069	<0.062
Sr	129.28	123.99	129.12	123.92	238.79	245.55	343.98	337.67	363.7	245.83	243.75	245.42	240.28
Y	2.78	2.75	2.77	2.69	1.79	1.845	1.85	1.89	2.15	5.63	5.66	5.84	6.32
Zr	7.88	6.34	7.6	7.16	22.02	22.66	22.81	22.97	24.74	73.9	71.1	73.17	80.73
Nb	0.246	0.23	0.233	0.21	0.321	0.314	0.665	0.734	0.895	0.621	0.925	0.681	0.589
Cs	<0.070	<0.070	<0.070	<0.067	<0.0205	<0.0204	<0.033	<0.028	<0.030	<0.033	<0.030	<0.030	<0.031
Ba	0.32	0.258	0.26	0.318	0.185	0.219	0.104	0.13	0.12	0.312	2.52	0.497	0.273
La	1.88	1.506	1.82	1.82	2.83	2.98	15.16	15.62	17.58	4.33	4.38	4.19	4.48
Ce	6.32	4.98	6.48	5.89	11.33	11.59	53.85	53.02	54.7	17.83	17.39	17.33	18.34
Pr	1.065	0.917	1.022	0.936	2.08	2.042	7.31	7.4	7.55	3.27	3.13	3.13	3.28
Nd	5.81	4.96	5.45	5.18	10.32	10.7	29.54	29.59	30.65	16.59	16.58	17	16.67
Sm	1.57	1.54	1.67	1.48	2.24	2.15	3.87	3.87	4.17	4.42	4.11	4.24	4.21
Eu	0.492	0.503	0.502	0.488	0.621	0.618	0.852	0.907	0.926	1.353	1.266	1.229	1.335
Gd	1.5	1.47	1.49	1.43	1.332	1.481	1.73	2.05	1.99	3.37	3.12	3.37	3.33
Tb	0.178	0.18	0.192	0.189	0.1451	0.1417	0.162	0.138	0.184	0.39	0.384	0.4	0.416
Dy	0.829	0.742	0.792	0.88	0.577	0.558	0.61	0.566	0.731	1.65	1.75	1.84	1.81
Ho	0.1003	0.1072	0.126	0.1166	0.0721	0.0741	0.0724	0.0736	0.0769	0.256	0.251	0.269	0.284
Er	0.216	0.226	0.258	0.237	0.147	0.144	0.168	0.16	0.17	0.499	0.504	0.506	0.547
Tm	0.0188	0.019	0.0195	0.0287	0.0144	0.0139	0.0174	0.0145	0.0175	0.0528	0.0611	0.047	0.0615
Yb	0.144	0.124	0.157	0.139	0.067	0.071	0.07	0.042	0.101	0.3	0.317	0.254	0.301
Lu	0.0085	0.0133	0.0187	0.0073	0.0076	0.0046	0.0071	0.0066	0.008	0.0311	0.0381	0.0318	0.0358
Hf	0.535	0.525	0.511	0.507	0.813	0.933	0.617	0.594	0.65	3.98	4.05	4.06	4.34
Ta	0.0146	0.0132	0.0291	0.0217	0.0272	0.0239	0.0619	0.0497	0.0943	0.0752	0.076	0.0792	0.0721
Pb	0.282	0.293	0.309	0.295	0.271	0.315	0.827	1.058	1.28	0.291	0.297	0.308	0.342
Th	0.0252	0.0274	0.0279	0.0269	0.0338	0.0339	0.377	0.539	0.855	0.0615	0.0895	0.0689	0.0793
U	0.0087	<0.0082	<0.0094	<0.0089	0.0074	0.0105	0.115	0.163	0.171	0.014	0.036	0.0213	0.0144

Sample	061XA11	068XA18	050XB16	051XB17	052XB18	084BL8	085BL9	086BL10	009L3	010L4	013L7	015L9	025L19
Locality	BW7	BW7	BW10	BW10	BW10	Bw44	Bw44	Bw44	BW4	BW4	BW4	BW4	BW5
Petrology	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
Li	1.22	1.26	1.364	1.637	1.443	0.827	0.998	0.888	0.698	0.861	0.641	0.751	0.881
Be	0.599	0.552	1.49	1.233	1.303	0.729	0.552	0.68	0.617	0.598	0.649	0.633	0.524
B	0.79	0.59	0.66	0.73	0.74	<0.38	0.53	0.59	1.42	1.53	1.52	1.38	1.27
Al	17815.25	17515.18	21744.19	23729.28	22596.08	16254.65	18179.68	17184.45	13566.36	14687.9	14620.19	15127.15	19064.55
Si	257091.67	257091.66	257091.62	257091.61	257091.62	262233.47	262233.44	262233.47	263168.41	263168.41	263168.41	263168.41	260363.77
P	54.66	72.41	77.5	118.79	104.03	63.48	66.16	65.67	34.2	43.15	36.22	32.82	55.81
Ca	135435.38	133944.59	127079.63	122175.91	123870.87	135526.41	136517.41	131787.42	127658.89	128881.55	130336.04	131740.03	126940.12
Ti	1876.72	2133.28	2485.53	2585.31	2522.1	1905.75	2017.25	1931.91	1987.33	2064.48	2113.27	2120.23	1813.31
V	382.85	380.32	348.3	337.28	340.4	426.93	428.85	423.63	303.57	337.36	322.63	347.42	314.16
Cr	10618.33	10440.98	10959.92	11004.65	11019.01	11370.9	11493.08	10841.46	10528.07	8463.76	10448.96	11117.73	7166.13
Mn	615.28	642.75	597.36	640.04	633.22	599.99	611.18	598.08	615.89	638.47	637.94	649.07	637.11
Co	20.11	20.05	16.52	16	16.39	19.35	19.25	18.77	21.18	21.39	21.42	21.52	19.43
Ni	364.08	354.81	282.95	263.87	265.76	352.98	350.01	340.69	379.71	379.15	378.95	375.63	355.27
Cu	1.19	1.54	0.829	0.866	0.807	1.2	1.16	1.19	1.92	2.38	2.04	1.83	1.82
Zn	10.89	10.92	12.24	12.25	12.36	10.06	10.15	10.51	13.44	14.43	14.04	14.2	11.38
Ga	5.57	4.52	11.74	11.57	11.6	8.3	7.41	8.37	7.16	7.41	7.57	7.54	5.45
Rb	<0.062	0.315	<0.048	0.05	<0.047	<0.121	<0.121	<0.126	<0.059	0.118	<0.064	<0.066	0.117
Sr	236.81	254.39	250.15	293.28	277.67	318.7	270.23	288.02	161.92	200.41	162.53	164.02	225.82
Y	6.29	5.83	7.78	9.97	8.92	4.47	5.52	5.21	3.97	4.02	4.29	4.15	6.48
Zr	79.31	73.47	141.32	151.33	145.41	56	75.34	68.35	37.72	38.51	40.19	39.55	86.43
Nb	0.548	1.512	1.074	1.565	1.369	0.586	0.896	0.607	0.373	0.92	0.309	0.333	1.063
Cs	<0.030	<0.027	<0.0225	<0.0238	<0.0230	<0.072	<0.073	<0.078	<0.033	<0.037	<0.036	<0.034	<0.042
Ba	0.139	298.22	0.083	1.73	0.111	0.225	2.34	0.42	0.603	4.11	0.123	0.151	6.14
La	4.43	4.92	6.74	8.21	7.9	5.74	4.58	4.87	2.236	2.76	2.215	2.19	4.58
Ce	18.21	19.02	25.96	30.45	29.29	23.37	19.27	19.67	8.89	10.39	8.79	8.68	17.76
Pr	3.25	3.24	4.37	5.03	4.96	3.96	3.51	3.69	1.61	2.008	1.647	1.689	3.24
Nd	16.83	17.91	21.31	24.52	24.08	18.61	18.29	19.56	9.22	10.88	9.16	9.19	17.26
Sm	4.31	4.41	5.19	5.59	5.65	3.76	4.3	4.01	2.48	2.67	2.58	2.61	4.49
Eu	1.32	1.293	1.584	1.743	1.664	1.066	1.266	1.246	0.844	0.84	0.82	0.811	1.36
Gd	3.37	3.25	4.14	4.6	4.4	2.59	3.3	3.02	2.183	2.3	2.31	2.29	3.64
Tb	0.414	0.363	0.517	0.61	0.561	0.32	0.394	0.353	0.277	0.284	0.28	0.285	0.469
Dy	1.82	1.81	2.417	2.73	2.616	1.239	1.724	1.483	1.318	1.228	1.346	1.295	2.032
Ho	0.265	0.271	0.37	0.424	0.386	0.182	0.262	0.223	0.1833	0.1816	0.198	0.1693	0.302
Er	0.578	0.544	0.655	0.909	0.771	0.33	0.456	0.459	0.355	0.354	0.371	0.37	0.577
Tm	0.0648	0.0574	0.0722	0.0914	0.0775	0.0369	0.0581	0.0402	0.0335	0.0298	0.0428	0.0351	0.0681
Yb	0.312	0.297	0.319	0.465	0.455	0.18	0.251	0.295	0.171	0.147	0.183	0.179	0.336
Lu	0.0399	0.03	0.0336	0.0611	0.055	0.0266	0.0288	0.0282	0.0136	0.0177	0.0219	0.0237	0.0422
Hf	4.33	3.43	5.49	5.25	5.3	1.886	3.11	2.27	2.137	2.042	2.37	2.36	3.15
Ta	0.069	0.1014	0.1468	0.267	0.237	0.0681	0.0815	0.0697	0.0334	0.0625	0.0429	0.0444	0.1108
Pb	0.335	0.3	0.448	0.608	0.579	0.406	0.356	0.349	0.205	0.225	0.17	0.197	0.326
Th	0.0689	0.151	0.1096	0.168	0.1326	0.0532	0.0959	0.0686	0.0316	0.0925	0.0344	0.0264	0.1174
U	0.0181	0.0508	0.0321	0.0378	0.0354	0.0124	0.031	0.0214	0.0141	0.0198	0.0122	0.0102	0.0289

