Petrogenesis of magmas in the Antillanca Volcanic Complex (AVC) (S. Chile) over space and time

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THE UNIVERSITY *of* ADELAIDE

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Petrogenesis in the AVC

ABSTRACT

Crater Rayhuén within the Antillanca Volcanic Complex (AVC) in Southern Chile is known as a monogenetic system. That is, the system contains simple chemistry and is not affected by igneous processes such as assimilation, magma mixing and has limited fractionation. However, the samples studied here show evidence for multiple mixing events as well as fractional crystallisation. Here, petrology, geochemical data and thermodynamic modelling is used to provide evidence of these processes. Petrogenesis is interpreted through the systems chemistry and comparison to nearby volcanoes of the same source. Results yield sieve and zoning textures which are interpreted to be evidence for multiple mixing events. Geochemical data plotted with thermodynamic modelling as well as fractionation vectors illustrate that anorthite fractionation was a dominant and important part of the systems magmatic history. This study reveals that Crater Rayhuén's magmatic history is much more complex than first thought and as such either does not fit within the definition of a monogenetic system or there is a need to re-evaluate the way we think about monogenetic volcanism.

Keywords

Petrogenesis, Antillanca Volcanic Complex, geochemistry, melts, monogenetic, stratigraphy, magmas

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INTRODUCTION

Evolved, polygenetic volcanism is typical in continental subduction zone volcanic complexes. As magmas ascend through the mantle wedge into the overlying continental crust they can change their composition from basaltic to more silica rich to become more evolved through the processes of fractional crystallisation, contamination by assimilation of wall rock and the mixing of magma bodies including the replenishment of basaltic, mantle derived, magmas. However, in the Antillanca Volcanic Complex (AVC), a subduction zone associated complex in southern Chile, we see basaltic compositions, a consequence of monogenetic volcanism in the local area. Monogenetic volcanism can be defined using three key parameters; eruptive volume, magmatic complexity and eruption history. Those volcanoes defined as monogenetic typically have small eruptive volumes ($\leq$2 Km^3), simple magmatic chemistry and a continuous, short eruption history ($\leq 10^2$ years) (Nemeth & Kereszturi, 2015). Although a relatively simple volcanic setting, this type of volcanism can create a variety of volcanic landforms as a consequence of differing eruption styles, such as spatter cones, scoria cones, maar-diatremes, tuff rings and cones (Nemeth & Kereszturi, 2015). It is an assumption that monogenetic systems refer to a singular batch of magma that is generated via a continuous process (McGee & Smith, 2016). These small-scale basaltic systems, in many cases, show geochemical characteristics that indicate insignificant modification by processes of fractional crystallisation, crustal assimilation and magma mixing and thus represent the chemistry of primary melts of a mantle source (McGee & Smith, 2016). However, a number of detailed studies indicate that sources of monogenetic systems can vary from simple melting of homogeneous sources to more complicated multi-faceted sources (McGee & Smith, 2016). They can also show deep-seated fractionation as outlined by Smith et al (2008) in which the sequence of pyroclastic and effusive eruptive units at Crater Hill in the Auckland Volcanic Field, New Zealand, showed clear evidence of fractionation close to the melting source shown by increasing silica content, Mg/Fe ratios and decreasing incompatible elements (Smith, et al., 2008). This same line of evidence for early fractional crystallisation was found by Reiners (2002) in his review on six different intraplate basaltic eruption sequences (Reiners, 2002). This can provide important insights into how the mantle produces partial melts and the processes that occur during ascent to the surface of the Earth.

The scoria cone residing in Crater Rayhuén within the AVC demonstrates this unique, monogenetic, style of volcanism, with the reactivation of this Pleistocene composite volcano in the Holocene showing a shift in magma chemistry to a predominately monogenetic system. The excellent exposure of the magmatic sequence shows a time slice through this magmatic system, which gives an opportunity to look at magmatic processes with respect to time and space. Based on the range of rock types present in the study area, Crater Rayhuén shows evidence of fractional crystallisation and magma mixing, despite being a monogenetic system.

There is an extensive understanding around the igneous processes of fractionation and magma mixing, which are key in our understanding of volcanic complexes, but a lack of information about the Antillanca Volcanic Complex (AVC) in particular. The aim of this study is to determine the igneous processes that influence the magma chemistry of the AVC which will further our understanding on how igneous processes affect monogenetic volcano chemistry, how they might interact in terms of time and space and how they may be related to other volcanoes via their plumbing system. Understanding this system can also provide valuable insight into the processes behind magma production and extraction in subduction zones. To do this, bulk rock and mineral chemistry of glomerocrysts and phenocrysts will be analysed and plotted using various methods. The bulk rock chemistry will then be compared to other basaltic compositions like Island Arc and Continental Arc basalts. Glomerocryst chemistry will be compared to granite lithics found in the area to determine source. Fractionation of minerals will then be modelled using the MELTS program (Ghiorso & Gualda, 2015) and again compared to Island Arc and Continental Arc basalts. It is essential to compare the chemical differences between the rocks in Crater Rayhuén to Ocean and Continental Arcs to evaluate the role of the continental crust in monogenetic eruptions. Petrology of glomerocrysts and phenocrysts will also be used to support findings.

GEOLOGICAL SETTING/BACKGROUND

The Andean volcanic arc, located along the western side of South America, is a continental mountain range which formed due to the activation of a subduction zone during the Jurassic in association with the opening of the Southern Atlantic Ocean, where the dense Nazca oceanic plate began to be subducted under the less dense South American continental plate off the west coast of South America at a rate of about 7.2 cm per year (Iglinski, 2014) (Schellart, 2017) (Stern, 2004). It includes over 200 potentially active Quaternary volcanoes including at least 12 caldera/ignimbrite systems, occurring in four separate segments; the Northern, Central, Southern and Austral Volcanic Zones (Stern, 2004). From the most northern part of the Southern Volcanic Zone to the most southerly there is an increase in subduction angle from approximately 20º to >25º and as a consequence, the distance from the trench to the volcanic front decreases from >290 km to <270 km and the depth of the subducted plate decreases from 120 to 90 km

(Stern, 2004). Continental crust thickness also decreases from north to south, from >50 km to 30 km (Stern, 2004).

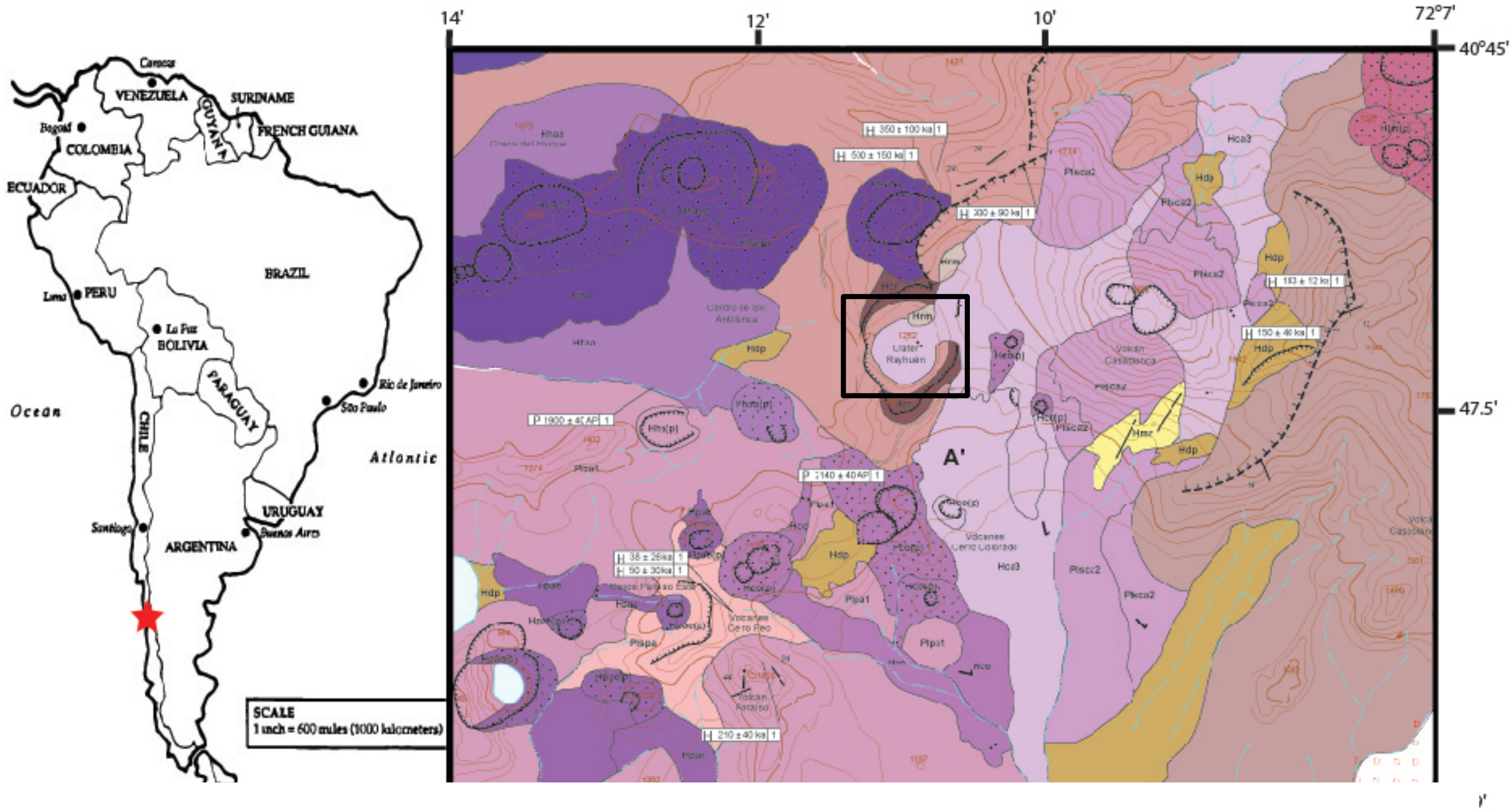

Figure 1: Left is a map of South America with the Antillanca Volcanic Complex denoted by the red star. Right is a geological map adapted from (Carrasco, McGee, Lara, & Chamberlain, 2015) showing where igneous units are exposed at the surface as well as the location of cones and volcanoes. The square box represents the study area, Crater Rayhuén.

The Antillanca Volcanic Complex (AVC) is located in the Central-Southern Volcanic Zone and is composed of a cluster of late-Pleistocene to Holocene basaltic to dacitic scoria cones, maars and stratovolcanoes covering an area of 380 km^2 in the Puyehue National Park. This complex is home to five volcanic cones and seven volcanoes including the large stratovolcanoes, Casablanca, Paraíso and Cerro Colorado. The area of interest in this study is Crater Rayhuén, located in between Volcano Casablanca and del Haique volcanic cone (Carrasco, McGee, Lara, & Chamberlain, 2015). There are only two known historic eruptions from this volcanic complex, the first one in 960 BCE ± 150 and the second in 230 BCE ± 200 from the Casablanca volcano itself (Venzke, 2021). Volcanic rock types in the area vary from basaltic pyroclastic fall and basaltic lavas to dacitic and rhyolitic deposits. The western regions of the volcanic complex contain fluvial and alluvial deposits as well as gravo-sandy diamictic aggregates.

The photograph in Figure 2 depicts the sequence of volcanic layers in Crater Rayhuén. Units 1 through A4 were sampled but here only units 4, 5, 6 and A3 shall be discussed, as seen in Figures 3 and 4, as these units don't contain granite lithics like the units below and are not from other volcanoes in the local area like the ones above, and as such can provide the clearest representation of the magmatic system and its petrogenesis.

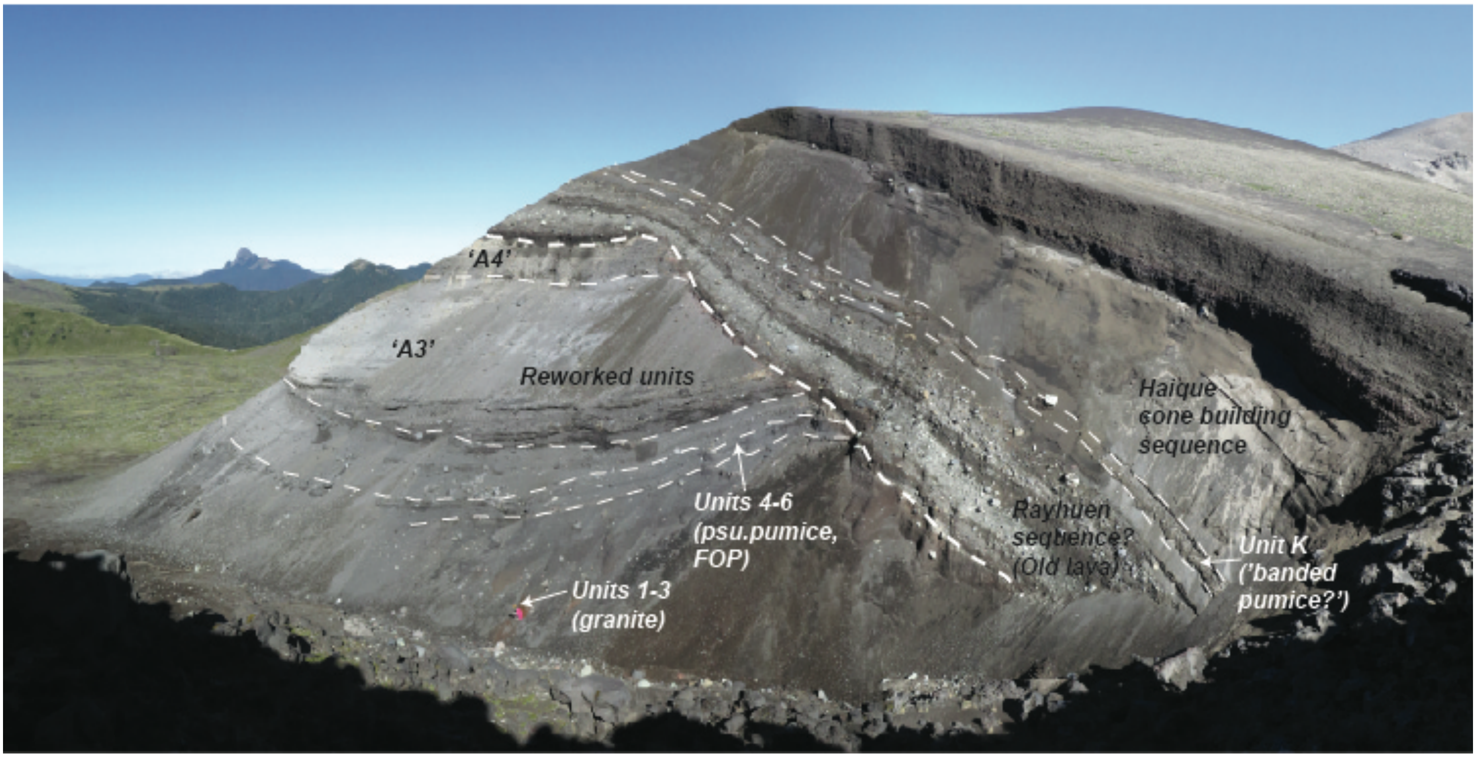

Figure 2: Illustrated photograph of the north east side of Crater Rayhuén taken and illustrated by Lucy McGee (2016) showing the entire volcanic sequence as well as the unconformity between unit A4 and the Rayhuén sequence.

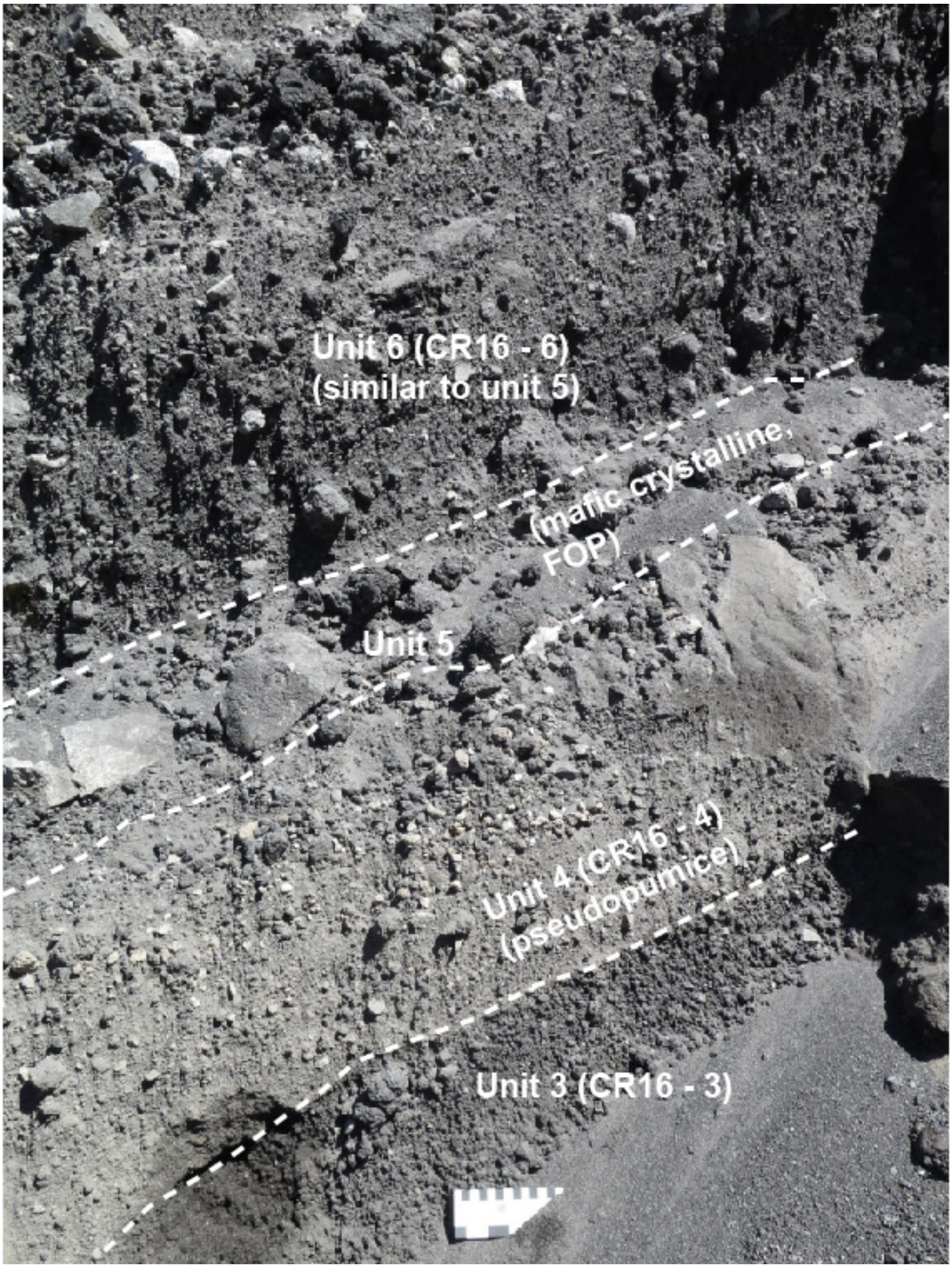

Figure 3: An illustrated photograph of the middle 4 layers from the volcanic sequence in figure 1. Taken and illustrated by Lucy McGee (2016).

Figure 4: An illustrated photograph of the igneous unit A3, taken and illustrated by Lucy McGee (2016).

METHODS

Sample collection

Thirty bulk samples were collected by McGee and Chamberlain in 2016. This study will focus on the units mentioned above, labelled as units 4, 5, 6 and A3.

Bulk rock geochemistry

Bulk rock major and trace element analyses for this study was carried out at the commercial laboratory Actlabs (Canada) in 2016. Major and trace elements were analysed using the 4LITHO procedure, which combines lithium metaborate/tetraborate fusion of glass discs analysed by inductively coupled plasma (ICP) and trace element ECP-MS techniques. Major elements and the trace elements Ba, Be, Sc, Sr, V, Y, Zr were analysed using Lithium Metaborate/Tetraborate fusion ICP and analysed on a Thermo Jarrell-Ash ENVIRO II ICP. The glass discs were then digested and the solutions diluted and further analysed via inductively coupled plasma mass spectrometry (ICP-MS) for trace elements (Ag, As, Ba, Bi, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Ga, Gd, Hf, Ho, In, La, Lu, Mo, Nb, Nd, Ni, Pb, Pr, Sb, Sm, Sn, Sr, Ta, Tb, Th, Tl, Tm, U, V, W, Y, Yb, Zn, Zr) in a Perkin Elmer Sciex ELAN ICP MS. A method blank using the same reagents as for samples was analysed, values obtained for all elements are above the detection limit. The error percent for each of the major and trace elements are presented in the appendix.

Zeiss slide scanner

Twenty-four 30 µm thick polished thin sections were prepared by Vancouver Petrographics. Thin section images were produced using the Zeiss Axioscan 7 automated slide scanner at Adelaide Microscopy. Samples were loaded into slide trays and areas of interest for subsequent scanning were highlighted in the Zeiss Zen Blue software. An initial focus map for each sample was acquired in order to map out the focal plane of the thin section. The thin sections were then image montaged using a x10 objective with one brightfield image and six cross polar images, with the polariser orientated at six different angles.

Scanning electron microscope (SEM)

Five samples were imaged using the Hitachi SU3800 SEM at Adelaide Microscopy, consisting of an accelerating potential of 25 kV and electron beam current of 39 µA, with a spot size of 60 and a working distance of 10 mm. Electron backscatter and mineral liberation analysis (MLA) maps were produced to help with identification of minerals and textures.

Electron probe micro analyses (EPMA)

Quantitative compositions of four samples were determined using a Cameca SX-Five electron probe microanalyzer (EPMA), equipped with 5 tunable wavelength-dispersive spectrometers. The instrument is running PeakSite v6.4 software for microscope operation, and Probe for EPMA software (distributed by Probe Software Inc.) for all data acquisition and processing. Instrument operating conditions were 15 kV/20nA with a defocused beam of 5um.

The full list of elements analysed along with primary and interference standards are presented in the appendix

Thermodynamic modelling

The easyMelts software, created by Einari Suikkanen (2020), is a software designed for thermodynamic modelling of phase equilibria using the MELTS engine and thermodynamic database provided by Mark S. Ghiorso. The easyMelts software contains several MELTS engines, rhyolite-MELTS v1.2.0 which shall be used in this study (Ghiorso & Gualda, 2015).

OBSERVATIONS AND RESULTS

CR16 – 4 (SCORIA)

Black pyroclastic, porphyritic juvenile scoria with angular white feldspar up to 3mm and fresh amphiboles and olivines up to 2mm. 10% crystals with small and fairly scarce vesicles.

Figure 5: Photograph of scoria hand sample depicting large crystals of white felspar and black mafic minerals.

CR16 – 5 (Pumice)

Figure 6: Photograph of pumice hand sample depicting its pumice texture. Geochemical data is from the darker, juvenile layer.

Cream to black pyroclastic, porphyritic pumice-like texture. Crystals of varying size, sub-rounded feldspars and amphiboles up to 2mm. 10-15% crystals with vesicles present. The geochemical data presented here is of the juvenile ·rial, the darker layer.

CR16 – 6 (CRYSTALLINE MAFIC)

Figure 7: Photograph of crystalline mafic hand sample depicting the large white feldspars and darker amphiboles.

Black crystalline porphyritic texture. Contains euhedral to subhedral white feldspars up to 5mm, black amphiboles up to 3mm and olivines up to 1mm. 20% crystals.

CR16 – 8 (Ashy Mafic)

Figure 8: Photograph of dacite hand sample depicting the variation in colour from lighter greys and creams to darker greys.

Cream to light grey dacite with a fine-grained porphyritic texture. Subhedral to tabular feldspar and amphiboles up to 1mm. 5% crystals.

PETROGRAPHY

This layered deposit varies from being crystal-poor, <10% crystals, at the bottom of the sequence (sample CR16-4 and sample CR16 - 5) to crystal rich, >80%, at the top of the sequence (sample CR16 – 6 and CR16 - 8). The dominant crystal phases are (in decreasing order of abundance) plagioclase feldspar + olivine ± clinopyroxene + amphibole + titanomagnetite. Feldspars become increasingly zoned up sequence and crystals become larger and more euhedral. Olivines show evidence of dissolution, and some contain inclusions of feldspar.

THIN SECTION DESCRIPTIONS

CR16 – 4 (scoria)

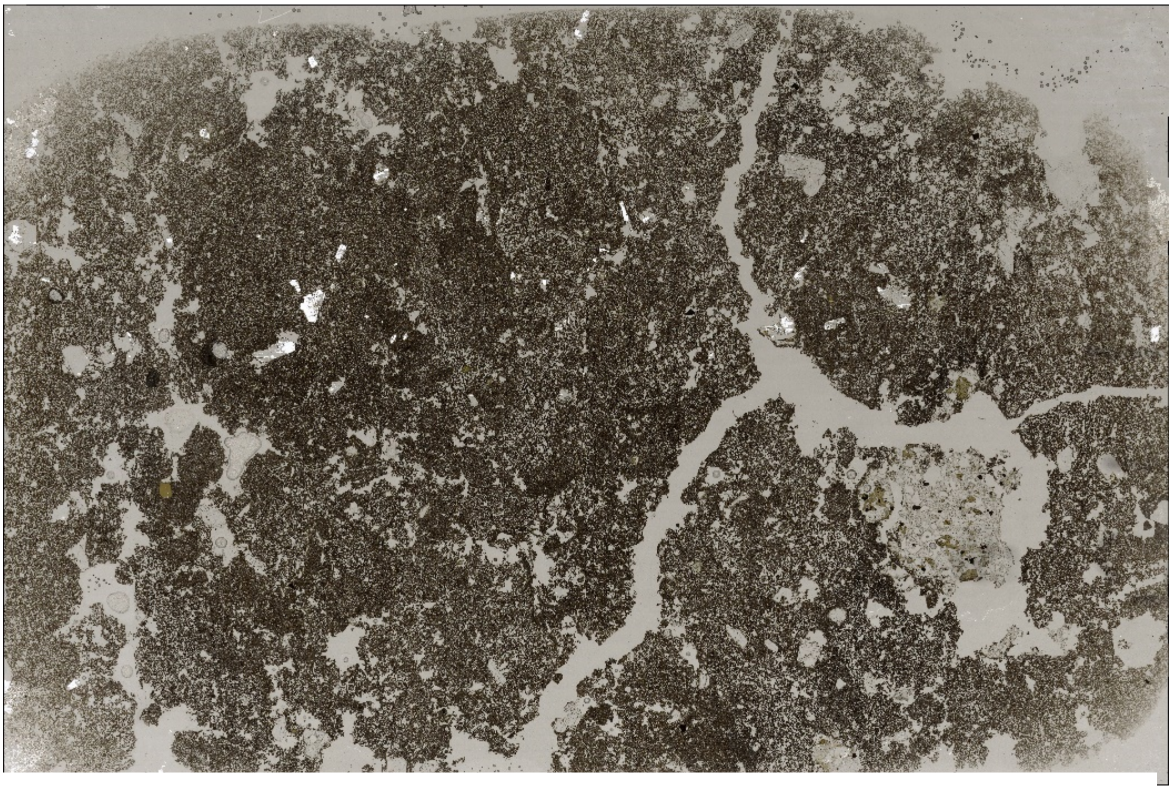

Figure 9: Plane polarised light photomicrograph taken with the Zeiss Axioscan 7 automated slide scanner at Adelaide Microscopy, illustrating phenocrysts of felspar, amphibole, olivine and titanomagnetite along with the large glomerocryst. Slide is 4 cm in length

Fld = feldspar, Amph = amphibole, Olv = olivine, Tmag = titanomagnetite, Glm = glomerocryst

A hypohyaline porphyritic rock with phenocrysts of feldspar, clinopyroxene and amphibole with crystals typically >0.5 mm and euhedral to subhedral in shape. Some zoning in feldspars, limited to larger grains. Contains a diffuse glomerocryst of feldspar, clinopyroxene and amphibole that are anhedral to subhedral in shape and <1 mm in size.

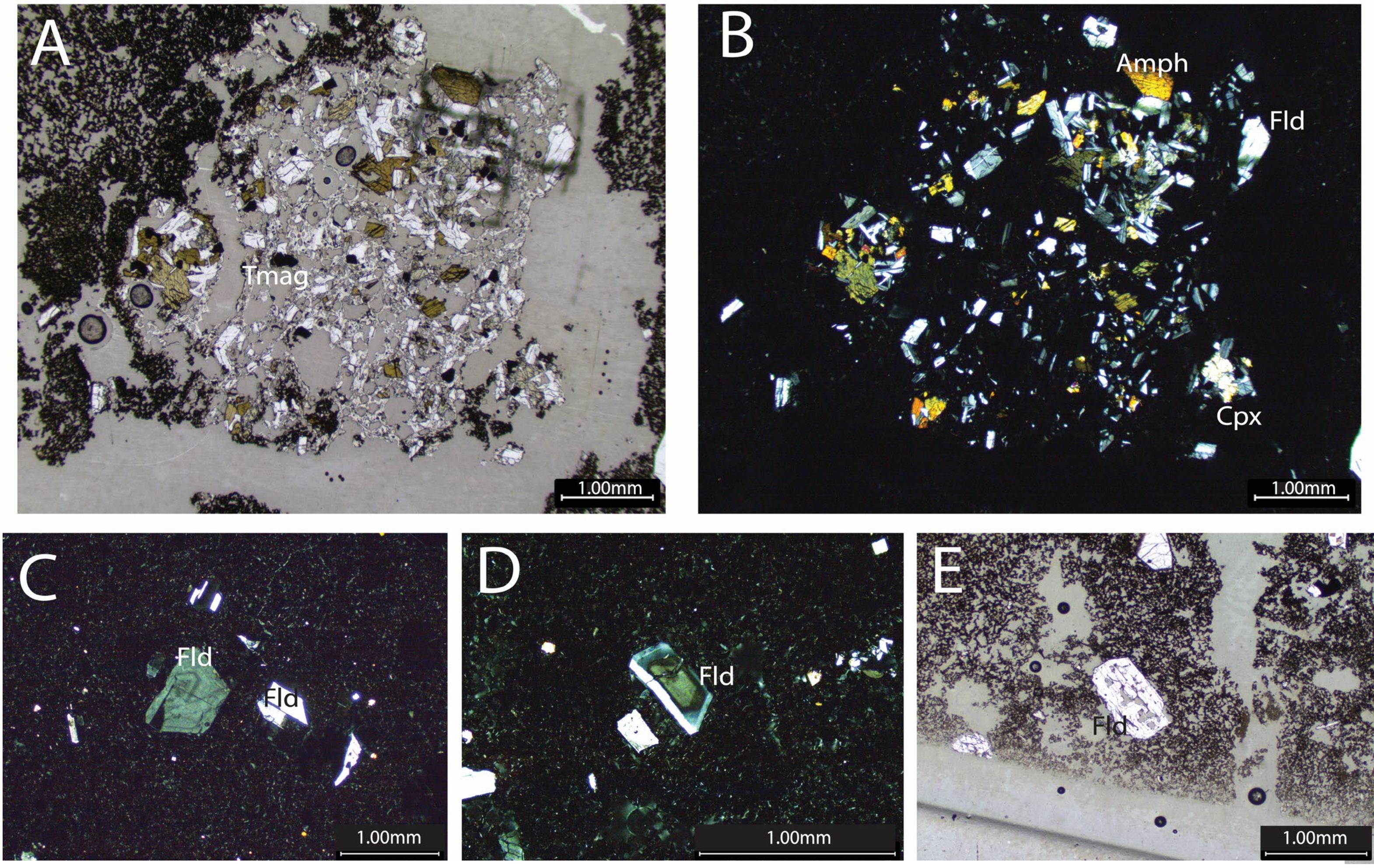

Figure 10: Plane polarised light photomicrograph of glomerocryst, showing the contact between the glomerocryst and the surrounding magma. B) Cross polarised light photomicrograph of glomerocryst, showing the relationships between mineral contacts. C) Cross polarised light photomicrograph of two feldspar crystals 0.5 to 1mm in size. The feldspar crystal on the left shows oscillating zoning around the core. D) Cross polarised light photomicrograph of a feldspar crystal, 0.5 mm in size, showing zoning from core to rim. D) Plane polarised light photomicrograph of a feldspar crystal, 1 mm in size, showing sieve texture with a small clean rim.

CR16 – 5 (PUMICE)

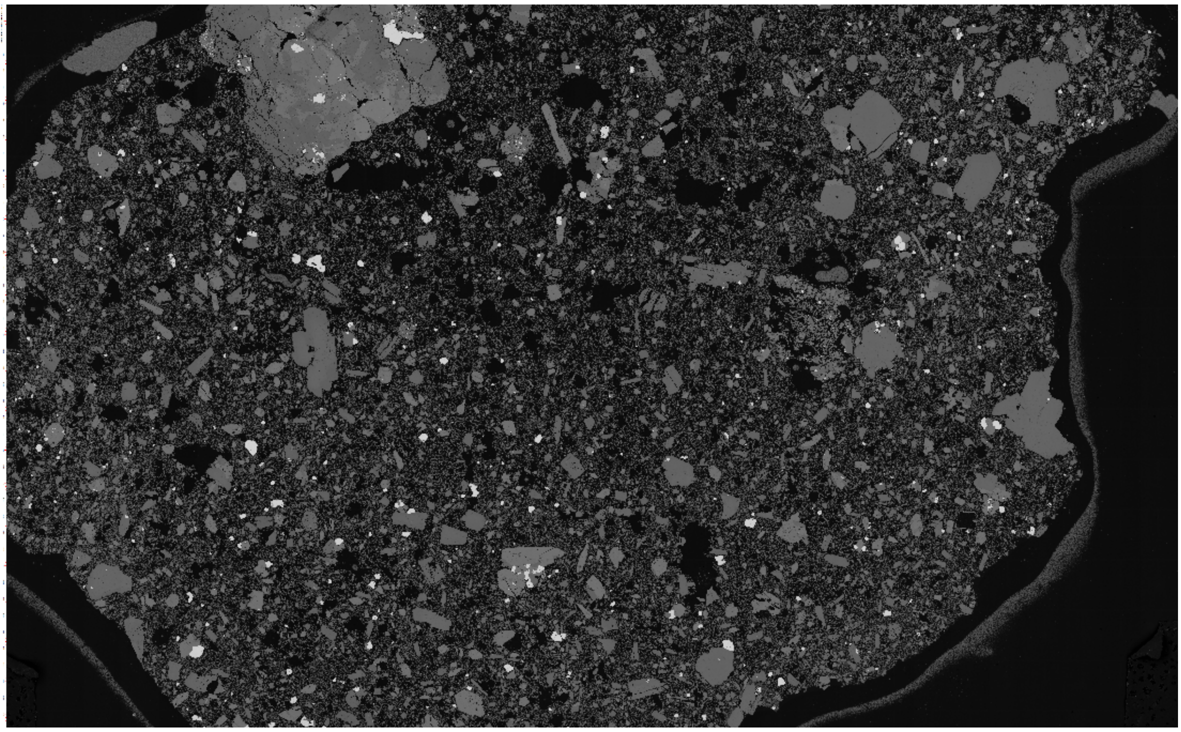

Figure 11: Back scatter image taken from the Hitachi SU3800 SEM at Adelaide Microscopy, showing phenocrysts of feldspar, olivine, amphibole, clinopyroxene and titanomagnetite. Note the large glomerocryst on the top right of the slide, consisting of olivine, felspar, clinopyroxene and titanomagnetite. Slide is 4 cm in length.

A hypocrystalline porphyritic rock with phenocrysts of feldspar, clinopyroxene, amphibole, olivine and titanomagnetite. Crystals vary in size from <0.5 mm to >2-3 mm and are subhedral to anhedral in shape. Zoning in felspar common, some sieve textures in feldspar too. Dissolution exists in some olivine's. contains two glomerocrysts of some composition as surrounding rock. the glomerocryst in the top left is predominantly composed of olivine and feldspar with some amphibole, titanomagnetite and clinopyroxene

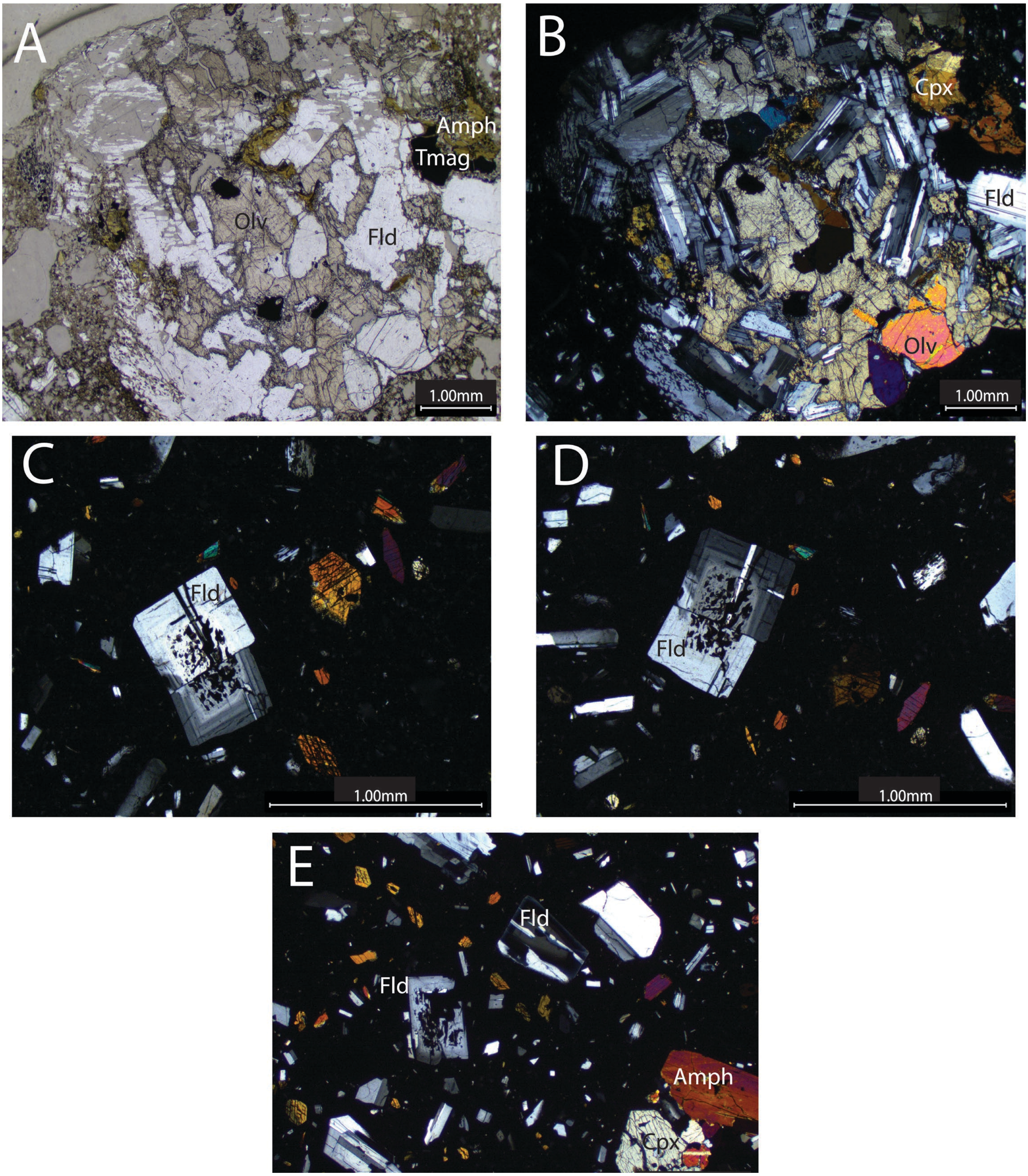

Figure 12: A) Plane polarised light photomicrograph of glomerocryst, showing relationships between crystals. B) Cross polarised light photomicrograph of glomerocryst, showing contact between glomerocryst and magma (black area surrounding glomerocryst) C and D) Cross polarised light photomicrographs of the same feldsapr crystal, 0.8 mm in size, with 180 degrees of rotation between them. Note the extensive sieving in the core of the crystal and zoning to rim. E) Cross polarised light photomicrographs, showing two feldspar crystals, 1 mm in size in middle of shot. Left most has extensive sieving and right crystal contains complex zonation.

