

Sample descriptions

Z7.3.1 Opx-bearing monzonite

Coarse grained rock with large (≈ 12 mm) euhedral perthite, plagioclase (An₁₇) and amphibole crystals and smaller ‘messy’ mixtures of quartz, amphibole, magnetite, biotite (Mg# = 0.13) and Opx (En₁₀), showing complex reaction textures.

Zircon forms clear and colourless grains, usually with rounded or fractured edges. Grains themselves are moderately fractured with occasional secondary in-fill material. Concentric zoning is seen in transmitted light; concentric and occasional sector zoning is seen in CL images. In some grains, irregularly zoned enclaves are seen, indicating localised recrystallisation. Distinct cores are rare.

Z7.10.1 Monzonite

Sample 10.1 is a coarse grained rock with large (10 mm) perthite phenocrysts and smaller plagioclase (An₂₃), biotite (Mg# = 0.32) and amphibole grains (ferroedenite-ferropargasite, Mg# = 0.29) in the coarse-grained matrix. Interstitial sites contain anhedral biotite ($X_{Mg} = 0.33$), amphibole, plagioclase (An₀₃), K-feldspar, ilmenite, apatite, titanite and zircon.

Zircon grains are clear, colourless and euhedral. Fractures are fairly common; these often contain abundant secondary material. CL images reveal that many grains contain distinct cores, although the majority of each grain volume is occupied by the most recent igneous growth zone, characterised by concentric and sector zoning. Some grains contain enclaves of blotchy, irregular zoning patterns.

Z7.10.3 Monzodiorite

This is a medium grained equigranular rock with 50% plagioclase (An₃₄; occasionally zoned). Other matrix phases are biotite (Mg# = 0.44), amphibole (ferroedenite, Mg# = 0.44), augite (Di₆₀) and orthoclase. A reactionary texture is seen; Cpx cores exist within replacement biotite and amphibole and Cpx crystals have a ragged appearance. Apatite and ilmenite are abundant throughout; zircon is rare.

Zircons: Grains are clear, colourless and very fractured, resulting in most being small (<200 μ m length) angular fragments of initially larger crystals. Some fracture in-filling; many inclusions lie on fractures. Transmitted light images of mounted and polished grains show concentric zoning. However, CL imaging reveals grains to have very low CL activity, and when zoning is seen it is often irregular, indicating recrystallisation. No cores are observed.

Z7.10.4 Microgranite

This is a medium grained rock with microcline, quartz, biotite (Mg# = 0.28) and sericitised plagioclase (An₁₅). Equigranular with no obvious interstitial crystallisation. Apatite is uncommon and zircon is rare, metamict, large, and mostly occurs included in biotite. Ophitic titanite occurs as single large crystals (>5mm) surrounding feldspar and quartz. Zircon is occasionally found included in quartz and feldspar in the interstitial titanite.

Zircon tends to be small and elongate. They are clear and colourless with occasional fracturing, sometimes accompanied by brownish secondary in-fill material. CL activity is very low so zoning is

difficult to determine, but appears sometimes concentric, sometimes irregular, implying some recrystallisation or replacement. Cores are present in some grains.

Z7.10.7 Amphibole-bearing granite

This sample consists of coarse grained microcline perthite (with occasional myrmekitic replacement at grain boundaries), quartz and plagioclase (An_{20}), with a small proportion (<10%) of amphibole (hastingsite, $Mg\# = 0.25$) and biotite ($Mg\# = 0.26$). Magnetite and ilmenite are present as distinct euhedral crystals and some magnetite contains ilmenite exsolution lamellae. Apatite is common, especially included in ilmenite; zircon is less common, and uncommon but large crystals of allanite are present.

Zircon: Grains are euhedral, though occasionally rounded and irregular. Some are clear and colourless, whereas others show an orange discolouration and metamictisation. Fracturing and secondary infilling is common. Zoning appears concentric in transmitted light, however CL imaging reveals irregular patches. Several grains have rounded cores with irregular zoning patterns.

Z7.10.8 Monzodiorite

Dark coloured rock containing 1mm grains of plagioclase and biotite as the most abundant phases, also containing quartz, hornblende, cpx and K-feldspar. Replacement of cpx by the hydrous phases is observed. Accessory apatite and ilmenite are abundant; zircon and titanite are less common; such phases, along with smaller grains of biotite and quartz, have a somewhat interstitial appearance.

Zircon: Grains are very large (up to 0.5mm), euhedral and have a pale brown colour. Often fairly fractured, though not metamict. Zoning is concentric, often with a large dark centre to each grain and brighter rim, though continuation of the concentric structure and sharp edges suggests that these are both part of a single growth.

Z7.10.11 Quartz monzonite

Medium grained rock containing perthitic microcline, plagioclase (An_{25}), quartz, biotite ($Mg\# = 0.33$), amphibole (ferroedenite, $Mg\# = 0.30$) and ilmenite. Darker minerals (amphibole and biotite) are clustered and associated with quartz, apatite and ilmenite and are probably formed from an interstitial hydrous melt. Apatite is common throughout the rock; zircon is less abundant, not restricted to interstitial areas and often found associated with apatite.

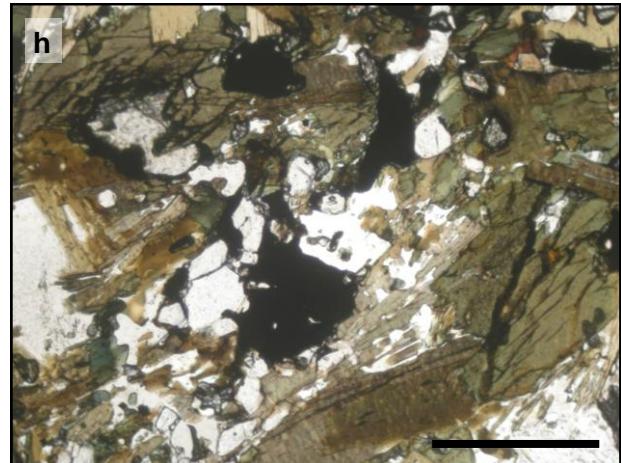
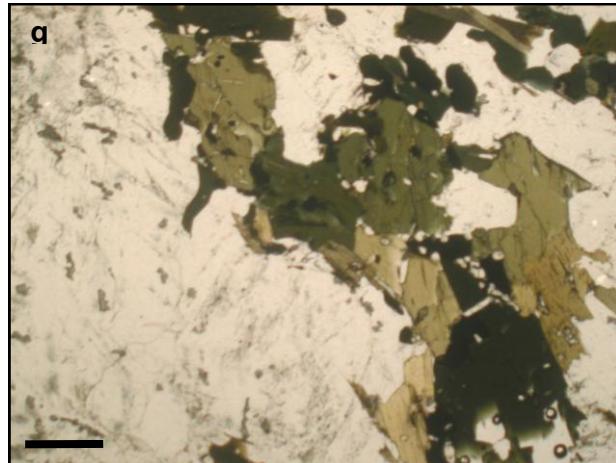
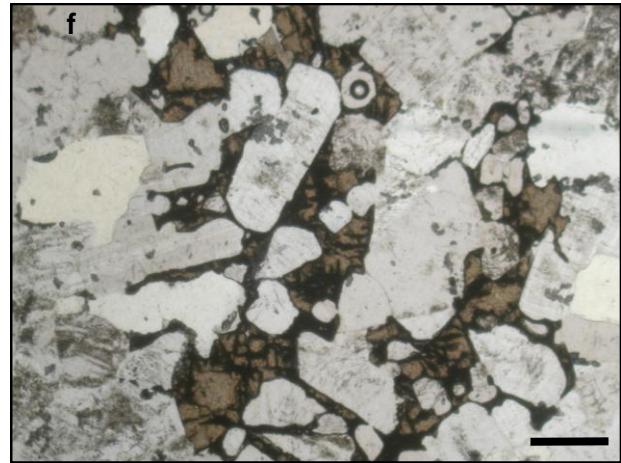
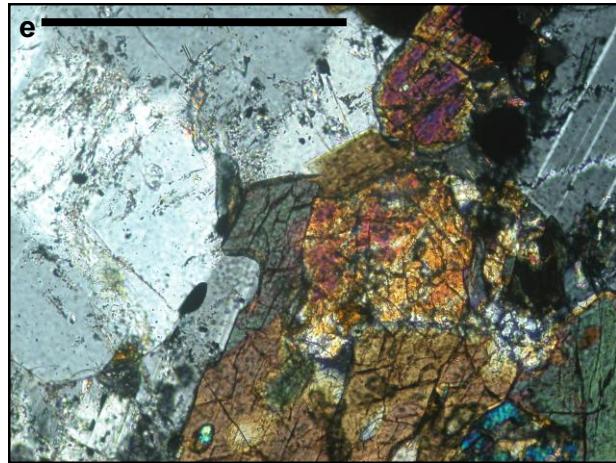
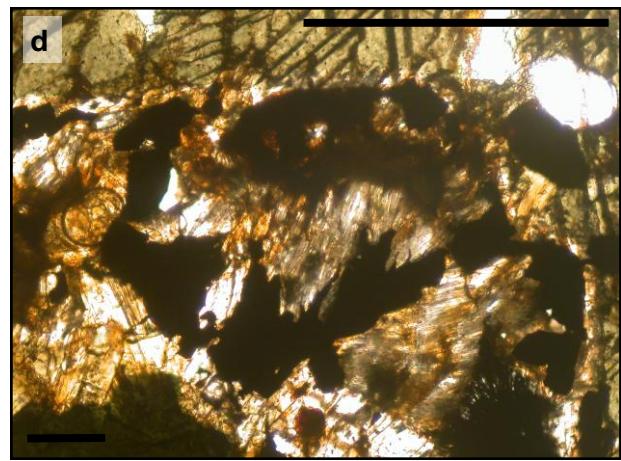
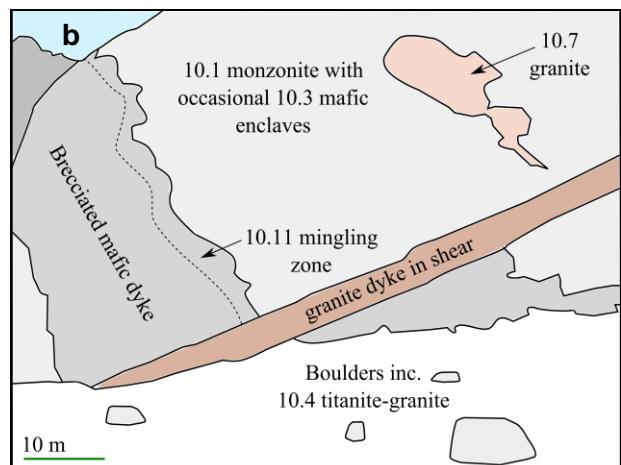
Zircon: Euhedral prismatic and slightly rounded. Some orange discolouration and metamictisation is present in most grains. Fracturing is minimal, though occasional dark patchy-looking inclusions may be secondary. Cores with irregular zoning are occasionally seen, though most grains are dominated by a concentrically zoned mantle with occasionally irregularly zoned patches.