Sample	027L21	028L22	038L27	018LX12	019LX13	020LX14	021LX15	031LX22	034LX25	035LX26	040LX31	041LX32	046LX37
Locality	BW5	BW5	BW5	Bw17	Bw17	Bw17	Bw17	H2	H2	H2	H2	H2	H2
Petrology	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
Li	0.89	0.922	0.982	0.624	0.675	0.686	0.669	1.11	1.12	1.38	1.21	1.3	1.04
Be	0.567	0.665	0.619	<0.131	<0.120	<0.080	0.099	<0.129	0.234	0.098	0.199	0.159	0.109
B	1.32	1.29	1.22	0.44	0.39	<0.38	<0.40	0.61	0.44	0.61	<0.39	0.58	0.57
Al	20734.58	20328.73	19482.39	5172.37	5030.64	4984.87	4989.7	11929.08	12299.57	12019.24	11618.05	11951.2	11624.92
Si	260363.75	260363.75	260363.75	258493.92	258493.94	258493.94	258493.92	259428.84	259428.84	259428.83	259428.84	259428.84	259428.83
P	51.61	56.61	69.41	12.36	19.83	18.14	15.82	30.43	29.38	30.48	34.07	37.55	32.48
Ca	127056.12	129628.69	129513.88	139992.2	134832.36	142652.5	137505.69	101732.91	103272.05	108939.52	106627.11	111608.47	101867.72
Ti	1896.11	1929.84	1904.73	203.46	195.8	205.55	192.99	1708.02	1736.75	1794.05	1700.3	1847.96	1726.31
V	320.01	323.63	330.51	133.31	128.47	128.73	129.67	172.67	182.13	179.4	173.91	176.56	175.17
Cr	7921.6	7976.51	8598.81	3458.58	3323.72	3359.77	3290.11	4350.32	4506.57	4336.2	4208.85	4264.81	4375.23
Mn	619.23	626.58	621.16	888.54	869.84	866.78	883.12	1002.95	995.57	987.25	966.05	987.66	964.3
Co	18.91	19.24	19.32	32.31	32.15	33.16	32.62	36.77	37.25	39.21	37.76	39.04	35.07
Ni	349.84	355.1	352.08	572.1	543.88	568.96	555.1	592.54	592.86	633.61	624.54	635.76	579.07
Cu	1.88	2.07	1.95	6.98	6.36	6.74	6.42	4.25	4.15	3.2	3.6	4.57	3.98
Zn	11.25	11.54	11.65	16.44	15.56	16.38	16.47	23.21	23.71	24.12	23.69	24.11	22.22
Ga	5.7	5.63	5.35	2.55	2.46	2.53	2.41	5.35	5.55	5.48	5.4	5.21	5.61
Rb	<0.075	<0.074	0.092	<0.133	<0.132	<0.144	<0.152	<0.128	<0.134	<0.138	<0.137	<0.138	<0.133
Sr	220.4	225.17	236.15	45.63	47.23	48.51	48.51	95.31	99	103.58	96.63	100.36	86.76
Y	6.59	6.58	6.45	0.434	0.41	0.418	0.445	3.04	3.07	3.13	3.12	3.25	2.92
Zr	87.86	86.66	78.8	0.19	0.147	0.181	0.18	5.15	5.17	5.34	5	5.54	5.26
Nb	0.638	0.869	1.471	0.089	0.101	0.0782	0.098	0.181	0.174	0.159	0.127	0.189	0.146
Cs	<0.042	<0.040	<0.043	<0.078	<0.080	<0.083	<0.087	<0.079	<0.084	<0.087	<0.083	<0.084	<0.080
Ba	0.103	2.14	9.96	0.297	0.329	0.354	0.326	0.331	0.295	0.335	0.294	0.321	0.285
La	4	4.25	4.82	0.96	0.967	0.993	0.985	1.502	1.549	1.48	1.474	1.587	1.425
Ce	16.65	16.97	17.67	2.98	3.05	2.99	3.02	5.57	5.44	5.87	5.74	5.94	5.4
Pr	3.1	3.14	3.17	0.426	0.407	0.433	0.397	0.975	0.966	1.004	0.987	1.028	1.008
Nd	16.86	17.2	16.79	1.91	1.76	1.67	1.91	5.07	5.31	5.38	5.05	5.58	5.21
Sm	4.26	4.41	4.49	0.301	0.333	0.27	0.299	1.42	1.41	1.55	1.352	1.6	1.319
Eu	1.345	1.354	1.333	0.08	0.081	0.061	0.084	0.477	0.495	0.457	0.461	0.467	0.442
Gd	3.49	3.61	3.52	0.213	0.195	0.162	0.158	1.373	1.381	1.232	1.208	1.412	1.336
Tb	0.442	0.43	0.434	0.0205	0.0304	0.0218	0.0208	0.173	0.19	0.172	0.18	0.18	0.143
Dy	1.925	1.993	1.964	0.117	0.083	0.105	0.103	0.827	0.913	0.881	0.88	0.876	0.754
Ho	0.309	0.284	0.28	0.0186	0.0207	0.015	0.0115	0.1131	0.143	0.138	0.1165	0.127	0.1281
Er	0.605	0.641	0.593	0.063	0.03	0.03	0.044	0.265	0.304	0.271	0.293	0.302	0.291
Tm	0.0631	0.0681	0.0607	<0.0076	<0.0077	0.0066	<0.0049	0.0303	0.0219	0.0326	0.0202	0.0326	0.0301
Yb	0.325	0.372	0.32	0.054	<0.029	0.0263	0.053	0.123	0.159	0.151	0.152	0.15	0.156
Lu	0.0356	0.0427	0.0476	0.0075	<0.0086	<0.0048	<0.0051	0.0141	0.0269	0.0292	0.018	0.0262	0.019
Hf	3.27	3.65	4.49	<0.026	<0.0238	<0.030	0.0215	0.32	0.295	0.327	0.323	0.296	0.293
Ta	0.1016	0.1006	0.1319	<0.0101	0.0083	<0.0095	0.0088	<0.0062	0.0092	0.01	<0.0094	<0.0093	0.0124
Pb	0.307	0.283	0.302	0.254	0.229	0.262	0.231	0.111	0.1	0.072	0.07	0.108	0.1
Th	0.0613	0.0852	0.166	0.0153	<0.0090	0.0088	<0.0106	0.0213	0.0135	0.0188	0.0226	0.01	0.0208
U	0.0108	0.0252	0.0406	<0.0107	<0.0107	0.0079	0.0101	<0.0070	<0.0067	0.0074	0.0082	<0.0088	<0.0086

Sample	047LX38	044L33	045L34	046L35	049L38	052L41	054L43	063L47	065L49	069L53	072L56	083LX68	086LX71
Locality	H2	H3	H3	H3	H4	H4	H4	H4	H6	H6	H6	C4	F3
Petrology	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx
Li	1.2	1.126	1.367	1.75	0.617	1.243	0.684	0.737	0.931	1.094	1.089	0.448	0.71
Be	0.187	0.197	0.26	0.22	0.18	0.224	0.172	0.233	0.318	0.357	0.319	0.575	0.415
B	0.46	1.25	1.074	1.143	0.866	1.036	0.742	0.825	1.033	0.851	0.747	0.54	1.01
Al	11336.94	11460.13	11711.28	14109.92	8540.39	9917.72	8953.9	8989.28	9337.14	10784.87	12364.75	22463.44	12252.44
Si	259428.84	264103.28	264103.28	264103.28	261766.06	261766.06	261766.08	261766.06	259428.86	259428.86	259428.86	254754.47	254754.48
P	33.41	36.81	32.71	30.96	27.94	24.76	26.58	32.11	25.8	28.91	26.21	69.06	23.1
Ca	102377.23	124342.92	121990.52	115309.8	128052.52	117147.05	120563.2	117781.13	133445.33	130244.88	129046.02	138447.55	159415.2
Ti	1665.96	2217.86	2217.42	2271.88	1203.08	1348.57	1265.15	1321.47	1996.06	2047.71	2134.84	432.4	803.49
V	166.04	230.19	229.96	257.55	141.67	155.21	145.43	152.71	190.79	213.71	237.05	309.16	312.15
Cr	4091.31	3455.17	3689.34	4915.68	4035.95	6333.37	4655.79	5777.77	2946.71	3689.4	4081.95	15444.7	11339.04
Mn	936	959.75	985.96	977.04	889.15	964.4	909.76	953.68	888.53	925.3	941.57	583.88	479.73
Co	36.48	35.04	35.72	34.67	35.74	36.94	35.65	37.59	31.14	30.98	32.24	16.17	16.44
Ni	586	532.31	526.18	527.53	615.53	620.37	598.46	624.88	516.77	520	517.9	263.08	304.49
Cu	3.92	4.31	4.47	5.81	3.53	4.2	3.74	3.94	5.24	5.48	5.6	0.71	0.78
Zn	21.47	30.9	31.42	31.24	21.51	23.76	23.2	23.44	21.14	21.83	22.88	7.76	8.31
Ga	5.22	7.36	7.43	7.63	3.23	3.39	3.27	3.4	4.84	5.21	5.66	3.92	3.35
Rb	<0.146	0.463	0.097	0.531	<0.079	0.241	<0.080	<0.091	<0.081	<0.089	<0.089	<0.145	<0.154
Sr	93.7	163.24	117.54	110.25	85.3	109.33	98.49	108.22	119.77	122.56	121.56	325.04	281.7
Y	3.01	4.29	4.2	4.28	1.009	1.61	1.233	1.288	3.46	3.6	3.7	9.71	2.38
Zr	4.99	10.3	9.96	10.64	3.15	3.41	3.03	2.98	8.25	8.63	9.16	107.74	20.62
Nb	0.191	0.559	0.442	0.555	0.148	0.225	0.149	0.157	0.167	0.19	0.19	0.172	0.307
Cs	<0.077	<0.048	<0.045	<0.045	<0.040	<0.047	<0.046	<0.050	<0.051	<0.047	<0.052	<0.093	<0.093
Ba	3.73	134.79	12.16	4.7	0.431	0.672	0.408	0.367	0.341	0.311	0.264	0.126	0.193
La	1.475	2.45	2.34	2.168	1.688	1.589	1.551	1.568	2.38	2.279	2.248	37.68	13.85
Ce	5.48	8.25	7.9	7.33	5.87	5.42	5.56	5.72	8.2	7.79	7.75	120.58	29.38
Pr	0.952	1.355	1.347	1.219	1.023	0.98	1.02	1.013	1.375	1.384	1.343	15.44	3.42
Nd	5.12	7.01	7.09	6.35	4.89	5.13	5	4.95	6.99	7.06	6.74	66.55	12.98
Sm	1.298	1.99	1.692	1.713	0.935	1.14	0.952	1.039	1.844	1.875	1.736	10.13	2.28
Eu	0.429	0.627	0.615	0.579	0.284	0.339	0.32	0.34	0.593	0.566	0.587	2.18	0.72
Gd	1.316	1.691	1.531	1.768	0.667	0.897	0.751	0.809	1.561	1.596	1.595	4.76	1.85
Tb	0.141	0.231	0.24	0.218	0.0646	0.1	0.0813	0.0947	0.2	0.21	0.206	0.5	0.2
Dy	0.764	1.147	1.152	1.188	0.297	0.47	0.352	0.425	0.985	1.08	0.951	2.22	0.765
Ho	0.1183	0.184	0.198	0.185	0.0481	0.0645	0.0501	0.0605	0.1491	0.1585	0.1584	0.434	0.091
Er	0.242	0.423	0.405	0.365	0.0928	0.116	0.116	0.122	0.331	0.295	0.332	1.139	0.202
Tm	0.028	0.0399	0.0461	0.0488	0.0132	0.0124	0.0104	0.0132	0.0292	0.0323	0.0309	0.132	0.0141
Yb	0.155	0.229	0.238	0.252	0.067	0.077	0.066	0.06	0.165	0.176	0.167	0.745	0.073
Lu	0.0174	0.0295	0.0266	0.029	<0.0065	0.0116	0.0102	0.0065	0.0187	0.0225	0.0251	0.095	0.0094
Hf	0.333	0.679	0.64	0.665	0.146	0.186	0.165	0.175	0.54	0.542	0.583	3.72	0.611
Ta	0.0094	0.027	0.0246	0.0305	0.0065	0.0136	0.0106	<0.0055	0.018	0.006	0.014	0.0234	0.0142
Pb	0.093	0.217	0.216	0.191	0.129	0.118	0.128	0.123	0.274	0.249	0.212	3.82	1.194
Th	0.0118	0.0579	0.0488	0.0558	0.0099	0.0182	0.0114	0.0081	0.02	0.0158	0.0219	1.465	1.689
U	<0.0067	0.0135	0.0163	0.0106	<0.0042	<0.0044	<0.0042	<0.0064	0.0051	<0.0056	<0.0058	0.266	0.281