CR16 – 6 (crystalline mafics)

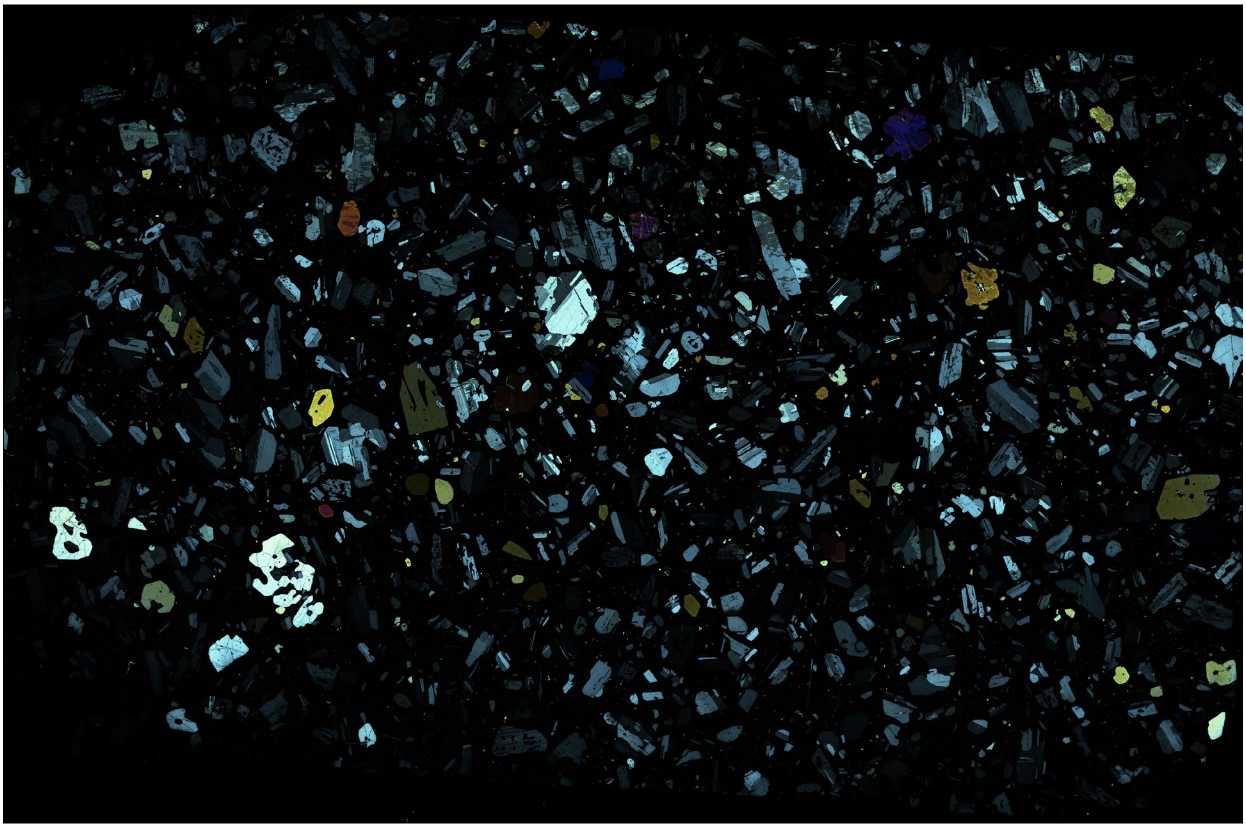

Figure 13: A cross polarised light photmicrograph taken with the Ziess Axioscan 7 automated slide scanner at adelaide microscopy, showing phenocrysts of feldsapr, olivine. Slide is 4 cm in length

A hypocrystalline porphyritic rock with phenocrysts of feldspar, olivine and titanomagnetite. Crystals are typically >1 mm, most around 2-4 mm in size and anhedral to euhedral in shape. Some zoning in small grains of feldspar as well as sieved textures and dissolution in some grains of olivine.

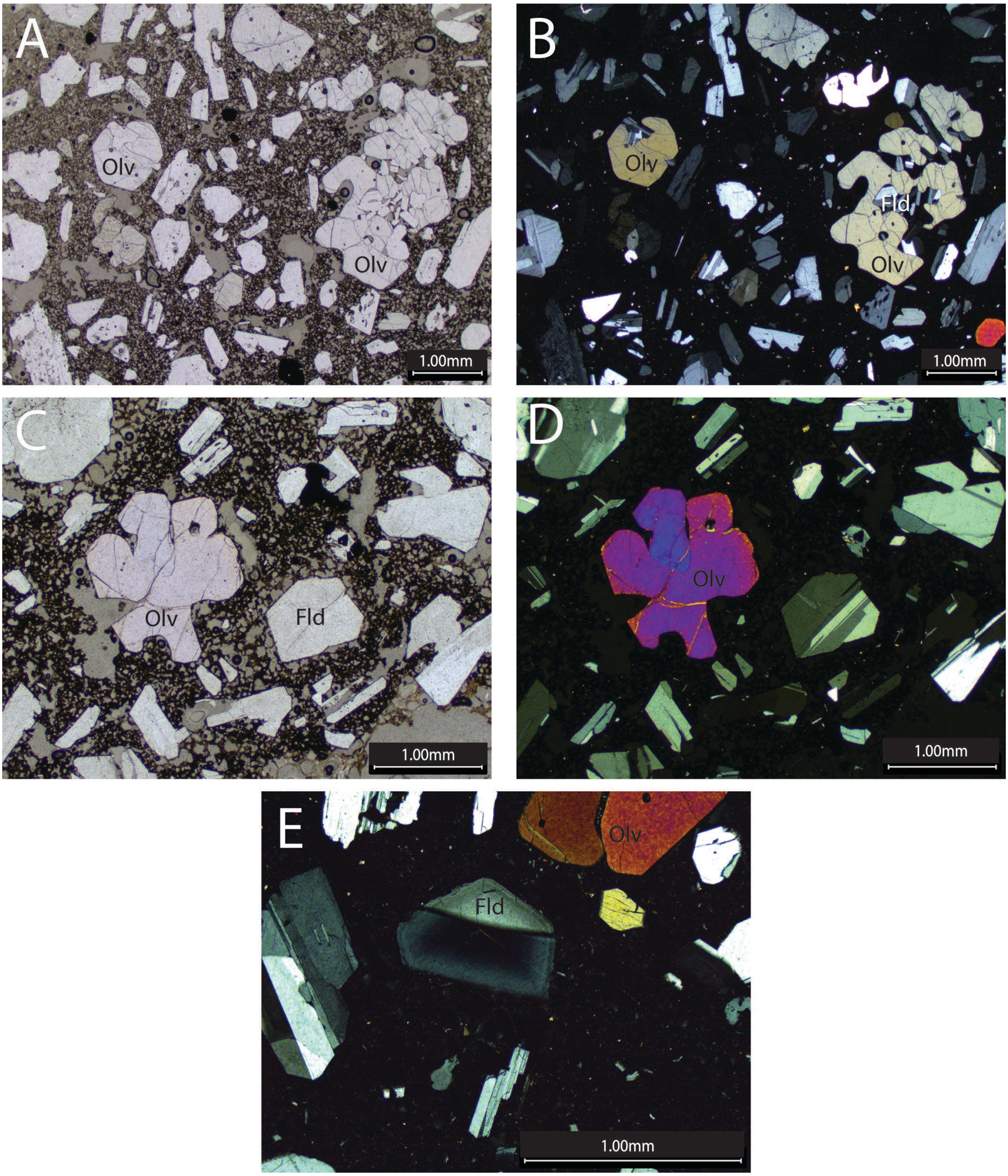

Figure 14: A) Plane polarised light photomicrograph of dissolved olivines, >1 mm in size. Note the inclusions of felsapr in the right olivine phenocryst. B) cross polarised light photomicrograph of aforementioned texture. C) Plane polarised light photomicrograph of olivine and feldspar phenocryst, >1 mm in size. Olivine displays dissolution texture. D) Cross polarised light photomicrograph of aforementioned texture. E) Cross polarised light photomicrograph of twinned feldspar, <1 mm in size. Note the core to rim zoning in the both twins.

CR16 – 8 (Ashy Mafic)

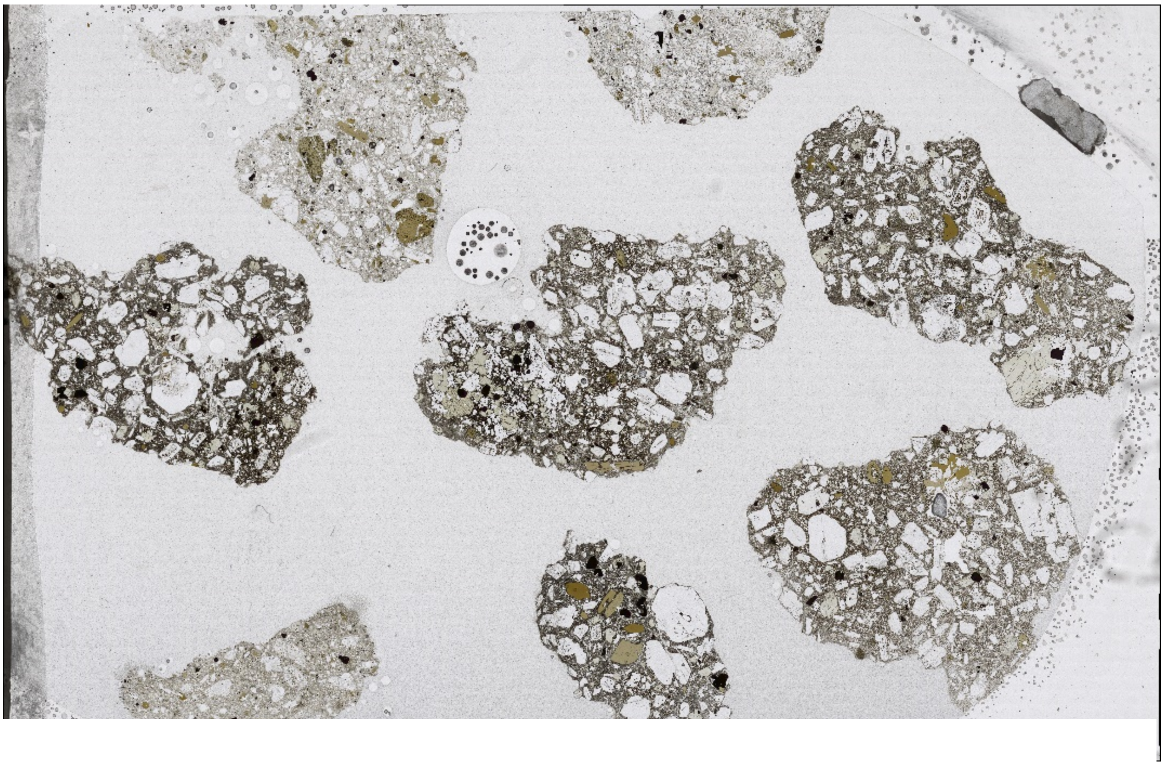

Figure 15: Plane polarised light image taken with the Ziess Axioscan 7 automated slide scanner at Adelaide Microscopy. Image shows phenocrysts of feldspar, olivine, amphibole and titanomagenetite. Slide is 4 cm in size.

A hypocrystalline porphyritic-aphanitic rock with phenocrysts of feldspar, olivine, clinopyroxene, amphibole and titanomagnetite. Crystals range from <0.5 mm to ≥2 mm, typically 1 mm, and anhedral to euhedral in shape. Sieve textures and zoning are common in feldspar and dissolution in some olivine's. glomerocryst in centre of image contains majority feldspar and clinopyroxene with small amounts of titanomagnetite and olivine.

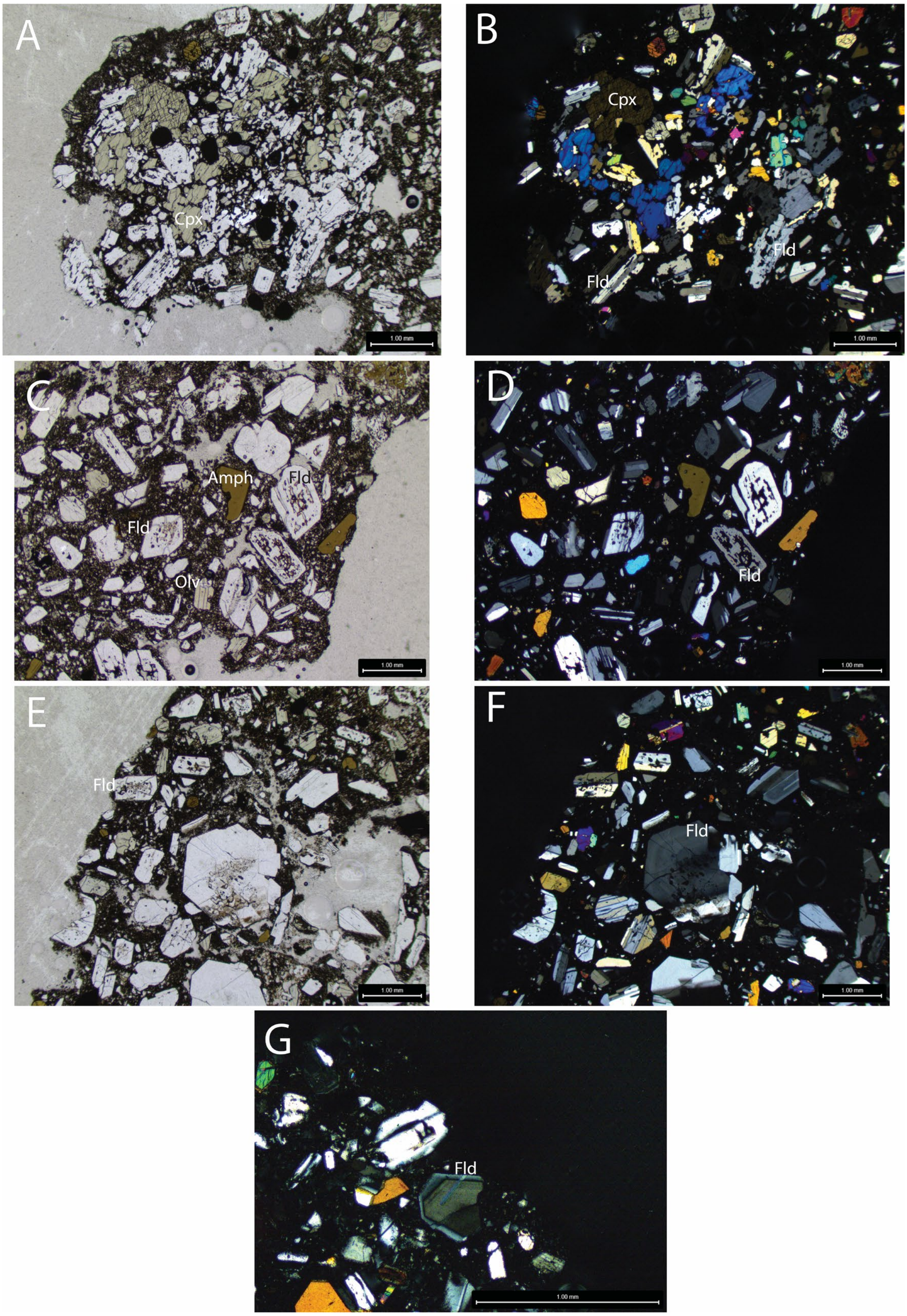

Figure 16: A) Plane polarised light photomicrograph of glomerocryst showing feldspar, clinopyroxene and titanomagnetite crystals, varying in size. B) Cross polarised light photomicrograph of glomerocrys. C) Plane polarised light photomicrograph showing sieved feldspar phenocrysts, 1 mm in size. D) Cross polarised light image of aforementioned texture. E) Plane polarised light photomicrograph of sieved felspar phenocrysts top left of the image, 1 mm in size. F) Cross polarised light photomicrograph of previous image. Note the zoning in the large feldspar phenocryst and the crystal above it.

BULK ROCK CHEMISTRY

Total alkali vs silica & calc-alkaline – tholeiitic ternary diagrams

The analysed Crater Rayhuén magmas are basalts (49.78-51.10% SiO2), except the sample at the bottom of the stratigraphic sequence, CR16 – 4, residing within the basaltic andesite range (53.31% SiO2). These samples have a small range in SiO2 content, 49.78% - 53.31%, and have a total alkali range of 2.95% - 5.16%. All samples correspond to the calc-alkaline series, except CR16 – 8, which sits on the border between calc-alkaline and tholeiitic (8.00% FeO, 6.26% MgO, 3.16% Na2O+K2O).

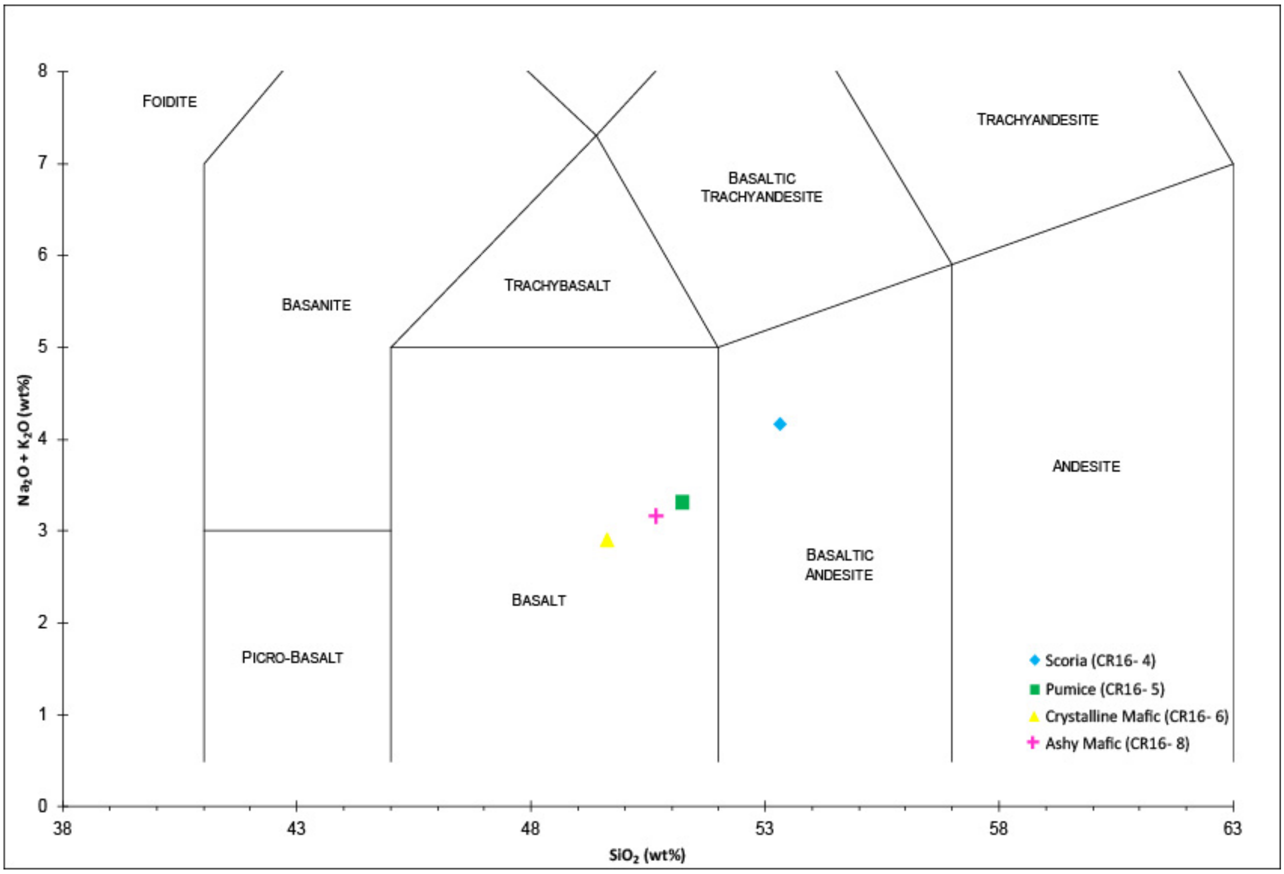

Figure 17: Total alkali-silica plot from bulk rock geochemistry.

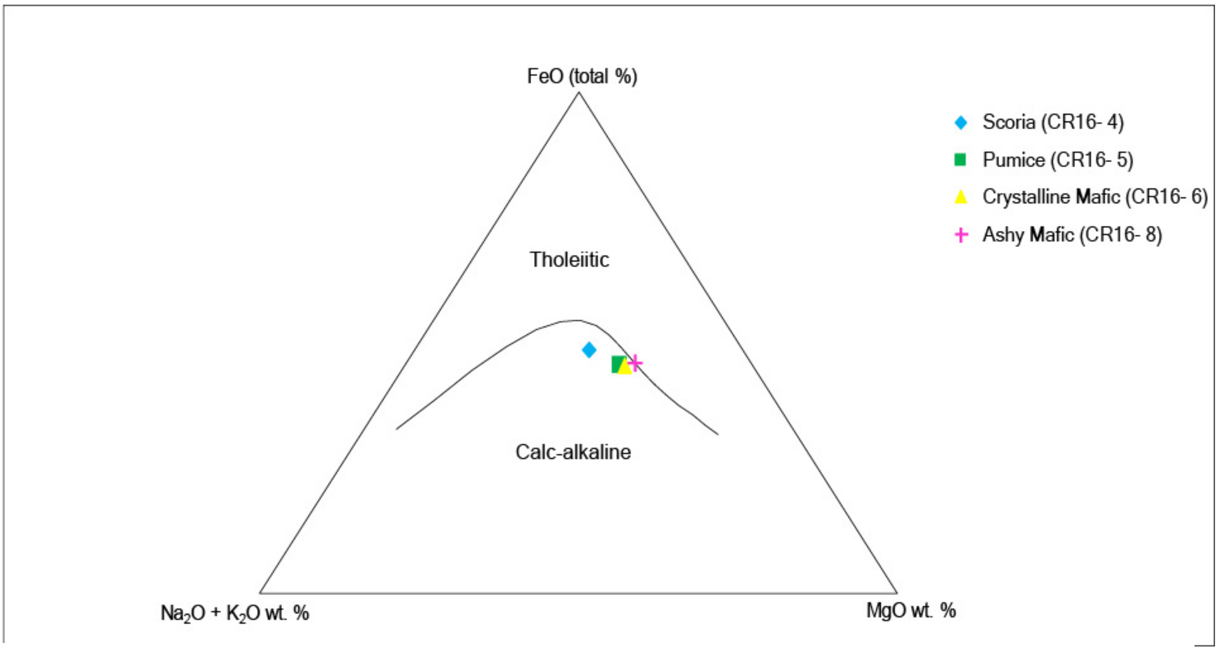

Figure 18: AFM diagram showing realtive proportions of alkalis, iron and magnesium in studied samples. Note that the Ashy Mafic sample sits on the line between Calc-alkaline and Tholeiitic.

Molar numbers

The tables below describe the molar numbers of Mg, Fo and An. The Mg# was used for bulk rock compositions and has an average value of 55.82. the Fo# was used on olivine mineral samples and varies from 61.6 to 81.5. The An# was used to describe plagioclase mineral chemistry and here the An# ranges from 34.9 to 89.7.

Table 1: Bulk rock Mg# for each sample.

Bulk rock sample	Scoria (CR16 – 4)	Pumice (CR16 – 5)	Crystalline Mafic (CR16 – 6)	Ashy Mafic (CR16 – 8)
Mg#	50.22348702	57.19811788	57.64214417	58.22572756

Table 2: Mg# for olivine crystals from each sample. Olivines were sampled using the SXFive electron microprobe.

Olivine Sample	**Scoria (CR16 – 4)**	**Pumice (CR16 – 5)**	**Crystalline Mafic (CR16 – 6)**	**Ashy Mafic (CR16 – 8)**
Mg#	81.31705398	72.54075463	76.13887815	78.6658574
	81.17752228	72.01842698	76.32978829	78.8850647
	80.72364807	72.31757206	76.08611737	78.78709604
	80.52393865	72.34703432	76.29554247	76.20772365
	80.49942611	72.49378754	75.8471633	62.78839202
	81.24270586	72.25065965	76.35032772	80.03622333
	81.36176963	72.35629968	79.0923606	67.48864961
	81.00479372	72.58979055	79.0273541	81.53214266
	81.25483796	71.95896146	78.9122615	81.31822854
	76.20446409		78.70212292	81.31449724
	75.99615718		79.16075892	61.6727392
	75.95359355		79.00551923	
	75.99692917		79.03604664	
	75.08848359		78.69447917	
	75.12790578			
	75.43402052			
	76.22543012			

Table 3: An# for feldspar crystals in each sample. Feldspars were analysed using the SXFive electron microprobe.

Feldspar sample	**Scoria (CR16 – 4)**	**Pumice (CR16 – 5)**	**Crystalline Mafic (CR16 – 6)**	**Ashy Mafic (CR16 – 8)**
An#	86.68202308	59.00255272	87.71267222	77.3205198
	79.45043582	70.3730501	86.82230987	77.89414412
	58.52625845	78.10562347	87.62003013	86.75952045
	81.99244189	34.95774451	83.80273253	65.26894825
	68.23837683	59.42819482	87.19047772	78.16188544
	73.46407894	50.12055368	87.39646677	58.40468879
	72.30451832	59.48399462	87.46611905	63.71701837
	60.43943438	55.65626769	88.73885509	87.89121953
	65.23864462	45.47447592	84.54814077	86.28468267
		42.93452207	88.80591502	86.30833757
		46.70128379		85.67698423
		42.64071635		88.70729159
		45.974645		89.75955952
		52.62772152		83.24142519
		60.19551945		
		63.51798624		

		63.68654133		
		71.56109712		
		84.28672211		
		80.9036889		
		87.03293126		
		68.8729906		
		69.01874191		
		53.02021214		
		69.80415555		
		74.85834191		

The plot here demonstrates how a felspar chemistry changes in the Pumice sample (CR16 – 5), here it changes from more Na_2O rich with a small An number, to a larger An number with less Na_2O and more CaO as indicated in the table below the plot. The trend shows negative parabolic motion as it trends back towards a smaller An#, increasing in Na_2O and decreasing CaO

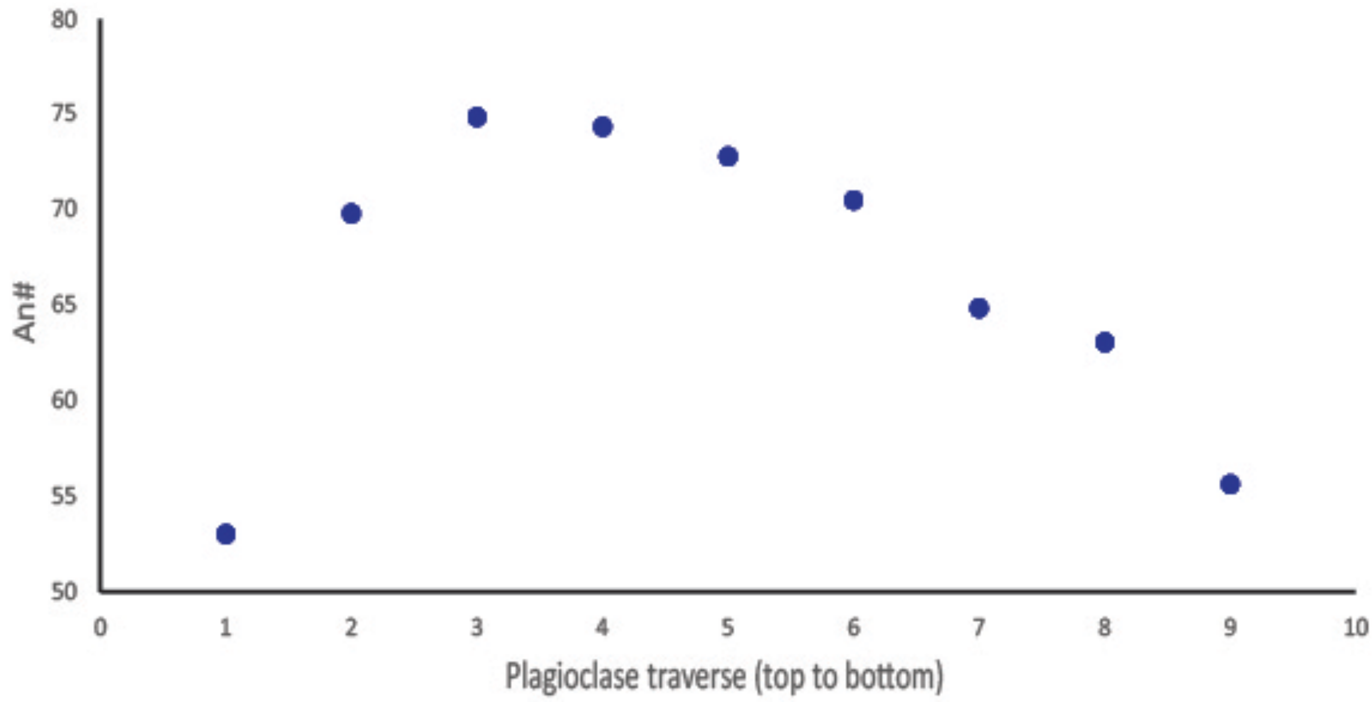

Figure 19: An# molar plot describing how feldspar chemistry changes over a crystal traverse. The traverase was carried out on the SXFive electron microprobe, nine spots were taken from the top to the bottom of the crystal.

Table 4: An#, CaO and Na_2O wt% concentrations for the traverse plotted above.

Feldspar traverse (spot number)	An#	CaO	Na_2O
1	53.02021	10.9824	5.3775
2	69.80416	14.3335	3.42635
3	74.85834	15.7457	2.92233
4	74.3584	15.3812	2.93102
5	72.79024	15.1439	3.12826
6	70.50112	14.6822	3.3948
7	64.84879	13.2049	3.95537
8	63.06394	13.0874	4.23581
9	55.63525	11.596	5.10987

Major elements

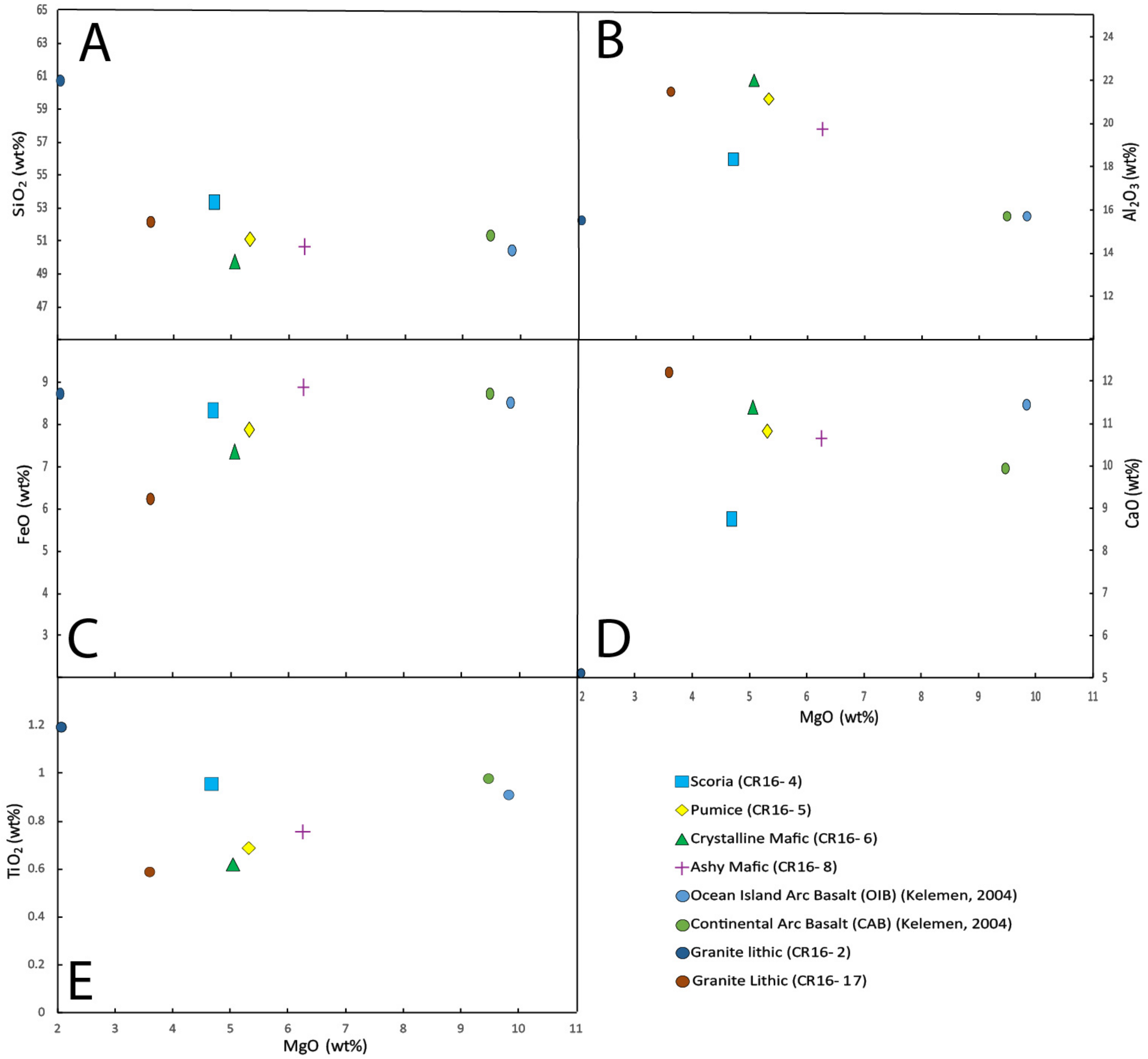

Figure 20: Geochemical plots describing the relationship between MgO and a given major element oxide. Samples are compared to the granite lithics lower in the stratigraphy and with Ocean Island Arc and Continental Arc Basalts (Kelemen, Hanghoj, & Greene, 2007).

MgO varies from 4.71 to 6.26 wt% and generally increases with decreasing SiO_2, FeO, P_2O_5 and TiO_2 until CR16 – 6 where the trend changes and there is a positive correlation, except P_2O_5 which continues the original trend. MgO shows a positive correlation with Al_2O_3 and CaO, CR16 – 6 marks a change in trend with decreasing Al_2O_3 and CaO and increasing MgO.

Trace elements

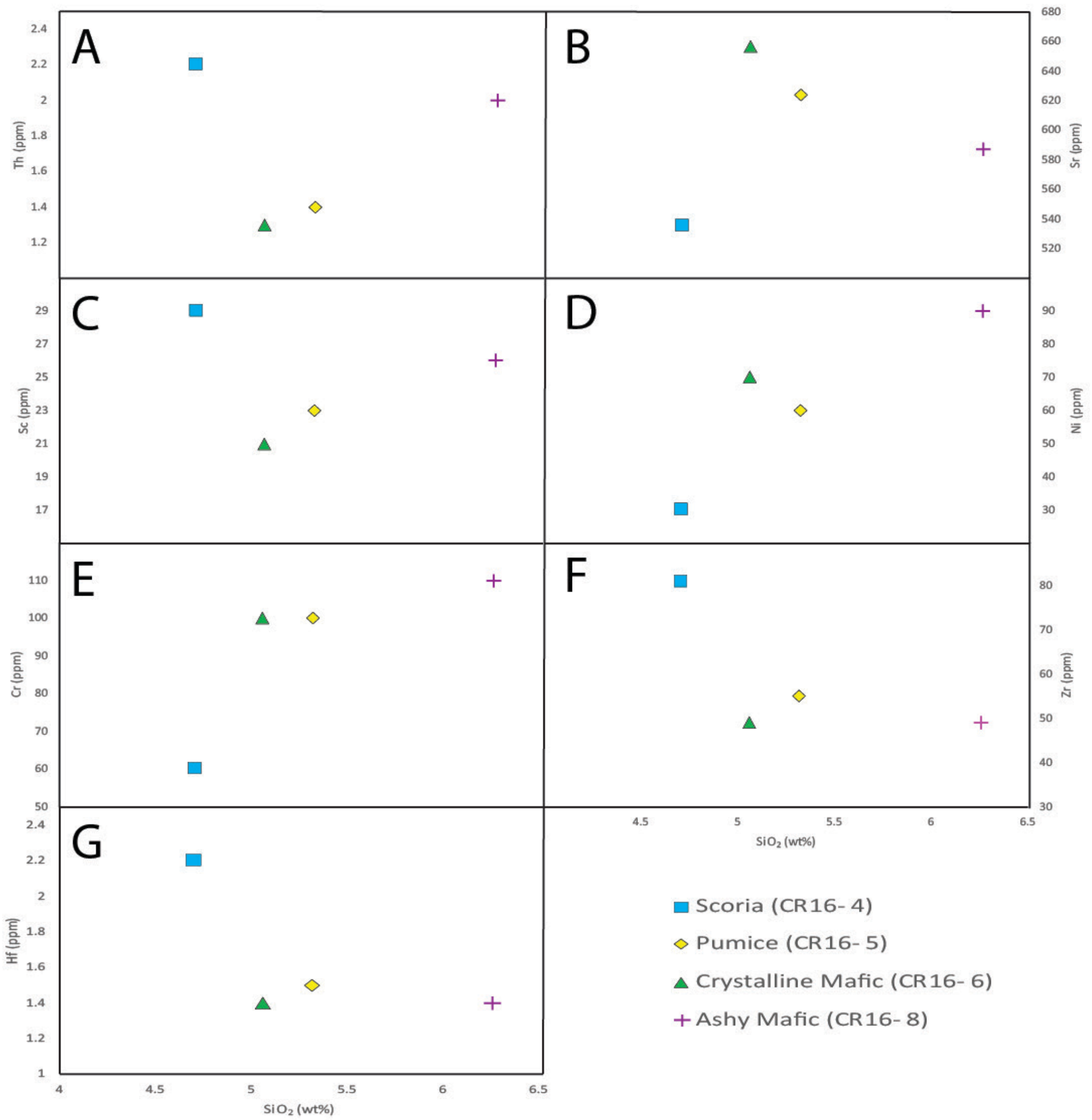

Figure 21: Geochemical plots of SiO_2 against trace element oxides.