Z7.41.1 Monzonite

This intrusion is referred to as the ‘Stabben Syenite’ in the literature, but the sample investigated in this study plots as monzonite on a Streckeisen diagram. Contains occasionally zoned macroperthitic microcline with complex exsolution patterns, plagioclase (An_{25}), biotite ($Mg\# = 0.48$) and rare myrmekite in the coarse matrix. In addition, several large pseudomorphs after pyroxene contain finer grained amphibole ($Mg\# = 0.61$), biotite, quartz, ilmenite, magnetite, limonite and chlorite, as well as accessory apatite, zircon and titanite. Biotite in these regions is intergrown with quartz and occasionally rimmed by it.

Zircon: Clear colourless crystals, occasionally with orange metamict regions, with euhedral and/or fractured outlines. Fracturing is less widespread than in other samples, however brown ‘blotchy’ inclusions of possible secondary origin are common. Zoning is concentric in most grains, and many grains contain cores with irregular zoning patterns.

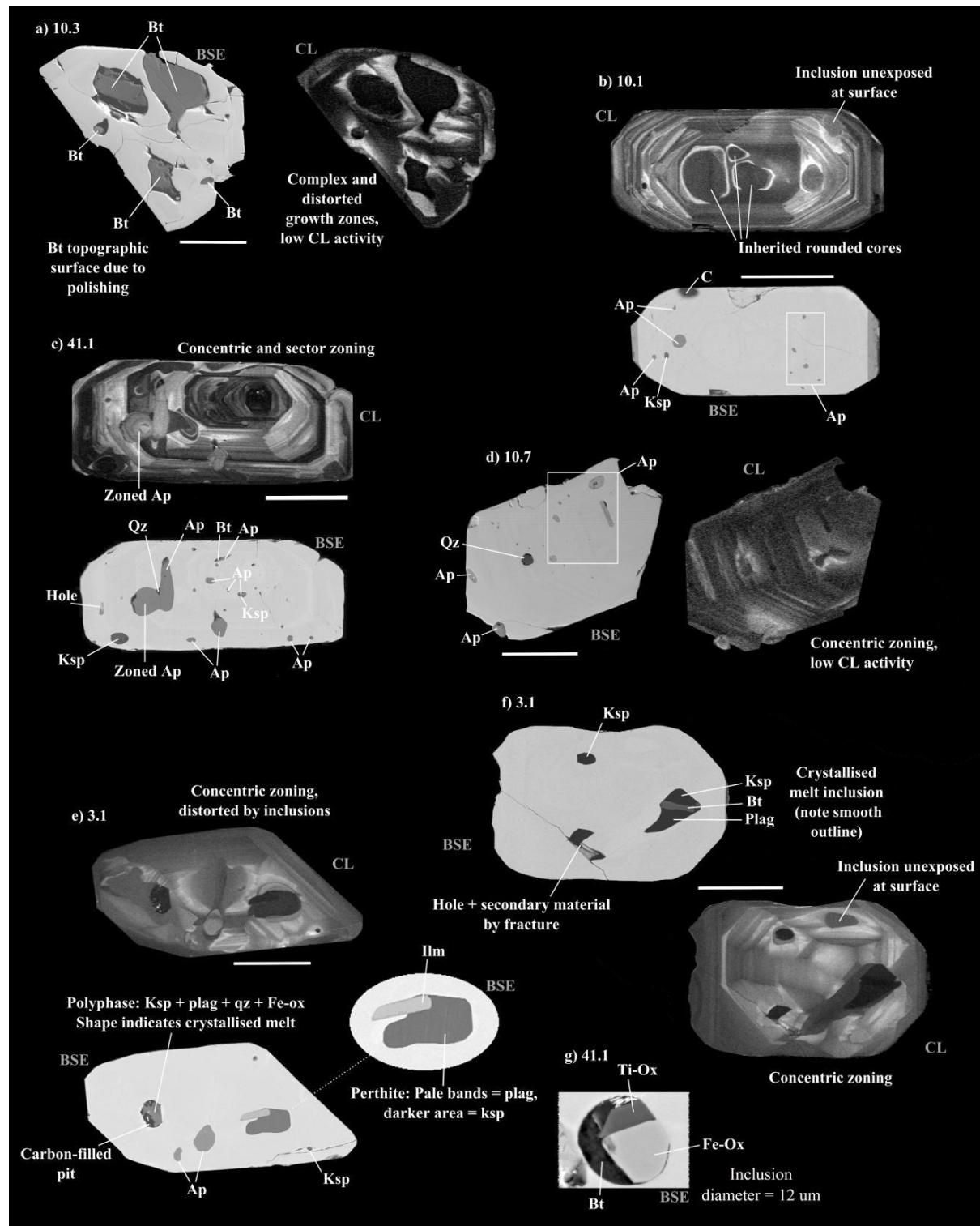
Selected images of field relations and thin sections of samples.