Sample	088LX73	093LX78	094LX79	099LX84
Locality	F3	F3	F3	F4
Petrology	Cpx	Cpx	Cpx	Cpx
Li	0.9	1.04	0.75	2.03
Be	0.267	0.303	0.149	0.2
B	0.53	<0.41	0.77	<0.44
Al	14221.33	15387.86	13582.89	20578.18
Si	254754.48	254754.48	254754.47	250547.52
P	31.69	27.03	96.55	21.56
Ca	171497.78	162228.72	163518.39	162724.62
Ti	1054.92	1097.24	958.19	1954.85
V	350.77	379.7	348.97	258.22
Cr	12706.46	14867.21	13951.65	7740.68
Mn	474.24	469.12	474.7	503.78
Co	17.22	16.1	16.06	12.76
Ni	322	301.28	304.43	249.53
Cu	0.89	0.92	1.25	0.51
Zn	9.87	8.41	8.32	3.9
Ga	3.55	4.02	3.6	1.6
Rb	<0.157	<0.163	<0.153	<0.170
Sr	270.25	251.78	268.29	66.1
Y	2.22	2.16	2.47	11.08
Zr	22.33	22.37	23.3	25.67
Nb	0.362	0.413	1.122	1.209
Cs	<0.094	<0.090	<0.087	<0.093
Ba	<0.095	0.367	7.58	<0.133
La	13.12	12.24	13.81	1.486
Ce	29.56	26.96	29.9	3.5
Pr	3.45	3.22	3.47	1.093
Nd	12.95	12.24	13.33	8.32
Sm	2.29	2.25	2.4	2
Eu	0.671	0.622	0.669	0.543
Gd	1.71	1.6	1.81	1.84
Tb	0.19	0.188	0.19	0.289
Dy	0.765	0.729	0.813	2.11
Ho	0.0861	0.0872	0.107	0.46
Er	0.183	0.144	0.193	1.246
Tm	0.0158	0.016	0.016	0.166
Yb	0.113	0.042	0.065	1.15
Lu	<0.0076	0.0073	0.0177	0.15
Hf	0.751	0.792	0.739	0.833
Ta	0.0171	0.0117	0.0492	0.25
Pb	1.28	1.057	1.236	3.55
Th	1.837	1.949	2.06	0.0563
U	0.35	0.387	0.368	0.0161

12.2.4 Garnet

Sample	081L65	082L66	088L67	007LX1	008LX2	014LX8	015LX9	089L68	090L69	091L70	089BL13	090BL14	094BL18
Locality	D1	D1	D1	D3	D3	D3	D3	D4	D4	D4	E4	E4	E4
Petrology	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Li	<0.156	<0.153	<0.146	<0.34	<0.36	<0.34	<0.35	<0.147	<0.145	<0.145	<0.245	<0.254	<0.27
Be	<0.083	0.017	0.0169	0.105	<0.167	<0.172	<0.141	<0.060	<0.042	<0.084	<0.115	<0.133	<0.074
B	0.77	0.648	0.89	<0.77	<0.66	<0.66	<0.63	0.625	0.97	0.684	<0.67	<0.55	0.58
Al	96114.84	99079.97	94462.31	97309.66	93729.59	85489.21	89140.45	101893.56	102240.8	102021.63	96911.76	99945.34	101444.42
Si	196324.55	196324.55	196324.55	190715.25	190715.23	190715.25	190715.25	196792	196791.98	196791.98	191182.67	191182.69	191182.69
P	24.63	27.12	29.76	215.35	182.59	130.86	119.34	206.61	195.96	197.52	152	104.82	113.69
Ca	52563.28	51135.12	51052.28	25780.28	31053.42	32569.59	31799.93	37771.67	38663.38	38718.43	28654.14	28650.43	29395.76
Ti	341.03	331.27	320.79	575.16	647.02	642.09	630.67	922.52	684.38	755.9	1046.05	1004.75	1057.6
V	529.65	514.01	523.26	268.5	279.42	283.43	283.32	276.28	305.57	292.33	180.89	195.69	209.15
Cr	55620.57	51737.86	53636.21	55710.55	54225.42	61796.9	57030.56	40832.85	40159.68	41258.72	21600.04	22901.65	21061.42
Mn	2635.04	2610.72	2605.78	2542.8	2523.12	2610.07	2538.02	2588.79	2619.26	2643.92	2646.94	2735.03	2744.31
Co	45.34	45.9	44.38	38.83	39.69	41.4	42.96	44.58	43.82	44.41	39.5	40.62	40.4
Ni	82.25	85.11	82.02	46.78	52.35	53.83	53.64	46.16	47.27	50.22	34.37	33.74	35.01
Cu	0.6	0.47	0.46	<0.42	0.51	0.61	0.82	0.487	0.317	0.553	<0.44	0.43	0.54
Zn	19.24	20.06	19.37	11.43	11.67	10.98	9.63	13.29	12.74	13.49	10.87	9.61	10.96
Ga	9.83	9.53	9.31	2.88	2.92	3.06	3.04	3.95	4.12	3.89	3.62	4.12	4.3
Rb	<0.141	<0.137	<0.130	<0.244	<0.239	<0.258	0.291	<0.136	0.127	<0.127	<0.176	<0.184	<0.195
Sr	0.138	0.143	0.164	0.615	1.087	1.276	1.194	0.682	0.925	0.704	0.359	0.283	0.279
Y	1.706	1.751	1.795	4.38	8.27	6.55	6.78	8.58	6.6	7.02	9.23	8.6	8.55
Zr	0.211	0.252	0.207	49.53	65.19	53.17	48.88	40.08	31.22	31.73	27.03	22.72	22.27
Nb	0.137	0.126	0.131	0.669	0.761	0.782	0.789	0.321	0.412	0.37	0.205	0.166	0.17
Cs	<0.073	<0.083	<0.074	<0.139	<0.143	<0.151	<0.150	<0.076	<0.073	<0.071	<0.102	<0.119	<0.117
Ba	<0.050	<0.049	0.029	0.074	<0.084	<0.061	<0.061	<0.077	0.415	<0.062	<0.111	<0.122	<0.110
La	0.0362	0.0292	0.0229	0.0376	0.069	0.096	0.083	0.082	0.188	0.164	0.0264	0.0359	0.0377
Ce	0.279	0.261	0.237	0.599	0.841	1.186	1.258	1.031	1.567	1.606	0.348	0.421	0.359
Pr	0.0364	0.0426	0.0424	0.278	0.439	0.595	0.603	0.406	0.525	0.557	0.158	0.163	0.134
Nd	0.169	0.119	0.161	3.51	4.96	6.45	6.83	3.62	3.83	3.79	1.78	1.196	1.116
Sm	0.062	<0.066	0.034	2.6	2.75	3.01	2.86	2.4	2.14	2.03	1.057	0.745	0.64
Eu	0.0181	<0.0152	0.0229	0.901	1.067	1.008	0.845	0.802	0.711	0.732	0.358	0.261	0.307
Gd	0.077	<0.073	0.094	2.39	3.1	2.67	2.13	2.21	1.91	1.98	1.181	1.022	1.036
Tb	0.0141	0.019	0.0167	0.254	0.447	0.337	0.302	0.321	0.248	0.268	0.233	0.207	0.174
Dy	0.175	0.167	0.179	1.202	1.93	1.53	1.46	1.803	1.365	1.369	1.599	1.404	1.475
Ho	0.0588	0.0533	0.0581	0.155	0.351	0.243	0.235	0.333	0.244	0.28	0.35	0.348	0.331
Er	0.282	0.279	0.291	0.446	0.811	0.615	0.491	0.978	0.744	0.882	1.093	1.058	1.035
Tm	0.0492	0.0662	0.0628	0.0522	0.1	0.0736	0.053	0.1307	0.1171	0.135	0.135	0.163	0.142
Yb	0.613	0.624	0.621	0.426	0.573	0.652	0.563	1.06	0.968	1.042	1.311	1.212	1.235
Lu	0.1212	0.1193	0.1098	0.083	0.08	0.105	0.111	0.199	0.206	0.214	0.201	0.24	0.195
Hf	<0.024	<0.033	<0.0210	0.955	1.39	0.872	0.894	0.68	0.607	0.572	0.487	0.475	0.452
Ta	<0.0071	<0.0110	<0.0078	0.0368	0.0326	0.0462	<0.0187	0.026	0.0453	0.0367	<0.0072	<0.0089	<0.0114
Pb	<0.0280	<0.0194	0.0135	<0.060	<0.050	<0.040	<0.051	<0.0228	0.0245	<0.0142	<0.0162	<0.023	<0.042
Th	<0.0134	0.0142	<0.0098	<0.0140	0.0298	0.0244	0.0276	0.0589	0.153	0.168	<0.0118	0.013	<0.0176
U	0.012	<0.0111	0.0093	0.0475	0.065	0.082	0.075	0.099	0.166	0.158	0.0207	0.0255	0.0255