Trace elements seem to have significant correlations with MgO, with several trace elements showing the same trend. Th, Sc, Zr and Hf all decrease with increasing MgO. Th and Sc then increase after CR16 – 6 and Zr and Hf both show flat trends with increasing MgO. Trace elements Sr, Cr and Ni all show positive correlations, except Sr which shows decreasing Sr with increasing MgO after CR16 – 6.

Spider diagram

All samples show a similar trend with respect to one another, with a slight enrichment in more compatible elements than the more incompatible elements. All samples show depletion in Nb and Ta, with slight depletions in Th, Ce, Yb and Lu. All samples show enrichment in Pb and slight enrichment in Ba, U and La, except CR16 – 8, which shows no relative enrichment or depletion in Ba and a slight enrichment of Rb. CR16 – 5, 6 and 8 are more similar to each other than CR16 – 4, except where CR16 – 8 has the same value for U, enriched from the other two samples. CR16 – 5 shows a slight enrichment in Nb from CR16 – 6 and 8.

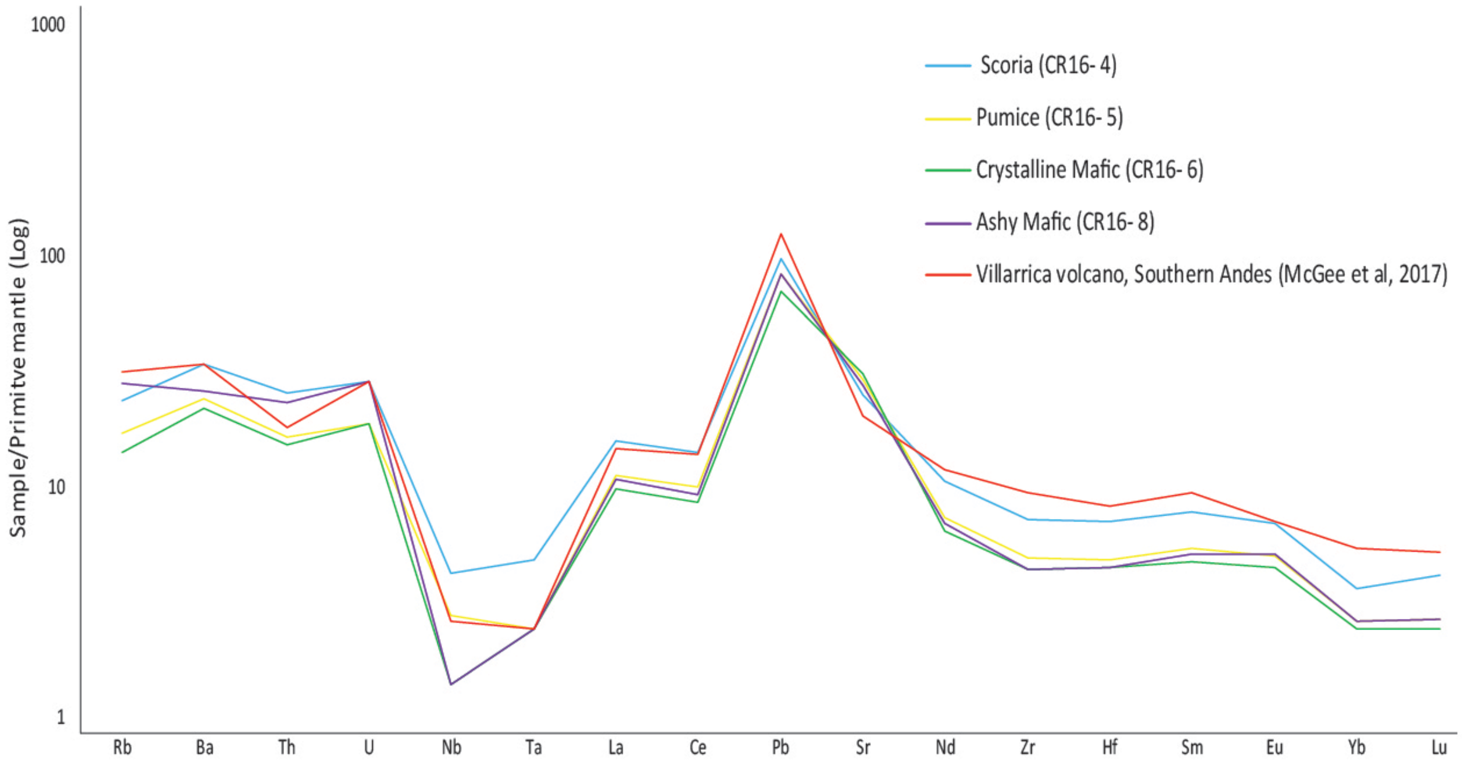

Figure 22: Spidergram of trace elements in order of decreasing compatibility. Samples are compared to Villarrica volcano (Morgado, et al., 2015).

MINERAL CHEMISTRY

Phenocryst and glomerocryst compositions

Each figure describes the differences in mineral compositions between those within glomerocrysts and those not.

Figure 23 shows that there is 0-10 wt% less SiO2 and 0-4 wt% less MgO for those amphibole crystals within glomerocrysts compared to amphibole phenocrysts.

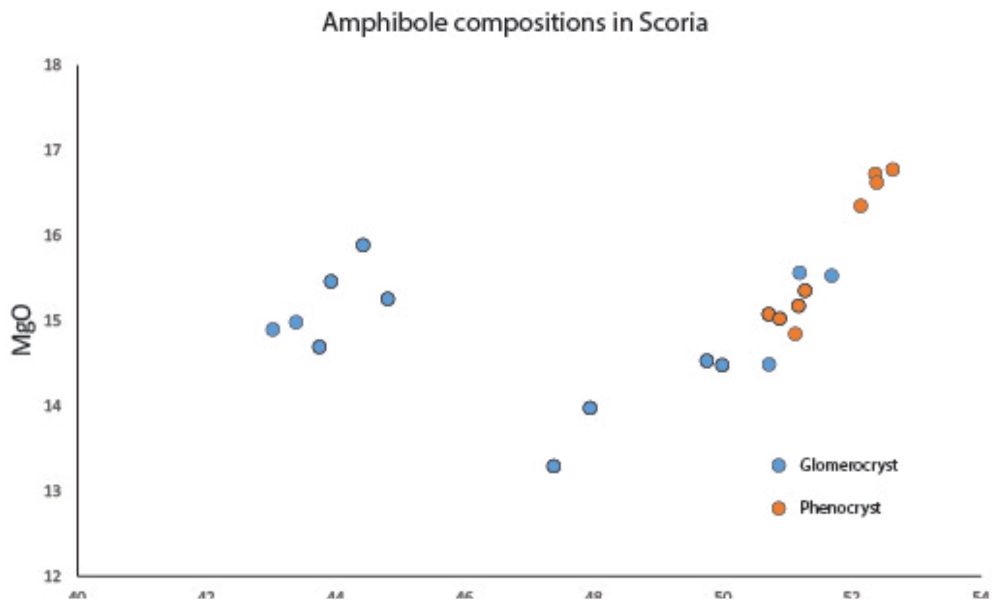

Figure 23: Geochemical plot of amphiboles within and outside of glomerocrysts within sample CR16 – 4

Figure 25 shows that there is some correlation between those feldspars within glomerocrysts and phenocrysts within the host magma. The trend here shows a negative linearity between CaO and SiO2 and that the feldspars within glomerocrysts are relatively enriched in CaO and depleted in SiO2 than the felspar phenocrysts in the host magma. The two granite lithic samples (CR16 – 2 and 17) both plot along this negative linear trend.

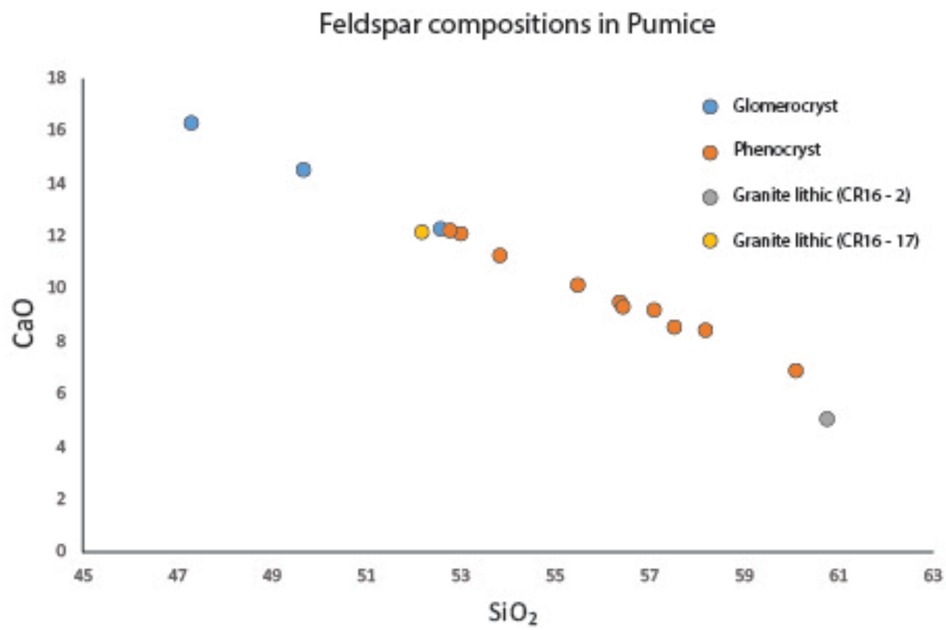

Figure 24: Geochemical plot of feldspar crystals within and outside of glomerocrysts in sample CR16 – 5. Samples are compared to granite lithics from lower in stratigraphic sequence.

Figure 26 shows that the titanomagnetites within the glomerocrysts contain approximately 2.5 wt% less FeO and approximately 4 wt% more TiO_2 than those titanomagnetite phenocrysts within the host magma.

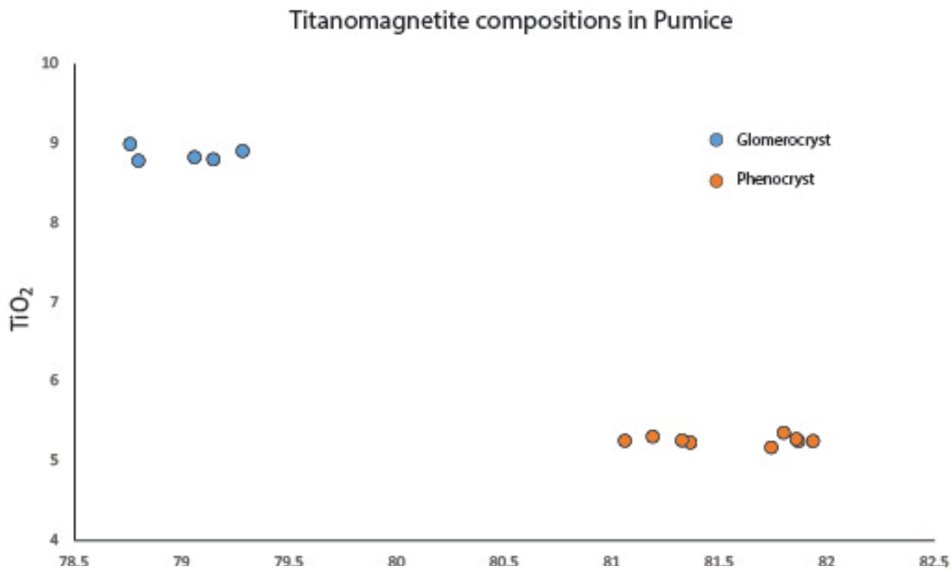

Figure 25: Geochemical plot of titanomagnetite crystals within and outside of glomerocryst in sample CR16 – 5.

THERMODYNAMIC MODELLING

MELTS

The aim was to fractionate minerals out of a melt starting from the most primitive composition; the most mafic composition (CR16 – 6) was used for this. Initially, 1 wt% H_2O and a QFM of +2 with a pressure of 1000 bar was used to simulate approximate conditions under a subduction zone. However, after testing this, it was found that spinel (titanomagnetite in the samples here) was fractionating out too early and clinopyroxene was not fractionating out till the last step. This did not match the samples accurately enough and thus the parameters had to be adjusted. By increasing the amount of H_2O and to 2 wt% adjusting the QFM to +1, spinel crystallisation could be delayed and clinopyroxene crystallisation could be promoted. The composition was then set at an initial temperature of 1300ºC at a constant pressure of 1000 bar, and then cooled to 1000ºC via incremental steps of -50ºC. These parameters and this method was used for each model, CR16 – 6, Ocean Arc Basalt and Continental Arc Basalt.

The tables below summarise the crystal phases and masses at each step.

Table 5: output from thermodynamic model describing how masses, liquid compositions and crystal phases change as temperature decreases in sample CR16 – 6.

CR16 - 6								
	Index	0	1	2	3	4	5	6
	T (C)	1300	1250	1200	1150	1100	1050	1000
	P (bar)	1000	1000	1000	1000	1000	1000	1000
Masses (g)	m (total)	99.423686	99.425914	99.428778	99.43116	99.449653	99.524249	99.576263
	m (melt)	99.423686	99.425914	99.428778	89.716667	76.21547	53.412052	21.404177
	m (solid)	0	0	0	9.714493	23.234183	46.112197	78.172085
Liquid composition (wt%)	SiO2	49.375736	49.374629	49.373207	49.73916	50.76883	54.593637	59.583936
	TiO2	0.616297	0.616283	0.616265	0.682978	0.786269	0.734402	0.604512
	Al2O3	21.821841	21.821352	21.820723	20.418429	17.881251	16.195595	15.284106
	Fe2O3	1.514302	1.536634	1.565344	1.761293	2.02217	1.702453	1.130499
	FeO	5.205957	5.185715	5.159693	5.694404	6.323132	4.819507	2.929485
	MnO	0.111426	0.111424	0.111421	0.123482	0.145357	0.18055	0.517583
	MgO	5.019122	5.01901	5.018865	5.562173	6.323748	4.970329	3.187467
	CaO	11.297462	11.297209	11.296883	10.575839	9.652662	8.950529	6.837951
	Na2O	2.440536	2.440481	2.440411	2.56646	2.717846	3.177473	3.487379
	K2O	0.486135	0.486124	0.48611	0.536173	0.624675	0.875602	1.976742
	P2O5	0.139037	0.139033	0.139029	0.15408	0.181374	0.258809	0.645833
	H2O	1.97215	1.972106	1.972049	2.18553	2.572685	3.541113	3.814507
Solids in eq with liquid (g)	olivine	0	0	0	0	0	4.633479	0
	orthopyroxene	0	0	0	0	0	0	10.159481
	clinopyroxene	0	0	0	0	0	0.664658	7.601672
	feldspar	0	0	0	9.714493	22.273546	37.493183	54.275776
	spinel	0	0	0	0	0.960636	3.251474	4.990836
	fluid	0	0	0	0	0	0.069403	1.144321

Table 6: output from thermodynamic model describing how masses, liquid compositions and crystal phases change as temperature decreases in an Oceanic basalt (Kelemen, Hanghoj, & Greene, 2007)

Oceanic basalt								
	Index	0	1	2	3	4	5	6
	T (C)	1300	1250	1200	1150	1100	1050	1000
	P (bar)	1000	1000	1000	1000	1000	1000	1000
Masses (g)	m (total)	100.1986	100.2015	100.2053	100.2013	100.1984	100.2808	100.3119
	m (melt)	100.1986	100.2015	100.2053	96.86375	80.13335	54.94787	24.88281
	m (solid)	0	0	0	3.337575	20.0651	45.33293	75.42907
Liquid composition (wt%)	SiO2	49.36769	49.36625	49.36441	49.68269	50.50887	54.40454	59.79323
	TiO2	0.890301	0.890275	0.890242	0.920953	1.004647	0.785522	0.628856
	Al2O3	15.37971	15.37926	15.37869	15.90921	16.44589	16.19163	14.92017
	Fe2O3	1.97846	2.007394	2.044582	2.074502	2.14638	1.697579	1.167193
	FeO	6.555327	6.52905	6.495277	6.308748	6.367111	4.734332	2.939055
	MnO	0.16632	0.166315	0.166309	0.164276	0.182556	0.232334	0.383088
	MgO	9.626993	9.626713	9.626354	8.365476	6.646632	4.94025	3.191333
	CaO	11.19236	11.19203	11.19161	11.56457	10.76611	8.838007	6.475004
	Na2O	2.299129	2.299063	2.298977	2.378285	2.753134	3.551194	4.405361
	K2O	0.440259	0.440246	0.44023	0.455416	0.548505	0.792149	1.639016
	P2O5	0.146753	0.146749	0.146743	0.151805	0.1835	0.267607	0.590948
	H2O	1.956706	1.956649	1.956576	2.024072	2.446662	3.564859	3.866754
Solids in eq with liquid (g)	olivine	0	0	0	3.337575	7.239128	9.724895	7.454448
	orthopyroxene	0	0	0	0	0	0	6.601949
	clinopyroxene	0	0	0	0	7.818207	17.78193	24.31968
	feldspar	0	0	0	0	5.007763	15.08612	31.64534
	spinel	0	0	0	0	0	2.738214	4.409222

Table 7: output from thermodynamic model describing how masses, liquid compositions and crystal phases change as temperature decreases in a Continental basalt (Kelemen, Hanghoj, & Greene, 2007).

Continental basalt								
	Step	0	1	2	3	4	5	6
	T (C)	1300	1250	1200	1150	1100	1050	1000
	P (bar)	1000	1000	1000	1000	1000	1000	1000
Masses (g)	m (total)	100.1999	100.2029	100.2066	100.1995	100.1912	100.2883	100.314
	m (melt)	100.1999	100.2029	100.2066	95.87748	87.85226	61.09606	40.97807
	m (solid)	0	0	0	4.322016	12.33898	39.19223	59.33591
Liquid composition (wt%)	SiO2	50.21328	50.21181	50.20991	50.67238	51.32138	55.4932	59.92196
	TiO2	0.958679	0.958651	0.958615	1.001899	1.06364	0.855217	0.676495
	Al2O3	15.35844	15.35799	15.35741	16.05084	16.64124	16.3831	15.36695
	Fe2O3	1.99138	2.020635	2.05824	2.07682	2.08356	1.560385	1.083228
	FeO	6.738424	6.71185	6.677691	6.424037	6.146911	4.287746	2.750532
	MnO	0.166302	0.166297	0.16629	0.163011	0.163769	0.203188	0.231977
	MgO	9.273756	9.273484	9.273134	7.636826	6.127331	4.454735	3.162181
	CaO	9.713966	9.713681	9.713314	10.13659	10.12581	8.168269	6.360586
	Na2O	2.553218	2.553143	2.553046	2.668324	2.868808	3.636422	4.066242
	K2O	0.860855	0.86083	0.860797	0.899665	0.980617	1.396067	2.031063
	P2O5	0.215214	0.215207	0.215199	0.224916	0.245462	0.352959	0.526242
	H2O	1.956489	1.956431	1.956357	2.044693	2.231473	3.208717	3.822546
Solids in eq with liquid (g)	olivine	0	0	0	4.322016	8.188175	10.61732	12.3129
	clinopyroxene	0	0	0	0	2.328837	12.37443	17.10221
	feldspar	0	0	0	0	1.821972	12.94919	24.77828
	spinel	0	0	0	0	0	3.251294	4.748518
	fluid	0	0	0	0	0	0	0.393994

Figures 27 to 30 shows how the liquid composition of samples CR16 – 6, OAB and CAB evolve over the six steps of the thermodynamic model. Here all samples show a negative relationship with SiO_2, that is, as SiO_2 increases the Y variable decreases. In figure 28 sample CR16 – 6 starts with considerably higher alumina (21.8 wt%) than both the OAB (15.3 wt%) and CAB (15.3 wt%). The trend that both the OAB and CAB exhibit is relatively flat, with no real change in alumina content from beginning to end. However, the CR16 – 6 sample loses a vast quantity of alumina (~6 wt%) before it exhibits a similar trend to the OAB and CAB. In figure 29 sample CR16 – 6 starts with less MgO (5.0 wt%) than the OAB (9.6 wt%) and CAB (9.2 wt%) but increases for four, reaching a similar amount of MgO before all three trend negatively.

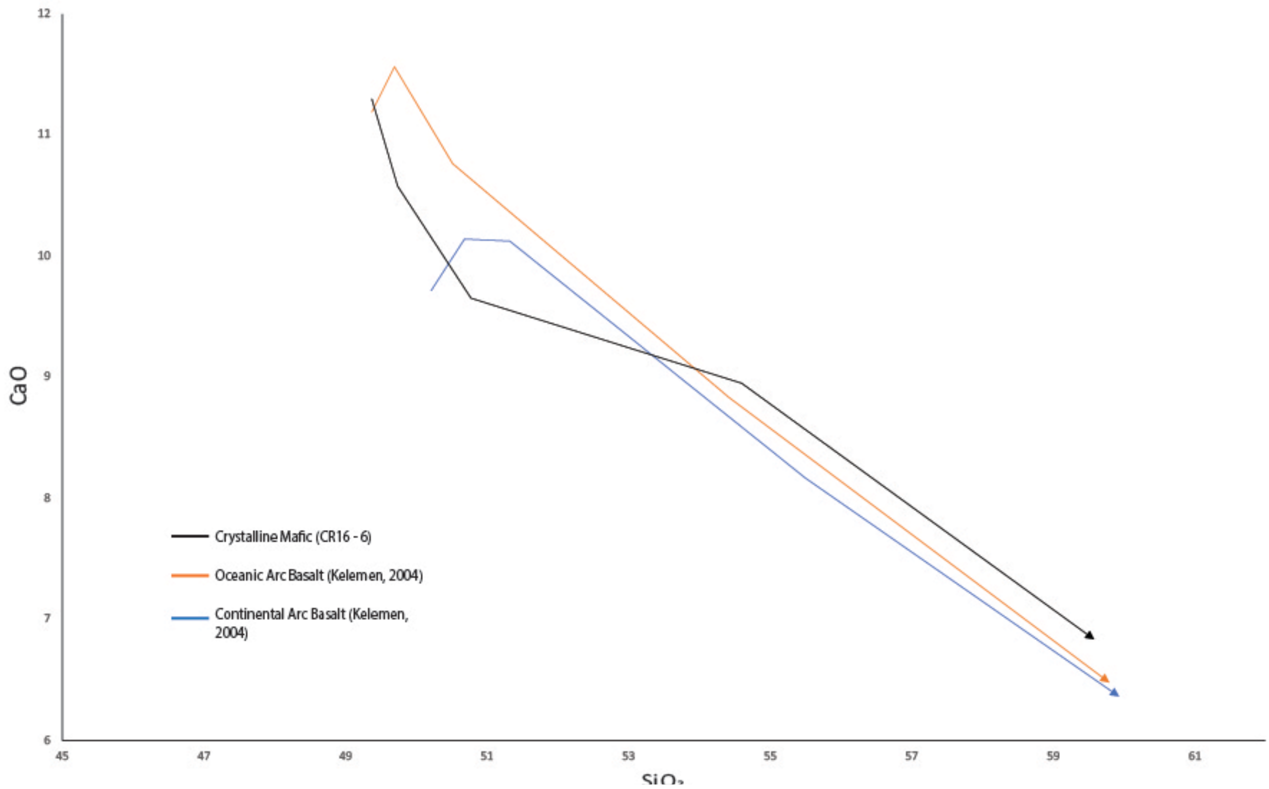

Figure 26: Thermodynamic plot describing the change in liquid composition of CaO against SiO_2 as described by tables 5, 6 and 7.

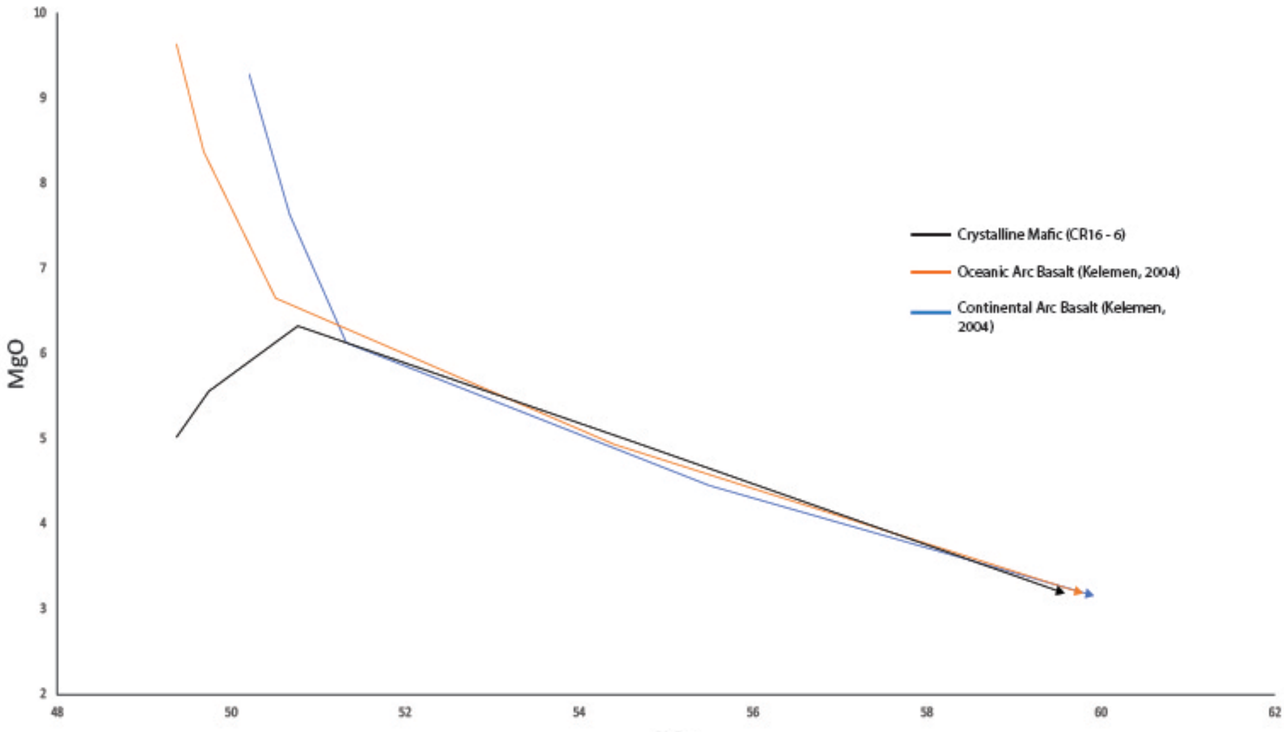

Figure 27: Thermodynamic plot describing the change in liquid composition of MgO against SiO_2 as described by tables 5, 6 and 7.

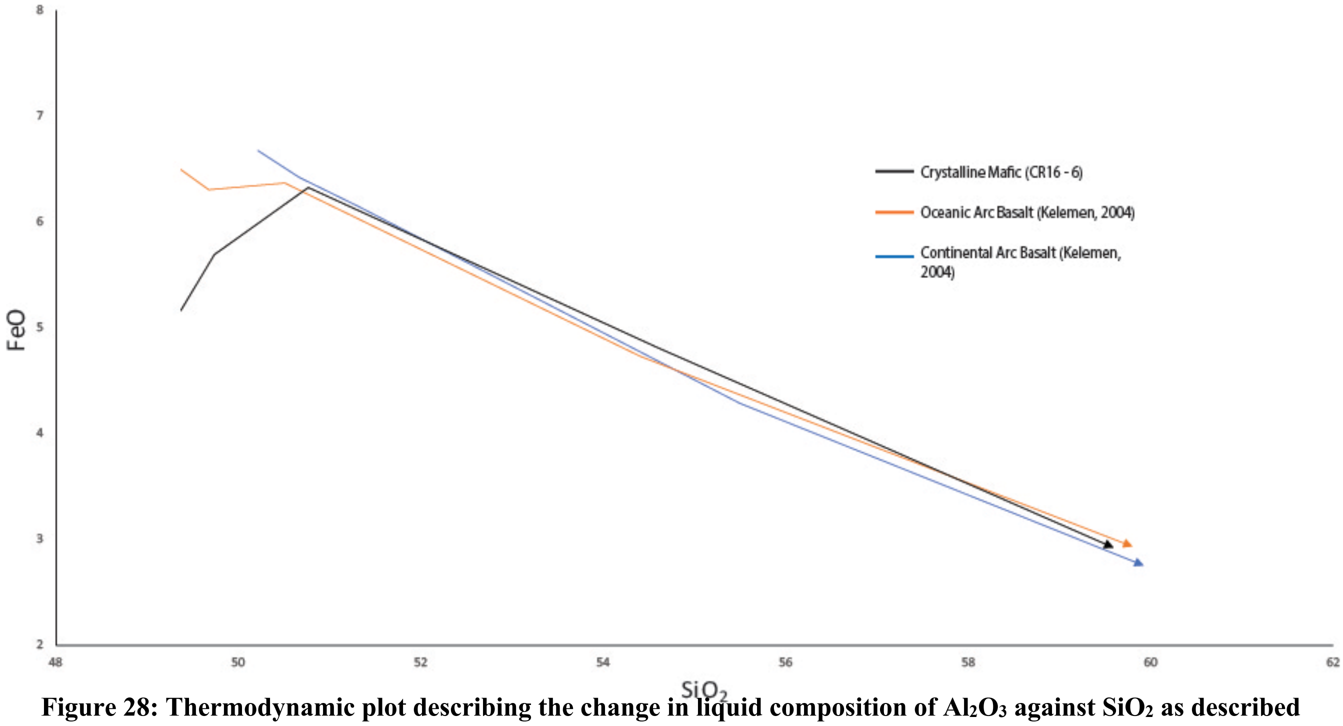

Figure 28: Thermodynamic plot describing the change in liquid composition of Al_2O_3 against SiO_2 as described by tables 5, 6 and 7. Note the differing trend from the crystalline mafic sample and the oceanic and continental basalts.

Figure 29: Thermodynamic plot describing the change in liquid composition of FeO against SiO_2 as described by tables 5, 6 and 7.

FRACTIONATION PATHWAYS

The Harker diagrams below contain the same bulk rock geochemical data as shown in Figure 20, however, these plots contain the liquid composition trends produced by thermodynamic modelling as well as fractionation vectors of both feldspar and olivine as seen in appendix. By observing the trend between CR16 – 6 and CR16 – 8 it is clear that it follows the same trend as the feldspar fractionation vector. This same trend is also shared with the start of the thermodynamic model. The thermodynamic model then changes and trends the opposite way in a similar fashion to that of the olivine fractionation vector.

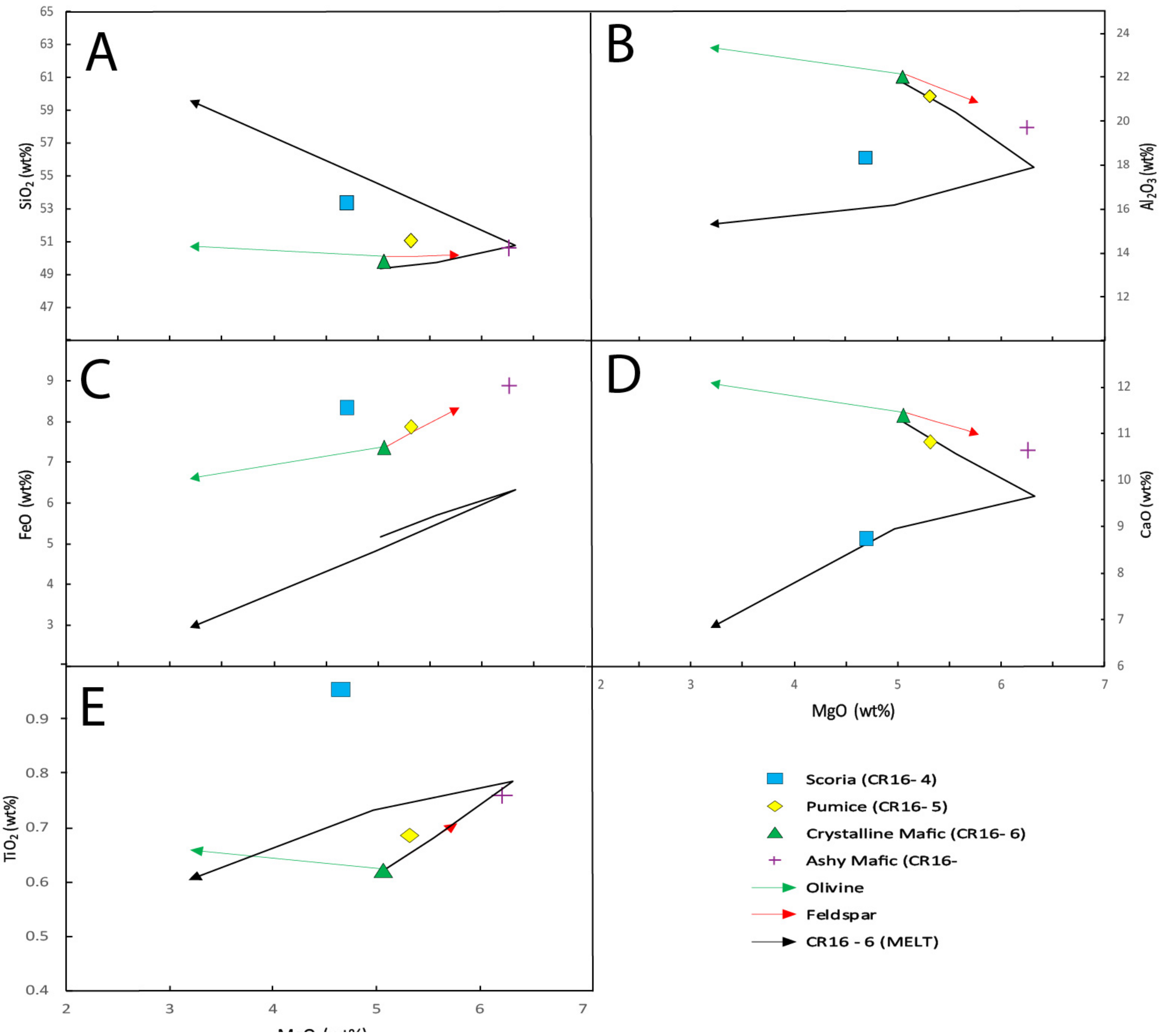

Figure 30: Geochemical plot of major element oxides. Green vector represents the olivine fractionation trend from most mafic sample (CR16 – 6). Red vector represents the feldspar fractionation trend from most mafic sample (CR16 – 6). Black vector represents change in liquid composition and therefore fracitonation as described by the termodynamic model in table 5.

DISCUSSION

This sequence of rocks displays evidence for a variety of igneous processes through its textures and chemical makeup. Here we discuss the nature of its petrogenesis and associated processes, causes for sieve textures, compositional zoning and glomerocrysts, as well as the thermodynamic model for the system.

The overall composition of the rocks studied

When compared to an Island Arc Basalt (IAB) and a Continental Arc Basalt (CAB) it is easy to recognise that the composition of the rocks in the AVC are unique, but that does not imply that it is unrepresentative of its environment. Figure 32 shows the geochemical signature of several types of basalts, when comparing this to the spider diagram presented in figure 22 and the Villarrica volcano, a known subduction-related polygenetic volcano (Morgado, et al., 2015) also presented figure 22, it is clear that the samples from Crater Rayhuén have the same geochemical signature as a subduction-related magmatic system and closely resembles that of an Island Arc Basalt as seen in figure 32. This deduction can reveal two things, these samples are subduction zone related and that there is minimal crustal influence.

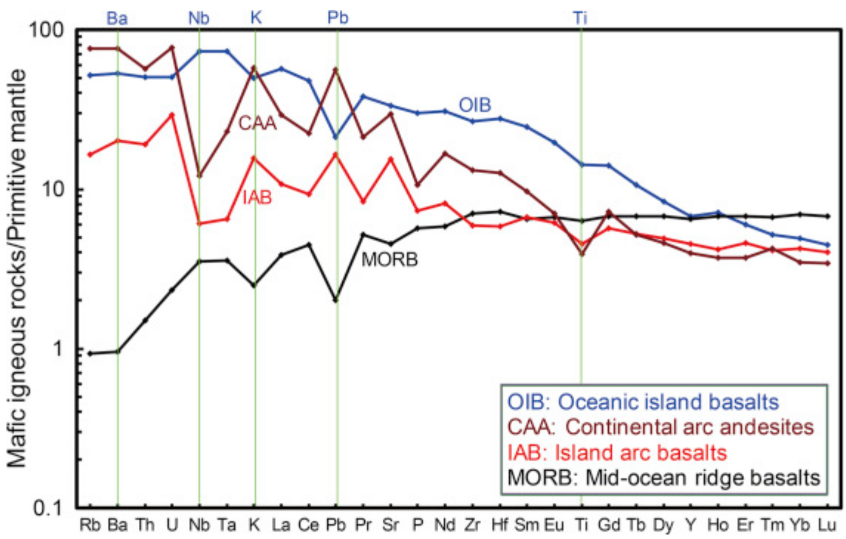

Figure 31: Spidergram illustrating geochemical signatures for four different types of subduction-related environments (Zheng, 2019).

These samples also bear a striking resemblance to those compositions outlined by Crawford (1987), a high-alumina basalt with <54% SiO_2, >16.5% Al_2O_3 and <7% MgO (Crawford, et al., 1987). With feldspar phenocryst compositions typically falling between An95 and An75, often showing complex compositional zoning and sieve textures, and olivine phenocrysts compositions ranging from Fo88 to Fo70 (Crawford, et al., 1987). The samples from Crater Rayhuén display a wider range of feldspar phenocryst compositions than what Crawford (1987) described, ranging from An34 to An89 (table 7), likely due to the variable composition in the glomerocrysts and the host magma. There is a much less diverse mixture of olivine phenocrysts, ranging from Fo70 to Fo81 (table 6). These bulk rock and mineral compositions and textures are seen throughout the series of samples analysed and thus can be interpreted to be a high-alumina basalt (HAB).

The high alumina content in the samples can be attributed to either of two independent mechanisms, prolonged prior crystallisation of clinopyroxene and olivine after initial partial melting of a mantle source or by plagioclase phenocryst accumulation in magmas (Crawford, et al., 1987). There is much conjecture about the primary source from which these magmas are derived, the low Mg# of HAB lavas suggest that they are incompatible with a peridotite mantle source (Brophy & Marsh, 1985) which holds true for the samples here as observed in table 5. But if primary, the source rock must be distinctly different from upper mantle peridotite and the alternative composition put forward is namely that of quartz eclogite from the subducted oceanic crust (Brophy & Marsh, 1985). Partial melting of this source then requires phenocryst fractionation of olivine and clinopyroxene, which would result in a composition close to that of a high-alumina basalt (Brophy & Marsh, 1985). On the other hand, partial melting of an olivine tholeiite or similar peridotite mantle source would require olivine reactions that result in an orthopyroxene product (Lopez-Escobar, Frey, & Vergara, 1977). However, there is no evidence for early olivine and clinopyroxene fractionation or clinopyroxene as a reaction product in any of the samples here. Therefore, Crawford's other interpretation of plagioclase phenocryst accumulation seems to be the most reasonable inference of such high alumina seen in the samples presented here.