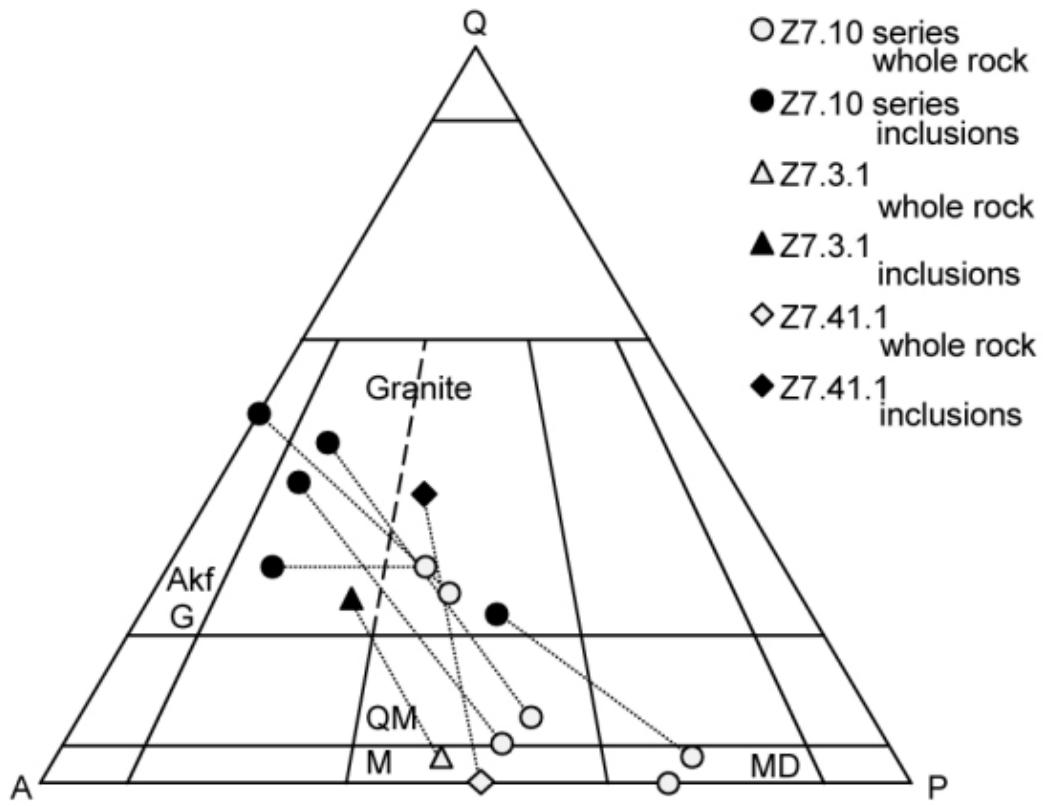


a Photograph of massive wall outcrop at Hoggestabben from which the 10.x sample series was taken. **b** Sketch of same outcrop indicating sample locations. **c** Photograph of Vedkosten and Hoggestabben, which are linked together. Man for scale (though provides poor perspective; the mountain Hoggestabben has 800 m of height exposed). **d** Sample 3.1 thin section: An example of a reactionary area. Opaque iron oxide, orange limonite, colourless quartz and less often opx, brown fine grained fibrous amphibole and biotite are seen, in contrast to the coarse green amphibole at the top of the photograph. Apatite and zircon are occasionally found in such areas. **e** Sample 10.3 thin section (x-polar): showing a cpx core surrounded by replacement amphibole. Biotite and oxides are associated with such areas. **f** Sample 10.4 thin section: ophitic titanite around crystals of plagioclase, K-feldspar and quartz. These large interstitial titanite crystal has a single extinction angle and is surrounded by an ‘halo’ \approx 2mm thick of just feldspar and quartz. **g** Sample 10.11 thin section: an example of the described ‘interstitial crystallisation’ mentioned in several sample descriptions. Subhedral green amphibole and biotite, quartz, K-feldspar and abundant apatite are clustered together along the boundary of a large (6mm) K-feldspar phenocryst (left hand side of image). **h** 41.1 thin section; this image shows part of a large (4mm) pyroxene pseudomorph. Biotite surrounded by and intergrown with quartz can be seen in the centre and bottom of the picture. Other phases here include titanite, green hornblende with brownish regions, an opaque phase, K-feldspar and abundant zircon (top right of image, with pleochroic halos).

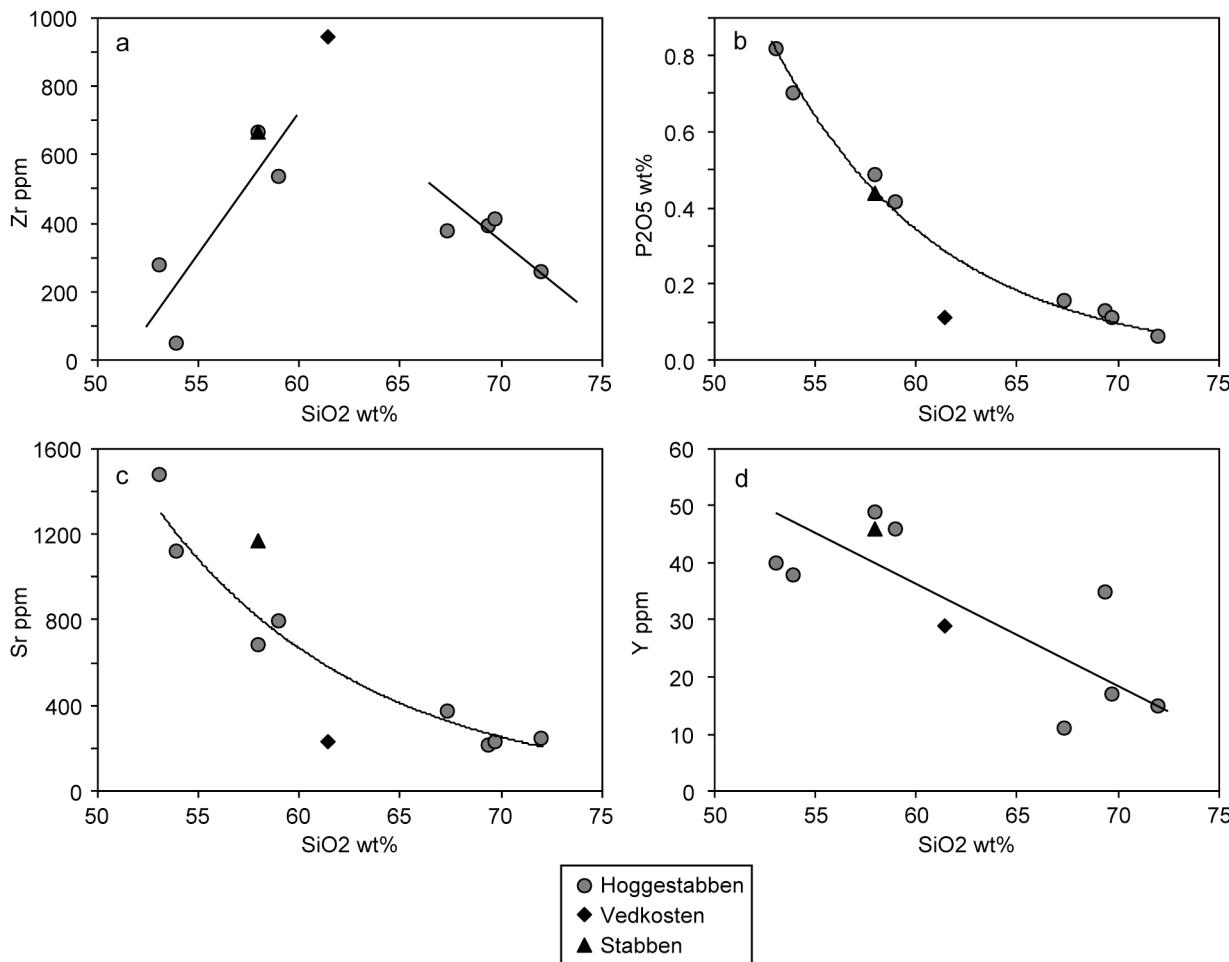
Scale for d – h is indicated by thick black line on the image (length = 0.5 mm)