Sample	095BL19	071XA21	072XA22	073XA23	074XA24	079XA25	038XB4	039XB5	041XB7	042XB8	007L1	008L2	011L5
Locality	E4	G1	G1	G1	G1	G1	BW1	BW1	BW1	BW1	BW4	BW4	BW4
Petrology	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Li	<0.26	<0.32	<0.31	<0.32	<0.33	<0.33	<0.207	<0.191	<0.198	<0.201	0.215	0.13	0.185
Be	<0.098	<0.150	<0.177	<0.121	<0.084	<0.103	<0.067	<0.060	<0.052	0.035	<0.037	<0.042	<0.068
B	<0.57	0.6	0.9	<0.51	<0.64	0.87	<0.40	0.44	0.46	0.61	1.07	1.01	1.27
Al	102814.55	111281.71	111721.59	111360.85	110581.81	113075.67	105101.3	105528.47	98643.94	100607.59	103560.5	105155.12	104983.91
Si	191182.69	196324.53	196324.53	196324.53	196324.53	199129.17	193987.31	193987.33	191650.11	193987.33	197726.88	197726.88	197726.88
P	106.37	147.28	146.27	148.07	142.53	141.47	247.95	102.27	108.56	113.9	121.56	117.75	111.31
Ca	29899.76	37684.02	38512.48	38730.23	38196.38	38585	30818.34	30313.43	31105.7	32209.6	26808.16	26613.45	26968.78
Ti	1094.49	262.22	270.49	271.51	271.17	281	1659.17	1719.35	1828.39	1799.18	2060.45	1918.08	2048.4
V	203.43	132.9	144	142.34	138.13	143.49	200.06	182.82	209.77	213.21	195.93	179.28	146.54
Cr	22127.12	21010.75	20959.89	20147.23	19337.86	20185.5	25119.68	22714.97	26437.09	25860.14	12638.76	12328.09	12619.47
Mn	2740.77	3624.44	3551.75	3569.09	3512.68	3572.43	2200.03	2163.83	2148.55	2130.4	2217.32	2263.97	2292.34
Co	39.41	39.28	38.01	38.59	38.18	38.9	52.13	51.76	47.75	49.51	41.8	42.75	41.43
Ni	34.26	18.79	19.93	20.49	20.41	19.67	58.06	58.51	54.32	53.96	50.11	49.54	49.87
Cu	<0.46	<0.43	<0.39	<0.38	<0.38	<0.43	0.48	<0.30	0.53	0.48	0.679	0.669	0.78
Zn	10.65	8.74	8.75	8.8	8.33	8.19	12.34	12.9	16.61	16.79	13.98	14.92	14.56
Ga	4.23	3.22	3.18	3.19	3.15	3.35	10.11	9.62	10.3	10.56	11.04	10.42	9.43
Rb	<0.189	<0.117	<0.115	<0.111	<0.112	<0.112	<0.080	<0.076	<0.082	<0.079	<0.080	<0.085	0.436
Sr	0.232	0.161	0.157	0.13	0.312	0.15	0.34	0.324	0.383	0.407	0.197	0.219	3.13
Y	8.89	19.27	20.3	19.9	19.76	19.99	4.96	5.42	4.59	4.78	14.63	13.81	15.43
Zr	23.87	21	20.74	20.45	19.94	20.3	19.26	23.02	15.43	15.58	33.95	31.98	39.53
Nb	0.163	0.081	0.064	0.08	0.0576	0.068	0.143	0.147	0.156	0.181	0.129	0.116	0.149
Cs	<0.108	<0.057	<0.049	<0.054	<0.054	<0.051	<0.034	<0.034	<0.037	<0.035	<0.041	<0.046	<0.049
Ba	<0.103	<0.059	0.049	<0.083	0.166	<0.107	<0.057	<0.052	<0.062	<0.058	<0.039	0.0185	1.62
La	0.0225	0.026	0.0334	0.0374	0.029	0.0346	0.0216	0.0127	0.0168	0.0214	0.0142	0.0113	0.0091
Ce	0.291	0.195	0.168	0.18	0.171	0.173	0.22	0.187	0.271	0.349	0.168	0.171	0.096
Pr	0.124	0.0852	0.0731	0.0679	0.058	0.0601	0.0976	0.0822	0.1153	0.14	0.0691	0.0669	0.0598
Nd	1.154	0.824	0.974	0.875	0.855	0.932	1.217	0.932	1.27	1.304	0.646	0.69	0.566
Sm	0.788	0.984	0.882	1.002	0.935	0.966	0.767	0.759	0.582	0.681	0.631	0.536	0.522
Eu	0.27	0.519	0.505	0.52	0.476	0.506	0.352	0.363	0.298	0.274	0.33	0.306	0.371
Gd	0.953	2.32	2.27	2.2	2.01	2.26	1.044	1.129	0.813	1.006	1.386	1.265	1.471
Tb	0.223	0.5	0.463	0.501	0.473	0.472	0.1474	0.177	0.1455	0.1407	0.296	0.317	0.331
Dy	1.475	3.34	3.61	3.36	3.34	3.2	0.936	1.073	0.885	0.881	2.44	2.123	2.37
Ho	0.362	0.743	0.751	0.718	0.736	0.783	0.176	0.201	0.169	0.176	0.593	0.54	0.583
Er	1.073	2.09	2.09	2.13	2.03	2.13	0.507	0.532	0.425	0.531	1.851	1.672	1.911
Tm	0.173	0.291	0.281	0.307	0.303	0.322	0.0679	0.0763	0.0717	0.079	0.272	0.256	0.282
Yb	1.251	2.1	2.2	2.17	2.06	1.97	0.474	0.503	0.552	0.594	2.105	1.919	2.04
Lu	0.197	0.318	0.37	0.357	0.333	0.347	0.0929	0.0993	0.086	0.1041	0.309	0.316	0.31
Hf	0.538	0.289	0.22	0.204	0.214	0.287	0.345	0.364	0.36	0.357	0.859	0.673	0.799
Ta	0.0098	<0.0087	<0.0092	<0.0102	<0.0084	<0.0092	0.0105	<0.0066	0.022	0.0278	0.0167	0.0153	0.013
Pb	<0.036	<0.028	<0.026	<0.042	<0.033	<0.034	<0.0250	0.0187	<0.036	<0.036	<0.0108	0.0106	<0.0193
Th	0.0128	0.0176	0.0233	<0.0142	0.0154	0.0275	<0.0063	<0.0065	<0.0074	<0.0077	0.0338	0.0141	<0.0060
U	0.0559	0.167	0.159	0.171	0.145	0.172	0.0182	0.012	0.0222	0.0235	0.0403	0.0083	<0.0170

Sample	012L6	034L23	035L24	036L25	037L26	103XA45	104XA46	105XA47	106XA48	107XA49	047XA1	048XA2	049XA3
Locality	BW4	BW5	BW5	BW5	BW5	BW6	BW6	BW6	BW6	BW6	BW7	BW7	BW7
Petrology	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Li	<0.121	<0.142	<0.134	0.218	0.18	<0.32	<0.32	<0.32	<0.30	0.39	<0.32	0.32	<0.32
Be	<0.054	<0.061	0.051	<0.065	<0.065	<0.146	<0.102	<0.086	<0.059	<0.118	<0.160	<0.096	<0.101
B	1.17	1.24	0.94	0.95	1.08	<0.55	<0.52	<0.56	<0.48	<0.57	<0.61	<0.59	<0.67
Al	105694.38	110761.56	111133.73	112469.98	109684.7	109854.91	110690.16	109414.14	110837.29	106126.83	109138.12	108805.02	109372.17
Si	197726.88	199129.19	199129.2	199129.19	199129.2	197259.41	197259.41	199596.61	197259.41	197259.41	194454.78	196324.55	198194.3
P	148.22	125.85	72.53	179.71	144.97	125.03	123.32	138.17	135.37	136.19	108.29	112.49	110.89
Ca	31064.56	27875.22	29058.7	27635.87	26779.66	29023.6	29791.77	28648.13	28110.86	28369.54	30512.86	30772.9	32126.85
Ti	2622.51	1614.46	1332.69	1669.68	1516.36	542.14	578.39	512.22	451.91	503.05	1723.77	1702.62	1820.52
V	185.95	119.24	153.44	121.56	114.45	118.71	120.61	104.48	97.02	103.21	195.46	196.52	197.51
Cr	19228.1	16099.68	16544.48	13880.83	14115.98	12040.36	12997.74	12300.94	12150.36	12632	17249.45	16949.08	16756.38
Mn	2428.77	2558.84	2570.28	2557.24	2529.03	2980.7	3006.18	3054.49	3019.29	2970.08	2672.58	2692.09	2747.56
Co	41.88	42.95	43.41	43.26	42.98	43.35	42.06	43.68	43.29	42.18	43.11	43.24	44.49
Ni	52.68	42.86	42.97	43.3	42.66	23.16	23.32	24.47	23.27	23.46	42.5	42.19	43.87
Cu	0.844	0.606	0.654	0.618	0.595	<0.38	<0.42	<0.41	<0.37	<0.42	<0.41	<0.37	0.44
Zn	16.49	13.49	14.13	14.26	13.03	11.23	12	12.43	11.11	9.97	13.12	13.3	13.9
Ga	8.77	6.23	7.76	5.48	5.44	6.75	6.68	6.39	6.12	6.25	11.32	11.04	10.69
Rb	<0.097	<0.106	<0.105	<0.107	<0.111	<0.109	<0.114	<0.120	<0.106	<0.117	<0.112	3.36	<0.119
Sr	0.243	0.504	0.173	0.633	0.24	0.108	0.156	0.093	0.123	0.118	0.226	1.961	0.216
Y	23.35	26.3	13.13	34.32	28.39	15.51	15.95	15.27	15.2	14.74	15.73	15.85	15.98
Zr	70.31	55.12	17.6	80.81	57.24	12.63	13.32	11.89	11.1	11.06	20.96	24.17	22.43
Nb	0.142	0.226	0.195	0.251	0.168	0.052	0.06	0.088	0.069	0.062	0.234	0.213	0.201
Cs	<0.052	<0.062	<0.061	<0.065	<0.064	<0.052	<0.052	<0.055	<0.047	<0.050	<0.057	0.16	<0.051
Ba	0.0188	0.303	<0.056	0.326	<0.039	<0.040	<0.040	<0.130	<0.040	<0.098	0.076	5.27	<0.069
La	0.0071	0.0396	0.0183	0.0381	0.0083	0.0092	0.0215	<0.0126	0.0098	<0.0131	0.0346	0.0623	0.0294
Ce	0.136	0.186	0.202	0.231	0.13	0.237	0.239	0.208	0.221	0.24	0.337	0.359	0.331
Pr	0.066	0.0723	0.0756	0.0718	0.0812	0.087	0.124	0.096	0.096	0.104	0.084	0.108	0.104
Nd	0.757	1.021	0.766	0.918	0.899	1.13	1.21	1	1.14	1.25	0.788	0.995	0.94
Sm	0.893	1.032	0.554	1.088	0.89	0.785	1.04	0.97	0.8	0.85	0.635	0.651	0.655
Eu	0.544	0.535	0.249	0.593	0.552	0.39	0.436	0.379	0.376	0.438	0.282	0.32	0.344
Gd	2.37	2.09	0.9	2.77	2.28	1.7	1.58	1.51	1.62	1.6	1.42	1.37	1.5
Tb	0.523	0.478	0.236	0.647	0.545	0.306	0.313	0.304	0.289	0.316	0.322	0.354	0.337
Dy	4.06	4.18	1.863	5.24	4.49	2.39	2.32	2.3	2.27	2.28	2.41	2.59	2.42
Ho	0.943	0.973	0.481	1.352	1.078	0.561	0.585	0.578	0.559	0.539	0.639	0.611	0.611
Er	2.93	2.91	1.574	4.31	3.24	1.97	1.99	1.79	1.83	1.79	1.9	1.8	1.93
Tm	0.387	0.418	0.257	0.672	0.493	0.305	0.302	0.274	0.285	0.281	0.272	0.291	0.268
Yb	2.7	3.28	1.763	4.82	3.63	2.18	2.16	2.01	2.04	2.16	2.16	1.98	2.18
Lu	0.425	0.49	0.286	0.765	0.578	0.354	0.32	0.309	0.316	0.305	0.298	0.313	0.332
Hf	1.547	0.652	0.223	1.078	0.571	0.164	0.193	0.102	0.08	0.087	0.411	0.441	0.514
Ta	0.0132	0.0211	0.0248	0.0205	0.0165	<0.0053	0.0112	<0.0108	<0.0074	<0.0052	0.0221	0.0168	0.0193
Pb	<0.0166	0.039	<0.0180	<0.0220	0.0139	<0.034	<0.031	<0.033	<0.034	<0.027	<0.030	<0.034	<0.039
Th	0.0046	0.0089	0.0334	0.0095	0.0056	<0.0098	<0.0069	<0.0082	<0.0089	<0.0069	0.0379	0.028	0.0296
U	<0.0066	0.0136	0.0329	0.0123	0.0122	<0.0111	0.0144	0.016	0.0215	0.0113	0.0489	0.0526	0.0526