Journey from magma source into the crust

The thermodynamic model of the Crystalline Mafic sample (sample CR16 – 6) shows early crystallisation of feldspar out of the melt at 1150˚C with an anorthite feldspar composition as seen in table. Compare this to an IAB or a CAB where the crystallisation of feldspar has a similar composition, but the temperature of crystallisation lower and the mass of feldspar phenocrysts is smaller. Due to the large amount of alumina available in the melt (21.8 wt%) as well as a smaller amount of MgO (5.0 wt%) and FeO available (5.2 wt%) in comparison to a typical OIB and CAB which contains 15.4 and 15.3 wt% of alumina, 9.6 and 9.2 wt% of MgO, and 6.5 and 6.7 wt% of FeO respectively, the magma from sample CR16 – 6 is able to crystallise out anorthite as its dominant phase, unlike the IAB and CAB. This can be seen in figure 28 where the wt% of Al2O3 decreases significantly after the onset of anorthite crystallisation and also in figure 31 where the fractionation trend given by the MELTS model always starts off by trending the way of feldspar fractionation vector.

The melt left behind is relatively enriched in magnesium and iron, thus creating a density gradient between the much less dense anorthite and remaining melt. This density gradient allows the crystallising anorthite to float to the top of the magma chamber, resulting in a mechanism known as 'anorthite floatation' (Elkins-Tanton, Burgess, & Yin, 2011). Once the magma in the chamber is erupted it is forced through the crystal mush of anorthite above it, and in doing so, rips some of the anorthite crystals with it, enriching the rock with phenocrysts of anorthite feldspar and in turn with aluminium.

Evidence for magma storage and recharge

There is a distinct difference in the composition of minerals within glomerocrysts and the host rock, where the glomerocrysts exhibit a less evolved composition than that of phenocrysts in the surrounding rock. From petrographic observations, as seen in figures 10 and 12, glomerocrysts display sharp edges and have harsh contact with the host magma, indicating that the glomerocrysts are not in equilibrium and did not crystallise from the melt around it and therefore have been transported from a different part of the magma chamber, or are xenoliths from the granite lithics stratigraphically below the analysed samples. This compositional discrepancy can be seen in figures 23, 24, 25 and 26. Olivines from glomerocrysts in the Pumice (sample CR16 – 5) have approximately 10 wt% more Mg and 10 wt% less SiO2 than their phenocryst counterpart. Feldspars from the same glomerocryst show a similar trend where the feldspar within the glomerocryst contains 2-10 wt% more Ca and 2-12 wt% less SiO2 than the host magma feldspar. It might be reasonable to assume that these glomerocrysts are actually xenoliths from the granite lithics, but upon inspection of figures 25 and 25 as well as the appearance of olivine within the glomerocrysts, there is no viable trend to say that this is the case. Hence it is reasonable to suspect that the glomerocrysts have come from a different part of the magmatic system, where elements that make up more mafic minerals like magnesium and calcium were more readily available and in equilibrium with the system. Further evidence of disequilibrium comes from feldspar and olivine phenocrysts from within the host rock itself. Feldspar phenocrysts exhibit strong composition zoning as seen in figures 10, 12, 14 and 16. These oscillatory patterns can be attributed to the crystals reaction to repeated inputs of magma into the system (Davidson, Morgan, Charlier, Harlou, & Hora, 2007) (Jerram, Dobson, Morgan, & Pankhurst , 2018). Some feldspar phenocrysts also exhibit sieve textures with clean rims (Figure 12 C and D), which are indicative of rapid ascent from one part of the system to another followed by stable growth in the crystal's new environment (Jerram, Dobson, Morgan, & Pankhurst , 2018). Olivine phenocrysts, as seen in figure 14, also exhibit disequilibrium in the form of dissolution textures, where the rims of olivines are dissolved away or changed into something else (Morgado, et al., 2017). The presence of glomerocrysts, compositional zoning and disequilibrium textures provide evidence for an input or multiple inputs of fresh magma into the magma body, thereby mobilising crystallising or already crystallised minerals to other parts of the magma chamber. The source of the input(s) is still unknown but it would be expected that if it was a mantle-derived magma introduced into the system, the host rock would be much more mafic than the glomerocrysts that reside in it. Therefore, it would be reasonable to say that there must be relationships within the magmatic plumbing system between Crater Rayhuén and that of surrounding volcanoes such as Casablanca, Cerro Colorado and/or the del Haique cone.

CONCLUSIONS

Crater Rayhuén is a great example to observe and understand the evolution of these small batch magmas over space and time. The conclusion that this magma body resembles those categorised as a high alumina basalt was pivotal in determining its petrogenesis and early history. The sieve textures within feldspars and the dissolution of olivines indicates that equilibrium was altered by an input of magma into the system. This has resulted in relatively more mafic glomerocrysts to be ripped from the crystal mush to ascend into other parts of the magmatic system. In this new part of the system felspars are in equilibrium with the system and can grow larger as seen in the Crystalline Mafic (CR16 – 6) and Ashy Mafic samples (CR16 – 8). The large amounts of feldspar fractionating here, due to such high alumina content as determined by its petrogenesis, has resulted in Anorthite floatation that sees a crystal mush of Anorthite rise to the top of the magma chamber. Any eruption from here will result in a rock largely consisting of anorthite which is very well represented by the Crystalline Mafic (CR16 – 6) and to an extent the Ashy Mafic (CR16 – 8).

Considering the evidence put forth in this paper it is clear that the way we think about monogenetic volcanism needs to be changed. These systems are thought of as simple systems with basic chemistry and small eruption volume and history. But as presented here, this is not the case. Crater Rayhuén has displayed very complex chemistry and shows evidence for magma storage as well as magma transport. This highlights the importance of a spectrum-based approach when it comes to volcanism as many volcanoes around the world do not fit the typical categorisation we usually given them.

Moving forward there are many things that can be done to improve upon what has been discovered here. Geochronology would be a logical next step in determining actual ages of crystallisation and other processes, although this might prove difficult due to lots of temperature change via influxes of magma seen in the system. Trace elements and isotopes would also prove useful in further uncovering the petrogenesis of this system, here there is a general idea of what the systems petrogenesis might be, but to fully understand it trace elements and isotopes should be used. Lastly building upon the thermodynamic model could further the understanding around this systems interaction with other magmatic systems.

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APPENDIX

Element and Line	Diffracting Crystal (Sp#)	Background type/fit	kV/nA/spot size(µm)	Peak Count Time	Standards*		Overlapping element and order/interference correction standard			
					Primary Standard	Interference Standards	Interfering line	Int. std	Interfering line	Int. std
Cl Ka	LPET (1)	MAN	15/20/5	15	545					
Ca Ka	LPET (1)	MAN	15/20/5	15	558					
K Ka	LPET (1)	MAN	15/20/5	15	541					
Ba Ka	LPET (1)	MAN	15/20/5	15	505					
F Ka	PC0 (2)	MAN	15/20/5	15	555	576,578	Mg Ka (II)	576	Fe La (I)	578
P Ka	LPET (3)	MAN	15/20/5	15	504					
Ti Ka	LPET (3)	MAN	15/20/5	15	559					
S Ka	LPET (3)	MAN	15/20/5	15	513					
Na Ka	TAP (4)	MAN	15/20/5	15	735					
Si Ka	TAP (4)	MAN	15/20/5	15	735					
Mg Ka	TAP (4)	MAN	15/20/5	15	1335					
Al Ka	TAP (4)	MAN	15/20/5	15	1327					
Fe Ka	LLIF (5)	MAN	15/20/5	15	502					
Mn Ka	LLIF (5)	MAN	15/20/5	15	557	577	Cr Ka (I)	577		
Cr Ka	LLIF (5)	MAN	15/20/5	15	577					
Zn Ka	LLIF (5)	MAN	15/20/5	15	546					
Ni Ka	LLIF (5)	MAN	15/20/5	15	1347					

* Standard # refers to internal database. Full list of standards in Table 2

Reference #	Mineral composition	Natural/Synthetic	Manufacturer
502	Almandine garnet	Natural	Astimex
513	Celestine	Natural	Astimex
545	Tugtupite	Natural	Astimex
546	Willemite	Natural	Astimex
554	Barite	Natural	P&H and Associates
557	Rhodonite	Natural	Astimex
558	Wollastonite	Natural	P&H and Associates
577	Chromium oxide	Synthetic	P&H and Associates
735	Albite	Natural	C.M. Taylor
736	Apatite	Natural	C.M. Taylor
1335	Olivine	Natural	NMNH
1342	Rutile	Synthetic	In-house
1344	Orthoclase	Synthetic	USGS
1347	Nickel Olivine	Synthetic	USGS
1600	MgF_2	Synthetic	In-house

BHVO-2	Analyte Symbol	LUCY- 11	error percent	BHVO-2	Analyte Symbol	LUCY- 11	error percent
49.6	SiO2	50.19	1.189516	1.623	Ge	1	38.38571
13.44	Al2O3	13.42	0.14881	9.261	Rb	9	2.81827
12.39	Fe2O3(T)	12.32	0.564972	18.1	Nb	16	11.60221
0.169	MnO	0.167	1.183432	4.07	Mo	4	1.719902
7.257	MgO	7.2	0.785449	1.776	Sn	2	12.61261
11.4	CaO	11.55	1.315789	15.2	La	15.9	4.605263
2.219	Na2O	2.19	1.306895	37.53	Ce	39.5	5.249134
0.513	K2O	0.51	0.584795	5.339	Pr	5.41	1.329837
2.731	TiO2	2.709	0.805566	24.27	Nd	24.4	0.535641
0.2685	P2O5	0.28	4.283054	6.023	Sm	6.3	4.599037
31.83	Sc	31	2.607603	2.043	Eu	2.18	6.705825
1.076	Be	1	7.063197	6.207	Gd	6.4	3.109393
318.2	V	323	1.508485	0.9392	Tb	1	6.473595
130.9	Ba	131	0.076394	5.28	Dy	5.5	4.166667
394.1	Sr	380	3.577772	0.9887	Ho	1	1.142915
25.91	Y	21	18.95021	2.511	Er	2.5	0.438072
171.2	Zr	180	5.140187	0.3349	Tm	0.33	1.463123
287.2	Cr	300	4.456825	1.994	Yb	2	0.300903
44.89	Co	43	4.210292	0.2754	Lu	0.29	5.30138
119.8	Ni	120	0.166945	4.47	Hf	4.8	7.38255
129.3	Cu	130	0.541377	1.154	Ta	1.2	3.986135
103.9	Zn	110	5.87103	1.224	Th	1.2	1.960784
21.37	Ga	21	1.731399	0.412	U	0.4	2.912621

Sample	CR16- 1-1a	CR16- 1-2a	CR16- 1-2b	CR16- 1-4a	CR16- 1-4b	CR16- 2	CR16- 4	CR16- 5	CR16- 6
SiO2	46.52	61.93	61.51	52.29	52.52	60.76	53.31	51.1	49.78
Al2O3	12.24	16.82	16.54	17.56	18.24	15.51	18.28	21.15	22
Fe2O3(T)	11.5	7.14	6.89	9.86	8.78	8.74	9.24	7.88	7.36
FeO (calc from Fe2O3)	10.3510351	6.426642664	6.201620162	8.874887489	7.90279	7.86679	8.31683	7.09271	6.62466
MnO	0.174	0.158	0.157	0.137	0.133	0.164	0.153	0.125	0.112
MgO	17.5	1.95	1.96	4.99	5.43	2.04	4.71	5.32	5.06
CaO	12.23	5	4.79	9.48	9.16	5.1	8.73	10.83	11.39
Na2O	0.65	4.79	4.71	2.9	2.87	4.38	3.39	2.7	2.46
K2O	0.03	1.6	1.54	1.05	0.9	1.94	0.77	0.55	0.49
TiO2	0.229	0.925	0.896	0.997	0.797	1.201	0.952	0.687	0.621
P2O5	< 0.01	0.31	0.33	0.24	0.18	0.38	0.23	0.17	0.14
LOI	-0.78	0.15	0.25	0.62	-0.16	0.16	0.02	-0.04	-0.22
Total	100.3	100.8	99.57	100.1	98.86	100.4	99.79	100.5	99.19
Na2O+K2O	0.68	6.39	6.25	3.95	3.77	6.32	4.16	3.25	2.95
Sc	42	18	18	32	25	24	29	23	21
V	124	81	81	284	212	111	237	180	165
Ba	20	433	430	283	255	594	237	169	153
Sr	283	403	390	579	533	324	535	624	657
Y	2	24	24	14	11	39	15	10	8
Zr	5	140	140	73	68	279	81	55	49
Cr	920	< 20	< 20	50	100	< 20	60	100	100
Co	82	11	12	34	31	14	26	27	26
Ni	300	< 20	< 20	30	70	< 20	30	60	70
Cu	30	20	30	100	70	50	70	50	70
Zn	60	90	90	60	60	80	80	60	60

Ga	9	19	19	19	18	20	19	18	18
Rb	< 2	37	38	26	22	50	15	11	9
Nb	< 1	4	4	2	2	7	3	2	1
Cs	< 0.5	2	2	1.4	1.1	3	0.8	0.6	0.5
La	1.1	17.8	17.6	12.4	10.3	26.4	11	7.7	6.8
Ce	2.9	39.1	39.1	27.2	22.4	60.7	25.3	17.7	15.3
Pr	0.47	5.02	4.99	3.53	2.88	7.95	3.34	2.29	2.01
Nd	2.4	20.6	21.2	15.4	12.2	34	14.4	10	8.7
Sm	0.8	4.7	4.9	3.7	2.9	8	3.5	2.4	2.1
Eu	0.36	1.52	1.51	1.21	0.98	2.11	1.17	0.85	0.76
Gd	1.1	4.9	4.9	3.6	2.8	7.9	3.4	2.4	2.1
Tb	0.2	0.8	0.8	0.6	0.4	1.3	0.6	0.4	0.3
Dy	1.2	4.8	4.9	3.4	2.7	7.6	3.3	2.4	2
Ho	0.2	1	1	0.7	0.6	1.6	0.7	0.5	0.4
Er	0.7	2.8	2.8	2	1.6	4.6	2	1.3	1.2
Tm	0.1	0.42	0.41	0.28	0.22	0.68	0.28	0.2	0.18
Yb	0.7	2.9	2.9	1.9	1.5	4.6	1.8	1.3	1.2
Lu	0.1	0.47	0.47	0.3	0.24	0.72	0.31	0.2	0.18
Hf	0.3	3.4	3.7	2.1	1.9	7.2	2.2	1.5	1.4
Ta	< 0.1	0.3	0.3	0.1	0.2	0.4	0.2	< 0.1	< 0.1
Pb	< 5	16	14	12	7	13	7	6	5
Th	< 0.1	4.8	4.8	5.3	3.7	6.5	2.2	1.4	1.3
U	< 0.1	1.4	1.4	1.5	1	1.9	0.6	0.4	0.4

Sample	CR16-8	CR16-9	CR16-10	CR16-12	CR16-13	CR16-14	CR16-17	CR16-11	CR16-16	CR16-15
SiO2	50.63	57.64	54.92	53.82	61.49	52.52	52.17	51.15	50.9	52.78
Al2O3	19.74	16.79	17.71	17.89	16.61	17.28	21.47	18.04	19.53	17.64
Fe2O3(T)	8.89	8.47	8.97	9.94	7.01	10.73	6.24	9.45	8.75	10.34
FeO (calc from Fe2O3)	8.0018	7.62376	8.07381	8.94689	6.30963	9.65797	5.61656	8.50585	7.87579	9.30693
MnO	0.125	0.153	0.158	0.166	0.156	0.174	0.098	0.153	0.142	0.17
MgO	6.26	3.28	3.58	4.58	2.09	5.41	3.6	6.65	6.01	5.15
CaO	10.64	7	8.11	8.77	4.93	9.28	12.21	9.99	10.23	9.38
Na2O	2.51	4.09	3.85	3.62	4.9	3.43	2.73	3	2.93	3.45
K2O	0.65	1.28	1.04	0.88	1.61	0.66	0.76	0.52	0.6	0.67
TiO2	0.757	1.023	1.075	1.085	0.934	1.07	0.59	0.883	0.812	1.053
P2O5	0.12	0.26	0.27	0.21	0.28	0.17	0.07	0.14	0.15	0.16
LOI	-0.23	-0.12	0.45	-0.44	0.38	-0.09	0.32	-0.22	-0.3	-0.45
Total	100.1	99.87	100.2	100.5	100.4	100.6	100.3	99.76	99.76	100.3
Na2O+K2O	3.16	5.37	4.89	4.50	6.51	4.09	3.49	3.52	3.53	4.12
Sc	26	25	25	32	19	38	29	32	27	37
V	232	207	221	265	90	291	183	237	210	283
Ba	182	362	324	266	455	207	258	163	188	208
Sr	587	463	476	480	406	424	501	433	510	445
Y	9	20	19	18	25	17	11	14	13	16
Zr	49	120	111	94	144	71	92	58	65	73
Cr	110	20	40	50	< 20	90	110	110	100	70
Co	33	19	26	26	16	31	19	35	31	30
Ni	90	< 20	30	< 20	< 20	30	20	60	60	20
Cu	90	50	70	90	50	100	20	80	70	90
Zn	60	80	90	80	90	80	50	70	70	80

Ga	18	19	19	18	19	18	18	17	18	19
Rb	18	28	21	18	37	13	16	10	11	14
Nb	1	3	3	3	4	2	1	2	2	2
Cs	1.1	1.4	1.2	1	2.2	0.8	0.5	0.6	0.6	0.8
La	7.5	15.6	14.1	11.8	17.6	9	7.5	6.9	8.6	8.6
Ce	16.6	34.8	32.1	26.6	39.3	20.7	15.3	16.2	19.3	20.1
Pr	2.19	4.42	4.2	3.54	5.06	2.84	1.92	2.22	2.58	2.73
Nd	9.4	18.1	17.7	15.2	21	12.2	8.1	10.1	11.3	12.4
Sm	2.3	4.2	4.1	3.8	4.9	3.3	2	2.7	2.7	3.1
Eu	0.87	1.37	1.36	1.26	1.51	1.19	0.74	0.99	0.95	1.09
Gd	2.3	4.2	4	3.8	4.8	3.6	2.1	3	2.8	3.4
Tb	0.4	0.6	0.7	0.6	0.8	0.6	0.4	0.5	0.5	0.6
Dy	2.3	4.1	3.9	3.8	4.8	3.7	2.2	3	2.9	3.5
Ho	0.4	0.8	0.8	0.8	1	0.7	0.4	0.6	0.6	0.7
Er	1.3	2.4	2.3	2.2	2.8	2.1	1.3	1.8	1.6	2
Tm	0.19	0.36	0.34	0.34	0.43	0.31	0.19	0.26	0.25	0.31
Yb	1.3	2.4	2.4	2.2	3	2.1	1.2	1.7	1.6	1.9
Lu	0.2	0.38	0.37	0.34	0.47	0.34	0.2	0.28	0.28	0.31
Hf	1.4	3	2.8	2.4	3.6	1.9	2	1.7	1.8	2
Ta	< 0.1	0.2	0.2	0.1	0.3	0.1	0.1	< 0.1	0.1	0.1
Pb	6	10	9	8	13	7	7	< 5	5	6
Th	2	4	3	2.3	4.8	1.8	3.3	1.2	1.5	1.7
U	0.6	1.1	0.8	0.7	1.4	0.5	1	0.3	0.4	0.5

SAMPLE	Cl WT%	Ca WT%	K WT%	Ba WT%	F WT%	Ti WT%	P WT%	Na WT%	Si WT%	Mg WT%
CR16 - 6 Titanomag1	0	0	0	0.06257	0.318911	4.07911	0	0	0.036846	2.32547
CR16 - 6 Titanomag1	0	0	0	0.078483	0.373746	4.05638	0.001213	0.00563	0.037006	2.40253
CR16 - 6 Titanomag1	0	0	0.005618	0.047356	0.311253	4.09063	0.000011	0.008967	0.03979	2.40183
CR16 - 6 Titanomag1	0	0.001558	0	0.04346	0.357036	4.0344	0.002401	0.000085	0.03845	2.31794
CR16 - 6 Titanomag1	0	0.000948	0	0.065297	0.352007	4.06445	0	0.028057	0.035416	2.40403
CR16 - 6 Titanomag1	0.004135	0.002984	0	0.06444	0.339158	4.04169	0.004951	0	0.028695	2.32734
CR16 - 6 Titanomag1	0	0.000558	0	0.070499	0.31378	3.99474	0	0.009701	0.037228	2.37609
CR16 - 6 Titanomag2	0	0.00734	0	0.077096	0.335677	5.21201	0.001178	0.014899	0.067071	2.53917
CR16 - 6 Titanomag2	0	0.003301	0	0.08744	0.310661	5.21015	0	0.004512	0.028879	2.47403
CR16 - 6 Titanomag2	0	0	0	0.088189	0.352992	5.22653	0	0.007872	0.039966	2.51313
CR16 - 6 Titanomag2	0	0.007306	0	0.072001	0.344995	5.2468	0	0.005584	0.042452	2.45555
CR16 - 6 Titanomag2	0	0.000176	0.001007	0.073771	0.320678	5.19316	0	0.007807	0.04284	2.52118
CR16 - 6 Titanomag2	0	0	0	0.085578	0.336045	5.22167	0	0.006664	0.04568	2.49778
CR16 - 6 Anorthite2	0	13.2056	0.010902	0	0.030893	0.00479	0.015609	0.909553	21.0653	0.038659
CR16 - 6 Anorthite2	0	0.146591	0	0	0.001512	0	0.002736	0.035529	0.248897	0

CR16 - 6 Anorthite2	0	0.144022	0	0	0	0	0.001229	0.029149	0.237069	0
CR16 - 6 Anorthite2	0	0.12578	0	0	0	0	0.000855	0.028824	0.229191	0
CR16 - 6 Anorthite2	0	0.141943	0	0	0	0	0.00823	0.04341	0.231034	0.002574
CR16 - 6 Anorthite2	0	0.14146	0	0	0.005695	0	0.007347	0.041803	0.230337	0
CR16 - 6 Anorthite2	0	13.239	0.012467	0	0.026504	0	0	0.922002	21.2416	0.053149
CR16 - 6 Amphibole1	0.026532	8.34199	0.314064	0.047358	0.187457	1.75685	0.011187	1.91943	19.5844	8.5799
CR16 - 6 Amphibole1	0.018091	8.42454	0.297801	0.032281	0.168546	1.72106	0.011878	1.85813	19.5607	8.65828
CR16 - 6 Amphibole1	0.029123	8.44544	0.312772	0.0248	0.165722	1.71673	0.022376	1.86485	19.3708	8.54099
CR16 - 6 Amphibole1	0.016255	8.41551	0.322256	0.027825	0.201785	1.70109	0.01203	1.8493	19.6349	8.84511
CR16 - 6 Amphibole1	0.02223	8.42831	0.302903	0.034131	0.214146	1.72346	0.006236	1.78945	19.518	8.64433
CR16 - 6 Amphibole1	0.019386	8.34756	0.311457	0	0.213366	1.6402	0.011317	1.80269	19.6438	8.65422
CR16 - 6 Amphibole1	0.027925	8.30075	0.312141	0.025393	0.238202	1.6512	0.00645	1.80623	19.6918	8.77999
CR16 - 6 Amphibole2	0.029927	8.32275	0.326629	0.021897	0.171621	1.67487	0.021151	1.86947	19.8319	8.94775
CR16 - 6 Amphibole2	0.032472	8.22628	0.329249	0.015097	0.191294	1.4889	0.011277	1.72159	20.1958	8.77479
CR16 - 6 Amphibole2	0.031085	8.30883	0.321759	0.006744	0.206788	1.45245	0.019124	1.73975	20.2853	8.97598

CR16 - 6 Amphibole2	0.030443	8.25171	0.304526	0.038781	0.196812	1.44315	0.023274	1.77646	20.1592	9.01282
CR16 - 6 Amphibole2	0.023474	8.42059	0.322964	0	0.160422	1.66383	0.01475	1.8431	19.7062	8.82877
CR16 - 6 Amphibole2	0.026807	8.51441	0.326533	0.031553	0.201547	1.68476	0.016952	1.86891	19.7606	8.88372
CR16 - 6 Amphibole2	0.016303	8.45394	0.324529	0.049286	0.152693	1.74018	0.012763	1.82892	19.7993	8.97917
CR16 - 6 Amphibole2	0.019499	8.37281	0.317244	0.047946	0.215127	1.71021	0.006454	1.81513	19.7249	8.90501
CR16 - 6 Anorthite1	0	13.0046	0.018306	0	0.015009	0.003946	0	1.04497	21.2698	0.037546
CR16 - 6 Anorthite1	0.01293	12.818	0.024646	0	0.055818	0.002242	0.008754	1.11594	21.4491	0.063305
CR16 - 6 Anorthite1	0	12.9312	0.01897	0	0.032938	0.011215	0.010095	1.04801	21.1851	0.0458
CR16 - 6 Anorthite1	0	12.3463	0.023363	0	0.011186	0.006321	0.002431	1.36878	21.7442	0.053506
CR16 - 6 Anorthite1	0	12.919	0.019072	0	0.020988	0.009001	0.016519	1.08869	21.2936	0.048351
CR16 - 6 Anorthite1	0	12.839	0.015612	0	0.031078	0.012429	0.005182	1.06204	21.3198	0.047735
CR16 - 6 Anorthite1	0	12.9364	0.025331	0	0.031708	0.008896	0.002287	1.06334	21.2082	0.039882
CR16 - 6 Anorthite1	0	13.1109	0.017628	0	0.034472	0.007765	0.006471	0.954354	21.0785	0.050772
CR16 - 6 Anorthite1	0	12.4327	0.032001	0	0	0.009804	0.005935	1.30333	21.6188	0.062651
CR16 - 6 Anorthite1	0	13.0829	0.017361	0	0.013472	0.000276	0.007873	0.945933	21.2351	0.045136

CR16 - 6 Olivine1	0.001124	0.102471	0.000305	0	0.105772	0.00548	0.011245	0.011781	17.9614	23.6602
CR16 - 6 Olivine1	0.005424	0.11353	0.003165	0	0.123751	0.010204	0	0	18.0654	23.8076
CR16 - 6 Olivine1	0	0.100025	0	0	0.149644	0.007606	0.008341	0	18.1044	23.7399
CR16 - 6 Olivine1	0	0.099032	0	0	0.130958	0.004006	0.003378	0.004891	18.0329	23.7215
CR16 - 6 Olivine1	0	0.102051	0	0	0.121195	0.001705	0.011152	0.022683	18.144	23.5797
CR16 - 6 Olivine1	0	0.091132	0	0	0.128888	0	0.004707	0.005307	18.0654	23.6572
CR16 - 6 Olivine2	0	0.104726	0.00034	0	0.112889	0.003761	0.008147	0.006647	18.3707	24.8488
CR16 - 6 Olivine2	0.004567	0.111343	0	0	0.107467	0.003854	0.012405	0.009908	18.2009	24.5891
CR16 - 6 Olivine2	0.004519	0.12106	0	0	0.118274	0.000126	0.007345	0.005236	18.1708	24.6767
CR16 - 6 Olivine2	0.00128	0.095549	0.004821	0	0.123031	0	0.008049	0.005274	18.1216	24.634
CR16 - 6 Olivine2	0.001406	0.10331	0.001006	0	0.101049	0	0.007401	0.004529	18.2538	24.7657
CR16 - 6 Olivine2	0.008865	0.116682	0.001892	0	0.111775	0.00972	0.027526	0.011333	18.2528	24.894
CR16 - 6 Olivine2	0.001277	0.123968	0	0	0.145855	0.007408	0.009469	0.001773	18.1534	24.6852
CR16 - 6 Olivine2	0	0.119864	0	0	0.117379	0	0.000811	0.003163	18.2591	24.7148
CR16 - 5 Anorthite2	0.000699	11.0587	0.025736	0	0.006691	0.004043	0.016332	1.09326	12.5572	0.014433

CR16 - 5 Anorthite2	0.00085 1	10.8019	0.02802 3	0	0.03906 4	0.00199 1	0	1.27014	12.6717	0.01723 7
CR16 - 5 Anorthite2	0.00701 4	10.9637	0.03050 3	0	0.02707 9	0	0.01003 8	1.1523	12.4918	0.01047 1
CR16 - 5 Anorthite2	0	9.89366	0.05173 6	0	0.03207	0.00349 4	0.00405 4	1.70578	12.8817	0.01252 8
CR16 - 5 Anorthite2	0.00265 6	8.79902	0.14544 5	0	0.01997 6	0.02079 6	0.00043	3.50696	24.5697	0.00848 5
CR16 - 5 Anorthite2	0	7.45127	0.10898 5	0	0	0.00645 3	0.00484 4	2.97584	13.6742	0.02038 5
CR16 - 5 Anorthite2	0	10.4209	0.09408 6	0	0.04262 9	0.00913 3	0.01511 4	2.51651	23.2221	0.03090 9
CR16 - 5 Anorthite2	0.00013 3	11.6703	0.05154 5	0	0.02920 9	0.01456	0.00838 7	1.87648	22.1153	0.02990 4
CR16 - 5 Titanomag2	0	0	0	0.06941 8	0.35805 9	5.29601	0.00124 5	0.01133 6	0.02284 7	1.39863
CR16 - 5 Titanomag2	0	0	0	0.07745 7	0.36119 2	5.2873	0	0.00281 4	0.02825 9	1.36795
CR16 - 5 Titanomag2	0.00258 1	0	0	0.09496 8	0.36201 7	5.28775	0	0.01937 3	0.02028 7	1.43734
CR16 - 5 Titanomag2	0	0	0	0.06373 3	0.31016 2	5.33199	0.00825 9	0	0.02219	1.37428
CR16 - 5 Titanomag2	0.02207 4	0.00426 1	0.00232 8	0.05843 7	0.31927 8	5.36696	0.00258	0.04328 3	0.01880 3	1.42001
CR16 - 5 Olivine1	0.00169	0.02446 3	0	0	0.16317	0.01539 5	0.00705 5	0	17.8737	22.2942
CR16 - 5 Olivine1	0.00188	0.04049 8	0.00166 4	0	0.16262	0.01299 8	0	0.02187 4	17.7698	21.9324
CR16 - 5 Olivine1	0	0.03110 9	0	0	0.18080 7	0.01265 8	0	0.00155	17.8363	22.1983

CR16 - 5 Olivine1	0	0.036934	0	0	0.168802	0.004738	0.00195	0.006465	17.8547	22.1783
CR16 - 5 Olivine1	0.014303	0.034952	0.003109	0	0.147996	0.01001	0.002684	0.008591	17.7537	22.2574
CR16 - 5 Olivine1	0.009614	0.020413	0	0	0.156853	0.011513	0.010596	0.014445	17.8018	21.9943
CR16 - 5 Olivine1	0.011187	0.02846	0.005983	0	0.16976	0.002875	0.004861	0.013718	17.7819	22.2781
CR16 - 5 Olivine1	0.040545	0.038571	0.001661	0	0.129896	0.004739	0.007766	0.029868	17.6911	22.1025
CR16 - 5 Olivine1	0.014839	0.050299	0	0	0.177174	0.006512	0.001244	0.023741	17.6236	21.9111
CR16 - 5 Olivine2	0	0.656737	0.001368	0	0.146058	0.064636	0	0.026571	24.9394	15.8305
CR16 - 5 Olivine2	0	0.874639	0.001083	0	0.144554	0.077258	0	0.020537	24.8648	16.4841
CR16 - 5 Olivine2	0.001945	0.935974	0.008432	0	0.154378	0.05486	0	0.003975	25.3691	16.8977
CR16 - 5 Olivine2	0.005096	0.893546	0.00949	0	0.122668	0.054397	0	0.01831	25.2972	16.7877
CR16 - 5 Olivine2	0.007478	0.673751	0	0	0.135451	0.056096	0	0.012911	25.0612	15.646
CR16 - 5 Olivine2	0.01962	0.857865	0.004408	0	0.148527	0.083709	0.00903	0.033267	24.7525	16.1863
CR16 - 5 Olivine2	0	0.877032	0	0	0.128275	0.058368	0	0.014457	25.3032	16.6622
CR16 - 5 Olivine2	0	0.818195	0	0	0.146674	0.060367	0.002985	0.012546	25.1078	16.1706
CR16 - 5 Olivine2	0	0.940607	0.000835	0	0.121604	0.060904	0.00402	0.015741	25.3469	16.8518

CR16 - 5 Olivine2	0.008361	0.633293	0.000217	0	0.134527	0.069205	0	0.016305	24.6316	15.2793
CR16 - 5 Olivine2	0.001054	0.850577	0.002425	0	0.162378	0.088996	0	0.020864	24.4749	15.6353
CR16 - 5 Olivine2	0.004736	0.656299	0	0	0.136473	0.055617	0.00276	0.007608	25.1031	15.5071
CR16 - 5 Amphibole2	0.044319	8.26597	0.289598	0	0.209363	1.12481	0.015632	1.61883	20.2278	8.87311
CR16 - 5 Amphibole2	0.080176	8.1786	0.262716	0	0.18548	1.11005	0.009266	1.61406	20.5308	8.92097
CR16 - 5 Amphibole2	0.038998	8.24585	0.270477	0.032482	0.203166	1.09892	0.013514	1.62641	20.4993	9.08381
CR16 - 5 Amphibole2	0.053856	8.14289	0.253322	0.001088	0.197685	1.11997	0.006509	1.65801	20.5289	9.0395
CR16 - 5 Amphibole2	0.027004	8.16809	0.247438	0.01406	0.177827	1.03023	0.014995	1.68941	19.8021	9.08258
CR16 - 5 Amphibole2	0.05418	8.1883	0.264714	0.014454	0.190118	1.22596	0.012046	1.66518	20.2467	8.86661
CR16 - 5 Amphibole2	0.038464	8.10725	0.271399	0	0.199161	1.07177	0.009285	1.71443	19.8137	8.78081
CR16 - 5 Amphibole2	0.091096	8.00018	0.261389	0.011542	0.183959	1.06921	0.005725	1.60079	20.4819	8.90025
CR16 - 5 Titanomag1	0.000559	0	0.001281	0.035661	0.363168	3.1895	0.003722	0.054075	0.02679	1.30482
CR16 - 5 Titanomag1	0.004508	0	0	0.044576	0.318735	3.14625	0	0.008762	0.038725	1.3689
CR16 - 5 Titanomag1	0	0	0	0.044739	0.369523	3.15258	0.001735	0.02298	0.022801	1.34525
CR16 - 5 Titanomag1	0.006594	0	0	0.009423	0.369902	3.19552	0	0.012305	0.023473	1.35214

CR16 - 5 Titanomag1	0	0	0	0.054396	0.363151	3.16182	0.001872	0.022342	0.032492	1.3049
CR16 - 5 Titanomag1	0	0	0	0.019337	0.342837	3.15433	0	0.007749	0.035599	1.33824
CR16 - 5 Titanomag1	0	0	0	0.03695	0.361438	3.12703	0.00053	0.019789	0.030916	1.36909
CR16 - 5 Titanomag1	0	0	0	0.05795	0.327591	3.16519	0	0.013942	0.026647	1.30637
CR16 - 5 Titanomag1	0	0	0	0.034592	0.351423	3.15255	0	0.005341	0.022769	1.3059
CR16 - 5 plag2	0.001659	4.97029	0.571616	0.009094	0.018482	0.001669	0	5.3045	28.0977	0.024285
CR16 - 5 plag2	0	8.67242	0.197305	0	0.022234	0.009383	0.011202	3.39613	24.78	0.020901
CR16 - 5 plag2	0	7.28985	0.296993	0.018332	0.007633	0.011048	0.020211	4.16138	25.931	0.026773
CR16 - 5 plag2	0	8.75316	0.211537	0	0.010559	0	0.004702	3.4198	24.6732	0.024294
CR16 - 5 plag2	0.001195	8.09669	0.242197	0	0.007949	0.002136	0.010597	3.7003	25.1672	0.018962
CR16 - 5 plag2	0	6.59443	0.359586	0.020537	0.010614	0.006158	0.000943	4.53545	26.6914	0.017263
CR16 - 5 plag2	0	6.12675	0.407059	0.046699	0.040616	0.006208	0	4.67098	26.8855	0.008798
CR16 - 5 plag2	0	6.79202	0.350199	0	0.014105	0.00442	0.006685	4.44629	26.3537	0.02379
CR16 - 5 plag2	0.018134	6.03106	0.506784	0.003587	0.040486	0.020573	0.006781	4.65355	27.2029	0.037725
CR16 - 5 plag2	0.003324	6.70433	0.359159	0	0.032188	0.011478	0.005913	4.51904	26.3806	0.023712

CR16 - 5 Anorthite1	0	7.75374	0.12605 1	0.00156 2	0.03520 4	0.01084 2	0.00425 2	4.00342	25.4348	0.02252 3
CR16 - 5 Anorthite1	0.01046 2	8.90606	0.09324 6	0	0.03563 6	0.00639 7	0.00460 1	3.37805	24.2672	0.04127 3
CR16 - 5 Anorthite1	0.00999 2	9.46063	0.08046 1	0	0.02870 8	0.00563 5	0.00605 6	3.11682	23.9719	0.03604 8
CR16 - 5 Anorthite1	0	9.24179	0.08058 3	0	0.02816 8	0.00726 8	0.01035	3.02264	24.2274	0.03272 3
CR16 - 5 Anorthite1	0.00151	10.5735	0.05632 3	0	0.03179	0.00147 1	0.00433 1	2.41028	22.8705	0.02842 4
CR16 - 5 Anorthite1	0.02149 6	12.2827	0.03232 9	0	0.02729 8	0.00644	0.00738 5	1.31344	21.4166	0.02574 6
CR16 - 5 Anorthite1	0.00574 1	11.8509	0.02731 5	0	0.02141 5	0.00364 4	0.00609 3	1.60451	21.9808	0.03316 3
CR16 - 5 Anorthite1	0	12.8073	0.02345 1	0	0.00904 1	0.00093 3	0.01288	1.09453	21.1703	0.04228 2
CR16 - 5 Anorthite1	0.00096 5	10.1534	0.05689 7	0	0.04992 9	0.00673 1	0.00789 8	2.63214	23.2361	0.03395 1
CR16 - 5 Anorthite1	0	10.2245	0.06486 7	0	0.01007 2	0.00569 6	0.00434 7	2.63259	23.2576	0.03528 4
CR16 - 5 Amphibole1	0.04040 4	8.29843	0.32834 3	0.02298 1	0.17621 5	1.42265	0.01692	1.74102	19.9529	8.95528
CR16 - 5 Amphibole1	0.04912 8	8.44805	0.32696 9	0.01254 4	0.19028 2	1.69174	0.00767 1	1.89664	19.2461	8.63616
CR16 - 5 Amphibole1	0.04349 4	8.38314	0.32438 8	0.01176 6	0.19327 6	1.54488	0.01547 1	1.86144	19.7777	8.73966
CR16 - 5 Amphibole1	0.04998 9	8.2485	0.32030 1	0.01856 7	0.17969 9	1.444	0.01275 4	1.77998	20.1808	8.91257
CR16 - 5 Amphibole1	0.04787 3	8.38544	0.32584 2	0.04870 4	0.18297 1	1.61804	0.01273	1.74814	19.6287	8.75175