Selected CL and BSE images of individual zircon grains from various samples

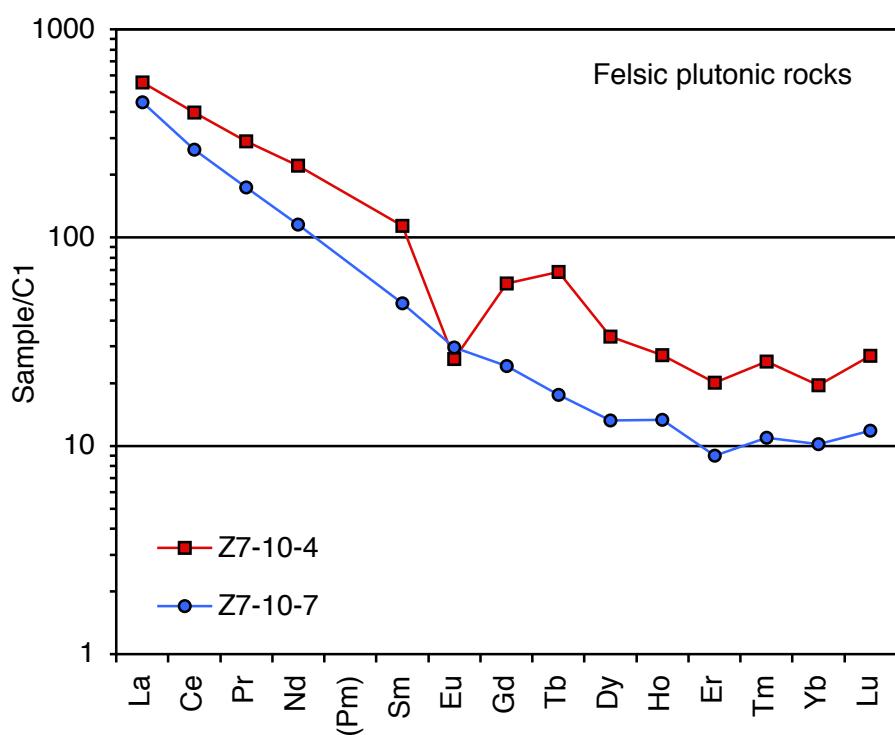
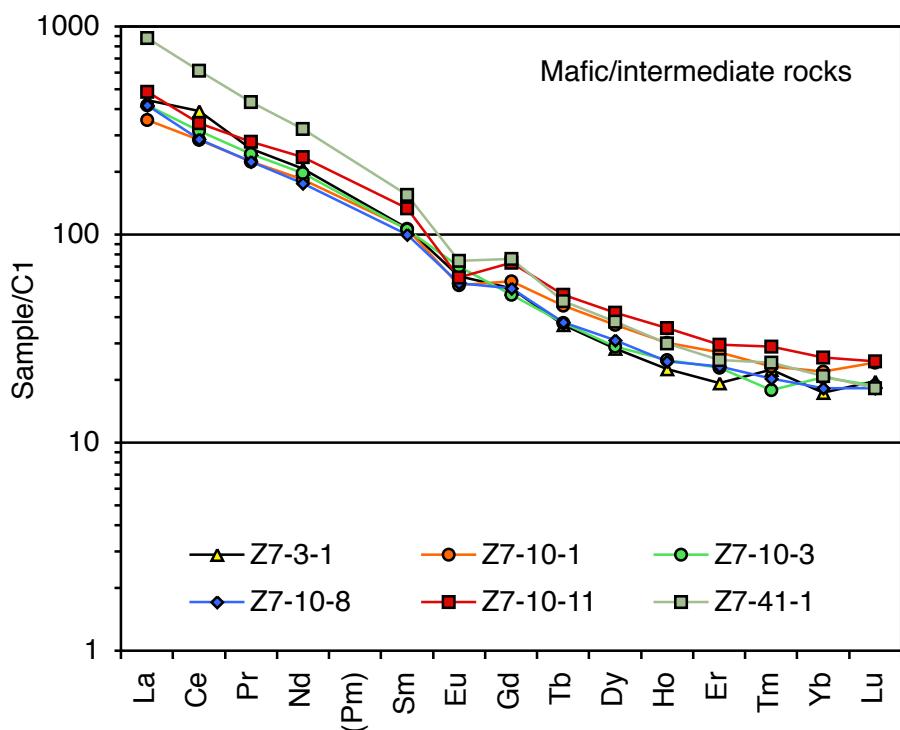




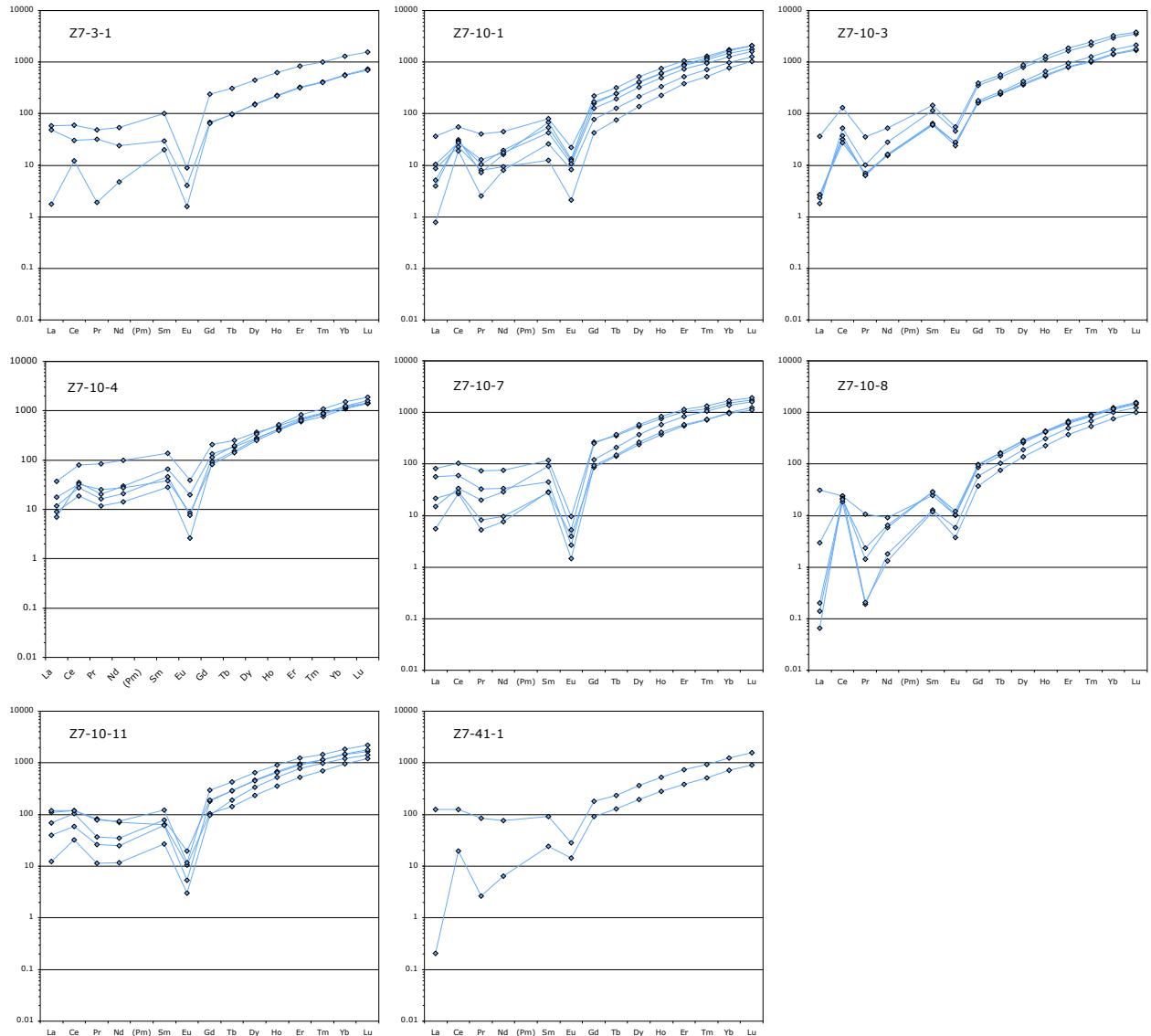
Suppl. Fig. (Jennings et al.): Streckeisen diagram showing whole rock mineralogy (based on CIPW analysis) and inclusion mineralogy (based on frequency). Although the two datasets are not directly comparable, it is clear that inclusion populations represent a significantly more evolved, granitic melt than is represented by the respective whole rocks. MD - monzodiorite, M - monzonite, QM - quartz monzonite, Akf G - alkali feldspar granite.