Sample	050XA4	063XA13	064XA14	053XB19	054XB20	103BL23	104BL24	105BL25	111BL31	077BL1	078BL2	081BL5	082BL6
Locality	BW7	BW7	BW7	BW10	BW10	A1	A1	A1	A1	Bw44	Bw44	Bw44	Bw44
Petrology	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Li	<0.32	<0.32	<0.32	<0.240	0.321	<0.31	<0.30	<0.32	<0.28	<0.32	0.38	<0.27	<0.27
Be	<0.126	<0.104	<0.154	<0.064	<0.057	<0.208	<0.112	<0.185	<0.075	<0.241	<0.202	<0.185	<0.180
B	0.67	<0.55	<0.50	0.4	<0.45	<0.73	<0.77	<0.73	0.74	<0.77	<0.66	<0.59	<0.68
Al	107727.73	113857.61	108100.07	111706.66	113690.5	117756.58	116393.98	120683.83	106910.88	112571.73	105521.92	105903.9	107049.81
Si	198661.73	199129.17	199129.17	196791.94	196791.94	217826.72	217826.72	217826.72	189780.39	203336.09	203336.11	203336.11	203336.11
P	119.63	126.22	121.71	275.01	266.4	96.45	106.82	96.17	70.61	153.61	118.96	199.33	143.15
Ca	29831.04	29965.05	30972.44	26377.44	25141.24	38134.27	37443.34	38254.72	34351.46	28431.53	27277.66	27338.31	26930
Ti	1652.95	1495.86	1565.92	1357.71	1300.5	4855.16	5107.97	4861.18	4087.73	1880.37	1854.05	1750.13	1604.21
V	186.29	179.7	180.93	92.62	83.62	268.72	284.25	273.81	231.64	188.22	178.37	173.23	158.54
Cr	16877.57	16542.36	16469.62	16769.95	12982.49	8208.04	9824.94	4318.78	4172.58	17060.51	16479.21	15551.65	16132.65
Mn	2718.69	2776.8	2712.4	3245.39	3251.99	2665.33	2627.11	2559.14	2255.77	2743.71	2630.11	2517.57	2551.92
Co	43.47	45.1	44.33	40.98	40.45	48.14	50	49.04	43.45	43.83	39.96	39.95	39.87
Ni	41.87	41.58	42.64	29.33	29.08	84.66	83.87	85.47	77.04	60.63	38	38.75	38.07
Cu	<0.40	<0.40	<0.40	0.31	0.5	1.41	1.18	1.57	0.89	<0.53	<0.46	<0.45	<0.43
Zn	13.93	12.97	12.58	16.68	17.18	21.61	23.79	22.73	18	13.1	11.85	11.42	12.39
Ga	10.99	10.23	10.07	9.09	8.9	18.55	19.62	19.45	16.67	10.22	10.02	9.14	8.89
Rb	<0.131	<0.116	<0.115	<0.088	<0.089	<0.201	<0.215	<0.222	<0.207	<0.238	<0.214	<0.182	<0.181
Sr	0.276	0.332	0.263	0.38	0.257	0.298	0.265	0.264	0.267	0.286	0.273	0.253	0.252
Y	15.48	16.7	15.25	46.96	48.98	16.76	18.93	18.02	15.9	15.87	15.4	16.76	15.62
Zr	22.02	24.45	20.83	71.62	68.97	20.91	28.16	20.89	16.69	27.18	23.58	39.33	24.18
Nb	0.162	0.16	0.163	0.301	0.273	0.116	0.152	0.167	0.127	0.163	0.19	0.149	0.198
Cs	<0.052	<0.053	<0.054	<0.045	<0.042	<0.128	<0.128	<0.137	<0.119	<0.135	<0.118	<0.110	0.115
Ba	<0.075	<0.79	<0.089	0.164	<0.053	<0.083	<0.102	<0.137	<0.124	<0.112	<0.076	<0.091	<0.089
La	0.0209	0.0259	0.0331	0.0351	0.0243	<0.0118	<0.0205	<0.0189	0.0138	0.0173	0.0243	0.0157	<0.0169
Ce	0.311	0.316	0.354	0.226	0.211	0.151	0.14	0.118	0.114	0.202	0.243	0.148	0.279
Pr	0.105	0.12	0.124	0.0889	0.0678	0.0519	0.063	0.0589	0.0545	0.113	0.086	0.0646	0.093
Nd	0.966	1.095	0.924	1.291	1.134	0.641	0.725	0.616	0.546	0.838	0.781	0.82	0.729
Sm	0.683	0.778	0.668	1.247	1.173	0.836	0.78	0.751	0.629	0.635	0.589	0.928	0.729
Eu	0.332	0.375	0.329	0.769	0.714	0.396	0.399	0.377	0.329	0.397	0.328	0.456	0.334
Gd	1.36	1.54	1.29	3.56	3.34	1.62	1.97	1.8	1.47	1.52	1.25	1.82	1.36
Tb	0.315	0.352	0.323	0.926	0.865	0.425	0.418	0.375	0.375	0.337	0.286	0.391	0.319
Dy	2.39	2.69	2.41	7.61	7.2	3.2	3.36	3.04	2.78	2.38	2.23	2.66	2.46
Ho	0.61	0.657	0.573	1.818	1.885	0.665	0.752	0.687	0.649	0.632	0.559	0.644	0.573
Er	1.86	1.92	2	5.61	6.13	2	2.26	1.96	1.94	1.94	1.8	1.91	1.89
Tm	0.296	0.301	0.28	0.755	0.968	0.292	0.338	0.279	0.27	0.298	0.238	0.289	0.304
Yb	2.07	2.08	2.04	5.43	6.87	2.09	2.1	2.19	1.88	2.18	2.02	2.12	2.14
Lu	0.322	0.326	0.317	0.762	1.076	0.284	0.293	0.331	0.3	0.308	0.305	0.31	0.32
Hf	0.424	0.41	0.372	0.816	0.793	0.675	0.75	0.714	0.575	0.53	0.378	0.503	0.431
Ta	0.0189	0.0144	0.0176	0.0198	0.0206	0.0139	<0.0149	<0.0142	0.0104	0.0324	<0.0207	0.0152	0.0173
Pb	<0.032	<0.032	<0.035	<0.035	<0.035	<0.056	<0.027	<0.040	<0.041	<0.045	<0.028	<0.038	<0.047
Th	0.0271	0.0197	0.0298	<0.0100	0.0173	<0.0125	<0.0141	<0.0147	<0.0146	<0.0136	<0.0161	<0.0097	<0.0121
U	0.0316	0.0293	0.0355	0.0166	0.0209	<0.0214	<0.0169	<0.0125	<0.0149	0.0201	0.0307	<0.0142	0.0567