CR16 - 5 Amphibole1	0.030326	8.29828	0.324834	0.039548	0.140934	1.53741	0.015466	1.81995	19.1921	8.66153
CR16 - 5 Amphibole1	0.074842	8.34042	0.285902	0.008778	0.172575	1.48549	0.004324	1.84062	19.9309	8.88202
CR16 - 5 Amphibole1	0.033845	8.3493	0.318955	0.028419	0.200025	1.45364	0.023796	1.75557	20.1502	8.80626
CR16 - 5 Amphibole1	0.020404	8.28791	0.323432	0.013931	0.199476	1.48794	0.008498	1.78247	20.0313	9.0116
CR16 - 5 Plag1 (top to bottom)	0	7.84905	0.142597	0	0.017712	0.016565	0.002028	3.98931	25.4778	0.02491
CR16 - 5 Plag1 (top to bottom)	0	10.2441	0.081077	0	0.04341	0.01136	0.00582	2.54185	23.3815	0.020106
CR16 - 5 Plag1 (top to bottom)	0.001288	11.2533	0.066788	0	0.038499	0.016514	0.015595	2.16793	22.645	0.030893
CR16 - 5 Plag1 (top to bottom)	0.004926	10.9929	0.065779	0	0.011665	0.005187	0.009821	2.17438	22.86	0.027433
CR16 - 5 Plag1 (top to bottom)	0.012141	10.8232	0.072193	0	0.012537	0.01603	0.013571	2.32071	23.1186	0.024169
CR16 - 5 Plag1 (top to bottom)	0.014319	10.4933	0.087129	0	0	0.01589	0.014321	2.51844	23.113	0.019059
CR16 - 5 Plag1 (top to bottom)	0.001268	9.43748	0.142515	0.005921	0	0.017563	0.012419	2.9343	24.1617	0.030085
CR16 - 5 Plag1 (top to bottom)	0	9.35345	0.093272	0	0.031655	0.015606	0.017406	3.14234	24.0912	0.031748
CR16 - 5 Plag1 (top to bottom)	0.009708	8.28757	0.145172	0	0.02582	0.005257	0.006233	3.79077	24.9754	0.027806
CR16 - 4 diopside1	0	14.7008	0	0	0.049788	0.232128	0.001185	0.215706	24.367	9.86168
CR16 - 4 diopside1	0	14.581	0.002372	0	0.060475	0.231956	0.005358	0.226555	24.4781	10.0913

CR16 - 4 diopside1	0	14.2591	0	0	0.042061	0.213552	0.013786	0.250536	24.5976	10.1191
CR16 - 4 diopside1	0	14.3096	0.00097	0	0.086402	0.202659	0.009551	0.2276	24.4874	10.0277
CR16 - 4 diopside1	0.015368	15.2248	0.000081	0	0.064921	0.395768	0.022503	0.295092	23.7201	9.08868
CR16 - 4 diopside1	0.002751	15.4099	0	0	0.046193	0.393778	0.007147	0.249719	23.7659	9.07036
CR16 - 4 diopside1	0.002798	15.5666	0.00323	0	0.08612	0.394962	0.016946	0.27248	23.8966	8.95308
CR16 - 4 diopside1	0	15.0393	0	0	0.072039	0.374627	0.004388	0.250641	23.9242	9.16881
CR16 - 4 diopside1	0	14.8913	0	0	0.04388	0.391797	0.012884	0.272453	23.9567	9.24767
CR16 - 4 amphibole1	0.019694	8.34365	0.291514	0.031267	0.195381	1.7562	0.017503	1.85597	19.8745	8.72067
CR16 - 4 amphibole1	0.017537	8.40227	0.311146	0.017202	0.203399	1.74861	0.013264	1.84456	19.7441	8.6808
CR16 - 4 amphibole1	0.027493	8.3879	0.304661	0.01164	0.18568	1.73776	0.009739	1.9013	19.7425	8.70052
CR16 - 4 amphibole1	0.018537	8.29117	0.305541	0.010028	0.200026	1.75198	0.010433	1.85819	19.8345	8.6643
CR16 - 4 amphibole1	0.024276	8.3062	0.291308	0.026227	0.199175	1.71996	0.018112	1.8638	19.8082	8.61329
CR16 - 4 amphibole1	0.010676	8.34799	0.292596	0.038585	0.199827	1.73171	0.021653	1.85997	19.808	8.60196
CR16 - 4 amphibole1	0.022836	8.36895	0.289075	0.040567	0.217298	1.72634	0.019604	1.88451	19.8765	8.63723
CR16 - 4 amphibole1	0.028193	8.34074	0.299335	0.035354	0.189039	1.79529	0.011932	1.85378	19.7199	8.63992

CR16 - 4 amphibole1	0.02187 3	8.44597	0.29422 8	0.01225 2	0.20602 1	1.78012	0.01824 8	1.87014	19.7286	8.71502
CR16 - 4 olivine2	0.00039 7	0.12312 3	0	0.00123 6	0.09491 7	0	0.00342 4	0	18.3256	25.7874
CR16 - 4 olivine2	0	0.12844 5	0	0	0.11867	0.01005 6	0.00262 5	0	18.3266	25.6179
CR16 - 4 olivine2	0.00021 5	0.15106 9	0	0	0.08866 9	0.00071 3	0.00403 9	0.00570 4	18.3589	25.4242
CR16 - 4 olivine2	0.00283 3	0.11373 6	0.00221 9	0	0.10135 4	0.00352 3	0	0	18.2841	25.4473
CR16 - 4 olivine2	0	0.12224 3	0.00055 6	0	0.15231 8	0.00004 9	0.00903 4	0.01370 4	18.3439	25.5675
CR16 - 4 olivine2	0	0.12722 5	0	0	0.07903 3	0.01033 2	0.01137 8	0.00442 8	18.4595	25.9683
CR16 - 4 olivine2	0	0.11455	0	0	0.09963 1	0	0.00275 1	0	18.4592	25.7495
CR16 - 4 olivine2	0	0.12761 2	0	0	0.11348	0.00463 5	0.00122 6	0	18.4293	25.7392
CR16 - 4 olivine2	0	0.12280 1	0	0	0.12680 9	0	0	0	18.493	25.7899
CR16 - 4 anorthite1	0.00465 2	0.40494 9	0	0.01120 9	0.02311 2	0.01096 9	0.00841 8	0.11199 2	0.33445 9	0.00695 7
CR16 - 4 anorthite1	0	0.39531 9	0	0.00589 8	0.01938 7	0.00794 6	0	0.14950 7	0.34451	0.0159
CR16 - 4 anorthite1	0	0.39420 7	0.00599 9	0.01734 7	0	0.00878 9	0.00146 7	0.08342	0.32833 8	0.01443 8
CR16 - 4 anorthite1	0	12.7955	0.01716 5	0	0.04166 6	0.00827 2	0.01874 1	1.12766	21.4797	0.03745 9
CR16 - 4 anorthite1	0.00024 9	0.42999	0	0.02451 7	0.03173 9	0.00267 9	0.01309 3	0.07886 3	0.34629 3	0.01306 9

CR16 - 4 anorthite1	0	0.431843	0.005896	0	0.018054	0.012987	0	0.106428	0.365028	0.01422
CR16 - 4 anorthite1	0	0.427179	0	0	0	0.017022	0.01178	0.068329	0.326021	0.0114
CR16 - 4 anorthite1	0	0.413776	0	0.007815	0	0.013719	0.005237	0.127992	0.356546	0.005232
CR16 - 4 anorthite1	0	0.415773	0	0.011603	0.018667	0.005658	0.001724	0.091185	0.36248	0.011377
CR16 - 4 anorthite1	0	0.40556	0.001852	0.003303	0.006985	0.008562	0.01122	0.107536	0.311897	0.010381
CR16 - 4 anorthite1	0	0.418748	0.000591	0.034405	0.00245	0.009074	0.009548	0.129773	0.332447	0.004949
CR16 - 4 titanomag1	0	0	0	0.079503	0.342481	4.21373	0	0	0.03079	1.34264
CR16 - 4 titanomag1	0	0	0	0.074695	0.371644	4.36531	0	0.000395	0.034673	1.45516
CR16 - 4 titanomag1	0	0	0	0.054608	0.345814	4.32654	0	0	0.040611	1.355
CR16 - 4 titanomag1	0	0.006911	0	0.075673	0.332125	4.22195	0.005132	0	0.040635	1.31749
CR16 - 4 titanomag1	0	0.001705	0	0.054275	0.377735	4.17378	0	0	0.027858	1.35016
CR16 - 4 titanomag1	0	0.008716	0	0.065808	0.346602	4.18281	0.000065	0	0.028102	1.33015
CR16 - 4 titanomag1	0	0.005736	0.001854	0.044981	0.37108	4.36569	0.003361	0.024648	0.028965	1.37628
CR16 - 4 titanomag1	0.001323	0.002765	0	0.047375	0.336317	4.42147	0	0.022648	0.033157	1.38194
CR16 - 4 amphibole2	0.036522	8.13338	0.250951	0.024765	0.196786	1.36042	0.012625	1.78867	20.1294	8.84732

CR16 - 4 amphibole2	0.042349	8.1779	0.256319	0.016142	0.140885	1.44168	0.014738	1.78711	20.244	8.60858
CR16 - 4 amphibole2	0.036226	8.00772	0.269749	0.009371	0.181537	1.468	0.032418	1.72643	19.9338	8.98173
CR16 - 4 amphibole2	0.036853	8.12334	0.257062	0	0.259353	1.41685	0.034559	1.72875	19.9715	8.76361
CR16 - 4 amphibole2	0.032529	7.90695	0.216406	0.034718	0.201508	1.38044	0.028542	1.83643	20.4845	9.39699
CR16 - 4 amphibole2	0.039149	8.14799	0.249809	0.038463	0.187352	1.44793	0.018928	1.77435	20.1788	8.64517
CR16 - 4 amphibole2	0.051027	7.88392	0.271351	0.030539	0.215905	1.42769	0.021881	1.75714	19.3352	8.45994
CR16 - 4 amphibole2	0.030316	7.98634	0.229532	0	0.24836	1.33259	0.032002	1.84892	20.4349	9.13936
CR16 - 4 amphibole2	0.040364	7.97358	0.213047	0.006067	0.232846	1.33304	0.029885	1.79631	20.5406	9.41763
CR16 - 4 amphibole2	0.03426	8.21421	0.248053	0.002295	0.214706	1.21672	0.017739	1.708	20.3829	9.13026
CR16 - 4 anorthite2	0.000941	11.6041	0.03649	0	0.011147	0	0.008218	1.72158	22.1938	0.037498
CR16 - 4 anorthite2	0	8.62208	0.083725	0	0.028594	0.003316	0.00325	3.50465	24.7074	0.02553
CR16 - 4 anorthite2	0	12.0806	0.026882	0	0.014445	0.004471	0.008847	1.52187	21.923	0.034509
CR16 - 4 anorthite2	0	10.0302	0.061855	0	0.022188	0.009184	0.010075	2.67791	23.5114	0.042381
CR16 - 4 anorthite2	0.001715	10.8723	0.043355	0	0.01882	0.014549	0.004126	2.25265	22.9237	0.068453
CR16 - 4 anorthite2	0.066135	10.7642	0.051781	0	0	0.016929	0.00928	2.36505	23.1377	0.061569

CR16 - 4 anorthite2	0	9.03227	0.081898	0	0.008402	0.006731	0.008911	3.39119	24.5441	0.034138
CR16 - 4 anorthite2	0.028565	9.7666	0.067828	0	0.006078	0.016097	0.008875	2.985044	23.97904	0.057146
CR16 - 4 diopside2	0.094905	8.06717	0.248575	0.041481	0.204336	1.45809	0.033913	1.95221	20.11	8.99247
CR16 - 4 diopside2	0.025088	7.92478	0.228268	0.019462	0.247151	1.39567	0.043288	1.78309	20.7678	9.58449
CR16 - 4 diopside2	0.037915	8.08524	0.259683	0.027875	0.228669	1.33835	0.021934	1.76245	20.2797	9.03662
CR16 - 4 diopside2	0.063273	7.96676	0.239034	0.054417	0.201832	1.35825	0.025499	1.75576	20.5282	9.3277
CR16 - 4 diopside2	0	15.2844	0	0	0.056284	0.44212	0.005682	0.243232	23.3498	8.73696
CR16 - 4 diopside2	0	14.9206	0	0	0.052247	0.482828	0.011321	0.250716	23.2697	8.75922
CR16 - 4 diopside2	0.05574	8.19615	0.237303	0.022144	0.182999	1.42017	0.02891	1.78705	20.4475	8.8633
CR16 - 4 diopside2	0.043283	8.16666	0.225738	0	0.15792	1.22978	0.017069	1.59246	20.941	9.20476
CR16 - 4 diopside2	0.016558	13.6057	0.073594	0.011289	0.081526	0.843432	0.031719	0.569083	22.4107	8.43419
CR16 - 4 diopside2	0	15.0546	0.010204	0	0.079782	0.301745	0.022734	0.232998	24.1617	9.37314
CR16 - 4 diopside2	0	15.2378	0	0	0.076547	0.848756	0.007486	0.266836	22.1486	8.02563
CR16 - 4 diopside2	0	14.7245	0	0.013086	0.06325	0.341325	0.00733	0.183243	23.9283	9.38539
CR16 - 4 diopside2	0.002574	15.1912	0	0	0.086295	0.693757	0.009112	0.240713	22.517	8.41277

CR16 - 4 olivine1	0	0.105773	0	0	0.12378	0.002984	0	0	18.0775	23.7503
CR16 - 4 olivine1	0.000417	0.104425	0	0	0.131791	0	0.00181	0.013033	17.9153	23.5765
CR16 - 4 olivine1	0.003487	0.095275	0	0	0.096285	0	0.011749	0.002546	17.9725	23.6118
CR16 - 4 olivine1	0	0.098066	0	0	0.145871	0.003193	0.008323	0.000072	18.0246	23.5212
CR16 - 4 olivine1	0	0.093466	0	0.000973	0.100396	0	0	0	17.9168	23.1535
CR16 - 4 olivine1	0	0.098894	0	0	0.097509	0	0.004533	0	17.9028	23.2056
CR16 - 4 olivine1	0	0.108168	0.003569	0	0.135215	0	0.01102	0.003444	17.9569	23.237
CR16 - 4 olivine1	0	0.102877	0	0	0.117647	0	0.003212	0	17.9781	23.5864
CR16 - 4 diop/An mix	0.063275	6.70252	0.437431	0	0.157584	0.560706	0.063011	1.71511	22.3637	4.92707
CR16 - 4 diop/An mix	0.023727	7.70005	0.307033	0	0.076098	0.491729	0.068984	1.95883	24.4399	4.9227
CR16 - 4 diop/An mix	0.074447	6.7408	0.590153	0.013448	0.073755	0.598459	0.099518	2.60469	25.1529	3.0596
CR16 - 4 diop/An mix	0.044086	6.80993	0.583835	0.033397	0.074922	0.557634	0.085401	2.72284	25.0592	2.99577
CR16 - 4 diop/An mix	0.076062	5.86614	0.830962	0.008175	0.069827	0.693344	0.126295	2.75301	25.4662	2.9945
CR16 - 4 diop/An mix	0.052331	6.63837	0.788931	0.052068	0.08166	0.720115	0.113664	2.63351	25.6901	3.26326
CR16 - 4 diop/An mix	0.073706	6.38362	0.761143	0	0.110956	0.650966	0.123481	2.89561	25.1012	2.21181

CR16 - 4 diop/An mix	0.061639	6.21472	0.603923	0.017315	0.05298	0.423273	0.081377	2.97174	25.0223	2.96408
CR16 - 4 diop/An mix	0.147715	5.32499	0.472898	0	0.224896	0.4315	0.077706	2.21553	19.282	1.83067
CR16 - 4 diop/An mix	0.044716	5.84157	0.860001	0.014813	0.064835	0.728614	0.109234	2.83682	25.3903	2.86511
CR16 - 4 diop/An mix	0.087379	6.13573	0.797478	0.049117	0.088117	0.726665	0.119177	2.89984	25.4542	2.19019
CR16 - 4 diop/An mix	0.068343	6.6312	0.743962	0.038014	0.069681	0.639723	0.100737	2.73639	25.4255	2.67849
CR16 - 4 diop/An mix	0.084389	6.07044	0.788996	0.009362	0.074541	0.700803	0.12389	2.61194	25.2705	2.81433
CR16 - 4 diop/An mix	0	0.329672	0.063039	0.533328	0.042609	0.046123	0.042294	0.384816	2.78928	0.615198
CR16 - 4 diop/An mix	0.081442	5.97348	0.840228	0.022758	0.073969	0.75431	0.124224	2.55189	25.3147	2.76256
CR16 - 4 diop/An mix	0.059107	5.73066	0.644326	0.030977	0.098569	0.543242	0.095019	2.68191	24.8212	3.67541
CR16 - 4 diop/An mix	0.081105	5.44261	0.641057	0.000888	0.052936	0.531422	0.111867	2.46326	24.4688	4.50439
CR16 - 4 diop/An mix	0	0.274225	0.044857	0.3031	0.058087	0.038914	0.028355	0.565292	2.79281	0.596566
CR16 - 4 diop/An mix	0.071402	6.8839	0.593834	0.010921	0.070497	0.562223	0.084856	2.72394	24.9142	2.39656
CR16 - 4 diop/An mix	0.026785	7.64332	0.400883	0	0.064603	0.410531	0.061858	2.71905	24.7592	2.75608

SAMPLE	Al WT%	Fe WT%	Mn WT%	Cr WT%	Ni WT%	Zn WT%	S WT%	O WT%	TOTAL
CR16 - 6 Titanomag1	2.88503	59.3469	0.227717	0.305082	0.029001	0.029013	0.002335	24.0998	93.7478
CR16 - 6 Titanomag1	2.88237	59.0288	0.23596	0.28832	0.055199	0	0.008746	24.0517	93.506
CR16 - 6 Titanomag1	2.96688	59.0786	0.23025	0.274772	0.027363	0	0.017515	24.1614	93.6622
CR16 - 6 Titanomag1	2.92154	59.2938	0.256464	0.283645	0.000586	0.041116	0	24.0757	93.6681
CR16 - 6 Titanomag1	2.85086	58.7197	0.254242	0.280865	0.027817	0	0.004075	23.9321	93.0199
CR16 - 6 Titanomag1	2.8984	58.9461	0.223037	0.259694	0.034058	0	0.008143	23.9522	93.135
CR16 - 6 Titanomag1	2.91839	58.6135	0.2248	0.278325	0	0	0.004657	23.8765	92.7187
CR16 - 6 Titanomag2	2.56952	57.9325	0.263228	0.021833	0	0.007076	0.006972	24.2304	93.286
CR16 - 6 Titanomag2	2.67589	58.4887	0.242647	0.012281	0	0.039977	0	24.3784	93.9569
CR16 - 6 Titanomag2	2.57321	58.6341	0.253439	0.014094	0	0.023067	0	24.3779	94.1044
CR16 - 6 Titanomag2	2.60759	58.5459	0.269272	0.013937	0	0.018926	0.003494	24.3706	94.0044
CR16 - 6 Titanomag2	2.57933	58.5317	0.246044	0.019813	0	0.029784	0.007577	24.3523	93.9272
CR16 - 6 Titanomag2	2.60508	58.5497	0.279913	0.02439	0	0.012315	0.006408	24.3939	94.0651
CR16 - 6 Anorthite2	18.287	0.433316	0.007033	0	0.006508	0.011144	0	46.0368	100.063
CR16 - 6 Anorthite2	0.352237	0.067967	0	0	0	0	0.000637	0.691734	1.54784
CR16 - 6 Anorthite2	0.331581	0.065364	0	0	0	0	0	0.652992	1.46141
CR16 - 6 Anorthite2	0.31562	0.057588	0	0	0	0	0	0.619713	1.37757
CR16 - 6 Anorthite2	0.318969	0.071454	0	0	0	0	0	0.651511	1.46913
CR16 - 6 Anorthite2	0.323855	0.029198	0	0	0	0	0.007672	0.650854	1.43822
CR16 - 6 Anorthite2	18.2275	0.460998	0	0	0.030539	0	0	46.1986	100.412
CR16 - 6 Amphibole1	6.35611	9.05122	0.14772	0	0	0	0.006343	41.5171	97.8477
CR16 - 6 Amphibole1	6.41973	8.84163	0.09386	0	0.015109	0	0.001267	41.5026	97.6255
CR16 - 6 Amphibole1	6.49591	8.90791	0.101746	0	0	0	0.02154	41.3477	97.3684
CR16 - 6 Amphibole1	6.2996	8.56659	0.101259	0	0	0	0.006349	41.5148	97.5147
CR16 - 6 Amphibole1	6.3748	8.72944	0.120892	0.00738	0	0	0.006959	41.3614	97.2841
CR16 - 6 Amphibole1	6.41265	8.9271	0.13557	0	0.011343	0.001915	0	41.5167	97.6492

CR16 - 6 Amphibole1	6.38733	8.67197	0.128	0	0	0	0.000635	41.5405	97.5685
CR16 - 6 Amphibole2	6.18496	8.51228	0.147754	0.016265	0	0	0.007613	41.6766	97.7634
CR16 - 6 Amphibole2	5.72998	9.23164	0.191059	0	0	0	0	41.5452	97.6847
CR16 - 6 Amphibole2	5.78606	8.7667	0.173081	0.005014	0	0.005553	0	41.7173	97.8015
CR16 - 6 Amphibole2	5.80189	8.79669	0.170453	0	0	0	0.011428	41.6226	97.6402
CR16 - 6 Amphibole2	6.12102	8.49967	0.119386	0.010804	0	0	0.002534	41.3871	97.1246
CR16 - 6 Amphibole2	6.21593	8.60552	0.131504	0	0.001692	0	0.012704	41.6819	97.9651
CR16 - 6 Amphibole2	6.21842	8.44412	0.133065	0.003635	0	0	0.005082	41.7304	97.8918
CR16 - 6 Amphibole2	6.19891	8.37368	0.105836	0	0	0	0.008892	41.4882	97.3098
CR16 - 6 Anorthite1	18.1202	0.430109	0	0	0	0.014469	0	46.0645	100.023
CR16 - 6 Anorthite1	18.15	0.481851	0.013582	0	0	0	0	46.2891	100.485
CR16 - 6 Anorthite1	18.0148	0.423066	0	0	0	0	0.005757	45.8725	99.5995
CR16 - 6 Anorthite1	17.6591	0.396512	0.005047	0	0	0	0.00064	46.0502	99.6675
CR16 - 6 Anorthite1	18.189	0.403935	0	0.001845	0	0	0	46.1556	100.166
CR16 - 6 Anorthite1	18.0925	0.460619	0	0.000248	0	0	0	46.0604	99.9467
CR16 - 6 Anorthite1	18.1135	0.443458	0.006689	0	0	0	0.010867	45.9952	99.8858
CR16 - 6 Anorthite1	18.1908	0.431858	0.001387	0.013879	0	0	0.003192	45.9482	99.8501
CR16 - 6 Anorthite1	17.8227	0.442457	0.008509	0	0	0	0.000641	46.0933	99.8328
CR16 - 6 Anorthite1	18.2665	0.460028	0.011462	0	0	0	0	46.1727	100.259
CR16 - 6 Olivine1	0.011753	17.0364	0.310975	0	0.050607	0	0	41.099	100.369
CR16 - 6 Olivine1	0.020048	16.9627	0.298181	0	0.018886	0.032101	0.003225	41.2905	100.755
CR16 - 6 Olivine1	0.008066	17.1434	0.326238	0	0.049033	0.001563	0.002579	41.3424	100.983
CR16 - 6 Olivine1	0.022287	16.9334	0.269219	0.013428	0.032993	0.009082	0	41.1771	100.454
CR16 - 6 Olivine1	0.008168	17.2521	0.288005	0	0.037895	0.012802	0.006441	41.3161	100.904
CR16 - 6 Olivine1	0.011489	16.8364	0.279813	0	0.065845	0.01141	0	41.1368	100.294
CR16 - 6 Olivine2	0.021312	15.0921	0.265337	0.00485	0.062866	0	0	41.7855	100.688
CR16 - 6 Olivine2	0.007391	14.9931	0.219932	0.020432	0.066364	0.012241	0	41.3875	99.7465
CR16 - 6 Olivine2	0.020079	15.1511	0.244669	0	0.080721	0.006144	0	41.4609	100.068

CR16 - 6 Olivine2	0.015107	15.3164	0.228237	0	0.038008	0.016961	0	41.3974	100.006
CR16 - 6 Olivine2	0.011607	14.9794	0.230818	0.013394	0.046718	0	0	41.5414	100.062
CR16 - 6 Olivine2	0.021299	15.199	0.27927	0.006115	0.076442	0	0	41.7555	100.772
CR16 - 6 Olivine2	0.02495	15.0438	0.24855	0	0.058624	0	0.000645	41.4223	99.9271
CR16 - 6 Olivine2	0.013013	15.3737	0.242585	0	0.078689	0.010623	0.005161	41.6419	100.581
CR16 - 5 Anorthite2	13.3656	0.197452	0	0.001517	0	0	0.005068	31.0941	69.4408
CR16 - 5 Anorthite2	13.2463	0.181711	0.012319	0	0	0	0	31.0481	69.3193
CR16 - 5 Anorthite2	13.2803	0.238525	0	0	0	0	0.009502	30.9316	69.1528
CR16 - 5 Anorthite2	12.7253	0.206514	0.000698	0	0	0	0	30.6247	68.1422
CR16 - 5 Anorthite2	15.6229	0.209039	0	0	0	0	0	46.7325	99.6379
CR16 - 5 Anorthite2	11.3691	0.180921	0	0.007948	0	0	0.001285	29.8062	65.6075
CR16 - 5 Anorthite2	16.6518	0.229999	0	0.014686	0.005497	0	0	46.4449	99.6983
CR16 - 5 Anorthite2	17.2725	0.22183	0.026573	0	0	0	0.006434	46.0043	99.3274
CR16 - 5 Titanomag2	1.45381	61.4862	0.372491	0.060644	0	0.002919	0.008653	23.5573	94.0996
CR16 - 5 Titanomag2	1.44651	61.5289	0.360042	0.039405	0	0.006574	0.005204	23.5219	94.0334
CR16 - 5 Titanomag2	1.48754	61.2498	0.365471	0.048329	0	0.003793	0.010418	23.5359	93.9256
CR16 - 5 Titanomag2	1.44401	61.5983	0.362975	0.067496	0.004471	0	0.001155	23.5821	94.1711
CR16 - 5 Titanomag2	1.44946	61.2283	0.358974	0.01098	0	0.032178	0.005196	23.5253	93.8684
CR16 - 5 Olivine1	0.010913	19.3897	0.43949	0	0.026062	0.007672	0	40.7717	101.025
CR16 - 5 Olivine1	0.001888	19.5789	0.388604	0	0.023592	0.006446	0	40.4493	100.392
CR16 - 5 Olivine1	0.007353	19.5232	0.421564	0	0.019748	0.034645	0	40.693	100.96
CR16 - 5 Olivine1	0.011473	19.477	0.428698	0.007312	0.023175	0	0	40.6904	100.89
CR16 - 5 Olivine1	0	19.4034	0.404301	0	0.042549	0.007416	0	40.5978	100.688
CR16 - 5 Olivine1	0.013543	19.4086	0.420071	0	0.029016	0.017219	0.005142	40.5107	100.424
CR16 - 5 Olivine1	0	19.5556	0.40083	0.002587	0.041499	0.024458	0.004498	40.6958	101.022
CR16 - 5 Olivine1	0.003744	19.1756	0.411862	0.004899	0.028711	0.016033	0.005785	40.3856	100.079
CR16 - 5 Olivine1	0.016555	19.6176	0.384378	0.016401	0.033129	0.017138	0	40.3058	100.2
CR16 - 5 Olivine2	0.483649	12.6818	0.73258	0.017928	0.008314	0.024522	0.005209	43.4522	99.0715

CR16 - 5 Olivine2	0.972633	10.9406	0.35973	0	0	0.027577	0	43.7006	98.468
CR16 - 5 Olivine2	0.485345	10.498	0.391266	0.000109	0	0	0.005874	44.0037	98.8106
CR16 - 5 Olivine2	0.468778	10.491	0.39263	0.00211	0.008103	0.03891	0	43.8249	98.4149
CR16 - 5 Olivine2	0.45898	12.4351	0.672512	0	0.004544	0.001617	0	43.3327	98.4983
CR16 - 5 Olivine2	1.09011	11.0468	0.365869	0	0.008897	0	0.003266	43.5283	98.1384
CR16 - 5 Olivine2	0.478589	10.5828	0.362699	0	0.012789	0.017366	0	43.7632	98.261
CR16 - 5 Olivine2	0.635706	11.4652	0.497232	0.000135	0.016749	0	0	43.6267	98.561
CR16 - 5 Olivine2	0.552316	10.5452	0.341649	0	0.000489	0.000256	0	44.0118	98.794
CR16 - 5 Olivine2	0.452376	12.5587	0.726139	0.013896	0.004857	0	0	42.6469	97.1756
CR16 - 5 Olivine2	1.10027	12.3806	0.451933	0.002179	0	0	0.00325	43.2484	98.4231
CR16 - 5 Olivine2	0.443924	12.5664	0.752543	0	0	0	0.001301	43.3313	98.5692
CR16 - 5 Amphibole2	5.35694	8.80831	0.197503	0.004934	0	0	0.002546	40.9339	95.9736
CR16 - 5 Amphibole2	5.33529	9.12064	0.240221	0.012187	0	0.026898	0.003819	41.345	96.9761
CR16 - 5 Amphibole2	5.23711	8.70866	0.216604	0.000431	0	0	0	41.2209	96.4966
CR16 - 5 Amphibole2	5.38076	8.78854	0.246241	0.003523	0.003905	0.009549	0	41.3573	96.7915
CR16 - 5 Amphibole2	5.90976	8.12977	0.129519	0	0	0	0.010793	40.7889	95.2224
CR16 - 5 Amphibole2	5.43914	8.76367	0.222744	0	0.009251	0.01211	0.006353	41.0724	96.2539
CR16 - 5 Amphibole2	5.78821	8.80958	0.145529	0	0	0	0.002542	40.6904	95.4425
CR16 - 5 Amphibole2	5.14582	8.90344	0.272697	0.003154	0	0	0.00699	40.9417	95.8798
CR16 - 5 Titanomag1	1.64816	63.1085	0.470968	0.016957	0	0.030426	0.017957	22.774	93.0465
CR16 - 5 Titanomag1	1.61775	63.2421	0.484394	0	0	0.052549	0.005805	22.7757	93.1087
CR16 - 5 Titanomag1	1.56742	63.2221	0.48125	0.000682	0	0.053895	0.004632	22.7009	92.9905
CR16 - 5 Titanomag1	1.64885	63.5932	0.49469	0	0	0.019014	0.013368	22.9117	93.6502
CR16 - 5 Titanomag1	1.58527	63.6292	0.499282	0.000572	0	0.004796	0.003486	22.8165	93.4801
CR16 - 5 Titanomag1	1.61245	63.666	0.478783	0.000549	0	0.015905	0.004645	22.8586	93.535
CR16 - 5 Titanomag1	1.61663	63.5634	0.453748	0.019138	0.0137	0.03805	0	22.8401	93.4905
CR16 - 5 Titanomag1	1.61749	63.6239	0.458485	0.012076	0	0.055462	0.016195	22.8602	93.5415
CR16 - 5 Titanomag1	1.60728	63.0108	0.486699	0	0	0.067726	0.017392	22.664	92.7265

CR16 - 5 plag2	12.9179	0.301042	0.000254	0.002346	0	0	0	47.5561	99.7769
CR16 - 5 plag2	15.5423	0.28003	0	0.000834	0.002458	0	0	46.8578	99.793
CR16 - 5 plag2	14.6033	0.255352	0	0.002528	0	0	0.001301	47.0825	99.7082
CR16 - 5 plag2	15.4739	0.258217	0	0	0.004232	0	0	46.7002	99.5338
CR16 - 5 plag2	15.1955	0.209168	0	0.015943	0	0	0	46.8548	99.5226
CR16 - 5 plag2	14.1942	0.165333	0.005307	0	0	0	0	47.3888	99.9901
CR16 - 5 plag2	13.7999	0.295881	0.011607	0.003862	0	0.00892	0	47.1689	99.4817
CR16 - 5 plag2	14.3721	0.216789	0.013843	0.006237	0	0.008815	0.00261	47.2427	99.8543
CR16 - 5 plag2	13.4769	0.440829	0.016923	0	0.016413	0.00572	0.001308	47.2988	99.7785
CR16 - 5 plag2	14.2076	0.214845	0.015824	0	0	0	0.004559	47.1207	99.6033
CR16 - 5 Anorthite1	15.0081	0.290253	0	0	0	0	0	46.9538	99.6445
CR16 - 5 Anorthite1	15.5606	0.32367	0	0.005068	0	0	0.008391	46.3847	99.0253
CR16 - 5 Anorthite1	16.1258	0.346814	0.007218	0	0	0.010293	0	46.6733	99.8797
CR16 - 5 Anorthite1	15.8578	0.353942	0	0	0.000865	0	0	46.6079	99.4714
CR16 - 5 Anorthite1	16.5999	0.408372	0.020705	0	0.005633	0	0.003227	46.0488	99.0647
CR16 - 5 Anorthite1	17.793	0.475564	0	0	0	0.005663	0.001922	45.7659	99.1754
CR16 - 5 Anorthite1	17.4685	0.438234	0	0.000044	0	0	0	46.0344	99.4748
CR16 - 5 Anorthite1	18.0276	0.437075	0.02112	0.002331	0	0	0	45.8316	99.4804
CR16 - 5 Anorthite1	16.4544	0.383352	0.00826	0.006589	0	0	0	46.2433	99.2738
CR16 - 5 Anorthite1	16.4486	0.415192	0.004693	0	0	0	0.003223	46.2983	99.405
CR16 - 5 Amphibole1	5.8273	8.64078	0.154607	0.012302	0	0	0.006979	41.3094	96.9065
CR16 - 5 Amphibole1	6.54715	8.72447	0.132713	0.018772	0.000654	0.013746	0.012033	41.2463	97.2011
CR16 - 5 Amphibole1	6.10624	8.6142	0.145929	0.004029	0	0	0.012044	41.363	97.1406
CR16 - 5 Amphibole1	5.72603	8.69013	0.172094	0	0	0	0.005716	41.4629	97.2041
CR16 - 5 Amphibole1	6.24807	8.57807	0.121289	0.006435	0.012155	0	0.003812	41.3134	97.0335
CR16 - 5 Amphibole1	6.52215	8.60178	0.09354	0.003229	0	0	0.003171	40.9319	96.2162
CR16 - 5 Amphibole1	5.79017	8.68275	0.150118	0.009493	0	0.002564	0	41.2695	96.9304
CR16 - 5 Amphibole1	5.7111	8.81323	0.148036	0	0	0.034685	0.018361	41.4538	97.2993

CR16 - 5 Amphibole1	5.85631	8.80146	0.174021	0	0	0	0	41.5381	97.5368
CR16 - 5 Plag1 (top to bottom)	14.9998	0.318305	0.012552	0	0.002949	0	0.008431	47.0594	99.9214
CR16 - 5 Plag1 (top to bottom)	16.5165	0.393082	0.001207	0	0.000594	0.046741	0.003228	46.4793	99.7699
CR16 - 5 Plag1 (top to bottom)	17.1285	0.438307	0.001219	0.00697	0.022704	0	0.002576	46.4874	100.324
CR16 - 5 Plag1 (top to bottom)	17.0881	0.399111	0	0	0.000845	0	0	46.5525	100.193
CR16 - 5 Plag1 (top to bottom)	16.983	0.385684	0	0.008077	0	0	0.012249	46.7662	100.568
CR16 - 5 Plag1 (top to bottom)	16.7946	0.478331	0	0	0	0	0.003225	46.5391	100.091
CR16 - 5 Plag1 (top to bottom)	15.9155	0.37958	0	0	0	0.010935	0	46.6627	99.712
CR16 - 5 Plag1 (top to bottom)	15.8649	0.401866	0.003875	0	0	0	0	46.5765	99.6238
CR16 - 5 Plag1 (top to bottom)	15.237	0.299559	0.009253	0.007988	0	0.019215	0.00583	46.8016	99.6541
CR16 - 4 diopside1	1.00037	5.98289	0.250173	0.010455	0	0.0205	0.003166	43.0463	99.7421
CR16 - 4 diopside1	1.11467	6.35157	0.274948	0	0	0	0	43.4856	100.904
CR16 - 4 diopside1	1.04168	6.46476	0.297888	0	0	0.004977	0.002533	43.4973	100.805
CR16 - 4 diopside1	1.00491	6.46117	0.368559	0	0	0	0	43.2929	100.479
CR16 - 4 diopside1	1.68311	6.2832	0.249923	0	0.018509	0.022038	0	42.8631	99.9471
CR16 - 4 diopside1	1.64529	6.32587	0.261436	0.006339	0	0	0	42.9146	100.099
CR16 - 4 diopside1	1.6801	6.46052	0.243933	0	0	0.035917	0.003159	43.146	100.762
CR16 - 4 diopside1	1.63472	6.59325	0.285668	0	0.003588	0	0	43.0681	100.419
CR16 - 4 diopside1	1.72839	6.72806	0.268701	0	0.002308	0.013486	0.00443	43.2546	100.817
CR16 - 4 amphibole1	6.17201	8.85635	0.134015	0	0.010538	0.004304	0.010136	41.7061	97.9997
CR16 - 4 amphibole1	6.11847	8.97393	0.163312	0	0	0	0	41.5181	97.7567