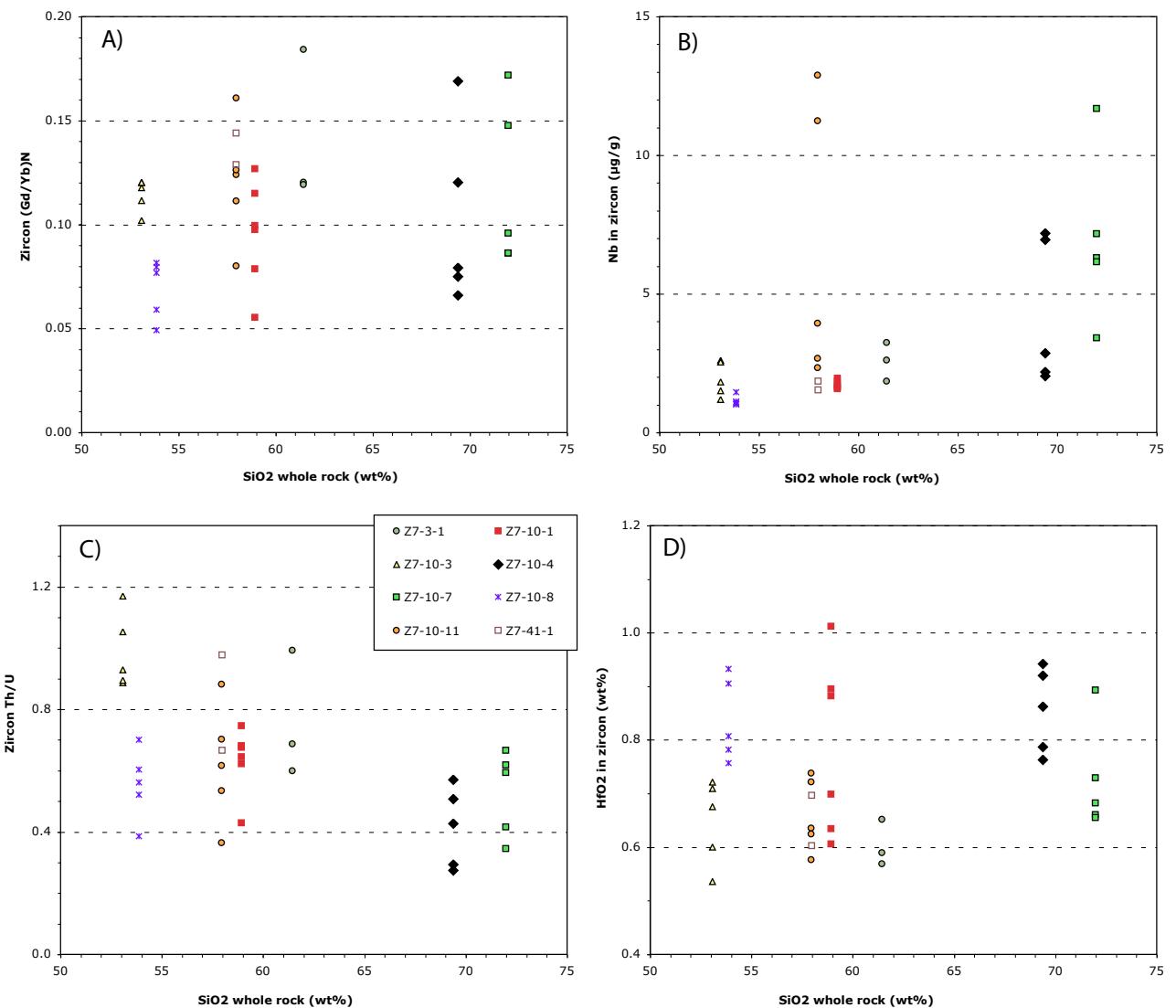
Suppl. figure (Jennings et al.): Variation of various whole-rock minor and trace-element abundances with SiO₂. (a) Zr increases up to ~63 wt% SiO₂, but decreases for more silica-rich compositions. (b) P2O₅, (c) Sr and (d) Y decrease with increasing SiO₂ over the full range of compositions. Note that zircon inclusions were only investigated from a subset of the samples plotted here.



Supplement figure (Jennings et al.): Whole-rock REE abundances normalized to C1 chondritic abundances (Boynton, 1985). Note that all samples show either no Eu anomaly (Z7-10-7), or negative Eu anomalies, showing that the rocks do not contain abundant plagioclase cumulus.



Supplement figure (Jennings et al.): REE patterns of zircon from all investigated samples determined by laser-ablation ICP-MS. Individual lines refer to individual analyses. Note that the analysed zircon grains contained inclusions of apatite and other minerals, and although care was taken to avoid the inclusions during analysis and sample reduction, light REE (La-Sm) are easily disturbed by apatite inclusions.



Supplement figure (Jennings et al.): Zircon HfO_2 and trace element data plotted versus whole-rock SiO_2 content. A) chondrite-normalized Gd/Yb ratio; B) Nb content; C) Th/U ratio; D) HfO_2 content.

Table DR1. Number of inclusions in which each mineral was observed for each sample

Sample	Z7.3.1 Mono- Poly-	Z7.10.1 Mono- Poly-	Z7.10.3 Mono- Poly-	Z7.10.4 Mono- Poly-	Z7.10.7 Mono- Poly-	Z7.10.8 Mono- Poly-	Z7.10.11 Mono- Poly-	Z7.41.1 Mono- Poly-								
Apatite	34	11	125	7	3	1	31	4	31	5	44	8	146	22	114	32
Quartz	2	11	4	5		1	4	1	3	2		5	8	15	1	31
Plagioclase	1	11		2		1			2		1	8	3	2	6	14
K-feldspar	7	20	5	6	2	1	4	1	5	5	2	6	13	9	12	18
Biotite	2	13	2	2	7	2	2	1	3	1	5	5	3	1	4	18
Fe-Ti-oxides	2	7	5	4			1		2	5			5	6		8
Hbl	1			3	1				2				2	4	8	9
Cpx					1							1				
Opx		1														
Monazite		1?														1
Pyrite			1										1	4	2	4
Calcite	1				1	1	1	1					1	1		1
Allanite													1?			3?
Total primary inc's	50	15	142	9	15	2	43	4	46	4	52	11	182	13	147	33
Total zircons	27		21		19		20		21		18		25		32	

Percentage of inclusions in which each mineral was observed for each sample

Sample	Z7.3.1	Z7.10.1	Z7.10.3	Z7.10.4	Z7.10.7	Z7.10.8	Z7.10.11	Z7.41.1
XRF No.	HM02	HM08	HM10	HM11	HM13	HM14	HM15	HM46
Rock type	Opx-monzonite	Monzonite	Monzodiorite	Granite	Granite	Bt rich domain	Qz-monzonite	Monzonite
Locality	Vedkosten	Hoggestabben	Hoggestabben	Hoggestabben	Hoggestabben	Hoggestabben	Hoggestabben	Stabben
(wt. %)								
SiO ₂	61.42	58.93	53.07	69.37	71.96	53.86	57.95	57.96
TiO ₂	0.67	1.27	2.09	0.54	0.27	2.11	1.61	1.10
Al ₂ O ₃	17.24	16.93	16.95	14.68	13.87	16.19	15.87	17.16
Fe ₂ O ₃	6.11	7.35	9.64	3.59	2.48	8.89	9.35	6.25
MnO	0.13	0.10	0.13	0.05	0.03	0.12	0.14	0.09
MgO	0.30	1.53	3.57	0.63	0.15	3.47	1.84	1.86
CaO	2.45	3.72	6.49	1.62	1.20	6.53	4.35	3.71
Na ₂ O	4.21	3.98	3.68	3.36	2.87	3.66	3.63	4.32
K ₂ O	6.80	5.15	3.35	5.58	6.21	2.76	4.25	5.83
P ₂ O ₅	0.11	0.42	0.82	0.13	0.06	0.70	0.49	0.44
LOI	0.57	0.71	0.56	0.85	0.44	0.46	0.66	0.92
Total	100.01	100.08	100.33	100.40	99.54	98.76	100.14	99.63
ASI	0.92	0.90	0.79	1.01	1.02	0.78	0.86	0.85
Mg#	0.09	0.29	0.42	0.26	0.11	0.44	0.28	0.37
CIPW norm								
qz	3.08	4.15	0.00	22.67	27.63	2.34	6.38	0.00
or	40.20	30.43	19.78	33.00	36.71	16.32	25.13	34.46
ab	35.62	33.65	31.11	28.44	24.26	30.93	30.70	36.55
an	8.05	13.13	19.85	7.18	5.53	19.61	14.46	10.22
c	0.00	0.00	0.00	0.48	0.40	0.00	0.00	0.00
il	1.27	2.40	3.96	1.02	0.51	4.01	3.06	2.09
ap	0.26	0.96	1.90	0.30	0.15	1.62	1.13	1.02
mt	1.33	1.60	2.10	0.78	0.54	2.15	2.03	1.36
di	2.97	2.22	5.78	0.00	0.00	6.81	3.34	4.44
hy	6.14	10.21	12.52	5.38	3.17	14.65	12.46	6.03
ol	0.00	0.00	1.96	0.00	0.00	0.00	0.00	2.02
Total	98.92	98.74	98.95	99.25	98.89	98.45	98.68	98.18
Plagioclase	43.11	34.73	50.96	35.71	27.78	50.54	29.62	41.04
Alkali feldspar	44.62	34.23	19.78	35.75	38.72	16.32	28.01	40.18
XRF data: (μ g/g)								
Ba	1158	3024	3329	1075	1179	2396	2165	3018
Rb	122	130	91	240	117	94	131	122
Sr	235	792	1481	214	250	1118	688	1165
Y	29	46	40	35	15	38	49	46
Cr	<10	<10	<10	<10	<10	10	<10	<10
V	2	73	186	34	6	195	92	67