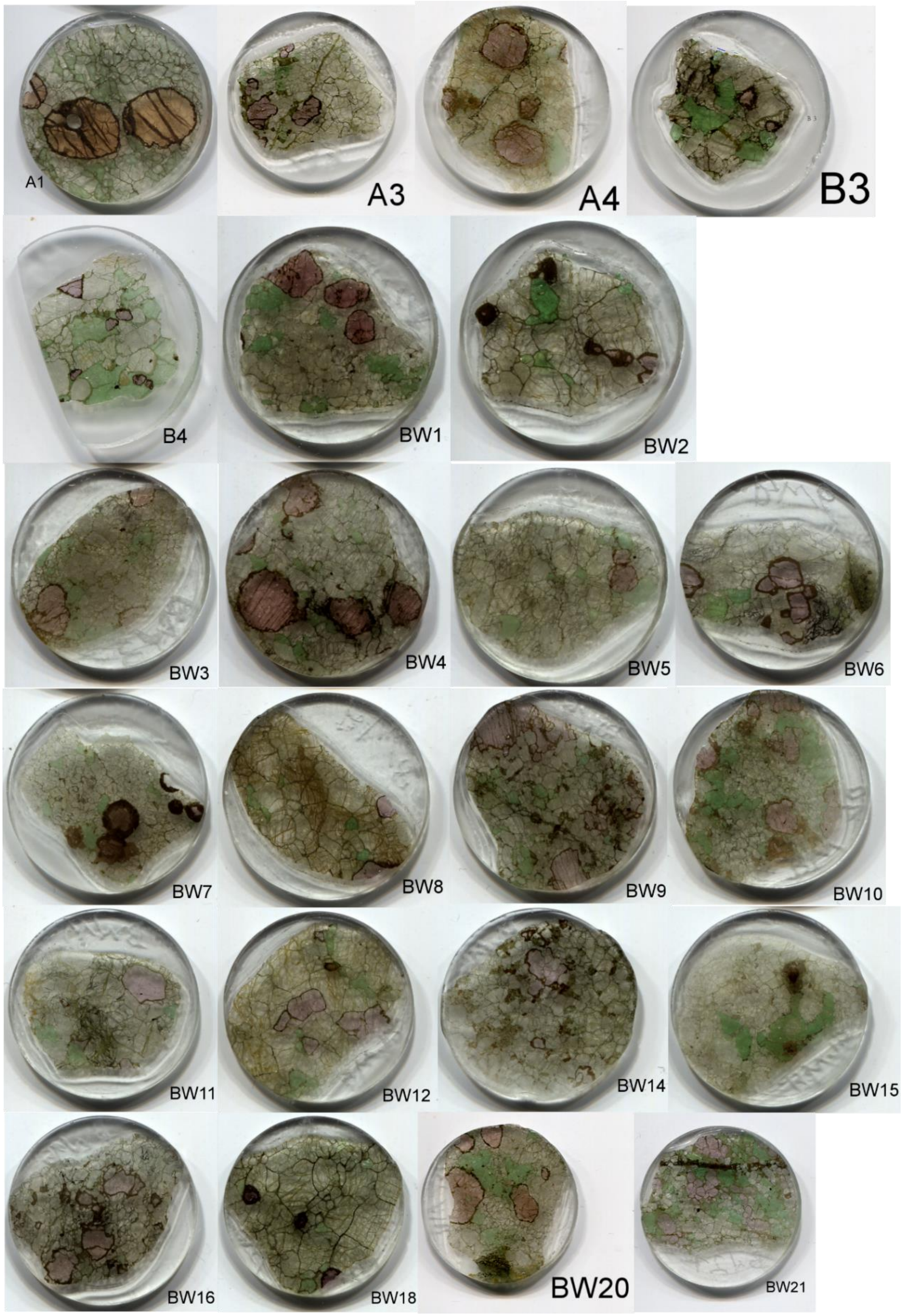
Sample	097L76	098L77	099L78	051LX42	055LX43	056LX44	061LX49	062LX50	113BL33	114BL34	122BL42	093XA39	094XA40
Locality	BW80	BW80	BW80	BW82	BW82	BW82	BW82	BW82	G5	G5	G5	BW17	BW17
Petrology	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Li	<0.162	<0.168	<0.152	<0.40	<0.37	<0.31	<0.41	<0.42	<0.30	<0.30	<0.28	<0.30	<0.32
Be	<0.066	0.056	<0.064	0.103	<0.246	<0.160	<0.180	<0.173	<0.136	<0.136	<0.107	0.067	<0.111
B	0.65	0.88	0.4	<0.92	<0.70	<0.56	<0.70	<0.82	0.8	<0.71	0.69	<0.47	0.88
Al	123877.98	123110.74	124555.84	142694.66	120212.41	90180.33	135253.88	130307.17	112433.3	111496.67	112255.77	103605.74	105337.3
Si	199129.19	199129.19	199129.19	194922.22	194922.22	194922.22	194922.22	194922.22	198661.73	198661.73	198661.73	197259.41	197259.39
P	40.69	54.47	42.64	26.3	42.55	58.15	30.27	33.37	45.13	36.59	56.67	51.18	70.94
Ca	36243.84	33645.21	32356.19	32856.1	26817.74	26612.03	35193.75	33271.05	29185.44	30101	31057.39	37028.28	36796.51
Ti	526.6	532.26	537.01	215.97	167.14	136.34	225.62	201.17	445.08	388.82	424.59	1055.67	1057.61
V	113.77	81.75	79.76	51.95	55.41	41.59	66.98	54.94	71.34	72.81	72.79	407.88	402.26
Cr	13667.64	8456.57	7376.54	5902.02	6736.72	5244.9	7135.88	6822.78	6663.63	6812.8	8326.36	25590.88	25264.94
Mn	3268.74	3166.37	3132.38	3607.31	3480.57	3428	3761.59	3761.54	3575.18	3660.8	3528.83	2173.42	2247.64
Co	40.61	42.82	43.03	36.47	38.7	37.58	36.45	37.4	38.33	40.35	39.35	44.21	45.24
Ni	13.12	12.55	12.5	10.46	10.25	9.98	12.92	11.53	10.92	12	12.23	99.91	98.75
Cu	0.85	0.33	0.371	<0.55	<0.44	0.57	<0.58	0.85	<0.49	<0.50	<0.46	1.02	0.71
Zn	10.99	10.5	11.32	8.63	7.26	5.33	9.78	9.85	7.03	7.97	8.23	16.67	15.97
Ga	6.83	4.37	4.35	2.02	2.57	1.97	3.04	2.46	3.12	3.35	3.23	12.45	11.49
Rb	<0.131	<0.142	<0.143	<0.30	<0.26	<0.219	<0.29	<0.30	<0.204	<0.208	<0.209	<0.109	<0.112
Sr	0.044	0.0234	0.0144	<0.024	<0.0194	0.0228	<0.0130	<0.0216	0.023	0.047	0.0223	0.158	0.175
Y	21.55	20.94	19.95	14.61	11.54	11.84	18.57	18.51	18.23	21.36	18.4	8.13	8.15
Zr	5.45	10.86	9.82	7.56	5.24	5.24	7.78	10.93	17.12	13.54	15.9	9.37	11.88
Nb	<0.02	0.0155	<0.0077	0.044	0.0204	<0.0164	<0.0184	0.038	<0.0140	<0.0140	<0.0135	0.36	0.382
Cs	<0.078	<0.085	<0.078	<0.178	<0.160	<0.139	<0.176	<0.174	<0.124	<0.130	<0.124	<0.054	<0.059
Ba	0.052	<0.143	<0.105	<0.122	<0.115	<0.079	<0.217	<0.128	<0.082	<0.058	<0.096	<0.055	<0.076
La	0.0069	<0.0118	<0.0078	<0.0116	<0.0134	<0.0092	<0.0179	<0.0122	0.0072	<0.0095	0.0051	0.0438	0.0238
Ce	0.0139	<0.0103	<0.0096	0.0176	0.01	0.0138	<0.0184	<0.0125	0.0366	0.0245	0.0296	0.351	0.327
Pr	<0.0066	<0.0098	<0.0046	0.0152	<0.0094	0.0097	0.0152	<0.0147	0.0209	<0.0128	0.022	0.098	0.089
Nd	0.087	<0.063	<0.070	0.16	0.071	0.092	0.119	<0.121	0.359	0.188	0.319	0.842	0.801
Sm	0.189	0.222	0.162	0.29	0.169	0.109	0.163	<0.160	0.442	0.326	0.427	0.396	0.391
Eu	0.217	0.215	0.196	0.136	0.093	0.074	0.115	0.102	0.295	0.277	0.299	0.165	0.182
Gd	1.046	1.193	1.168	0.771	0.645	0.637	0.737	0.659	1.44	1.33	1.39	0.599	0.577
Tb	0.34	0.356	0.343	0.183	0.144	0.171	0.195	0.233	0.362	0.37	0.378	0.151	0.167
Dy	2.92	3.23	3.03	2.23	1.53	1.48	3.15	3.08	2.8	3.27	2.84	1.132	1.17
Ho	0.821	0.808	0.732	0.652	0.505	0.403	0.882	0.962	0.673	0.785	0.653	0.26	0.302
Er	2.46	2.76	2.5	2.36	1.78	1.212	3.2	2.92	1.76	2.35	1.72	1.134	1.067
Tm	0.395	0.417	0.411	0.364	0.287	0.181	0.481	0.461	0.242	0.351	0.203	0.156	0.166
Yb	2.83	3.04	2.71	2.12	1.89	2.01	3.57	2.99	1.67	2.15	1.33	1.24	1.25
Lu	0.455	0.501	0.439	0.323	0.261	0.302	0.552	0.446	0.213	0.339	0.17	0.205	0.23
Hf	0.094	0.169	0.215	<0.060	0.062	<0.036	<0.066	0.091	0.268	0.129	0.233	0.273	0.362
Ta	<0.0049	<0.0125	0.0212	<0.0118	<0.0183	<0.0108	0.0026	<0.0215	<0.0120	<0.0120	<0.0142	0.0435	0.0274
Pb	<0.0191	<0.0231	<0.0187	<0.048	<0.030	<0.048	<0.055	<0.063	<0.035	<0.040	<0.032	<0.032	<0.035
Th	0.0114	<0.0136	<0.0089	<0.0143	<0.0224	<0.0126	<0.0135	<0.0167	<0.0139	<0.0152	<0.0134	0.0132	0.0156
U	<0.0109	0.0065	<0.0107	<0.0153	<0.0184	<0.0133	<0.0198	<0.0102	0.0102	<0.0144	<0.0098	0.0176	0.0312