CR16 - 4 amphibole1	6.12954	9.0532	0.193252	0	0	0.016427	0.005701	41.5832	97.9905
CR16 - 4 amphibole1	6.1206	8.99745	0.160104	0	0	0.004407	0.011392	41.593	97.8317
CR16 - 4 amphibole1	6.11891	8.864	0.168517	0	0	0	0.01075	41.4856	97.5184
CR16 - 4 amphibole1	6.04215	8.90221	0.149488	0	0	0	0.015196	41.4512	97.4731
CR16 - 4 amphibole1	6.09728	8.93609	0.161959	0	0	0	0	41.6022	97.8804
CR16 - 4 amphibole1	6.12023	8.76367	0.161654	0	0	0.030743	0.007613	41.4311	97.4284
CR16 - 4 amphibole1	6.27704	8.88163	0.158815	0	0	0.001033	0	41.6863	98.0973
CR16 - 4 olivine2	0.016921	13.6127	0.229052	0.000595	0.117437	0.014461	0.00583	41.9353	100.268
CR16 - 4 olivine2	0.01224	13.6476	0.217487	0	0.08202	0	0.001938	41.8157	99.9812
CR16 - 4 olivine2	0.024572	13.949	0.230352	0	0.062444	0.020076	0.003234	41.8342	100.157
CR16 - 4 olivine2	0	14.1414	0.237978	0	0.078045	0.025903	0.015526	41.804	100.258
CR16 - 4 olivine2	0.014357	14.2304	0.230754	0.003559	0.08398	0.000655	0	41.9784	100.751
CR16 - 4 olivine2	0.024148	13.7753	0.200753	0.006455	0.071053	0	0	42.2497	100.988
CR16 - 4 olivine2	0.018873	13.5527	0.221623	0	0.08132	0	0.005186	42.0259	100.331
CR16 - 4 olivine2	0.011833	13.8676	0.235288	0.016312	0.099114	0.00722	0	42.0857	100.739
CR16 - 4 olivine2	0.019286	13.6699	0.207484	0.001299	0.096024	0.000393	0.000647	42.1185	100.646
CR16 - 4 anorthite1	0.720256	0.009292	0	0	0.004494	0.016571	0	1.25438	2.92171
CR16 - 4 anorthite1	0.712806	0	0.00715	0	0.001985	0	0	1.25547	2.91588
CR16 - 4 anorthite1	0.710282	0.012165	0.017197	0	0	0	0	1.22129	2.81494
CR16 - 4 anorthite1	18.1565	0.445292	0	0.001268	0	0.005656	0	46.3108	100.446
CR16 - 4 anorthite1	0.748153	0.010415	0	0	0.00051	0.006602	0.001886	1.29684	3.00489
CR16 - 4 anorthite1	0.710831	0	0	0	0.003671	0	0.006286	1.28725	2.96249
CR16 - 4 anorthite1	0.757687	0.003653	0.011921	0	0.020796	0	0.007548	1.29529	2.95862
CR16 - 4 anorthite1	0.717749	0.009862	0	0	0	0	0	1.27748	2.93541
CR16 - 4 anorthite1	0.711295	0.000459	0.000106	0	0.002245	0	0	1.25901	2.89158
CR16 - 4 anorthite1	0.69637	0.002924	0	0.002625	0.002772	0	0.005653	1.21316	2.7908
CR16 - 4 anorthite1	0.691831	0	0.001853	0	0	0	0.001887	1.23561	2.87317
CR16 - 4 titanomag1	1.80788	61.8443	0.512255	0.006305	0	0.046995	0	23.2331	93.46

CR16 - 4 titanomag1	1.85996	61.5154	0.496575	0.028176	0	0.016024	0.004049	23.3686	93.5907
CR16 - 4 titanomag1	1.86143	61.7852	0.510171	0.035505	0.010051	0.096465	0	23.3833	93.8047
CR16 - 4 titanomag1	1.76251	61.9279	0.530086	0.011379	0	0.056483	0.007521	23.2469	93.5428
CR16 - 4 titanomag1	1.72861	62.4855	0.526243	0.024086	0	0.015439	0	23.3235	94.0889
CR16 - 4 titanomag1	1.7698	62.1095	0.475794	0.007602	0	0.055595	0.006952	23.2477	93.6352
CR16 - 4 titanomag1	1.91564	61.3614	0.472398	0.05028	0	0	0.005207	23.3287	93.3563
CR16 - 4 titanomag1	1.95365	60.9126	0.507866	0.044637	0	0.0238	0.010436	23.2948	92.9947
CR16 - 4 amphibole2	5.83516	8.94047	0.224531	0.000665	0.004513	0	0.006967	41.4364	97.2295
CR16 - 4 amphibole2	5.91628	9.19894	0.195418	0	0	0	0.00888	41.6233	97.6725
CR16 - 4 amphibole2	5.99968	9.02688	0.205412	0	0	0	0.001271	41.4852	97.3654
CR16 - 4 amphibole2	5.89524	8.40274	0.170715	0.008872	0	0	0.00698	41.1273	96.2037
CR16 - 4 amphibole2	5.60946	8.40785	0.233747	0	0.006715	0	0	41.7963	97.5731
CR16 - 4 amphibole2	5.84137	9.19774	0.22249	0.001989	0.002814	0	0.00761	41.5083	97.5103
CR16 - 4 amphibole2	5.86236	8.75878	0.18844	0	0.007147	0	0.008263	40.1917	94.4713
CR16 - 4 amphibole2	5.7519	8.66494	0.231979	0	0	0.008614	0	41.7775	97.7172
CR16 - 4 amphibole2	5.75626	8.39279	0.234047	0	0	0	0.005089	41.9846	97.9561
CR16 - 4 amphibole2	5.75779	8.64091	0.200793	0.00659	0.008679	0	0.009525	41.6693	97.4628
CR16 - 4 anorthite2	17.227	0.471968	0.001764	0	0	0	0.007049	46.0303	99.3519
CR16 - 4 anorthite2	15.3838	0.318147	0.012428	0	0.000711	0	0	46.631	99.3246
CR16 - 4 anorthite2	17.7149	0.480371	0	0	0	0.000599	0.001921	46.2706	100.083
CR16 - 4 anorthite2	16.2327	0.362617	0	0	0	0	0.001932	46.329	99.2914
CR16 - 4 anorthite2	16.7019	0.476382	0	0	0	0	0	46.3039	99.6819
CR16 - 4 anorthite2	16.7502	0.418285	0	0	0.014649	0	0.009671	46.5939	100.259
CR16 - 4 anorthite2	15.7712	0.376671	0	0	0	0	0	46.9416	100.197
CR16 - 4 anorthite2	16.16201	0.40212	-0.00228	0	0.006177	-2.7E-20	0.002407	46.82761	100.3131
CR16 - 4 diopside2	6.26943	8.83023	0.203755	0	0.004527	0.019739	0	41.9773	98.5082
CR16 - 4 diopside2	5.50971	8.32225	0.210442	0.001251	0	0	0.003181	42.1444	98.2103
CR16 - 4 diopside2	5.93629	8.63162	0.207111	0	0.002594	0	0.018407	41.7162	97.5907

CR16 - 4 diopside2	5.5164	8.56629	0.188601	0	0	0.013696	0.00381	41.7412	97.5508
CR16 - 4 diopside2	2.42137	6.58401	0.179821	0.018188	0.023604	0.019473	0	42.9562	100.321
CR16 - 4 diopside2	2.5665	6.84999	0.205404	0.011445	0	0.002264	0.005676	42.979	100.367
CR16 - 4 diopside2	5.65868	9.22784	0.253535	0.004542	0	0.015914	0	41.8195	98.2213
CR16 - 4 diopside2	5.06424	8.90861	0.263409	0.00195	0.005068	0	0.000637	41.7597	97.5823
CR16 - 4 diopside2	3.57495	7.10306	0.149552	0.058902	0.003481	0	0	42.6228	99.5906
CR16 - 4 diopside2	1.62475	5.98676	0.187474	0.053015	0	0	0.009479	43.2768	100.375
CR16 - 4 diopside2	3.54054	7.04541	0.140862	0.047563	0.000922	0	0	42.5019	99.8888
CR16 - 4 diopside2	1.70625	6.66442	0.211594	0.005172	0	0.010246	0	43.1156	100.36
CR16 - 4 diopside2	3.23303	6.68902	0.153168	0.047062	0	0	0.004406	42.6814	99.9615
CR16 - 4 olivine1	0.014582	17.0396	0.286479	0.00098	0.077156	0	0.003219	41.2802	100.763
CR16 - 4 olivine1	0.015664	17.1097	0.279197	0.012849	0.093349	0.03287	0.007726	41.0291	100.324
CR16 - 4 olivine1	0.011319	17.1753	0.31291	0	0.095878	0.003035	0	41.1236	100.516
CR16 - 4 olivine1	0.019307	17.0689	0.282686	0.003153	0.078702	0.014264	0.005158	41.0963	100.37
CR16 - 4 olivine1	0.008848	17.6489	0.415664	0	0.105253	0.044198	0	40.9178	100.406
CR16 - 4 olivine1	0.011727	17.6513	0.37456	0.019211	0.089829	0.052318	0.000644	40.943	100.452
CR16 - 4 olivine1	0.011217	17.3868	0.351361	0	0.111513	0.02729	0.001287	40.9481	100.293
CR16 - 4 olivine1	0.01082	16.9023	0.272101	0.011359	0.113499	0	0.005781	41.0318	100.136
CR16 - 4 diop/An mix	6.97159	6.35765	0.118749	0.019797	0	0	0.003213	40.6127	91.0741
CR16 - 4 diop/An mix	8.90481	6.06324	0.143175	0.023921	0	0	0.014147	45.054	100.192
CR16 - 4 diop/An mix	9.79534	5.8479	0.112566	0	0	0	0.001936	45.3441	100.11
CR16 - 4 diop/An mix	9.6413	5.55925	0.128815	0	0.021016	0	0.003211	45.0122	99.3327
CR16 - 4 diop/An mix	8.79063	6.86528	0.154033	0.005338	0	0	0	44.9167	99.6164
CR16 - 4 diop/An mix	8.95298	6.01291	0.126472	0.012919	0.003668	0.007513	0	45.512	100.662
CR16 - 4 diop/An mix	9.60212	5.39614	0.11951	0	0	0	0.010941	44.4994	97.9406
CR16 - 4 diop/An mix	10.7856	5.29567	0.090817	0	0	0	0.007111	45.637	100.23
CR16 - 4 diop/An mix	7.60301	4.13816	0.06766	0	0	0	0.004501	34.531	76.3522
CR16 - 4 diop/An mix	8.80853	6.34624	0.117138	0.001248	0	0	0.003864	44.6331	98.6661

CR16 - 4 diop/An mix	9.51566	6.34152	0.113497	0.003438	0	0	0.011592	45.0428	99.5764
CR16 - 4 diop/An mix	9.51202	5.83686	0.115654	0.0077	0	0.01266	0.003221	45.2237	99.8438
CR16 - 4 diop/An mix	8.91435	6.68388	0.147945	0.002937	0	0.005341	0.000643	44.6585	98.9628
CR16 - 4 diop/An mix	0.966169	0.606303	0.003352	0	0	0	0.001296	5.04496	11.4684
CR16 - 4 diop/An mix	8.4732	6.79934	0.141886	0.017339	0	0	0.008381	44.3193	98.259
CR16 - 4 diop/An mix	9.20652	6.92107	0.134063	0	0.006829	0.005985	0	44.756	99.4109
CR16 - 4 diop/An mix	8.49151	7.9529	0.149183	0.008275	0.002157	0	0.002575	44.3878	99.2927
CR16 - 4 diop/An mix	1.18589	0.594437	0.008824	0	0.009807	0	0.007155	5.2291	11.7374
CR16 - 4 diop/An mix	10.0759	5.69852	0.103256	0.004657	0	0	0	44.8948	99.0894
CR16 - 4 diop/An mix	10.9401	4.32772	0.085552	0	0	0.008961	0.003228	45.4602	99.668

SAMPLE	Cl	CaO	K2O	BaO	F	TiO2	P2O5	Na2O	SiO2	MgO
CR16 - 6 Titanomag1	0	0	0	0.06986	0.318911	6.8042	0	0	0.078827	3.85633
CR16 - 6 Titanomag1	0	0	0	0.087626	0.373746	6.76627	0.002779	0.007589	0.079169	3.98412
CR16 - 6 Titanomag1	0	0	0.006768	0.052873	0.311253	6.82341	0.000026	0.012088	0.085125	3.98296
CR16 - 6 Titanomag1	0	0.00218	0	0.048523	0.357036	6.72961	0.005503	0.000114	0.082258	3.84384
CR16 - 6 Titanomag1	0	0.001326	0	0.072904	0.352007	6.77973	0	0.037821	0.075768	3.9866
CR16 - 6 Titanomag1	0.004135	0.004175	0	0.071947	0.339158	6.74178	0.011344	0	0.061388	3.85944
CR16 - 6 Titanomag1	0	0.000781	0	0.078712	0.31378	6.66345	0	0.013076	0.079643	3.94027
CR16 - 6 Titanomag2	0	0.010271	0	0.086078	0.335677	8.69393	0.0027	0.020083	0.143489	4.2107
CR16 - 6 Titanomag2	0	0.004618	0	0.097627	0.310661	8.69084	0	0.006082	0.061782	4.10269
CR16 - 6 Titanomag2	0	0	0	0.098463	0.352992	8.71816	0	0.010612	0.085502	4.16753
CR16 - 6 Titanomag2	0	0.010222	0	0.080389	0.344995	8.75197	0	0.007528	0.090819	4.07204
CR16 - 6 Titanomag2	0	0.000246	0.001213	0.082365	0.320678	8.6625	0	0.010524	0.091649	4.18087
CR16 - 6 Titanomag2	0	0	0	0.095548	0.336045	8.71005	0	0.008982	0.097727	4.14207
CR16 - 6 Anorthite2	0	18.4773	0.013133	0	0.030893	0.00799	0.035767	1.22606	45.0662	0.064109
CR16 - 6 Anorthite2	0	0.20511	0	0	0.001512	0	0.00627	0.047893	0.53248	0

CR16 - 6 Anorthite2	0	0.201516	0	0	0	0	0.002815	0.039292	0.507175	0
CR16 - 6 Anorthite2	0	0.175992	0	0	0	0	0.001958	0.038854	0.49032	0
CR16 - 6 Anorthite2	0	0.198607	0	0	0	0	0.018858	0.058516	0.494265	0.004269
CR16 - 6 Anorthite2	0	0.197931	0	0	0.005695	0	0.016835	0.056349	0.492772	0
CR16 - 6 Anorthite2	0	18.524	0.015018	0	0.026504	0	0	1.24284	45.4433	0.088137
CR16 - 6 Amphibole1	0.026532	11.6721	0.378319	0.052875	0.187457	2.93053	0.025633	2.58735	41.8981	14.2281
CR16 - 6 Amphibole1	0.018091	11.7876	0.358729	0.036042	0.168546	2.87082	0.027216	2.50472	41.8474	14.358
CR16 - 6 Amphibole1	0.029123	11.8169	0.376762	0.027689	0.165722	2.86361	0.051272	2.51378	41.441	14.1635
CR16 - 6 Amphibole1	0.016255	11.775	0.388188	0.031066	0.201785	2.83752	0.027567	2.49281	42.0062	14.6679
CR16 - 6 Amphibole1	0.02223	11.7929	0.364875	0.038107	0.214146	2.87483	0.014288	2.41214	41.756	14.3349
CR16 - 6 Amphibole1	0.019386	11.6799	0.37518	0	0.213366	2.73595	0.025933	2.42999	42.025	14.3513
CR16 - 6 Amphibole1	0.027925	11.6144	0.376003	0.028351	0.238202	2.7543	0.014779	2.43476	42.1278	14.5599
CR16 - 6 Amphibole2	0.029927	11.6452	0.393455	0.024448	0.171621	2.79378	0.048466	2.52	42.4275	14.8381
CR16 - 6 Amphibole2	0.032472	11.5102	0.396611	0.016856	0.191294	2.48357	0.02584	2.32066	43.206	14.5512
CR16 - 6 Amphibole2	0.031085	11.6257	0.387589	0.00753	0.206788	2.42277	0.043821	2.34515	43.3975	14.8849

CR16 - 6 Amphibole2	0.030443	11.5458	0.36683	0.043299	0.196812	2.40726	0.05333	2.39463	43.1277	14.946
CR16 - 6 Amphibole2	0.023474	11.7821	0.38904	0	0.160422	2.77537	0.033799	2.48446	42.1586	14.6408
CR16 - 6 Amphibole2	0.026807	11.9134	0.39334	0.035229	0.201547	2.81029	0.038844	2.51924	42.275	14.7319
CR16 - 6 Amphibole2	0.016303	11.8288	0.390925	0.055028	0.152693	2.90272	0.029246	2.46534	42.3579	14.8902
CR16 - 6 Amphibole2	0.019499	11.7152	0.38215	0.053532	0.215127	2.85274	0.014789	2.44676	42.1985	14.7672
CR16 - 6 Anorthite1	0	18.196	0.022051	0	0.015009	0.006583	0	1.40859	45.5037	0.062263
CR16 - 6 Anorthite1	0.01293	17.935	0.029689	0	0.055818	0.00374	0.02006	1.50426	45.8872	0.104979
CR16 - 6 Anorthite1	0	18.0934	0.022851	0	0.032938	0.018707	0.023132	1.4127	45.3225	0.075951
CR16 - 6 Anorthite1	0	17.275	0.028143	0	0.011186	0.010543	0.00557	1.84508	46.5186	0.08873
CR16 - 6 Anorthite1	0	18.0763	0.022974	0	0.020988	0.015014	0.037852	1.46753	45.5547	0.08018
CR16 - 6 Anorthite1	0	17.9644	0.018806	0	0.031078	0.020732	0.011875	1.43161	45.6107	0.079159
CR16 - 6 Anorthite1	0	18.1006	0.030513	0	0.031708	0.014839	0.00524	1.43335	45.372	0.066136
CR16 - 6 Anorthite1	0	18.3447	0.021234	0	0.034472	0.012952	0.014827	1.28645	45.0944	0.084196
CR16 - 6 Anorthite1	0	17.3959	0.038548	0	0	0.016353	0.0136	1.75686	46.2503	0.103895
CR16 - 6 Anorthite1	0	18.3056	0.020913	0	0.013472	0.00046	0.01804	1.2751	45.4295	0.074848

CR16 - 6 Olivine1	0.001124	0.143377	0.000368	0	0.105772	0.009141	0.025767	0.015881	38.4259	39.2358
CR16 - 6 Olivine1	0.005424	0.158851	0.003813	0	0.123751	0.01702	0	0	38.6483	39.4801
CR16 - 6 Olivine1	0	0.139955	0	0	0.149644	0.012688	0.019113	0	38.7317	39.3679
CR16 - 6 Olivine1	0	0.138566	0	0	0.130958	0.006682	0.00774	0.006593	38.5788	39.3373
CR16 - 6 Olivine1	0	0.142789	0	0	0.121195	0.002843	0.025555	0.030577	38.8164	39.1023
CR16 - 6 Olivine1	0	0.127513	0	0	0.128888	0	0.010786	0.007154	38.6483	39.2307
CR16 - 6 Olivine2	0	0.146533	0.00041	0	0.112889	0.006274	0.018667	0.00896	39.3016	41.2068
CR16 - 6 Olivine2	0.004567	0.155791	0	0	0.107467	0.006429	0.028425	0.013356	38.9382	40.7762
CR16 - 6 Olivine2	0.004519	0.169387	0	0	0.118274	0.000211	0.01683	0.007058	38.8739	40.9214
CR16 - 6 Olivine2	0.00128	0.133692	0.005807	0	0.123031	0	0.018443	0.007109	38.7685	40.8505
CR16 - 6 Olivine2	0.001406	0.144551	0.001211	0	0.101049	0	0.016958	0.006106	39.0513	41.069
CR16 - 6 Olivine2	0.008865	0.163261	0.002279	0	0.111775	0.016213	0.063074	0.015276	39.0492	41.2818
CR16 - 6 Olivine2	0.001277	0.173457	0	0	0.145855	0.012357	0.021698	0.00239	38.8366	40.9355
CR16 - 6 Olivine2	0	0.167714	0	0	0.117379	0	0.001857	0.004264	39.0628	40.9846
CR16 - 5 Anorthite2	0.000699	15.4733	0.031001	0	0.006691	0.006744	0.037422	1.4737	26.8644	0.023934

CR16 - 5 Anorthite2	0.000851	15.114	0.033756	0	0.039064	0.003321	0	1.71212	27.1092	0.028584
CR16 - 5 Anorthite2	0.007014	15.3405	0.036744	0	0.027079	0	0.023	1.55327	26.7244	0.017364
CR16 - 5 Anorthite2	0	13.8432	0.06232	0	0.03207	0.005829	0.009289	2.29935	27.5586	0.020775
CR16 - 5 Anorthite2	0.002656	12.3116	0.175202	0	0.019976	0.034689	0.000984	4.72731	52.5633	0.014071
CR16 - 5 Anorthite2	0	10.4258	0.131283	0	0	0.010764	0.011099	4.01137	29.254	0.033805
CR16 - 5 Anorthite2	0	14.581	0.113336	0	0.042629	0.015235	0.034633	3.3922	49.6804	0.051256
CR16 - 5 Anorthite2	0.000133	16.3291	0.062091	0	0.029209	0.024287	0.019217	2.52945	47.3126	0.04959
CR16 - 5 Titanomag2	0	0	0	0.077505	0.358059	8.83406	0.002854	0.015281	0.048878	2.31936
CR16 - 5 Titanomag2	0	0	0	0.08648	0.361192	8.81952	0	0.003793	0.060456	2.26848
CR16 - 5 Titanomag2	0.002581	0	0	0.106032	0.362017	8.82027	0	0.026114	0.043401	2.38354
CR16 - 5 Titanomag2	0	0	0	0.071158	0.310162	8.89407	0.018924	0	0.047471	2.27896
CR16 - 5 Titanomag2	0.022074	0.005962	0.002804	0.065245	0.319278	8.9524	0.005911	0.058344	0.040226	2.35481
CR16 - 5 Olivine1	0.00169	0.034229	0	0	0.16317	0.025679	0.016166	0	38.2382	36.9705
CR16 - 5 Olivine1	0.00188	0.056665	0.002004	0	0.16262	0.021681	0	0.029485	38.016	36.3706
CR16 - 5 Olivine1	0	0.043528	0	0	0.180807	0.021114	0	0.00209	38.1581	36.8114

CR16 - 5 Olivine1	0	0.051678	0	0	0.168802	0.007904	0.004467	0.008714	38.1976	36.7783
CR16 - 5 Olivine1	0.014303	0.048905	0.003746	0	0.147996	0.016696	0.00615	0.01158	37.9814	36.9095
CR16 - 5 Olivine1	0.009614	0.028562	0	0	0.156853	0.019205	0.02428	0.019471	38.0843	36.4732
CR16 - 5 Olivine1	0.011187	0.039821	0.007207	0	0.16976	0.004795	0.011139	0.018492	38.0419	36.9438
CR16 - 5 Olivine1	0.040545	0.053969	0.002001	0	0.129896	0.007905	0.017796	0.040262	37.8475	36.6525
CR16 - 5 Olivine1	0.014839	0.070378	0	0	0.177174	0.010863	0.002851	0.032002	37.7032	36.3352
CR16 - 5 Olivine2	0	0.918908	0.001648	0	0.146058	0.107816	0	0.035817	53.3543	26.2517
CR16 - 5 Olivine2	0	1.2238	0.001305	0	0.144554	0.12887	0	0.027683	53.1947	27.3355
CR16 - 5 Olivine2	0.001945	1.30962	0.010157	0	0.154378	0.09151	0	0.005359	54.2736	28.0214
CR16 - 5 Olivine2	0.005096	1.25025	0.011431	0	0.122668	0.090738	0	0.024682	54.1197	27.8391
CR16 - 5 Olivine2	0.007478	0.942713	0	0	0.135451	0.093572	0	0.017404	53.6149	25.9458
CR16 - 5 Olivine2	0.01962	1.20033	0.005309	0	0.148527	0.139631	0.020691	0.044843	52.9544	26.8418
CR16 - 5 Olivine2	0	1.22715	0	0	0.128275	0.097361	0	0.019488	54.1325	27.631
CR16 - 5 Olivine2	0	1.14482	0	0	0.146674	0.100695	0.006839	0.016912	53.7146	26.8158
CR16 - 5 Olivine2	0	1.3161	0.001006	0	0.121604	0.101591	0.009212	0.021218	54.226	27.9453

CR16 - 5 Olivine2	0.008361	0.886105	0.000261	0	0.134527	0.115438	0	0.021979	52.6958	25.3376
CR16 - 5 Olivine2	0.001054	1.19013	0.002921	0	0.162378	0.14845	0	0.028125	52.3606	25.9281
CR16 - 5 Olivine2	0.004736	0.918295	0	0	0.136473	0.092772	0.006324	0.010255	53.7045	25.7154
CR16 - 5 Amphibole2	0.044319	11.5658	0.348847	0	0.209363	1.87626	0.03582	2.18215	43.2745	14.7143
CR16 - 5 Amphibole2	0.080176	11.4435	0.316466	0	0.18548	1.85162	0.021233	2.17572	43.9227	14.7937
CR16 - 5 Amphibole2	0.038998	11.5376	0.325815	0.036266	0.203166	1.83306	0.030966	2.19237	43.8553	15.0637
CR16 - 5 Amphibole2	0.053856	11.3936	0.30515	0.001215	0.197685	1.86818	0.014916	2.23496	43.9186	14.9902
CR16 - 5 Amphibole2	0.027004	11.4288	0.298063	0.015698	0.177827	1.71848	0.03436	2.27729	42.3638	15.0617
CR16 - 5 Amphibole2	0.05418	11.4571	0.318873	0.016137	0.190118	2.04498	0.027602	2.24462	43.3149	14.7035
CR16 - 5 Amphibole2	0.038464	11.3437	0.326925	0	0.199161	1.78778	0.021275	2.31101	42.3885	14.5612
CR16 - 5 Amphibole2	0.091096	11.1939	0.314868	0.012886	0.183959	1.78351	0.013117	2.15783	43.818	14.7593
CR16 - 5 Titanomag1	0.000559	0	0.001543	0.039816	0.363168	5.32027	0.008529	0.072891	0.057314	2.16378
CR16 - 5 Titanomag1	0.004508	0	0	0.04977	0.318735	5.24813	0	0.01181	0.082847	2.27005
CR16 - 5 Titanomag1	0	0	0	0.049951	0.369523	5.25869	0.003975	0.030977	0.04878	2.23084
CR16 - 5 Titanomag1	0.006594	0	0	0.010521	0.369902	5.33032	0	0.016587	0.050218	2.24226

CR16 - 5 Titanomag1	0	0	0	0.060733	0.363151	5.2741	0.004289	0.030116	0.069513	2.16391
CR16 - 5 Titanomag1	0	0	0	0.02159	0.342837	5.2616	0	0.010445	0.076159	2.21921
CR16 - 5 Titanomag1	0	0	0	0.041255	0.361438	5.21607	0.001215	0.026675	0.066141	2.27036
CR16 - 5 Titanomag1	0	0	0	0.064702	0.327591	5.27972	0	0.018794	0.057007	2.16635
CR16 - 5 Titanomag1	0	0	0	0.038622	0.351423	5.25864	0	0.007199	0.048711	2.16557
CR16 - 5 plag2	0.001659	6.95443	0.688565	0.010153	0.018482	0.002784	0	7.15035	60.1111	0.040272
CR16 - 5 plag2	0	12.1345	0.237672	0	0.022234	0.015651	0.025669	4.57791	53.0133	0.03466
CR16 - 5 plag2	0	10.2	0.357756	0.020468	0.007633	0.018428	0.046312	5.60944	55.4757	0.044398
CR16 - 5 plag2	0	12.2474	0.254816	0	0.010559	0	0.010775	4.60982	52.7848	0.040287
CR16 - 5 plag2	0.001195	11.3289	0.291749	0	0.007949	0.003563	0.024282	4.98792	53.8416	0.031445
CR16 - 5 plag2	0	9.22694	0.433154	0.02293	0.010614	0.010272	0.00216	6.11369	57.1023	0.028627
CR16 - 5 plag2	0	8.57256	0.490341	0.052139	0.040616	0.010355	0	6.29638	57.5177	0.014589
CR16 - 5 plag2	0	9.5034	0.421848	0	0.014105	0.007373	0.015319	5.9935	56.38	0.03945
CR16 - 5 plag2	0.018134	8.43866	0.610468	0.004005	0.040486	0.034317	0.015539	6.27287	58.1967	0.06256
CR16 - 5 plag2	0.003324	9.38071	0.432641	0	0.032188	0.019147	0.01355	6.09156	56.4375	0.039322

CR16 - 5 Anorthite1	0	10.849	0.15184	0.001744	0.035204	0.018085	0.009744	5.39651	54.414	0.037349
CR16 - 5 Anorthite1	0.010462	12.4614	0.112323	0	0.035636	0.010671	0.010544	4.55353	51.9161	0.068442
CR16 - 5 Anorthite1	0.009992	13.2373	0.096922	0	0.028708	0.0094	0.013876	4.20141	51.2845	0.059779
CR16 - 5 Anorthite1	0	12.9311	0.097069	0	0.028168	0.012123	0.023716	4.07445	51.8311	0.054265
CR16 - 5 Anorthite1	0.00151	14.7945	0.067846	0	0.03179	0.002454	0.009925	3.249	48.9281	0.047136
CR16 - 5 Anorthite1	0.021496	17.1859	0.038943	0	0.027298	0.010742	0.016922	1.77049	45.8177	0.042695
CR16 - 5 Anorthite1	0.005741	16.5818	0.032903	0	0.021415	0.006078	0.013962	2.16285	47.0249	0.054995
CR16 - 5 Anorthite1	0	17.92	0.028249	0	0.009041	0.001556	0.029513	1.4754	45.2908	0.070116
CR16 - 5 Anorthite1	0.000965	14.2066	0.068537	0	0.049929	0.011227	0.018098	3.54807	49.7104	0.056301
CR16 - 5 Anorthite1	0	14.3061	0.078139	0	0.010072	0.009501	0.009961	3.54868	49.7564	0.058511
CR16 - 5 Amphibole1	0.040404	11.6112	0.395519	0.025658	0.176215	2.37306	0.03877	2.34686	42.6863	14.8506
CR16 - 5 Amphibole1	0.049128	11.8205	0.393864	0.014005	0.190282	2.82192	0.017578	2.55662	41.1743	14.3214
CR16 - 5 Amphibole1	0.043494	11.7297	0.390756	0.013137	0.193276	2.57695	0.03545	2.50918	42.3115	14.493
CR16 - 5 Amphibole1	0.049989	11.5413	0.385832	0.02073	0.179699	2.40867	0.029225	2.39937	43.174	14.7797
CR16 - 5 Amphibole1	0.047873	11.7329	0.392508	0.054378	0.182971	2.69899	0.029168	2.35646	41.9929	14.513

CR16 - 5 Amphibole1	0.030326	11.611	0.391293	0.044155	0.140934	2.56449	0.035438	2.45325	41.0588	14.3634
CR16 - 5 Amphibole1	0.074842	11.6699	0.344396	0.0098	0.172575	2.47788	0.009907	2.48112	42.6392	14.7291
CR16 - 5 Amphibole1	0.033845	11.6824	0.384211	0.03173	0.200025	2.42475	0.054526	2.36647	43.1085	14.6034
CR16 - 5 Amphibole1	0.020404	11.5965	0.389604	0.015554	0.199476	2.48197	0.019472	2.40273	42.8541	14.9439
CR16 - 5 Plag1 (top to bottom)	0	10.9824	0.171772	0	0.017712	0.027632	0.004648	5.3775	54.5061	0.041308
CR16 - 5 Plag1 (top to bottom)	0	14.3335	0.097665	0	0.04341	0.018949	0.013335	3.42635	50.0214	0.033342
CR16 - 5 Plag1 (top to bottom)	0.001288	15.7457	0.080453	0	0.038499	0.027547	0.035736	2.92233	48.4458	0.051229
CR16 - 5 Plag1 (top to bottom)	0.004926	15.3812	0.079237	0	0.011665	0.008653	0.022504	2.93102	48.9057	0.045492
CR16 - 5 Plag1 (top to bottom)	0.012141	15.1439	0.086963	0	0.012537	0.02674	0.031098	3.12826	49.459	0.04008
CR16 - 5 Plag1 (top to bottom)	0.014319	14.6822	0.104955	0	0	0.026505	0.032814	3.3948	49.4469	0.031605
CR16 - 5 Plag1 (top to bottom)	0.001268	13.2049	0.171672	0.006611	0	0.029295	0.028457	3.95537	51.6905	0.049891
CR16 - 5 Plag1 (top to bottom)	0	13.0874	0.112355	0	0.031655	0.026032	0.039884	4.23581	51.5396	0.052648
CR16 - 5 Plag1 (top to bottom)	0.009708	11.596	0.174873	0	0.02582	0.00877	0.014283	5.10987	53.4313	0.046111
CR16 - 4 diopside1	0	20.5694	0	0	0.049788	0.387202	0.002715	0.290767	52.1297	16.3536
CR16 - 4 diopside1	0	20.4018	0.002857	0	0.060475	0.386916	0.012278	0.30539	52.3674	16.7344

CR16 - 4 diopside1	0	19.9514	0	0	0.042061	0.356217	0.03159	0.337717	52.6231	16.7805
CR16 - 4 diopside1	0	20.0219	0.001168	0	0.086402	0.338047	0.021884	0.3068	52.3872	16.629
CR16 - 4 diopside1	0.015368	21.3025	0.000097	0	0.064921	0.660164	0.051563	0.397778	50.7457	15.0718
CR16 - 4 diopside1	0.002751	21.5616	0	0	0.046193	0.656845	0.016378	0.336615	50.8438	15.0414
CR16 - 4 diopside1	0.002798	21.7809	0.003891	0	0.08612	0.65882	0.038829	0.367297	51.1234	14.8469
CR16 - 4 diopside1	0	21.043	0	0	0.072039	0.6249	0.010055	0.337858	51.1824	15.2046
CR16 - 4 diopside1	0	20.8359	0	0	0.04388	0.65354	0.029523	0.36726	51.252	15.3354
CR16 - 4 amphibole1	0.019694	11.6745	0.351156	0.034909	0.195381	2.92944	0.040106	2.5018	42.5186	14.4615
CR16 - 4 amphibole1	0.017537	11.7565	0.374804	0.019206	0.203399	2.91678	0.030393	2.48643	42.2398	14.3954
CR16 - 4 amphibole1	0.027493	11.7364	0.366993	0.012996	0.18568	2.89868	0.022315	2.56291	42.2362	14.4281
CR16 - 4 amphibole1	0.018537	11.601	0.368053	0.011196	0.200026	2.92241	0.023906	2.5048	42.4332	14.368
CR16 - 4 amphibole1	0.024276	11.6221	0.350908	0.029283	0.199175	2.869	0.041502	2.51236	42.3769	14.2834
CR16 - 4 amphibole1	0.010676	11.6805	0.35246	0.04308	0.199827	2.88859	0.049616	2.5072	42.3764	14.2646
CR16 - 4 amphibole1	0.022836	11.7098	0.348218	0.045293	0.217298	2.87963	0.04492	2.54027	42.5229	14.3231
CR16 - 4 amphibole1	0.028193	11.6704	0.360576	0.039473	0.189039	2.99465	0.027342	2.49885	42.1878	14.3276

CR16 - 4 amphibole1	0.021873	11.8176	0.354425	0.013679	0.206021	2.96934	0.041814	2.5209	42.2066	14.4521
CR16 - 4 olivine2	0.000397	0.172273	0	0.001381	0.094917	0	0.007845	0	39.2051	42.7633
CR16 - 4 olivine2	0	0.17972	0	0	0.11867	0.016774	0.006015	0	39.2071	42.4821
CR16 - 4 olivine2	0.000215	0.211377	0	0	0.088669	0.001189	0.009255	0.007688	39.2762	42.161
CR16 - 4 olivine2	0.002833	0.15914	0.002673	0	0.101354	0.005877	0	0	39.1163	42.1993
CR16 - 4 olivine2	0	0.171043	0.00067	0	0.152318	0.000082	0.0207	0.018472	39.2442	42.3986
CR16 - 4 olivine2	0	0.178013	0	0	0.079033	0.017234	0.026071	0.005969	39.4914	43.0632
CR16 - 4 olivine2	0	0.160279	0	0	0.099631	0	0.006303	0	39.4909	42.7004
CR16 - 4 olivine2	0	0.178555	0	0	0.11348	0.007732	0.002809	0	39.4269	42.6833
CR16 - 4 olivine2	0	0.171823	0	0	0.126809	0	0	0	39.5631	42.7675
CR16 - 4 anorthite1	0.004652	0.566605	0	0.012514	0.023112	0.018297	0.019289	0.150962	0.715528	0.011536
CR16 - 4 anorthite1	0	0.55313	0	0.006586	0.019387	0.013255	0	0.201533	0.737029	0.026368
CR16 - 4 anorthite1	0	0.551574	0.007226	0.019368	0	0.01466	0.003363	0.112448	0.702433	0.023942
CR16 - 4 anorthite1	0	17.9035	0.020677	0	0.041666	0.013799	0.042943	1.52006	45.9527	0.062118
CR16 - 4 anorthite1	0.000249	0.601643	0	0.027374	0.031739	0.004468	0.030002	0.106305	0.740844	0.021673

CR16 - 4 anorthite1	0	0.604236	0.007103	0	0.018054	0.021663	0	0.143462	0.780926	0.023581
CR16 - 4 anorthite1	0	0.597709	0	0	0	0.028393	0.026994	0.092106	0.697476	0.018905
CR16 - 4 anorthite1	0	0.578956	0	0.008725	0	0.022885	0.011999	0.17253	0.762778	0.008676
CR16 - 4 anorthite1	0	0.58175	0	0.012955	0.018667	0.009438	0.003951	0.122915	0.775475	0.018867
CR16 - 4 anorthite1	0	0.56746	0.002231	0.003688	0.006985	0.014281	0.02571	0.144956	0.667259	0.017214
CR16 - 4 anorthite1	0	0.585912	0.000712	0.038413	0.00245	0.015136	0.021879	0.174931	0.711223	0.008207
CR16 - 4 titanomag1	0	0	0	0.088765	0.342481	7.02874	0	0	0.065872	2.2265
CR16 - 4 titanomag1	0	0	0	0.083397	0.371644	7.28159	0	0.000532	0.074179	2.41309
CR16 - 4 titanomag1	0	0	0	0.060969	0.345814	7.21692	0	0	0.086882	2.247
CR16 - 4 titanomag1	0	0.00967	0	0.084489	0.332125	7.04247	0.01176	0	0.086933	2.18479
CR16 - 4 titanomag1	0	0.002386	0	0.060597	0.377735	6.96211	0	0	0.059597	2.23898
CR16 - 4 titanomag1	0	0.012195	0	0.073475	0.346602	6.97717	0.00015	0	0.060121	2.20579
CR16 - 4 titanomag1	0	0.008026	0.002234	0.050221	0.37108	7.28223	0.007702	0.033225	0.061966	2.28228
CR16 - 4 titanomag1	0.001323	0.003868	0	0.052894	0.336317	7.37527	0	0.03053	0.070935	2.29167
CR16 - 4 amphibole2	0.036522	11.3802	0.302294	0.02765	0.196786	2.26926	0.02893	2.41109	43.0639	14.6715