Co	<5	11	23	<5	<5	24	12	10
Ni	<3	4	9	<3	<3	7	3	9
Cu	10	9	13	5	<3	13	10	11
Zn	111	113	119	80	36	114	152	112
Ga	23	24	23	20	19	23	23	23
As	<5	<5	<5	<5	<5	<5	<5	<5
Zr	946	537	280	395	260	51	664	667
Nb	24	26	18	15	<3	22	28	30
Pb	36	38	29	32	40	23	35	46
Th	9	10	6	43	14	9	15	19

ICP-MS data:
(µg/g)

La	105	84	99	132	106	99	115	208
Ce	240	175	193	244	162	176	210	377
Pr	24.0	20.8	22.6	26.8	16.1	20.8	26.0	40.1
Nd	94.7	83.9	90.5	101	52.9	80.7	108	147
Sm	15.9	15.8	15.7	16.8	7.2	14.8	19.7	23.0
Eu	3.56	3.22	3.94	1.47	1.67	3.28	3.50	4.23
Gd	11.0	11.8	10.3	12.0	4.80	11.0	14.6	15.3
Tb	1.33	1.65	1.36	2.48	0.64	1.37	1.86	1.73
Dy	6.98	9.04	7.12	8.26	3.25	7.62	10.3	9.39
Ho	1.24	1.65	1.36	1.49	0.73	1.35	1.94	1.64
Er	3.09	4.35	3.67	3.21	1.44	3.73	4.73	3.99
Tm	0.55	0.58	0.44	0.63	0.27	0.50	0.72	0.60
Yb	2.80	3.54	3.32	3.14	1.64	2.95	4.14	3.37
Lu	0.49	0.60	0.46	0.66	0.29	0.45	0.60	0.45

Sample	Z7.3.1	Z7.3.1	Z7.3.1	Z7.3.1	Z7.10.1	Z7.10.1	Z7.10.1	Z7.10.3	Z7.10.3	Z7.10.4	Z7.10.4	Z7.10.4	Z7.10.7	Z7.10.7	Z7.10.7	Z7.10.8	Z7.10.8	Z7.10.8	Z7.10.11	Z7.10.11	Z7.10.11	Z7.41.1	Z7.41.1	Z7.41.1									
Mineral	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap	Ap									
Type	Incl.	Incl.	n/a	n/a	n	n	n/a	n/a	y	y	n/a	n/a	n	n	n/a	n/a	n/a	n/a	n	n/a	n/a	n	n/a	n/a									
Fracture?	n	n	n/a	n/a	n	n	n/a	n/a	y	y	n/a	n/a	n	n	n/a	n/a	n/a	n/a	n	y	n/a	n/a	n	n/a	n/a								
(wt. %)																																	
SiO ₂	0.85	0.45	1.45	0.68	0.50	0.64	0.48	0.47	0.87	1.67	0.23	0.51	1.19	1.83	0.67	0.68	2.53	3.14	0.58	0.77	0.47	0.32	0.31	0.53	0.40	0.76	0.25	0.31	1.66	0.86	0.31	0.86	
Al ₂ O ₃	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FeO	0.04	0.05	0.38	0.35	0.02	0.06	0.16	0.03	0.03	0.02	0.22	0.10	0.05	0.06	0.29	0.02	0.02	0.05	0.11	0.44	0.37	0.08	0.76	0.50	0.00	0.04	0.02	0.52	0.11	0.04	0.05	0.22	
MnO	0.05	0.05	0.09	0.04	0.03	0.03	0.05	0.01	0.09	0.03	0.03	0.11	0.08	0.05	0.08	0.09	0.15	0.05	0.07	0.00	0.14	0.01	0.00	0.03	0.04	0.02	0.04	0.11	0.06	0.04	0.16		
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
CaO	53.65	54.55	52.31	54.21	54.31	53.98	54.59	54.77	52.79	53.88	54.79	54.31	52.70	52.42	54.20	54.75	50.22	51.11	54.34	53.86	54.73	54.93	54.96	54.38	54.50	54.52	55.08	54.69	50.77	53.47	54.74	52.07	
SrO	0.00	0.04	0.00	0.03	0.09	0.05	0.08	0.06	0.14	0.08	0.13	0.09	0.03	0.00	0.03	0.00	0.02	0.04	0.04	0.01	0.07	0.15	0.07	0.11	0.08	0.05	0.05	0.08	0.08	0.12	0.08	0.11	
Na ₂ O	0.00	0.03	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.06	0.02	0.01	0.02	0.03	0.00	0.04	0.02	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.14	0.00	0.02	0.26				
P ₂ O ₅	39.74	40.88	40.00	40.75	41.35	40.79	41.36	41.37	40.24	40.83	42.19	41.71	39.21	40.10	41.21	40.75	37.63	38.75	41.14	40.73	38.70	39.29	40.80	40.47	41.11	41.09	41.86	41.79	38.99	40.70	41.84	40.17	
Y ₂ O ₃	0.21	0.12	0.39	0.18	0.22	0.29	0.26	0.21	0.25	0.13	0.08	0.13	0.65	0.52	0.45	0.36	1.13	0.23	0.29	0.38	0.08	0.10	0.06	0.14	0.09	0.20	0.06	0.21	0.33	0.19	0.15	0.24	
La ₂ O ₃	0.41	0.23	0.69	0.30	0.08	0.11	0.10	0.09	0.22	0.11	0.10	0.11	0.22	0.13	0.06	0.07	0.61	0.45	0.11	0.18	0.14	0.16	0.10	0.12	0.11	0.24	0.10	0.05	0.96	0.35	0.10	0.71	
Ce ₂ O ₃	0.93	0.54	1.29	0.75	0.31	0.40	0.26	0.45	0.70	0.29	0.20	0.32	0.75	0.38	0.26	0.27	1.76	1.01	0.40	0.56	0.35	0.32	0.26	0.43	0.27	0.67	0.21	0.19	2.28	0.86	0.29	1.41	
Nd ₂ O ₃	0.46	0.29	0.85	0.39	0.30	0.46	0.29	0.33	0.45	0.19	0.17	0.24	0.65	0.37	0.28	0.25	1.37	0.54	0.41	0.48	0.32	0.17	0.19	0.21	0.21	0.39	0.20	0.13	0.99	0.50	0.23	0.64	
ThO ₂	0.04	0.02	0.12	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.03	0.05	0.04	0.04	0.01	0.01	0.17	0.02	0.00	0.03	0.03	0.05	0.04	0.00	0.01	0.00	0.04	0.00	0.03	0.00	0.00	0.03	
F	3.13	2.59	3.47	2.95	3.14	2.56	4.13	2.80	3.95	3.36	3.43	3.29	3.86	5.82	4.14	2.76	3.41	3.29	3.66	3.71	2.86	3.60	3.66	3.49	2.76	2.47	2.83	2.84	2.73	2.63	2.91	3.20	
Cl	0.01	0.01	0.02	0.00	0.04	0.01	0.01	0.01	0.07	0.09	0.05	0.06	0.04	0.04	0.01	0.00	0.05	0.14	0.01	0.02	0.05	0.06	0.02	0.01	0.02	0.33	0.03	0.04	0.27				
H ₂ O	0.26	0.55	0.13	0.41	0.29	0.56	0.47				0.19	0.19	0.23					0.06	0.14	0.06	0.04	0.39	0.02	0.10	0.15	0.47	0.62	0.46	0.49	0.33	0.52	0.42	0.16
Total (p.f.u.)	98.47	99.31	99.77	99.81	99.36	98.90	100.05	99.91	98.14	99.43	100.35	99.77	97.93	99.37	99.97	99.39	97.64	97.66	99.71	99.71	98.57	99.34	99.84	99.14	98.90	100.08	100.00	100.21	98.62	99.20	100.00	99.11	
Si	0.07	0.04	0.13	0.06	0.04	0.06	0.04	0.04	0.08	0.14	0.02	0.04	0.10	0.16	0.06	0.06	0.23	0.27	0.05	0.07	0.04	0.03	0.03	0.05	0.03	0.06	0.02	0.03	0.15	0.07	0.03	0.08	
Al	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fe ²⁺	0.00	0.00	0.03																														