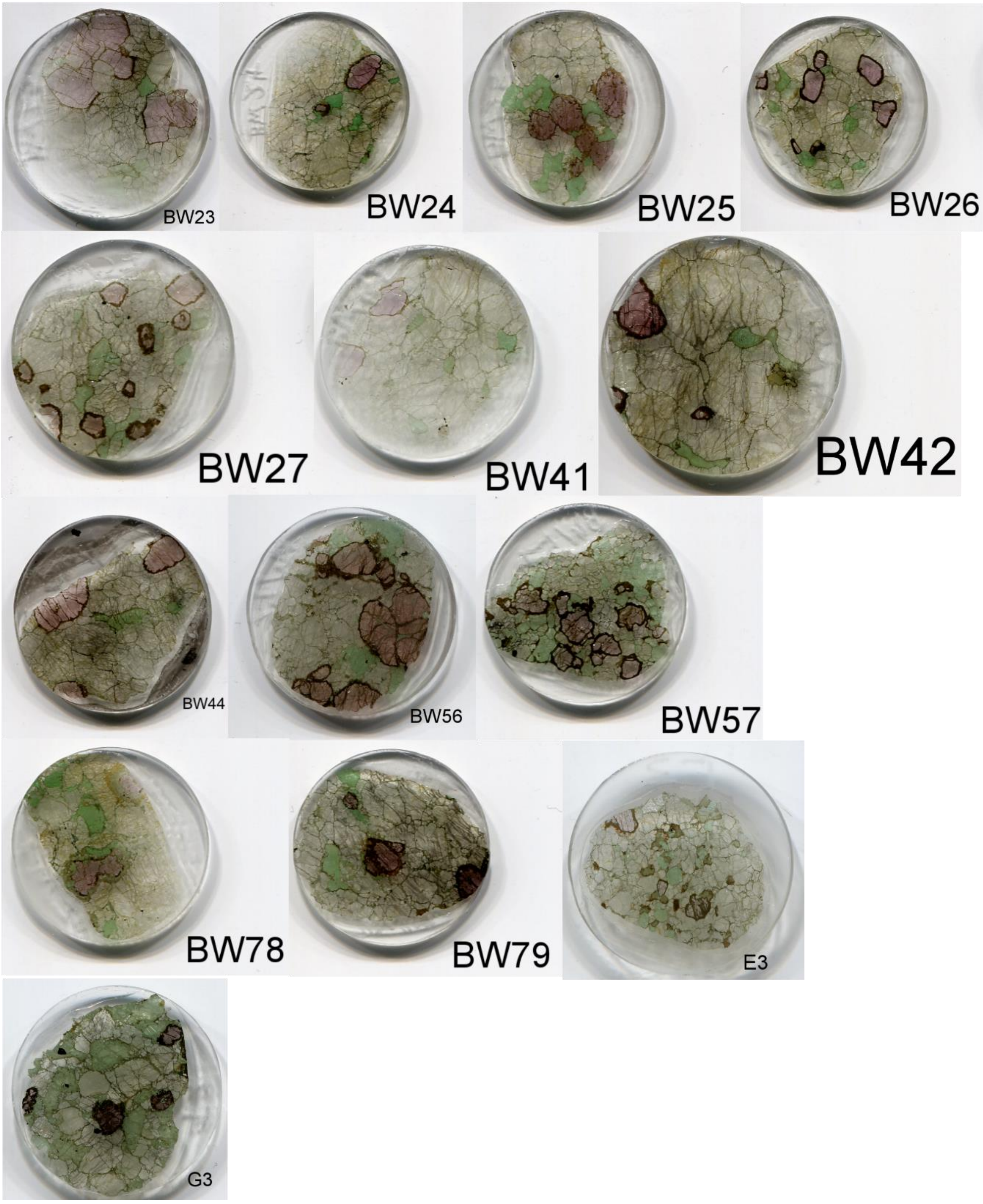
Sample	096XA42	038LX29	039LX30	042LX33	043LX34	041L30	042L31	043L32	055L44	061L45	062L46	066L50	067L51	068L52
Locality	BW17	H2	H2	H2	H2	H3	H3	H3	H4	H4	H4	H6	H6	H6
Petrology	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt	Grt
Li	<0.33	<0.35	0.41	0.36	<0.36	0.39	0.338	0.233	<0.150	<0.162	<0.139	<0.154	<0.158	<0.210
Be	<0.072	0.083	<0.191	<0.150	<0.211	<0.041	0.0134	<0.078	<0.062	<0.044	<0.054	<0.087	<0.109	<0.084
B	<0.57	<0.70	<0.55	0.65	0.71	1.2	0.75	0.77	0.76	0.9	0.776	0.85	0.62	1.15
Al	103458.23	110377.59	109294.04	113545.55	109901.02	107357.31	107509.39	108673.99	100810.42	105682.06	103620.44	108693.2	109195.75	142023.3
Si	194454.78	203336.12	203336.12	203336.12	203336.12	200998.95	200998.95	200998.94	200998.94	200998.95	200998.95	199129.19	199129.2	259428.86
P	72.22	111.57	149.13	197.11	177.13	52.02	115.22	41.85	17.94	84.61	36.41	21.14	34.84	39.73
Ca	38761.45	30109.75	29097.85	32901.77	33058.56	33484.84	30348.39	37963.96	39484.42	36859.94	38059.26	38703.42	38693.71	51494.94
Ti	1135.72	4395.15	4866.02	5964.31	5952.38	4669.86	5544.85	2336.01	656.37	4181.51	2103.85	908.29	1326.6	1177.88
V	403.81	261.44	246.06	276.78	269.74	292.13	263.75	401.36	392.12	283.71	321.01	419.74	436.88	580.09
Cr	25047.89	17556.25	15910.16	17794.63	16026.89	20124.69	12260.29	21808.28	34193.07	30460.85	32410.44	23862.17	23892.18	31927.54
Mn	2235.73	1915.22	1906.26	1954.96	1917.44	2308.06	2271.75	2288.44	1859.2	1930.58	1906.79	2237.98	2230.51	2925.28
Co	44.64	48.8	49.11	48.7	49.63	49.7	49.67	49.45	44.74	48.1	47.68	44.94	46.1	59.49
Ni	101.26	146.71	143.6	153.94	154.75	100.73	105.33	96.41	137.88	142.96	137.78	92.85	95.57	125.06
Cu	0.75	1.32	1.34	1.25	1.72	1.72	1.46	1.07	0.75	1.17	0.9	0.86	0.97	1.17
Zn	16.21	21.59	21.16	21.69	20.77	29.16	27.78	28.95	20.85	21.16	20.64	20.8	21.82	25.04
Ga	12.1	12.58	12.24	14.62	14.45	13.32	15.17	13.37	10.64	9.31	10.39	12.79	12.86	16.93
Rb	<0.119	<0.244	<0.236	<0.27	<0.263	1.089	<0.126	<0.122	0.126	<0.126	<0.110	<0.132	<0.129	<0.182
Sr	0.194	0.648	0.7	0.789	0.695	3.26	0.397	0.37	0.785	0.87	0.776	0.137	0.192	0.149
Y	7.91	13.69	15.43	19.61	21.44	14.08	24.54	9.04	4.26	6.86	4.48	7.52	7.74	10.46
Zr	12.04	36.02	47.51	67.55	70.09	34.32	58.98	6.22	0.185	39.88	7.13	1.73	4	1.124
Nb	0.387	0.246	0.213	0.267	0.242	0.322	0.185	0.267	0.557	0.405	0.4	0.265	0.246	0.365
Cs	<0.058	<0.145	<0.140	<0.157	<0.157	<0.072	<0.071	<0.074	<0.076	<0.077	<0.069	<0.071	<0.074	<0.100
Ba	<0.070	<0.152	<0.130	<0.193	<0.143	11.11	0.028	<0.081	<0.064	<0.064	<0.068	<0.064	<0.080	0.019
La	0.0358	0.063	0.0342	0.0541	0.0564	0.16	0.0253	0.0294	0.0801	0.0729	0.0652	0.0254	0.0192	0.0221
Ce	0.355	0.391	0.385	0.415	0.442	0.556	0.29	0.341	0.677	0.589	0.673	0.11	0.219	0.141
Pr	0.099	0.129	0.126	0.152	0.139	0.13	0.0968	0.1102	0.122	0.197	0.192	0.026	0.0458	0.0331
Nd	0.874	1.35	1.37	1.4	1.56	1.275	1.133	0.893	0.39	1.69	1.474	0.147	0.398	0.217
Sm	0.472	0.97	0.927	1.36	1.23	0.91	0.903	0.376	<0.068	1.265	0.407	0.165	0.26	0.159
Eu	0.193	0.463	0.427	0.641	0.628	0.375	0.481	0.132	0.0189	0.448	0.143	0.064	0.069	0.066
Gd	0.708	1.53	1.8	2.3	2.3	1.446	2.12	0.575	0.13	1.399	0.313	0.332	0.484	0.413
Tb	0.144	0.326	0.354	0.49	0.487	0.311	0.535	0.135	0.0374	0.229	0.0621	0.1079	0.121	0.162
Dy	1.21	2.19	2.61	3.49	3.76	2.3	3.93	1.3	0.468	1.186	0.539	1.074	1.109	1.461
Ho	0.302	0.528	0.556	0.802	0.795	0.527	0.948	0.326	0.149	0.208	0.154	0.271	0.283	0.392
Er	1.005	1.68	1.87	2.35	2.46	1.602	3.11	1.17	0.635	0.767	0.576	1.007	1.153	1.419
Tm	0.175	0.233	0.264	0.352	0.3	0.253	0.474	0.204	0.1106	0.125	0.1153	0.175	0.176	0.252
Yb	1.45	1.82	2	2.14	2.31	1.834	3.37	1.544	0.932	1.073	1.025	1.381	1.343	1.98
Lu	0.213	0.323	0.292	0.324	0.369	0.284	0.546	0.253	0.194	0.198	0.187	0.214	0.237	0.3
Hf	0.283	0.901	1.2	1.91	1.91	0.708	1.612	0.147	<0.030	0.816	0.127	0.077	0.109	0.069
Ta	0.0341	0.0171	0.0173	0.0272	0.0254	0.0308	0.0254	0.0305	0.0581	0.0347	0.0429	0.0281	0.025	0.0258
Pb	<0.039	<0.048	<0.040	<0.044	<0.047	0.048	0.008	<0.0293	<0.0208	<0.028	<0.036	<0.0208	<0.0212	<0.0282
Th	0.0122	<0.0156	0.015	0.0182	<0.0173	0.0256	<0.0099	0.0264	0.0214	<0.0112	<0.0106	0.0067	<0.0144	<0.0135
U	0.0211	0.0132	0.0163	0.0215	<0.0154	0.0138	0.0099	0.014	0.0252	0.027	0.0246	0.0085	0.0151	0.0173