CR16 - 4 amphibole2	0.042349	11.4425	0.30876	0.018023	0.140885	2.40481	0.03377	2.40898	43.3092	14.2756
CR16 - 4 amphibole2	0.036226	11.2044	0.324938	0.010463	0.181537	2.4487	0.074282	2.32719	42.6454	14.8944
CR16 - 4 amphibole2	0.036853	11.3662	0.309655	0	0.259353	2.36339	0.079189	2.33031	42.7262	14.5327
CR16 - 4 amphibole2	0.032529	11.0634	0.260681	0.038763	0.201508	2.30265	0.0654	2.47546	43.8236	15.583
CR16 - 4 amphibole2	0.039149	11.4007	0.300918	0.042944	0.187352	2.41524	0.043373	2.39179	43.1697	14.3363
CR16 - 4 amphibole2	0.051027	11.0312	0.326867	0.034097	0.215905	2.38146	0.050138	2.36858	41.3649	14.0291
CR16 - 4 amphibole2	0.030316	11.1745	0.276493	0	0.24836	2.22284	0.07333	2.49231	43.7175	15.1558
CR16 - 4 amphibole2	0.040364	11.1566	0.256635	0.006774	0.232846	2.22358	0.068478	2.42139	43.9436	15.6173
CR16 - 4 amphibole2	0.03426	11.4933	0.298803	0.002562	0.214706	2.02957	0.040646	2.30235	43.6064	15.1407
CR16 - 4 anorthite2	0.000941	16.2364	0.043955	0	0.011147	0	0.01883	2.32065	47.4805	0.062182
CR16 - 4 anorthite2	0	12.064	0.100855	0	0.028594	0.005531	0.007448	4.72419	52.8581	0.042337
CR16 - 4 anorthite2	0	16.9031	0.032382	0	0.014445	0.007458	0.020273	2.05145	46.9011	0.057226
CR16 - 4 anorthite2	0	14.0343	0.07451	0	0.022188	0.01532	0.023086	3.60976	50.2993	0.07028
CR16 - 4 anorthite2	0.001715	15.2126	0.052225	0	0.01882	0.024269	0.009454	3.03652	49.042	0.113516
CR16 - 4 anorthite2	0.066135	15.0614	0.062375	0	0	0.028238	0.021264	3.18803	49.4997	0.1021

CR16 - 4 anorthite2	0	12.638	0.098654	0	0.008402	0.011227	0.020419	4.57124	52.5085	0.056612
CR16 - 4 anorthite2	0.028565	13.66556	0.081705	0	0.006078	0.02685	0.020336	4.023766	51.29961	0.094766
CR16 - 4 diopside2	0.094905	11.2876	0.299431	0.046314	0.204336	2.43218	0.077708	2.63153	43.0225	14.9122
CR16 - 4 diopside2	0.025088	11.0884	0.274971	0.02173	0.247151	2.32805	0.099189	2.40356	44.4297	15.894
CR16 - 4 diopside2	0.037915	11.3129	0.312812	0.031122	0.228669	2.23245	0.05026	2.37574	43.3856	14.9854
CR16 - 4 diopside2	0.063273	11.1471	0.287939	0.060757	0.201832	2.26564	0.058428	2.36673	43.9172	15.4681
CR16 - 4 diopside2	0	21.386	0	0	0.056284	0.737482	0.013021	0.327872	49.9535	14.4885
CR16 - 4 diopside2	0	20.8769	0	0	0.052247	0.805384	0.02594	0.33796	49.7822	14.5254
CR16 - 4 diopside2	0.05574	11.4681	0.285853	0.024723	0.182999	2.36893	0.066244	2.4089	43.7444	14.698
CR16 - 4 diopside2	0.043283	11.4268	0.271922	0	0.15792	2.05134	0.039112	2.1466	44.8004	15.2643
CR16 - 4 diopside2	0.016558	19.0371	0.088651	0.012604	0.081526	1.40689	0.07268	0.767112	47.9445	13.9864
CR16 - 4 diopside2	0	21.0644	0.012292	0	0.079782	0.503328	0.052092	0.314076	51.6906	15.5435
CR16 - 4 diopside2	0	21.3207	0	0	0.076547	1.41578	0.017154	0.359688	47.3837	13.3089
CR16 - 4 diopside2	0	20.6025	0	0.01461	0.06325	0.56935	0.016796	0.247008	51.1911	15.5638
CR16 - 4 diopside2	0.002574	21.2556	0	0	0.086295	1.15723	0.02088	0.324476	48.1719	13.9509

CR16 - 4 olivine1	0	0.147998	0	0	0.12378	0.004977	0	0	38.6741	39.3852
CR16 - 4 olivine1	0.000417	0.146112	0	0	0.131791	0	0.004149	0.017568	38.3273	39.0969
CR16 - 4 olivine1	0.003487	0.133309	0	0	0.096285	0	0.026923	0.003432	38.4496	39.1554
CR16 - 4 olivine1	0	0.137214	0	0	0.145871	0.005326	0.019072	0.000097	38.561	39.0053
CR16 - 4 olivine1	0	0.130778	0	0.001086	0.100396	0	0	0	38.3305	38.3955
CR16 - 4 olivine1	0	0.138373	0	0	0.097509	0	0.010387	0	38.3005	38.4818
CR16 - 4 olivine1	0	0.151349	0.004299	0	0.135215	0	0.02525	0.004643	38.4162	38.534
CR16 - 4 olivine1	0	0.143945	0	0	0.117647	0	0.00736	0	38.4615	39.1133
CR16 - 4 diop/An mix	0.063275	9.37817	0.526927	0	0.157584	0.935291	0.144383	2.31193	47.8439	8.17056
CR16 - 4 diop/An mix	0.023727	10.7739	0.36985	0	0.076098	0.820233	0.158069	2.64046	52.2857	8.16332
CR16 - 4 diop/An mix	0.074447	9.43174	0.710894	0.015015	0.073755	0.998265	0.228036	3.51107	53.811	5.07374
CR16 - 4 diop/An mix	0.044086	9.52846	0.703284	0.037288	0.074922	0.930165	0.195688	3.67033	53.6105	4.96789
CR16 - 4 diop/An mix	0.076062	8.20791	1.00097	0.009127	0.069827	1.15654	0.289394	3.711	54.4812	4.96578
CR16 - 4 diop/An mix	0.052331	9.28842	0.950341	0.058134	0.08166	1.20119	0.260451	3.54991	54.9602	5.41147
CR16 - 4 diop/An mix	0.073706	8.93197	0.916867	0	0.110956	1.08585	0.282946	3.90322	53.7005	3.66784

CR16 - 4 diop/An mix	0.061639	8.69564	0.727481	0.019333	0.05298	0.706044	0.186468	4.00584	53.5317	4.91533
CR16 - 4 diop/An mix	0.147715	7.45074	0.56965	0	0.224896	0.719767	0.178056	2.98648	41.251	3.0358
CR16 - 4 diop/An mix	0.044716	8.17353	1.03595	0.016539	0.064835	1.21537	0.2503	3.82396	54.319	4.75121
CR16 - 4 diop/An mix	0.087379	8.58512	0.960636	0.054839	0.088117	1.21212	0.273082	3.90891	54.4557	3.63199
CR16 - 4 diop/An mix	0.068343	9.27839	0.896172	0.042442	0.069681	1.0671	0.230829	3.68859	54.3942	4.44174
CR16 - 4 diop/An mix	0.084389	8.49377	0.950419	0.010453	0.074541	1.16898	0.283881	3.52084	54.0626	4.667
CR16 - 4 diop/An mix	0	0.461278	0.075936	0.595461	0.042609	0.076935	0.096913	0.518723	5.96727	1.02018
CR16 - 4 diop/An mix	0.081442	8.3581	1.01213	0.025409	0.073969	1.25823	0.284648	3.43989	54.1573	4.58115
CR16 - 4 diop/An mix	0.059107	8.01835	0.776151	0.034585	0.098569	0.906159	0.217728	3.61516	53.1014	6.09493
CR16 - 4 diop/An mix	0.081105	7.61531	0.772213	0.000991	0.052936	0.886444	0.256333	3.32041	52.3474	7.46963
CR16 - 4 diop/An mix	0	0.383696	0.054035	0.338411	0.058087	0.064911	0.064974	0.762001	5.97482	0.989285
CR16 - 4 diop/An mix	0.071402	9.63197	0.715328	0.012194	0.070497	0.937821	0.19444	3.67181	53.3003	3.97422
CR16 - 4 diop/An mix	0.026785	10.6945	0.4829	0	0.064603	0.68479	0.141742	3.66522	52.9687	4.57041

SAMPLE	Al2O3	FeO	MnO	Cr2O3	NiO	ZnO	SO3	O	TOTAL
CR16 - 6 Titanomag1	5.45121	76.3496	0.294036	0.4459	0.036904	0.036114	0.005832	0.000002	93.7478
CR16 - 6 Titanomag1	5.44619	75.9404	0.30468	0.421402	0.070242	0	0.021839	-0.00001	93.506
CR16 - 6 Titanomag1	5.60587	76.0044	0.297307	0.401599	0.03482	0	0.043735	0.000002	93.6622
CR16 - 6 Titanomag1	5.52019	76.2812	0.331156	0.414568	0.000746	0.05118	0	0.000002	93.6681
CR16 - 6 Titanomag1	5.38666	75.5428	0.328286	0.410505	0.035398	0	0.010174	0	93.0199
CR16 - 6 Titanomag1	5.47647	75.834	0.287994	0.379561	0.04334	0	0.020333	0	93.135
CR16 - 6 Titanomag1	5.51424	75.406	0.29027	0.406792	0	0	0.011629	-0.00001	92.7187
CR16 - 6 Titanomag2	4.85506	74.53	0.33989	0.031911	0	0.008807	0.017408	0	93.286
CR16 - 6 Titanomag2	5.05605	75.2455	0.313315	0.01795	0	0.049761	0	0	93.9569
CR16 - 6 Titanomag2	4.86203	75.4326	0.32725	0.0206	0	0.028713	0	0	94.1044
CR16 - 6 Titanomag2	4.92698	75.3191	0.347694	0.020369	0	0.023558	0.008725	0.000004	94.0044
CR16 - 6 Titanomag2	4.87359	75.3009	0.317701	0.028958	0	0.037074	0.018921	0	93.9272
CR16 - 6 Titanomag2	4.92225	75.324	0.361435	0.035648	0	0.01533	0.016002	0.000004	94.0651
CR16 - 6 Anorthite2	34.5529	0.55746	0.009081	0	0.008282	0.013872	0	0	100.063
CR16 - 6 Anorthite2	0.665546	0.087439	0	0	0	0	0.001591	0	1.54784
CR16 - 6 Anorthite2	0.626517	0.084091	0	0	0	0	0	0	1.46141
CR16 - 6 Anorthite2	0.596359	0.074086	0	0	0	0	0	0	1.37757
CR16 - 6 Anorthite2	0.602686	0.091926	0	0	0	0	0	0	1.46913
CR16 - 6 Anorthite2	0.611918	0.037563	0	0	0	0	0.019157	0	1.43822
CR16 - 6 Anorthite2	34.4406	0.593072	0	0	0.038862	0	0	0	100.412
CR16 - 6 Amphibole1	12.0098	11.6444	0.190742	0	0	0	0.015838	-0.00001	97.8477
CR16 - 6 Amphibole1	12.13	11.3747	0.121196	0	0.019227	0	0.003164	0	97.6255
CR16 - 6 Amphibole1	12.2739	11.46	0.131379	0	0	0	0.053786	0.000004	97.3684
CR16 - 6 Amphibole1	11.903	11.0209	0.130749	0	0	0	0.015855	0	97.5147
CR16 - 6 Amphibole1	12.0451	11.2304	0.156101	0.010787	0	0	0.017376	0	97.2841
CR16 - 6 Amphibole1	12.1166	11.4847	0.175053	0	0.014434	0.002384	0	0.000004	97.6492
CR16 - 6 Amphibole1	12.0687	11.1565	0.165279	0	0	0	0.001586	0	97.5685

CR16 - 6 Amphibole2	11.6864	10.951	0.190786	0.023772	0	0	0.019009	0	97.7634
CR16 - 6 Amphibole2	10.8267	11.8765	0.246702	0	0	0	0	-0.00001	97.6847
CR16 - 6 Amphibole2	10.9327	11.2783	0.223489	0.007329	0	0.006913	0	0	97.8015
CR16 - 6 Amphibole2	10.9626	11.3169	0.220096	0	0	0	0.028536	0	97.6402
CR16 - 6 Amphibole2	11.5656	10.9348	0.154156	0.015791	0	0	0.006327	0	97.1246
CR16 - 6 Amphibole2	11.7449	11.071	0.169802	0	0.002153	0	0.031721	0	97.9651
CR16 - 6 Amphibole2	11.7496	10.8633	0.171818	0.005312	0	0	0.01269	0	97.8918
CR16 - 6 Amphibole2	11.7127	10.7727	0.136659	0	0	0	0.022204	0	97.3098
CR16 - 6 Anorthite1	34.2379	0.553334	0	0	0	0.01801	0	0	100.023
CR16 - 6 Anorthite1	34.294	0.6199	0.017538	0	0	0	0	0	100.485
CR16 - 6 Anorthite1	34.0387	0.544274	0	0	0	0	0.014376	0	99.5995
CR16 - 6 Anorthite1	33.3665	0.510112	0.006517	0	0	0	0.001598	0.000008	99.6675
CR16 - 6 Anorthite1	34.3679	0.519661	0	0.002697	0	0	0	0.000004	100.166
CR16 - 6 Anorthite1	34.1854	0.592584	0	0.000362	0	0	0	0	99.9467
CR16 - 6 Anorthite1	34.2251	0.570507	0.008637	0	0	0	0.027134	0.000004	99.8858
CR16 - 6 Anorthite1	34.3713	0.555584	0.001791	0.020285	0	0	0.007971	0.000008	99.8501
CR16 - 6 Anorthite1	33.6756	0.569219	0.010987	0	0	0	0.001599	0.000004	99.8328
CR16 - 6 Anorthite1	34.5142	0.591825	0.0148	0	0	0	0	0	100.259
CR16 - 6 Olivine1	0.022207	21.9172	0.401543	0	0.064399	0	0	0	100.369
CR16 - 6 Olivine1	0.03788	21.8225	0.385022	0	0.024033	0.039959	0.008054	0	100.755
CR16 - 6 Olivine1	0.01524	22.0549	0.42125	0	0.062395	0.001946	0.006441	-0.00001	100.983
CR16 - 6 Olivine1	0.042111	21.7848	0.347625	0.019626	0.041985	0.011306	0	0	100.454
CR16 - 6 Olivine1	0.015433	22.1947	0.371883	0	0.048223	0.015936	0.016084	0.000004	100.904
CR16 - 6 Olivine1	0.021709	21.66	0.361305	0	0.083789	0.014203	0	0.000008	100.294
CR16 - 6 Olivine2	0.040269	19.4159	0.342613	0.007089	0.079998	0	0	0.000008	100.688
CR16 - 6 Olivine2	0.013965	19.2886	0.283984	0.029863	0.084451	0.015237	0	0	99.7465
CR16 - 6 Olivine2	0.037938	19.4919	0.315926	0	0.10272	0.007647	0	0.000004	100.068
CR16 - 6 Olivine2	0.028544	19.7045	0.294708	0	0.048367	0.021112	0	0.000004	100.006

CR16 - 6 Olivine2	0.02193	19.271	0.298041	0.019576	0.059449	0	0	0	100.062
CR16 - 6 Olivine2	0.040244	19.5535	0.360604	0.008938	0.097275	0	0	0.000004	100.772
CR16 - 6 Olivine2	0.047142	19.3538	0.320937	0	0.0746	0	0.001611	0	99.9271
CR16 - 6 Olivine2	0.024588	19.7782	0.313235	0	0.100134	0.013223	0.012887	0.000008	100.581
CR16 - 5 Anorthite2	25.254	0.254021	0	0.002217	0	0	0.012655	0	69.4408
CR16 - 5 Anorthite2	25.0287	0.233771	0.015907	0	0	0	0	0	69.3193
CR16 - 5 Anorthite2	25.0929	0.306861	0	0	0	0	0.023726	0	69.1528
CR16 - 5 Anorthite2	24.0442	0.26568	0.000902	0	0	0	0	0.000002	68.1422
CR16 - 5 Anorthite2	29.5192	0.268928	0	0	0	0	0	-0.00001	99.6379
CR16 - 5 Anorthite2	21.4817	0.232754	0	0.011617	0	0	0.003207	0	65.6075
CR16 - 5 Anorthite2	31.4632	0.295893	0	0.021464	0.006996	0	0	0	99.6983
CR16 - 5 Anorthite2	32.636	0.285383	0.034313	0	0	0	0.016066	0	99.3274
CR16 - 5 Titanomag2	2.74695	79.1018	0.480974	0.088636	0	0.003633	0.021605	0.000002	94.0996
CR16 - 5 Titanomag2	2.73316	79.1567	0.4649	0.057593	0	0.008183	0.012994	0.000004	94.0334
CR16 - 5 Titanomag2	2.81067	78.7977	0.47191	0.070637	0	0.004722	0.026014	0	93.9256
CR16 - 5 Titanomag2	2.72843	79.2461	0.468687	0.098651	0.00569	0	0.002883	0	94.1711
CR16 - 5 Titanomag2	2.73873	78.77	0.46352	0.016048	0	0.040054	0.012975	-0.00001	93.8684
CR16 - 5 Olivine1	0.02062	24.9448	0.567486	0	0.033164	0.00955	0	-0.00001	101.025
CR16 - 5 Olivine1	0.003567	25.1882	0.501781	0	0.030021	0.008024	0	0	100.392
CR16 - 5 Olivine1	0.013894	25.1166	0.544339	0	0.02513	0.043125	0	0	100.96
CR16 - 5 Olivine1	0.021678	25.0571	0.55355	0.010687	0.029491	0	0	0.000004	100.89
CR16 - 5 Olivine1	0	24.9624	0.522049	0	0.054144	0.009231	0	0	100.688
CR16 - 5 Olivine1	0.025589	24.9691	0.542411	0	0.036924	0.021434	0.012841	-0.00001	100.424
CR16 - 5 Olivine1	0	25.1582	0.517566	0.003781	0.052809	0.030444	0.011233	0	101.022
CR16 - 5 Olivine1	0.007074	24.6694	0.531812	0.007161	0.036535	0.019957	0.014445	0	100.079
CR16 - 5 Olivine1	0.03128	25.238	0.496323	0.023971	0.042157	0.021332	0	-0.00001	100.2
CR16 - 5 Olivine2	0.913847	16.3151	0.945934	0.026203	0.01058	0.030524	0.013008	0.000004	99.0715
CR16 - 5 Olivine2	1.83777	14.075	0.464497	0	0	0.034327	0	0	98.468

CR16 - 5 Olivine2	0.91705	13.5056	0.505218	0.00016	0	0	0.014666	0	98.8106
CR16 - 5 Olivine2	0.885748	13.4966	0.506979	0.003084	0.010311	0.048433	0	0	98.4149
CR16 - 5 Olivine2	0.867234	15.9977	0.868372	0	0.005783	0.002013	0	0	98.4983
CR16 - 5 Olivine2	2.05974	14.2116	0.472424	0	0.011322	0	0.008154	0	98.1384
CR16 - 5 Olivine2	0.904285	13.6147	0.46833	0	0.016274	0.021616	0	0	98.261
CR16 - 5 Olivine2	1.20115	14.7499	0.642045	0.000198	0.021314	0	0	0	98.561
CR16 - 5 Olivine2	1.04359	13.5663	0.44115	0	0.000623	0.000318	0	0	98.794
CR16 - 5 Olivine2	0.854756	16.1567	0.937618	0.02031	0.00618	0	0	0	97.1756
CR16 - 5 Olivine2	2.07894	15.9276	0.583552	0.003184	0	0	0.008116	-0.00001	98.4231
CR16 - 5 Olivine2	0.838786	16.1667	0.971711	0	0	0	0.003249	0.000004	98.5692
CR16 - 5 Amphibole2	10.1218	11.3319	0.255023	0.007211	0	0	0.006356	0.000004	95.9736
CR16 - 5 Amphibole2	10.0809	11.7337	0.310183	0.017813	0	0.033482	0.009536	-0.00001	96.9761
CR16 - 5 Amphibole2	9.89543	11.2037	0.279687	0.000629	0	0	0	0	96.4966
CR16 - 5 Amphibole2	10.1668	11.3064	0.317955	0.005149	0.004969	0.011886	0	0.000004	96.7915
CR16 - 5 Amphibole2	11.1664	10.4589	0.16724	0	0	0	0.026949	0	95.2224
CR16 - 5 Amphibole2	10.2772	11.2744	0.287616	0	0.011772	0.015074	0.015862	0.000004	96.2539
CR16 - 5 Amphibole2	10.9367	11.3335	0.187912	0	0	0	0.006348	0	95.4425
CR16 - 5 Amphibole2	9.72293	11.4543	0.352116	0.004609	0	0	0.017453	0	95.8798
CR16 - 5 Titanomag1	3.11417	81.1889	0.608132	0.024784	0	0.037873	0.044839	0.000002	93.0465
CR16 - 5 Titanomag1	3.05671	81.3608	0.625468	0	0	0.065411	0.014496	0.000002	93.1087
CR16 - 5 Titanomag1	2.96161	81.3351	0.621408	0.000996	0	0.067087	0.011567	0	92.9905
CR16 - 5 Titanomag1	3.11548	81.8125	0.638763	0	0	0.023668	0.03338	0	93.6502
CR16 - 5 Titanomag1	2.99534	81.8587	0.644692	0.000836	0	0.00597	0.008706	0.000006	93.4801
CR16 - 5 Titanomag1	3.0467	81.9061	0.618222	0.000803	0	0.019798	0.011599	0	93.535
CR16 - 5 Titanomag1	3.05459	81.7741	0.585896	0.027971	0.017433	0.047363	0	0.000002	93.4905
CR16 - 5 Titanomag1	3.05622	81.852	0.592013	0.01765	0	0.069037	0.040438	0.000008	93.5415
CR16 - 5 Titanomag1	3.03692	81.0633	0.628444	0	0	0.084303	0.043427	0	92.7265
CR16 - 5 plag2	24.4081	0.387289	0.000327	0.003428	0	0	0	0.000004	99.7769

CR16 - 5 plag2	29.3669	0.360258	0	0.001219	0.003128	0	0	0	99.793
CR16 - 5 plag2	27.5926	0.328509	0	0.003695	0	0	0.003248	0.000004	99.7082
CR16 - 5 plag2	29.2377	0.332196	0	0	0.005386	0	0	0	99.5338
CR16 - 5 plag2	28.7116	0.269095	0	0.023302	0	0	0	0	99.5226
CR16 - 5 plag2	26.8198	0.2127	0.006853	0	0	0	0	0.000008	99.9901
CR16 - 5 plag2	26.0746	0.38065	0.014987	0.005644	0	0.011103	0	0.000004	99.4817
CR16 - 5 plag2	27.1559	0.278898	0.017875	0.009116	0	0.010973	0.006517	0	99.8543
CR16 - 5 plag2	25.4644	0.567125	0.021851	0	0.020886	0.00712	0.003266	0.000008	99.7785
CR16 - 5 plag2	26.8451	0.276397	0.020432	0	0	0	0.011384	0.000004	99.6033
CR16 - 5 Anorthite1	28.3575	0.373409	0	0	0	0	0	0	99.6445
CR16 - 5 Anorthite1	29.4015	0.416401	0	0.007407	0	0	0.020953	0.000004	99.0253
CR16 - 5 Anorthite1	30.4694	0.446176	0.009321	0	0	0.012812	0	0	99.8797
CR16 - 5 Anorthite1	29.963	0.455345	0	0	0.001101	0	0	0	99.4714
CR16 - 5 Anorthite1	31.3651	0.52537	0.026735	0	0.007168	0	0.008058	0.000008	99.0647
CR16 - 5 Anorthite1	33.6195	0.611812	0	0	0	0.007049	0.004799	0	99.1754
CR16 - 5 Anorthite1	33.0064	0.563787	0	0.000065	0	0	0	0	99.4748
CR16 - 5 Anorthite1	34.0627	0.562295	0.027271	0.003407	0	0	0	0	99.4804
CR16 - 5 Anorthite1	31.0902	0.493182	0.010665	0.00963	0	0	0	0	99.2738
CR16 - 5 Anorthite1	31.0794	0.534143	0.00606	0	0	0	0.008047	0.000004	99.405
CR16 - 5 Amphibole1	11.0106	11.1163	0.199635	0.01798	0	0	0.017426	0	96.9065
CR16 - 5 Amphibole1	12.3707	11.224	0.171364	0.027437	0.000832	0.01711	0.030047	0.000004	97.2011
CR16 - 5 Amphibole1	11.5376	11.0821	0.188429	0.005888	0	0	0.030074	0.000008	97.1406
CR16 - 5 Amphibole1	10.8192	11.1798	0.222214	0	0	0	0.014273	0	97.2041
CR16 - 5 Amphibole1	11.8056	11.0357	0.156613	0.009405	0.015467	0	0.009518	0	97.0335
CR16 - 5 Amphibole1	12.3235	11.0662	0.120782	0.004719	0	0	0.007917	0	96.2162
CR16 - 5 Amphibole1	10.9404	11.1703	0.193838	0.013874	0	0.003192	0	0	96.9304
CR16 - 5 Amphibole1	10.791	11.3382	0.19115	0	0	0.043175	0.045848	0	97.2993
CR16 - 5 Amphibole1	11.0654	11.3231	0.224702	0	0	0	0	0.000008	97.5368

CR16 - 5 Plag1 (top to bottom)	28.3418	0.409499	0.016208	0	0.003752	0	0.021053	0	99.9214
CR16 - 5 Plag1 (top to bottom)	31.2077	0.505698	0.001558	0	0.000756	0.058182	0.008059	0	99.7699
CR16 - 5 Plag1 (top to bottom)	32.364	0.563881	0.001573	0.010187	0.028892	0	0.006433	0	100.324
CR16 - 5 Plag1 (top to bottom)	32.2877	0.513454	0	0	0.001076	0	0	0	100.193
CR16 - 5 Plag1 (top to bottom)	32.0891	0.496182	0	0.011806	0	0	0.030586	0.000004	100.568
CR16 - 5 Plag1 (top to bottom)	31.7331	0.615372	0	0	0	0	0.008052	0.000004	100.091
CR16 - 5 Plag1 (top to bottom)	30.0721	0.488328	0	0	0	0.013611	0	0	99.712
CR16 - 5 Plag1 (top to bottom)	29.9765	0.516999	0.005003	0	0	0	0	-0.00001	99.6238
CR16 - 5 Plag1 (top to bottom)	28.7899	0.385382	0.011948	0.011675	0	0.023918	0.014556	-0.00002	99.6541
CR16 - 4 diopside1	1.89018	7.69697	0.323033	0.015281	0	0.025518	0.007906	0	99.7421
CR16 - 4 diopside1	2.10615	8.17128	0.355023	0	0	0	0	0	100.904
CR16 - 4 diopside1	1.96823	8.3169	0.384644	0	0	0.006195	0.006324	0	100.805
CR16 - 4 diopside1	1.89876	8.31228	0.475897	0	0	0	0	0	100.479
CR16 - 4 diopside1	3.18021	8.08331	0.32271	0	0.023553	0.027432	0	0.000004	99.9471
CR16 - 4 diopside1	3.10875	8.13821	0.337576	0.009266	0	0	0	-0.00001	100.099
CR16 - 4 diopside1	3.17453	8.31144	0.314975	0	0	0.044708	0.007887	0	100.762
CR16 - 4 diopside1	3.08878	8.4822	0.368865	0	0.004566	0	0	0	100.419
CR16 - 4 diopside1	3.26575	8.65563	0.346957	0	0.002936	0.016787	0.011061	0	100.817
CR16 - 4 amphibole1	11.6619	11.3937	0.173045	0	0.013409	0.005357	0.02531	0	97.9997
CR16 - 4 amphibole1	11.5607	11.5449	0.210874	0	0	0	0	0.000004	97.7567
CR16 - 4 amphibole1	11.5817	11.6469	0.249535	0	0	0.020448	0.014236	0	97.9905

CR16 - 4 amphibole1	11.5648	11.5752	0.206732	0	0	0.005486	0.028446	0.000004	97.8317
CR16 - 4 amphibole1	11.5616	11.4035	0.217595	0	0	0	0.026843	0	97.5184
CR16 - 4 amphibole1	11.4165	11.4527	0.193024	0	0	0	0.037944	0	97.4731
CR16 - 4 amphibole1	11.5207	11.4963	0.209127	0	0	0	0	0	97.8804
CR16 - 4 amphibole1	11.5641	11.2744	0.208734	0	0	0.038267	0.01901	0	97.4284
CR16 - 4 amphibole1	11.8604	11.4262	0.205068	0	0	0.001286	0	0	98.0973
CR16 - 4 olivine2	0.031971	17.5127	0.29576	0.000869	0.149442	0.018	0.014557	0	100.268
CR16 - 4 olivine2	0.023128	17.5576	0.280827	0	0.104372	0	0.004839	0	99.9812
CR16 - 4 olivine2	0.046429	17.9454	0.297439	0	0.079461	0.02499	0.008075	0	100.157
CR16 - 4 olivine2	0	18.1928	0.307286	0	0.099314	0.032243	0.03877	0	100.258
CR16 - 4 olivine2	0.027128	18.3073	0.297958	0.005202	0.106867	0.000815	0	0	100.751
CR16 - 4 olivine2	0.045628	17.7219	0.259219	0.009435	0.090417	0	0	0	100.988
CR16 - 4 olivine2	0.03566	17.4355	0.286168	0	0.103482	0	0.012949	0.000004	100.331
CR16 - 4 olivine2	0.022359	17.8406	0.303813	0.023842	0.126126	0.008987	0	0.000008	100.739
CR16 - 4 olivine2	0.036441	17.5862	0.267911	0.001899	0.122193	0.00049	0.001617	0	100.646
CR16 - 4 anorthite1	1.36091	0.011954	0	0	0.005719	0.020627	0	0	2.92171
CR16 - 4 anorthite1	1.34683	0	0.009232	0	0.002526	0	0	0	2.91588
CR16 - 4 anorthite1	1.34207	0.01565	0.022206	0	0	0	0	0	2.81494
CR16 - 4 anorthite1	34.3065	0.572866	0	0.001853	0	0.00704	0	0	100.446
CR16 - 4 anorthite1	1.41362	0.013399	0	0	0.00065	0.008218	0.00471	0	3.00489
CR16 - 4 anorthite1	1.3431	0	0	0	0.004672	0	0.015696	0	2.96249
CR16 - 4 anorthite1	1.43164	0.0047	0.015393	0	0.026463	0	0.018847	0	2.95862
CR16 - 4 anorthite1	1.35617	0.012687	0	0	0	0	0	0	2.93541
CR16 - 4 anorthite1	1.34398	0.000591	0.000137	0	0.002856	0	0	0	2.89158
CR16 - 4 anorthite1	1.31578	0.003761	0	0.003837	0.003527	0	0.014115	0	2.7908
CR16 - 4 anorthite1	1.3072	0	0.002393	0	0	0	0.004713	0	2.87317
CR16 - 4 titanomag1	3.41595	79.5626	0.661442	0.009215	0	0.058498	0	0	93.46
CR16 - 4 titanomag1	3.51436	79.1394	0.641196	0.041182	0	0.019946	0.01011	0.000002	93.5907

CR16 - 4 titanomag1	3.51713	79.4865	0.658752	0.051894	0.01279	0.120076	0	0.000002	93.8047
CR16 - 4 titanomag1	3.33023	79.6701	0.684467	0.016631	0	0.070308	0.01878	0	93.5428
CR16 - 4 titanomag1	3.26619	80.3874	0.679505	0.035203	0	0.019217	0	0.000004	94.0889
CR16 - 4 titanomag1	3.344	79.9037	0.614363	0.011111	0	0.069203	0.017358	0.000002	93.6352
CR16 - 4 titanomag1	3.61956	78.9413	0.609978	0.073489	0	0	0.013001	-0.00001	93.3563
CR16 - 4 titanomag1	3.69139	78.3639	0.655776	0.06524	0	0.029625	0.026059	0	92.9947
CR16 - 4 amphibole2	11.0254	11.5019	0.289923	0.000971	0.005743	0	0.017398	0.000015	97.2295
CR16 - 4 amphibole2	11.1787	11.8344	0.252331	0	0	0	0.022173	0	97.6725
CR16 - 4 amphibole2	11.3363	11.6131	0.265235	0	0	0	0.003173	0.000004	97.3654
CR16 - 4 amphibole2	11.1389	10.8101	0.220433	0.012967	0	0	0.01743	0.000004	96.2037
CR16 - 4 amphibole2	10.599	10.8167	0.301822	0	0.008545	0	0	-0.00001	97.5731
CR16 - 4 amphibole2	11.0372	11.8329	0.287287	0.002908	0.003581	0	0.019003	0	97.5103
CR16 - 4 amphibole2	11.0768	11.2681	0.24332	0	0.009095	0	0.020632	-0.00001	94.4713
CR16 - 4 amphibole2	10.8681	11.1474	0.299539	0	0	0.010722	0	0	97.7172
CR16 - 4 amphibole2	10.8763	10.7973	0.30221	0	0	0	0.012707	0	97.9561
CR16 - 4 amphibole2	10.8792	11.1165	0.259272	0.009631	0.011044	0	0.023784	0	97.4628
CR16 - 4 anorthite2	32.5502	0.607186	0.002278	0	0	0	0.017602	0	99.3519
CR16 - 4 anorthite2	29.0673	0.409295	0.016047	0	0.000904	0	0	0	99.3246
CR16 - 4 anorthite2	33.4719	0.617996	0	0	0	0.000745	0.004797	0	100.083
CR16 - 4 anorthite2	30.6714	0.466505	0	0	0	0	0.004825	0.000004	99.2914
CR16 - 4 anorthite2	31.5579	0.612864	0	0	0	0	0	0	99.6819
CR16 - 4 anorthite2	31.6492	0.538122	0	0	0.018641	0	0.024148	0.000004	100.259
CR16 - 4 anorthite2	29.7995	0.484587	0	0	0	0	0	0	100.197
CR16 - 4 anorthite2	30.53787	0.517326	-0.00294	0	0.00786	-2.7E-20	0.006009	0	100.3131
CR16 - 4 diopside2	11.846	11.3601	0.263096	0	0.005761	0.02457	0	0.000004	98.5082
CR16 - 4 diopside2	10.4105	10.7065	0.271731	0.001829	0	0	0.007942	0.000004	98.2103
CR16 - 4 diopside2	11.2165	11.1046	0.267429	0	0.003301	0	0.045962	0.000004	97.5907
CR16 - 4 diopside2	10.4231	11.0205	0.243529	0	0	0.017049	0.009515	0	97.5508

CR16 - 4 diopside2	4.57514	8.47031	0.232192	0.026584	0.030037	0.024239	0	0	100.321
CR16 - 4 diopside2	4.84935	8.8125	0.265226	0.016728	0	0.002819	0.014173	0.000004	100.367
CR16 - 4 diopside2	10.692	11.8716	0.327374	0.006638	0	0.019809	0	0	98.2213
CR16 - 4 diopside2	9.56878	11.4609	0.340124	0.002849	0.006449	0	0.00159	0.000004	97.5823
CR16 - 4 diopside2	6.75481	9.13806	0.193108	0.08609	0.00443	0	0	0.000004	99.5906
CR16 - 4 diopside2	3.06994	7.70196	0.242074	0.077485	0	0	0.023668	0	100.375
CR16 - 4 diopside2	6.68978	9.0639	0.181886	0.069517	0.001174	0	0	-0.00001	99.8888
CR16 - 4 diopside2	3.22393	8.57375	0.273218	0.007559	0	0.012753	0	0.000004	100.36
CR16 - 4 diopside2	6.10875	8.60541	0.197776	0.068784	0	0	0.011003	0	99.9615
CR16 - 4 olivine1	0.027552	21.9213	0.369913	0.001433	0.098183	0	0.008037	0.000004	100.763
CR16 - 4 olivine1	0.029596	22.0115	0.36051	0.018779	0.118789	0.040915	0.019292	0	100.324
CR16 - 4 olivine1	0.021387	22.0959	0.404041	0	0.122007	0.003778	0	0	100.516
CR16 - 4 olivine1	0.036479	21.959	0.365015	0.004608	0.10015	0.017755	0.012879	0	100.37
CR16 - 4 olivine1	0.016718	22.7052	0.536721	0	0.133937	0.055016	0	0.000008	100.406
CR16 - 4 olivine1	0.022157	22.7083	0.483646	0.028078	0.11431	0.065124	0.001607	-0.00001	100.452
CR16 - 4 olivine1	0.021195	22.3681	0.45369	0	0.141904	0.033969	0.003213	-0.00001	100.293
CR16 - 4 olivine1	0.020445	21.7448	0.351347	0.016602	0.14443	0	0.014436	0	100.136
CR16 - 4 diop/An mix	13.1727	8.1791	0.153333	0.028935	0	0	0.008022	0.000004	91.0741
CR16 - 4 diop/An mix	16.8255	7.80034	0.184873	0.034963	0	0	0.035326	0.000008	100.192
CR16 - 4 diop/An mix	18.5081	7.52331	0.14535	0	0	0	0.004835	0	100.11
CR16 - 4 diop/An mix	18.2171	7.15196	0.166331	0	0.026743	0	0.008017	0	99.3327
CR16 - 4 diop/An mix	16.6097	8.83216	0.198893	0.007802	0	0	0	0.000004	99.6164
CR16 - 4 diop/An mix	16.9165	7.73559	0.163306	0.018882	0.004667	0.009352	0	0	100.662
CR16 - 4 diop/An mix	18.143	6.94212	0.154316	0	0	0	0.027319	0	97.9406
CR16 - 4 diop/An mix	20.3791	6.81286	0.117266	0	0	0	0.017755	-0.00001	100.23
CR16 - 4 diop/An mix	14.3658	5.32373	0.087365	0	0	0	0.011239	0.000004	76.3522
CR16 - 4 diop/An mix	16.6436	8.16442	0.151253	0.001824	0	0	0.009649	0	98.6661
CR16 - 4 diop/An mix	17.9797	8.15834	0.146552	0.005025	0	0	0.028946	0.000004	99.5764

CR16 - 4 diop/An mix	17.9728	7.5091	0.149337	0.011254	0	0.015759	0.008044	0	99.8438
CR16 - 4 diop/An mix	16.8435	8.59879	0.191032	0.004293	0	0.006648	0.001606	0.000008	98.9628
CR16 - 4 diop/An mix	1.82556	0.780007	0.004329	0	0	0	0.003237	0	11.4684
CR16 - 4 diop/An mix	16.01	8.74733	0.183209	0.025342	0	0	0.020928	0	98.259
CR16 - 4 diop/An mix	17.3956	8.90394	0.173107	0	0.00869	0.00745	0	0.000004	99.4109
CR16 - 4 diop/An mix	16.0446	10.2314	0.192631	0.012095	0.002745	0	0.006429	0.000008	99.2927
CR16 - 4 diop/An mix	2.24073	0.764741	0.011394	0	0.01248	0	0.017865	0	11.7374
CR16 - 4 diop/An mix	19.0381	7.33113	0.133328	0.006807	0	0	0	0	99.0894
CR16 - 4 diop/An mix	20.671	5.5676	0.110469	0	0	0.011155	0.00806	-0.00001	99.668