Sample	Z7.41.1	Z7.41.1	Z7.41.1	Z7.41.1	Z7.3.1	Z7.3.1	Z7.3.1	Z7.10.3	Z7.10.3	Z7.10.3	Z7.10.3	Z7.10.4	Z7.10.4	Z7.10.8	Z7.10.8	Z7.10.8	Z7.10.8	
Mineral	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	Bt	
Type	Inc	Inc	Matrix	Matrix	Inc	Inc	Matrix	Matrix	Inc	Matrix	Matrix	Inc	Matrix	Inc	Inc	Matrix	Matrix	
Fracture?	n	n	n/a	n/a	n	n	n/a	n/a	y	n/a	n/a	n	n/a	n	y	n/a	n/a	
(wt. %)																		
SiO ₂	37.15	35.07	37.33	36.31	35.02	34.32	34.77	34.15	35.42	35.97	35.52	36.00	35.72	35.31	35.80	34.56	34.52	35.13
TiO ₂	2.95	1.10	3.64	3.37	0.70	3.65	3.66	5.14	4.33	4.74	5.01	3.76	3.20	3.16	4.51	3.35	3.03	4.05
Al ₂ O ₃	13.26	16.83	12.85	13.15	15.44	13.51	13.32	13.37	13.55	13.71	13.82	12.65	14.61	14.04	13.25	13.48	14.05	13.99
Cr ₂ O ₃	0.00	0.00	0.02	0.02	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.04	0.00	0.01	0.00	0.01	0.01	0.01
FeO	20.19	23.68	20.17	21.00	32.56	32.31	31.78	33.07	22.50	21.64	22.39	24.52	26.47	26.06	22.35	21.11	21.87	22.46
MnO	0.08	0.11	0.36	0.30	0.12	0.10	0.31	0.36	0.15	0.08	0.12	0.40	0.39	0.27	0.16	0.07	0.20	0.18
MgO	11.62	8.56	11.50	10.15	1.66	3.05	3.34	2.13	9.24	9.67	9.48	5.44	5.65	6.05	9.51	10.42	10.73	9.75
CaO	0.00	0.02	0.00	0.02	0.02	0.03	0.05	0.00	0.04	0.00	0.05	0.02	0.01	0.01	0.02	0.09	0.25	0.01
Na ₂ O	0.18	0.00	0.03	0.09	0.00	0.00	0.04	0.02	0.08	0.10	0.08	0.14	0.01	0.01	0.03	0.13	0.17	0.02
K ₂ O	9.49	9.07	9.54	9.24	9.08	9.21	9.04	9.18	8.97	9.41	9.36	8.68	9.50	9.26	9.23	8.83	8.01	9.68
H ₂ O	4.41	4.32	4.43	4.32	4.14	4.19	4.21	4.22	4.32	4.39	4.39	4.16	4.30	4.24	4.35	4.23	4.15	4.22
ZrO ₂	0.00	0.00			0.02	0.18			0.00			2.12		0.00	0.02	0.00	0.03	
Total	99.32	98.77	99.87	97.97	98.76	100.57	100.55	101.65	98.61	99.71	100.20	97.93	99.84	98.40	99.20	96.29	96.97	99.52
(p.f.u.)																		
Si	2.86	2.76	2.87	2.85	2.87	2.78	2.81	2.75	2.79	2.79	2.75	2.90	2.83	2.83	2.80	2.77	2.74	2.75
Ti	0.17	0.06	0.21	0.20	0.04	0.22	0.22	0.31	0.26	0.28	0.29	0.23	0.19	0.19	0.26	0.20	0.18	0.24
Al	1.20	1.56	1.16	1.22	1.49	1.29	1.27	1.27	1.26	1.25	1.26	1.20	1.36	1.33	1.22	1.27	1.32	1.29
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe ₂	1.30	1.56	1.29	1.38	2.23	2.19	2.14	2.23	1.48	1.40	1.45	1.65	1.75	1.75	1.46	1.42	1.45	1.47
Mn	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.03	0.03	0.02	0.01	0.00	0.01	0.01
Mg	1.34	1.00	1.32	1.19	0.20	0.37	0.40	0.26	1.08	1.12	1.09	0.65	0.67	0.72	1.11	1.25	1.27	1.14
Ca	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	
Na	0.03	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.02	0.00	0.00	0.01	0.02	0.03	0.00
K	0.93	0.91	0.93	0.93	0.95	0.95	0.93	0.94	0.90	0.93	0.92	0.89	0.96	0.95	0.92	0.90	0.81	0.97
Total	7.84	7.86	7.81	7.81	7.81	7.81	7.78	7.79	7.78	7.80	7.57	7.78	7.79	7.79	7.85	7.84	7.86	
Mg#	0.51	0.39	0.50	0.46	0.08	0.14	0.16	0.10	0.42	0.44	0.43	0.28	0.28	0.29	0.43	0.47	0.47	0.44

Sample	Z7.3.1	Z7.3.1	Z7.3.1	Z7.10.4	Z7.10.4	Z7.10.4	Z7.10.7	Z7.10.7	Z7.10.7	Z7.10.8	Z7.10.8	Z7.10.8	Z7.10.8	Z7.10.11	Z7.10.11	Z7.10.11	Z7.41.1	Z7.41.1	Z7.41.1		
Mineral	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag	Plag		
Type	Inc	Matrix	Matrix	Inc	Matrix	Matrix	Inc	Matrix	Inc	Inc	Matrix	Matrix	Inc	Matrix	Inc	Matrix	Inc	Matrix	Matrix		
Fracture?	n	n/a	n/a	y	n/a	n/a	y	n/a	n/a	n	y	n/a	n/a	n	n/a	n/a	n	n	n/a	n/a	
Polyphase? (wt. %)	y	n/a	n/a	n	n/a	n/a	y	n/a	n/a	n	y	n/a	n/a	n	n/a	n/a	y	n	n/a	n/a	
SiO ₂	76.34	65.74	68.66	68.35	63.08	68.58	77.83	63.18	68.77	65.10	67.97	59.47	58.15	62.96	62.33	64.68	69.28	73.82	61.73	63.45	
TiO ₂	0.00	0.02	0.01	0.00	0.00	0.05	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.02	0.02	0.01	0.03	0.01	0.01	0.00	
Al ₂ O ₃	18.06	22.65	19.93	19.32	23.56	20.01	11.44	23.38	20.07	23.77	21.04	24.80	25.60	24.04	24.30	22.90	19.30	17.75	24.39	23.33	
Cr ₂ O ₃	0.04	0.00	0.00	0.00	0.03	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fe ₂ O ₃	0.80	0.08	0.00	0.00	0.00	0.02	0.16	0.03	0.01	0.20	0.20	0.14	0.04	0.06	0.06	0.26	0.33	0.14	0.00	0.00	
FeO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MnO	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.01	0.05	0.00	0.04	0.02	0.09		
MgO	0.02	0.01	0.00	0.02	0.00	0.03	0.05	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.00		
CaO	1.27	3.60	0.29	0.31	4.77	0.54	0.43	4.61	0.34	4.04	0.42	6.39	7.34	5.12	5.56	3.98	0.65	0.09	5.63	4.40	
Na ₂ O	7.87	7.53	11.19	11.36	8.98	10.89	7.76	8.82	11.47	6.22	9.36	8.08	7.49	8.69	8.00	9.12	10.56	10.42	8.27	9.09	
K ₂ O	0.07	0.33	0.09	0.12	0.17	0.08	0.03	0.24	0.13	0.10	0.04	0.16	0.23	0.16	0.21	0.08	0.08	0.10	0.12	0.08	
ZrO ₂	0.01			0.17			0.01			0.61	0.09	0.03	0.01	0.08	0.18	0.22	0.00	0.04			
Total	104.56	99.97	100.16	99.66	100.60	100.18	97.58	100.41	100.82	99.89	99.19	99.13	98.97	101.09	100.68	101.09	101.09	100.15	102.68	100.32	100.44
(p.f.u.)																					
Si	3.14	2.87	2.99	3.00	2.78	2.98	3.38	2.78	2.98	2.85	2.97	2.68	2.63	2.76	2.75	2.83	3.01	3.11	2.73	2.79	
Ti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Al	0.87	1.17	1.02	1.00	1.22	1.03	0.59	1.21	1.02	1.23	1.08	1.32	1.36	1.24	1.26	1.18	0.99	0.88	1.27	1.21	
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fe ₃	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	
Fe ₂	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
Ca	0.06	0.17	0.01	0.01	0.23	0.02	0.02	0.22	0.02	0.19	0.02	0.31	0.36	0.24	0.26	0.19	0.03	0.00	0.27	0.21	
Na	0.63	0.64	0.94	0.97	0.77	0.92	0.65	0.75	0.96	0.53	0.79	0.70	0.66	0.74	0.68	0.77	0.89	0.85	0.71	0.78	
K	0.00	0.02	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	
Total	4.73	4.87	4.97	4.99	5.00	4.96	4.65	4.99	4.99	4.80	4.88	5.02	5.02	4.99	4.97	4.97	4.94	4.87	4.99	4.99	
An#	0.08	0.20	0.01	0.01	0.22	0.03	0.03	0.22	0.02	0.26	0.02	0.30	0.35	0.24	0.27	0.19	0.03	0.00	0.27	0.21	