12.3 Thin section scans

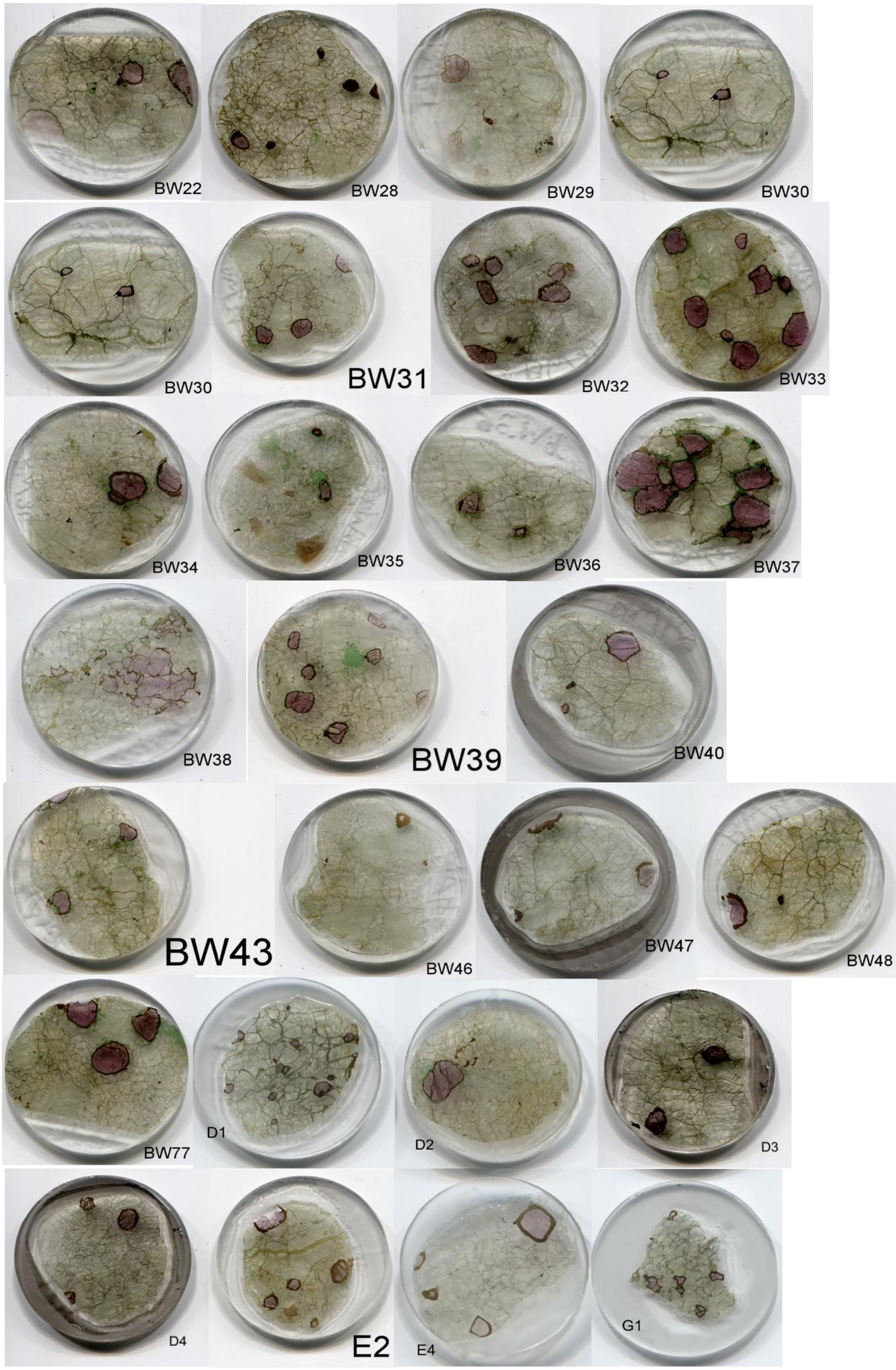
Images of hand specimens are available on request by contacting the authors.

12.3.1 Garnet Lherzolite

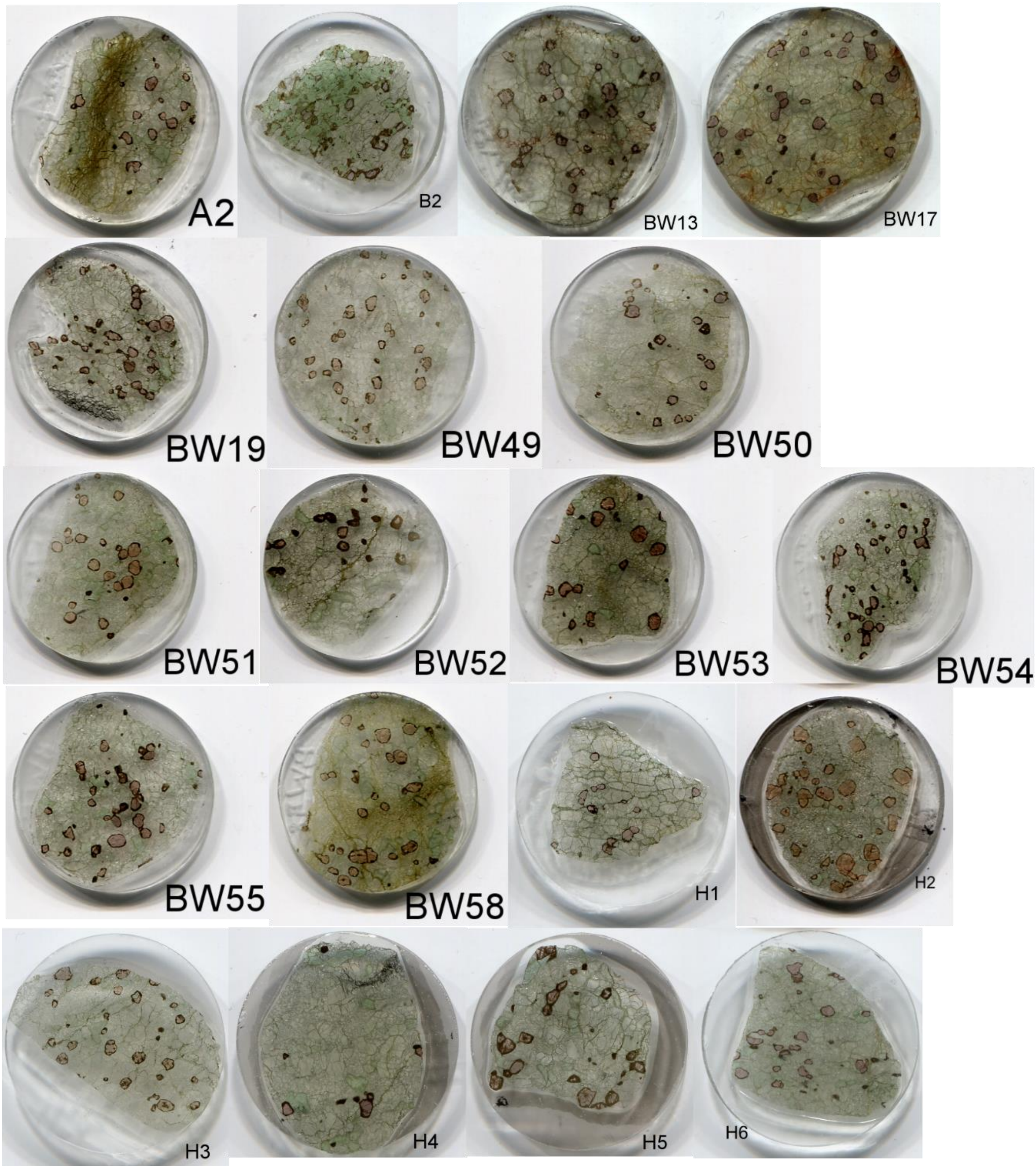



BW23
BW24
BW25
BW26
BW27
BW41
BW42
BW44
BW56
BW57
BW78
BW79
E3
G3

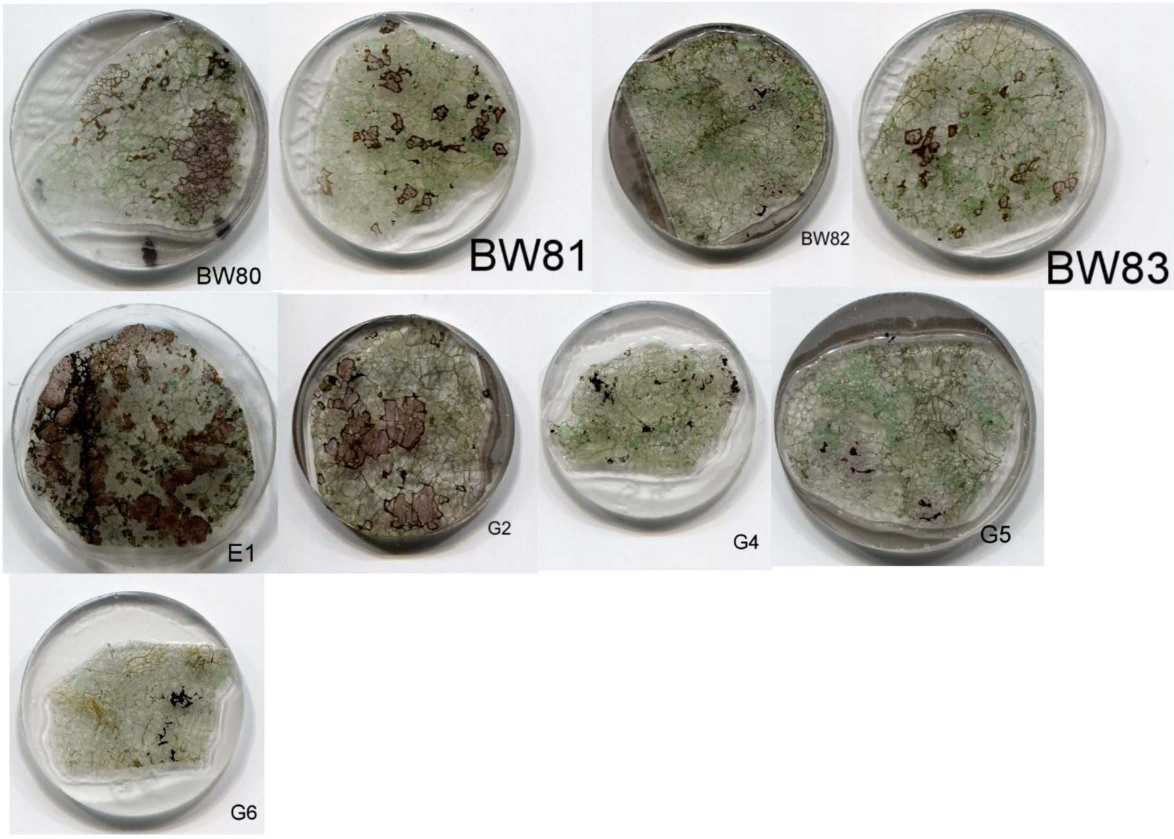
12.3.2 Garnet Harzburgite



12.3.3 Porphyroclastic Lherzolites



12.3.4 Spinel-Garnet Lherzolite



12.3.5 Spinel Peridotites