SAMPLE	Cl WT%	Ca WT%	K WT%	Ba WT%	F WT%	Ti WT%	P WT%	Na WT%	Si WT%	Mg WT%
CR16-8 area1 plag trav	0	11.3057	0.042294	0	0.007053	0.01589	0.006718	1.90216	22.3095	0.055821
CR16-8 area1 plag trav	0.129406	3.21272	1.23538	0.022289	0.183562	0.124451	0.013328	2.85737	20.3634	2.55898
CR16-8 area1 plag trav	0	11.3362	0.042221	0.009816	0.008419	0.016681	0.003167	1.84536	22.4297	0.054608
CR16-8 area1 plag trav	0	12.3145	0.028249	0	0.047161	0.013274	0.004944	1.07799	20.9066	0.041968
CR16-8 area3 diopside trav	0	12.3704	0.024046	0	0	0.006606	0.010679	1.18788	21.2928	0.019897
CR16-8 area3 diopside trav	0	14.6402	0	0.002663	0.079096	0.267668	0.014953	0.196394	24.5407	9.73396
CR16-8 area4 diopside trav	0	15.0926	0.002047	0	0.042356	0.300397	0.008384	0.222169	24.0279	9.57762
CR16-8 area4 diopside trav	0.004411	15.1469	0.00722	0	0.074341	0.34741	0	0.216486	23.9073	9.36554
CR16-8 area5 hornblende/diopside	0.000176	7.80419	0.202453	0.02012	0	0.009716	0.007673	3.91166	25.2014	0.035572
CR16-8 area5 hornblende/diopside	0.042302	8.06678	0.285401	0.031208	0.167565	1.67736	0.007537	1.61845	20.6801	9.02391
CR16-8 area5 hornblende/diopside	1.32142	38.5119	0.001859	0	1.24941	0.002116	18.232	0.051626	0.017422	0.146469
CR16-8 area5 hornblende/diopside	0.005126	0.065745	0.000346	0.575922	0.261307	22.8926	0	0.005904	0.010406	1.70583
CR16-8 area6 plag trav (anorthite)	0	9.46198	0.065025	0	0.015854	0.01607	0	2.88805	23.4159	0.034989
CR16-8 area6 plag trav (anorthite)	0.004628	11.3306	0.06375	0	0.020924	0.021623	0.004626	1.81587	22.2649	0.008049
CR16-8 area6 plag trav (anorthite)	0.004277	8.53775	0.096893	0.008145	0.008878	0.030927	0.004708	3.48779	24.6924	0.055692
CR16-8 area6 plag trav (anorthite)	0	9.37264	0.063873	0	0.027094	0.011403	0.003007	3.0614	24.0486	0.064137
CR16-8 area6 plag trav (anorthite)	0	12.6183	0.013825	0.002269	0.015412	0.010228	0.004978	0.99717	21.2741	0.048685
CR16-8 area6 plag trav (anorthite)	0	12.2636	0.015446	0	0.013892	0.006758	0.007945	1.11816	20.8579	0.048027
CR16-8 area6 plag trav (anorthite)	0.036268	10.58	0.033505	0.000963	0.038146	0	0.000073	0.962727	18.1878	0.025633
CR16-8 area6 plag trav (anorthite)	0	12.2634	0.028107	0	0.002773	0.006137	0.005145	1.17596	21.5306	0.052816
CR16-8 area6 plag trav (anorthite)	0	12.7766	0.0153	0.014046	0	0.001433	0.002134	0.932964	21.0563	0.049416
CR16-8 area6 plag trav (anorthite)	0.243831	1.55958	0.516439	0	0.405035	0.061231	0.018736	0.915412	10.0188	1.78395
CR16-8 area6 plag trav (anorthite)	0	12.9419	0.02426	0	0.027408	0.003669	0.002075	0.846927	20.8556	0.027515
CR16-8 area6 plag trav (anorthite)	0	12.1295	0.038651	0	0.007343	0.011881	0.000126	1.40072	21.4697	0.034968
CR16-8 area9 diopside	0.001194	15.3829	0.001563	0	0.062555	0.441051	0.008461	0.243225	23.8596	9.27317
CR16-8 area9 diopside	0	11.955	0.025333	0	0.001823	0.008704	0.002304	1.44448	21.5692	0.054578
CR16-8 area9 diopside	0	12.1766	0.029934	0	0.011334	0.004645	0.006668	1.42215	21.7183	0.044596

CR16-8 area9 diopside	0.030495	12.0011	0.020432	0	0.016319	0.003879	0.007816	1.0576	20.416	0.048121
CR16-8 area10 olivine	0	0.12071	0	0.003112	0.098078	0	0.006354	0	18.0451	24.8263
CR16-8 area10 olivine	0.00004	0.105467	0	0	0.082624	0	0	0	17.9702	25.0255
CR16-8 area10 olivine	0.006723	0.102913	0	0	0.109157	0.006904	0	0	18.1383	24.9632
CR16-8 area10 olivine	0.002191	0.114821	0.00284	0	0.117159	0.001881	0	0	17.7181	23.8502
CR16-8 area11 olivine trav	0.001597	0.133414	0.004512	0	0.173759	0.017651	0	0	16.824	18.3939
CR16-8 area11 olivine trav	0.000047	0.13441	0.003797	0	0.110836	0.005113	0	0	18.14	25.2878
CR16-8 area11 olivine trav	0	0.120695	0.014231	0.005631	0.18033	0.018707	0.007956	0.001127	17.2175	20.1649
CR16-8 area11 olivine trav	0	0.108205	0	0	0.140004	0	0	0	18.2853	26.1219
CR16-8 area11 olivine trav	0	0.114421	0	0.00233	0.139546	0.005171	0.004673	0	18.114	26.1718
CR16-8 area11 olivine trav	0.006768	0.111345	0.002571	0	0.109818	0.000419	0.00025	0.000375	18.2312	26.1648
CR16-8 area11 olivine trav	0	0.117439	0.012058	0.019778	0.154908	0.006498	0	0.016976	16.5855	17.7842
CR16-8 area12 diopside trav	0.020315	14.9952	0.005157	0	0.061725	0.329436	0.00718	0.232584	24.1931	9.41168
CR16-8 area12 diopside trav	0.001866	14.6986	0	0	0.046688	0.259172	0.000151	0.196415	24.161	9.65433
CR16-8 area12 diopside trav	0.004209	11.538	0.039558	0.000345	0.026361	0.009898	0.008248	1.7275	22.0504	0.046426
CR16-8 area12 diopside trav	0.143537	2.64587	1.50709	0.064417	0.054348	0.398158	0.193957	4.65077	29.3665	0.911684

SAMPLE	Al WT%	Fe WT%	Mn WT%	Cr WT%	Ni WT%	Zn WT%	O WT%	TOTAL
CR16-8 area1 plag trav	17.0388	0.476812	0.013141	0	0	0	45.9545	99.1283
CR16-8 area1 plag trav	5.97679	4.26297	0.115927	0	0	0	34.0896	75.1462
CR16-8 area1 plag trav	16.9878	0.471839	0.006844	0.004773	0.014557	0.004625	46.0387	99.2752
CR16-8 area1 plag trav	17.4701	0.487639	0.012778	0	0	0	44.8426	97.2477
CR16-8 area3 diopside trav	17.7935	0.48149	0	0.011512	0.007448	0	45.6203	98.8266
CR16-8 area3 diopside trav	0.982217	6.03821	0.205463	0	0	0	43.1431	99.8445
CR16-8 area4 diopside trav	1.2974	5.9562	0.153871	0.010452	0.000509	0.002792	42.9065	99.6012
CR16-8 area4 diopside trav	1.45295	6.05887	0.188707	0.000908	0	0.013356	42.8468	99.6312
CR16-8 area5 hornblende/diopside	14.9797	0.36896	0.011115	0	0	0	46.7067	99.2595
CR16-8 area5 hornblende/diopside	4.98794	8.77003	0.179819	0	0	0	41.4799	97.0183
CR16-8 area5 hornblende/diopside	0	0.342578	0.115954	0.004463	0	0.001885	39.1894	99.1885
CR16-8 area5 hornblende/diopside	0.185004	42.6094	0.384758	0.016337	0.001189	0	29.0158	97.7357
CR16-8 area6 plag trav (anorthite)	15.8172	0.385315	0	0.002926	0.004755	0.013022	45.6938	97.8149
CR16-8 area6 plag trav (anorthite)	17.122	0.293228	0.017043	0.01113	0	0.005206	45.8866	98.8702
CR16-8 area6 plag trav (anorthite)	15.29	0.500806	0.008859	0.003205	0	0.011823	46.5902	99.3323
CR16-8 area6 plag trav (anorthite)	15.6757	0.521955	0.003719	0.014932	0.007626	0	46.3764	99.2525
CR16-8 area6 plag trav (anorthite)	17.8569	0.448664	0.0122	0	0.009566	0.020166	45.6944	99.0268
CR16-8 area6 plag trav (anorthite)	17.6283	0.460449	0.006867	0	0	0.002729	44.9135	97.3435
CR16-8 area6 plag trav (anorthite)	15.0316	0.427031	0	0.013544	0.001617	0	38.8043	84.1432
CR16-8 area6 plag trav (anorthite)	17.7219	0.430087	0	0.001244	0.010077	0.002571	45.7776	99.0084
CR16-8 area6 plag trav (anorthite)	18.0632	0.453592	0	0.005496	0	0	45.6561	99.0265
CR16-8 area6 plag trav (anorthite)	2.31691	3.89364	0.073335	0	0	0	16.8989	38.7058
CR16-8 area6 plag trav (anorthite)	18.095	0.480018	0	0	0.012075	0.002873	45.488	98.8073
CR16-8 area6 plag trav (anorthite)	17.558	0.534783	0.007802	0.000465	0	0	45.6035	98.7974
CR16-8 area9 diopside	1.74225	6.32068	0.147105	0.005321	0.003561	0	43.2274	100.72
CR16-8 area9 diopside	17.3965	0.5634	0	0	0.01969	0	45.5407	98.5817
CR16-8 area9 diopside	17.6175	0.501352	0.0081	0.006926	0	0.003524	45.9684	99.5199

CR16-8 area9 diopside	17.0529	0.581927	0.0135	0	0.001244	0	43.8078	95.0591
CR16-8 area10 olivine	0.005797	15.4696	0.239709	0	0.089964	0	41.4912	100.396
CR16-8 area10 olivine	0.009267	15.3906	0.26682	0.010458	0.095249	0.013624	41.5203	100.49
CR16-8 area10 olivine	0.009292	15.4427	0.236478	0	0.098346	0.017716	41.6776	100.809
CR16-8 area10 olivine	0.01427	17.1083	0.284066	0	0.039565	0	40.9432	100.196
CR16-8 area11 olivine trav	0.022249	25.0467	0.339284	0	0.065385	0.006544	38.6571	99.6861
CR16-8 area11 olivine trav	0.014341	14.4926	0.232929	0.024025	0.083737	0.004082	41.6404	100.174
CR16-8 area11 olivine trav	0.018815	22.3192	0.284881	0.018928	0.056092	0.034726	39.493	99.9567
CR16-8 area11 olivine trav	0.018819	13.5947	0.207621	0.010074	0.115855	0	42.081	100.683
CR16-8 area11 olivine trav	0.012106	13.8147	0.187354	0.013618	0.096312	0	41.9783	100.654
CR16-8 area11 olivine trav	0.01549	13.8144	0.201647	0.014169	0.09311	0	42.104	100.87
CR16-8 area11 olivine trav	0.048976	25.3937	0.306861	0	0.024614	0.027675	38.0877	98.5869
CR16-8 area12 diopside trav	1.34165	6.15888	0.212058	0.001848	0	0.004779	43.0794	100.055
CR16-8 area12 diopside trav	1.2033	6.0319	0.199846	0.003535	0.004125	0	42.8523	99.3132
CR16-8 area12 diopside trav	17.2762	0.582388	0.008484	0.000251	0.006723	0.009729	45.9269	99.2616
CR16-8 area12 diopside trav	8.69402	4.24147	0.086473	0	0.005619	0.01826	46.5455	99.5277

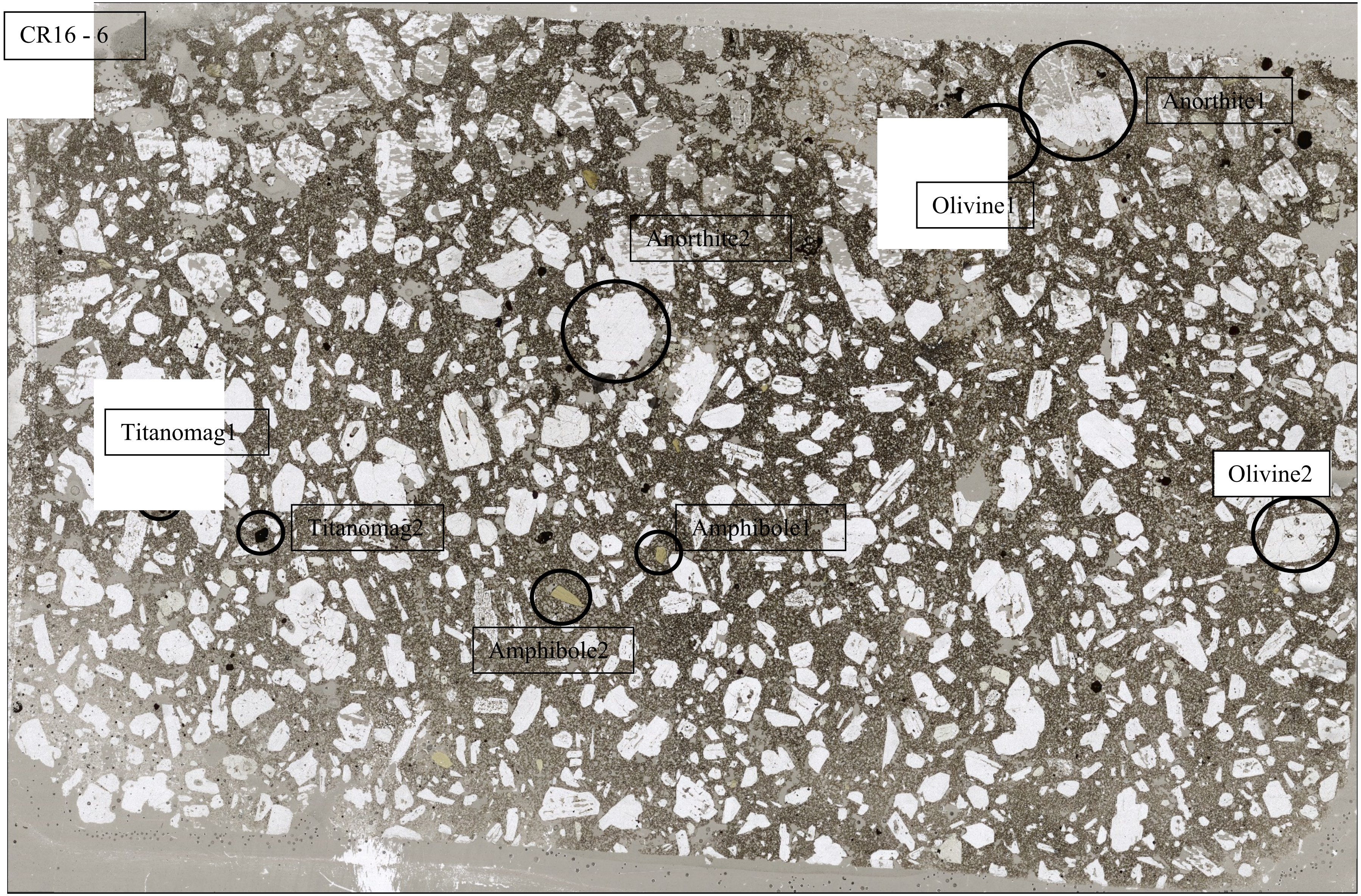
SAMPLE	Cl	CaO	K2O	BaO	F	TiO2	P2O5	Na2O	SiO2	MgO
CR16-8 area1 plag trav	0	15.8189	0.050947	0	0.007053	0.026505	0.015393	2.56406	47.7279	0.092569
CR16-8 area1 plag trav	0.129406	4.49524	1.48813	0.024886	0.183562	0.207592	0.030539	3.85167	43.5646	4.24355
CR16-8 area1 plag trav	0	15.8616	0.050859	0.010959	0.008419	0.027825	0.007257	2.4875	47.985	0.090556
CR16-8 area1 plag trav	0	17.2304	0.034029	0	0.047161	0.022141	0.01133	1.4531	44.7267	0.069596
CR16-8 area3 diopside trav	0	17.3087	0.028966	0	0	0.011019	0.024469	1.60123	45.5529	0.032995
CR16-8 area3 diopside trav	0	20.4846	0	0.002973	0.079096	0.446485	0.034263	0.264734	52.5013	16.1418
CR16-8 area4 diopside trav	0	21.1176	0.002465	0	0.042356	0.50108	0.019211	0.299479	51.4043	15.8826
CR16-8 area4 diopside trav	0.004411	21.1936	0.008697	0	0.074341	0.5795	0	0.291818	51.1463	15.5309
CR16-8 area5 hornblende/diopside	0.000176	10.9196	0.243873	0.022464	0	0.016207	0.017582	5.27283	53.9148	0.05899
CR16-8 area5 hornblende/diopside	0.042302	11.2871	0.343792	0.034843	0.167565	2.79794	0.017271	2.18163	44.2421	14.9644
CR16-8 area5 hornblende/diopside	1.32142	53.8859	0.002239	0	1.24941	0.003529	41.777	0.069591	0.037272	0.242889
CR16-8 area5 hornblende/diopside	0.005126	0.091991	0.000416	0.643016	0.261307	38.1862	0	0.007958	0.022261	2.82877
CR16-8 area6 plag trav (anorthite)	0	13.2392	0.078329	0	0.015854	0.026806	0	3.89302	50.0951	0.058023
CR16-8 area6 plag trav (anorthite)	0.004628	15.8538	0.076793	0	0.020924	0.036068	0.0106	2.44775	47.6326	0.013348
CR16-8 area6 plag trav (anorthite)	0.004277	11.946	0.116717	0.009094	0.008878	0.051588	0.010789	4.70146	52.8258	0.092354

CR16-8 area6 plag trav (anorthite)	0	13.1142	0.076942	0	0.027094	0.019021	0.00689	4.1267	51.4485	0.106358
CR16-8 area6 plag trav (anorthite)	0	17.6556	0.016654	0.002533	0.015412	0.017061	0.011407	1.34416	45.5128	0.080735
CR16-8 area6 plag trav (anorthite)	0	17.1593	0.018606	0	0.013892	0.011273	0.018206	1.50725	44.6225	0.079642
CR16-8 area6 plag trav (anorthite)	0.036268	14.8036	0.040359	0.001075	0.038146	0	0.000167	1.29773	38.9102	0.042507
CR16-8 area6 plag trav (anorthite)	0	17.159	0.033857	0	0.002773	0.010238	0.01179	1.58517	46.0616	0.087585
CR16-8 area6 plag trav (anorthite)	0	17.8771	0.01843	0.015683	0	0.002391	0.00489	1.25762	45.0469	0.081946
CR16-8 area6 plag trav (anorthite)	0.243831	2.18216	0.622099	0	0.405035	0.102136	0.042931	1.23396	21.4337	2.95833
CR16-8 area6 plag trav (anorthite)	0	18.1083	0.029223	0	0.027408	0.00612	0.004755	1.14164	44.6176	0.045627
CR16-8 area6 plag trav (anorthite)	0	16.9717	0.046558	0	0.007343	0.019819	0.00029	1.88815	45.9313	0.057988
CR16-8 area9 diopside	0.001194	21.5238	0.001883	0	0.062555	0.7357	0.019387	0.327861	51.0442	15.3777
CR16-8 area9 diopside	0	16.7275	0.030516	0	0.001823	0.014519	0.005279	1.94713	46.1443	0.090506
CR16-8 area9 diopside	0	17.0375	0.036058	0	0.011334	0.007748	0.015278	1.91703	46.4632	0.073954
CR16-8 area9 diopside	0.030495	16.7919	0.024612	0	0.016319	0.006471	0.017909	1.42562	43.6771	0.079798
CR16-8 area10 olivine	0	0.168897	0	0.003474	0.098078	0	0.01456	0	38.6048	41.1695
CR16-8 area10 olivine	0.00004	0.147569	0	0	0.082624	0	0	0	38.4447	41.4998

CR16-8 area10 olivine	0.006723	0.143997	0	0	0.109157	0.011516	0	0	38.8044	41.3965
CR16-8 area10 olivine	0.002191	0.160658	0.003421	0	0.117159	0.003137	0	0	37.9053	39.5508
CR16-8 area11 olivine trav	0.001597	0.186673	0.005435	0	0.173759	0.029442	0	0	35.9925	30.5026
CR16-8 area11 olivine trav	0.000047	0.188067	0.004573	0	0.110836	0.008528	0	0	38.8079	41.9349
CR16-8 area11 olivine trav	0	0.168876	0.017143	0.006287	0.18033	0.031204	0.01823	0.001519	36.8343	33.4395
CR16-8 area11 olivine trav	0	0.151401	0	0	0.140004	0	0	0	39.1188	43.3179
CR16-8 area11 olivine trav	0	0.160098	0	0.002602	0.139546	0.008626	0.010708	0	38.7522	43.4007
CR16-8 area11 olivine trav	0.006768	0.155794	0.003097	0	0.109818	0.000698	0.000573	0.000506	39.003	43.3891
CR16-8 area11 olivine trav	0	0.164321	0.014525	0.022082	0.154908	0.010839	0	0.022883	35.4823	29.4915
CR16-8 area12 diopside trav	0.020315	20.9813	0.006212	0	0.061725	0.549518	0.016452	0.313518	51.7577	15.6074
CR16-8 area12 diopside trav	0.001866	20.5663	0	0	0.046688	0.432313	0.000346	0.264763	51.6891	16.0098
CR16-8 area12 diopside trav	0.004209	16.144	0.047651	0.000386	0.026361	0.01651	0.018898	2.32864	47.1737	0.076988
CR16-8 area12 diopside trav	0.143537	3.7021	1.81543	0.071922	0.054348	0.664151	0.444434	6.26913	62.8254	1.51185

SAMPLE	Al2O3	Fe3O4	FeO	MnO	Cr2O3	NiO	ZnO	O	TOTAL
CR16-8 area1 plag trav	32.1946	0.613417	0.61341	0.016969	0	0	0	-0.00001	99.1283
CR16-8 area1 plag trav	11.293	5.4843	5.484233	0.14969	0	0	0	0	75.1462
CR16-8 area1 plag trav	32.0981	0.607019	0.607012	0.008838	0.006976	0.018525	0.005757	0	99.2752
CR16-8 area1 plag trav	33.0094	0.627346	0.627339	0.016499	0	0	0	0	97.2477
CR16-8 area3 diopside trav	33.6206	0.619435	0.619428	0	0.016826	0.009478	0	0.000004	98.8266
CR16-8 area3 diopside trav	1.85588	7.76814	7.768046	0.265302	0	0	0	0	99.8445
CR16-8 area4 diopside trav	2.45141	7.66263	7.662542	0.198684	0.015277	0.000648	0.003475	0.000008	99.6012
CR16-8 area4 diopside trav	2.74532	7.79472	7.794625	0.243665	0.001327	0	0.016625	0	99.6312
CR16-8 area5 hornblende/diopside	28.3039	0.474666	0.47466	0.014352	0	0	0	0.000008	99.2595
CR16-8 area5 hornblende/diopside	9.42462	11.2826	11.28248	0.232189	0	0	0	0.000004	97.0183
CR16-8 area5 hornblende/diopside	0	0.440726	0.44072	0.149724	0.006523	0	0.002346	0	99.1885
CR16-8 area5 hornblende/diopside	0.349562	54.8169	54.81621	0.496814	0.023878	0.001512	0	0	97.7357
CR16-8 area6 plag trav (anorthite)	29.8864	0.495706	0.495701	0	0.004277	0.00605	0.016209	-0.00001	97.8149
CR16-8 area6 plag trav (anorthite)	32.3517	0.377237	0.377232	0.022007	0.016268	0	0.00648	0.000008	98.8702
CR16-8 area6 plag trav (anorthite)	28.8902	0.644286	0.644278	0.011439	0.004685	0	0.014717	0	99.3323
CR16-8 area6 plag trav (anorthite)	29.6189	0.671493	0.671486	0.004802	0.021825	0.009704	0	0	99.2525
CR16-8 area6 plag trav (anorthite)	33.7402	0.577205	0.577198	0.015753	0	0.012173	0.025102	0	99.0268
CR16-8 area6 plag trav (anorthite)	33.3083	0.592366	0.592359	0.008867	0	0	0.003397	0	97.3435
CR16-8 area6 plag trav (anorthite)	28.402	0.549374	0.549368	0	0.019795	0.002057	0	0.000004	84.1432
CR16-8 area6 plag trav (anorthite)	33.4852	0.553305	0.553299	0	0.001818	0.012823	0.003201	0.000004	99.0084
CR16-8 area6 plag trav (anorthite)	34.13	0.583545	0.583538	0	0.008033	0	0	0.000004	99.0265
CR16-8 area6 plag trav (anorthite)	4.37776	5.00916	5.009096	0.094693	0	0	0	0	38.7058
CR16-8 area6 plag trav (anorthite)	34.1901	0.617542	0.617534	0	0	0.015366	0.003576	0.000004	98.8073
CR16-8 area6 plag trav (anorthite)	33.1756	0.687997	0.687989	0.010074	0.00068	0	0	0	98.7974
CR16-8 area9 diopside	3.29195	8.13154	8.131439	0.189948	0.007777	0.004531	0	0.000011	100.72
CR16-8 area9 diopside	32.8703	0.724812	0.724804	0	0	0.025055	0	0	98.5817
CR16-8 area9 diopside	33.2879	0.644988	0.64498	0.010459	0.010123	0	0.004386	0.000004	99.5199

CR16-8 area9 diopside	32.2211	0.748648	0.748638	0.017432	0	0.001583	0	-0.00001	95.0591
CR16-8 area10 olivine	0.010953	19.9015	19.90136	0.309522	0	0.114482	0	0	100.396
CR16-8 area10 olivine	0.01751	19.8	19.79972	0.344528	0.015285	0.121207	0.016959	0	100.49
CR16-8 area10 olivine	0.017557	19.867	19.86675	0.305349	0	0.125148	0.022052	0	100.809
CR16-8 area10 olivine	0.026962	22.0097	22.00951	0.366796	0	0.050348	0	0	100.196
CR16-8 area11 olivine trav	0.04204	32.2226	32.22212	0.438097	0	0.083205	0.008146	0	99.6861
CR16-8 area11 olivine trav	0.027097	18.6447	18.64446	0.300767	0.035115	0.106558	0.005081	0	100.174
CR16-8 area11 olivine trav	0.035551	28.7136	28.71324	0.367849	0.027665	0.071379	0.043226	0.000008	99.9567
CR16-8 area11 olivine trav	0.035558	17.4896	17.48933	0.268088	0.014724	0.147428	0	0	100.683
CR16-8 area11 olivine trav	0.022874	17.7725	17.77236	0.241918	0.019904	0.122559	0	0	100.654
CR16-8 area11 olivine trav	0.029269	17.7722	17.77197	0.260374	0.020709	0.118485	0	0.000004	100.87
CR16-8 area11 olivine trav	0.092539	32.6689	32.66853	0.39623	0	0.031321	0.034449	0	98.5869
CR16-8 area12 diopside trav	2.53502	7.92338	7.923286	0.273817	0.002701	0	0.005948	-0.00001	100.055
CR16-8 area12 diopside trav	2.27361	7.76002	7.759929	0.258049	0.005167	0.005249	0	0.000004	99.3132
CR16-8 area12 diopside trav	32.6431	0.74924	0.749231	0.010955	0.000367	0.008556	0.01211	0.000004	99.2616
CR16-8 area12 diopside trav	16.4272	5.45664	5.456573	0.111657	0	0.007151	0.02273	0.000008	99.5277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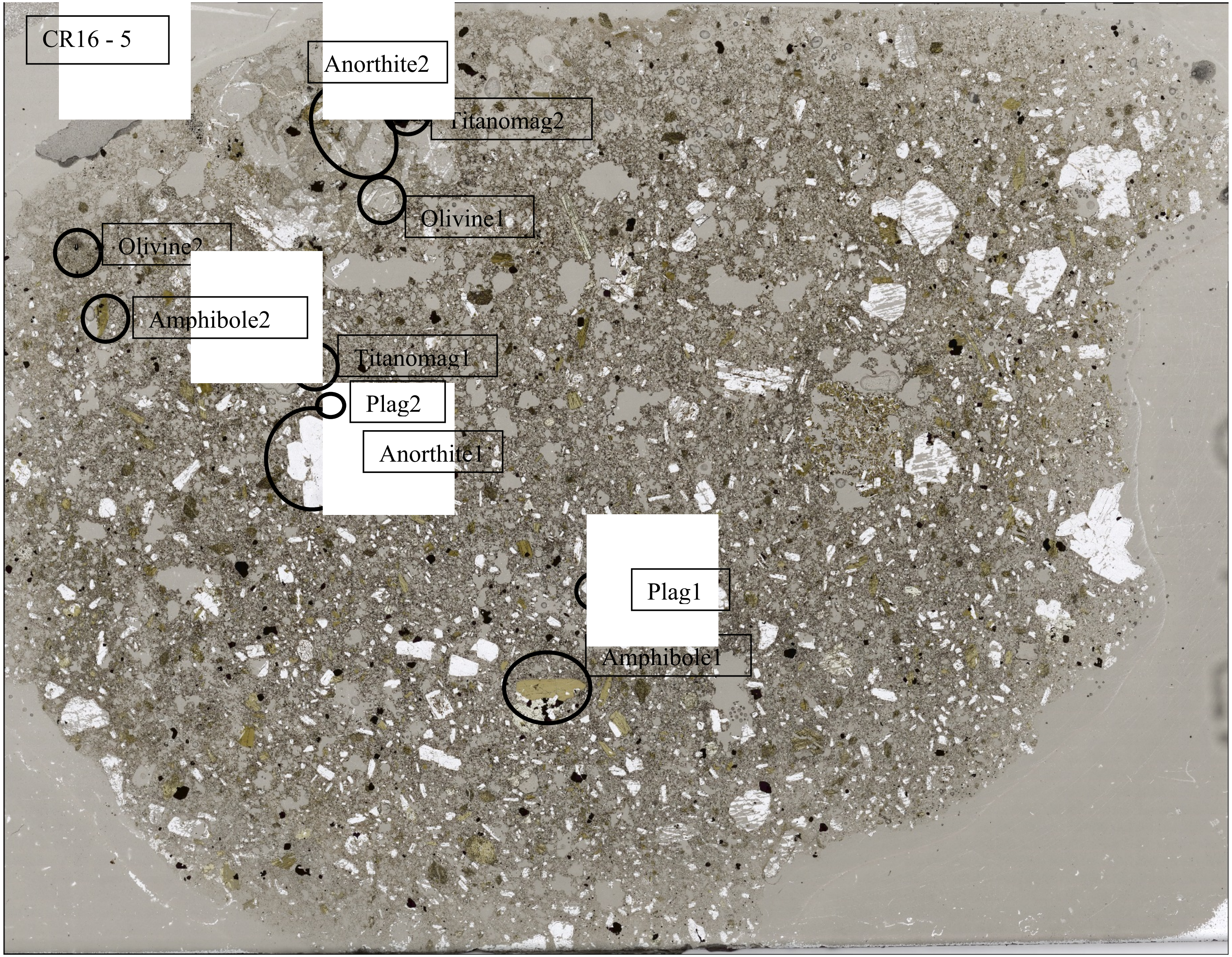
Anorthite1
Olivine1
Anorthite2
Titanomag1
Titanomag2
Amphibole1
Amphibole2
Olivine2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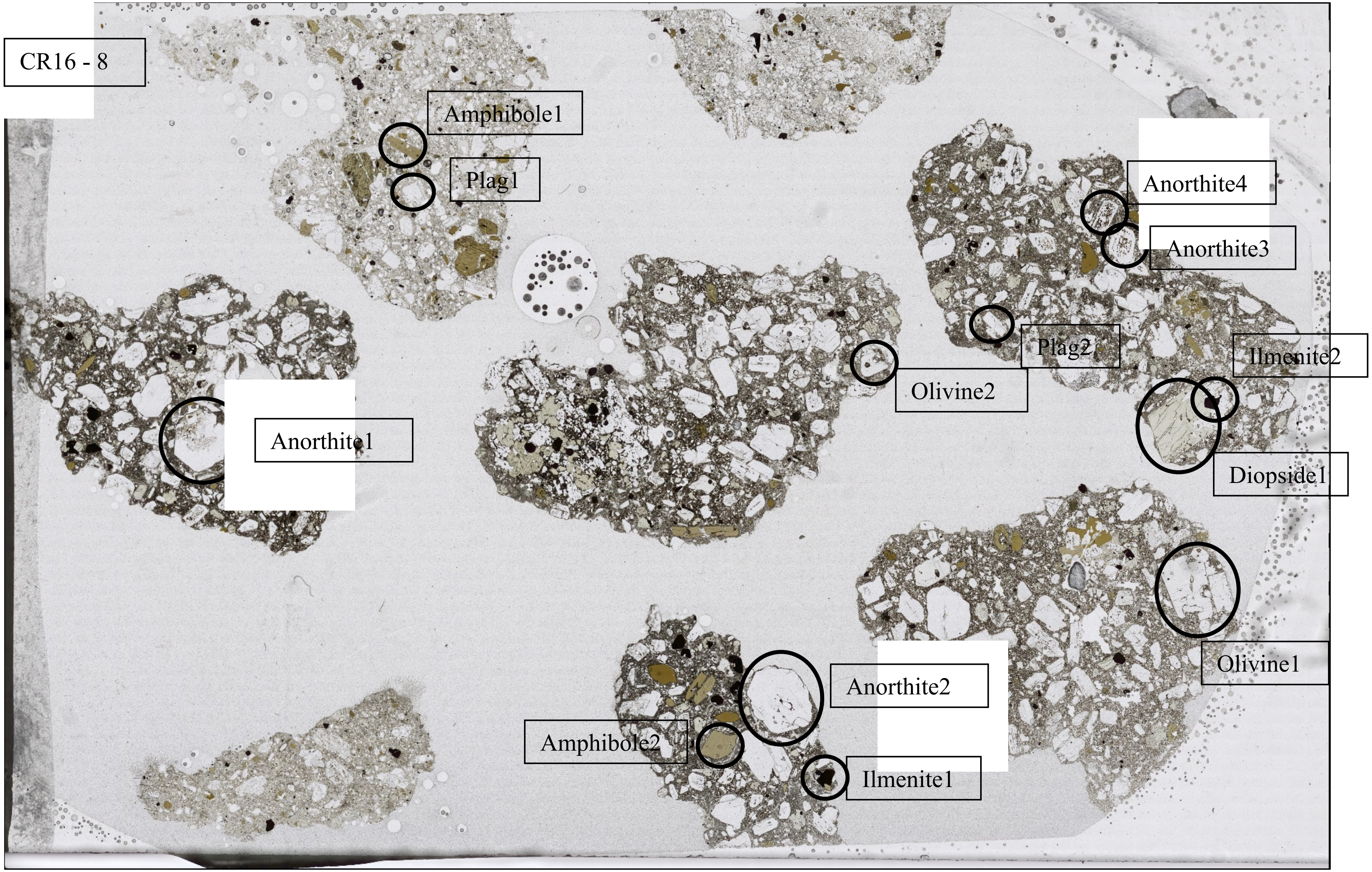
Titanomag2
Olivine1
Olivine2
Amphibole2
Titanomag1
Plag2
Anorthite1
Plag1
Amphibole1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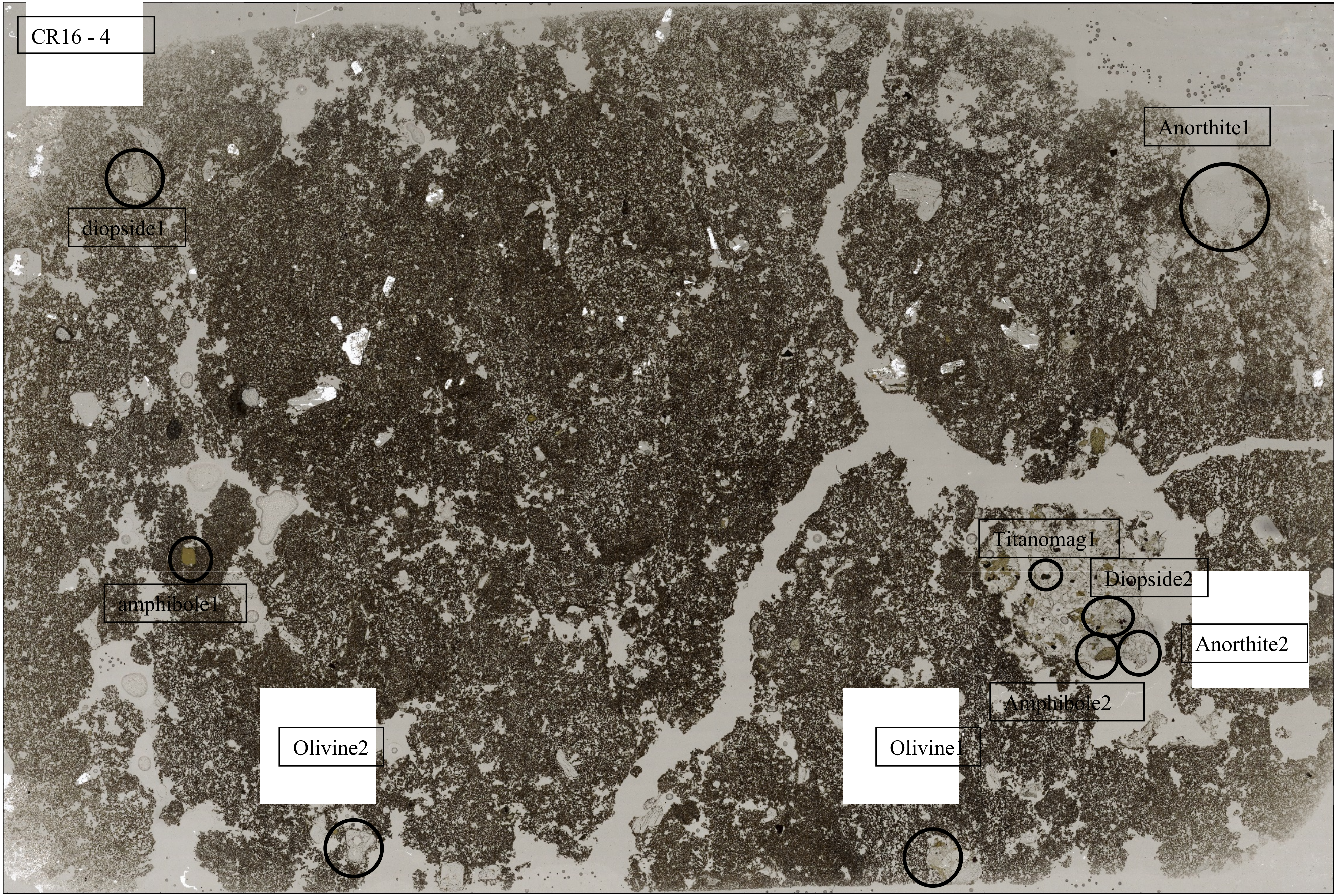
Amphibole1
Plag1
Anorthite4
Anorthite3
Plag2
Ilmenite2
Olivine2
Anorthite1
Diopside1
Olivine1
Anorthite2
Amphibole2
Ilmenite1


CR16 - 4
Anorthite1
diopside1
Titanomag1
Diopside2
amphibole1
Anorthite2
Amphibole2
Olivine2
Olivine1