Comment	Z7.3.1	Z7.3.1	Z7.3.1	Z7.3.1	Z7.10.1	Z7.10.1	Z7.10.1	Z7.10.1	Z7.10.4	Z7.10.4	Z7.10.8	Z7.10.8	Z7.10.8	Z7.10.8	Z7.10.11	Z7.10.11	Z7.10.11	Z7.41.1	Z7.41.1	Z7.41.1	Z7.41.1		
Mineral	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp	Ksp		
Type	Inc	Inc	Matrix	Matrix	Inc	Inc	Matrix	Matrix	Inc	Matrix	Inc	Inc	Matrix	Matrix	Inc	Inc	Matrix	Inc	Inc	Matrix	Matrix		
Fracture?	n	n	n/a	n/a	n	n	n/a	n/a	n	n/a	n	n	n/a	n/a	n	n	n/a	n	n	n/a	n/a		
Polyphase? (wt. %)	y	n	n/a	n/a	n	n	n/a	n/a	n	n/a	n	y	n/a	n/a	n	n	n/a	y	y	n/a	n/a		
SiO ₂	64.67	63.75	65.50	64.62	64.33	63.12	64.05	64.32	78.32	65.03	64.65	62.83	64.53	61.04	61.33	64.60	66.62	65.10	64.50	62.64	64.81	64.36	66.47
TiO ₂	0.01	0.00	0.02	0.00	0.09	0.00	0.00	0.01	0.00	0.01	0.07	0.04	0.00	0.04	0.00	0.01	0.03	0.00	0.00	0.02	0.00	0.00	0.09
Al ₂ O ₃	18.52	18.01	18.77	18.63	19.17	17.95	18.85	18.62	11.48	18.94	18.46	19.31	18.16	18.82	19.06	18.43	16.87	18.73	18.69	18.57	18.52	18.30	18.83
Cr ₂ O ₃	0.00	0.01	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe ₂ O ₃	0.04	0.03	0.12	0.10	0.09	0.31	0.00	0.02	0.02	0.00	0.08	0.03	0.00	0.19	0.04	0.08	0.02	0.00	0.00	0.13	0.02	0.03	0.00
FeO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.04	0.00	0.05	0.10	0.00	0.07
MnO	0.00	0.04	0.00	0.07	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.07	0.04	0.00	0.05	0.10	0.00	0.07
MgO	0.02	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.00	0.03	0.01	0.01	0.01	0.01	0.01
CaO	0.00	0.01	0.02	0.01	0.07	0.29	0.00	0.03	0.02	0.03	0.00	0.00	0.00	0.01	0.00	0.08	0.01	0.07	0.05	0.00	0.00	0.00	0.00
Na ₂ O	1.05	0.00	1.34	0.91	0.17	0.09	1.32	1.07	0.23	1.49	0.66	1.48	0.07	1.05	1.34	1.07	0.13	1.54	0.84	0.62	0.00	0.87	1.08
K ₂ O	15.19	16.11	15.13	15.49	14.51	15.93	14.78	14.48	10.26	14.65	15.88	13.41	15.47	14.93	14.59	15.03	14.75	14.19	15.28	14.77	16.44	15.03	14.13
ZrO ₂	0.00	0.14			1.27	0.00	0.05	0.00	0.28			0.03	0.06			0.08	0.57	0.00	0.03	0.17	0.00		
Total	99.51	98.10	100.90	99.85	99.80	97.76	99.06	98.54	100.60	100.15	99.80	97.16	98.31	96.08	96.43	99.32	99.13	99.65	99.44	97.02	99.93	98.61	100.68
(p.f.u.)																							
Si	2.99	3.01	2.99	2.99	2.98	2.99	2.98	2.99	3.41	2.98	2.99	2.96	3.02	2.94	2.94	3.00	3.08	2.99	2.99	2.98	3.00	3.00	3.01
Ti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al	1.01	1.00	1.01	1.01	1.05	1.00	1.03	1.02	0.59	1.02	1.01	1.07	1.00	1.07	1.08	1.01	0.92	1.02	1.02	1.04	1.01	1.01	1.01
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe ₃	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe ₂	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ca	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.09	0.00	0.12	0.08	0.02	0.01	0.12	0.10	0.02	0.13	0.06	0.14	0.01	0.10	0.12	0.10	0.01	0.14	0.08	0.06	0.00	0.08	0.10
K	0.90	0.97	0.88	0.91	0.86	0.96	0.88	0.86	0.57	0.86	0.94	0.81	0.92	0.92	0.89	0.89	0.87	0.83	0.90	0.90	0.97	0.89	0.82
Total	5.00	4.98	5.00	5.00	4.92	4.99	5.00	4.97	4.59	5.00	5.00	4.97	4.95	5.03	5.03	4.99	4.90	4.98	4.99	4.98	4.98	4.98	4.94
Ab/(Or+Ab)	0.10	0.00	0.12	0.08	0.02	0.01	0.12	0.10	0.03	0.13	0.06	0.14	0.01	0.10	0.12	0.10	0.01	0.14	0.08	0.06	0.00	0.08	0.10

Comment	Z7.10.3	Z7.10.3	Z7.10.3	Z7.10.8	Z7.10.8	Z7.10.8	Z7.3.1	Z7.3.1	Z7.3.1	Z7.41.1	Z7.41.1	Z7.41.2	Z7.41.1	Z7.41.1	Z7.41.1	Z7.41.2
Mineral	Cpx	Cpx	Cpx	Cpx	Cpx	Cpx	Opx	Opx	Opx	Am						
Type	Inc	Matrix	Matrix	Inc	Matrix	Matrix	Inc	Matrix	Matrix	Inc	Inc	Inc	Matrix	Matrix	Matrix	Matrix
Fracture?	n	n/a	n/a	n	n/a	n/a	n	n/a	n/a	n	n	n/a	n/a	n/a	n/a	n/a
(wt. %)																
SiO ₂	50.85	52.09	51.99	51.84	50.35	50.45	48.18	48.15	48.58	43.39	44.96	50.27	41.01	43.51	41.59	48.20
TiO ₂	0.12	0.11	0.11	0.06	0.02	0.11	0.01	0.08	0.03	1.08	1.51	0.29	5.62	2.39	1.62	0.73
Al ₂ O ₃	0.80	0.71	0.86	0.56	0.44	0.84	0.33	0.89	0.18	8.76	7.55	4.06	14.43	8.23	9.07	4.21
Cr ₂ O ₃	0.01	0.01	0.04	0.00	0.01	0.02	0.00	0.01	0.02	0.00	0.00	0.00	0.13	0.00		
Fe ₂ O ₃	0.00	1.02	0.67	0.00	5.45	4.76	0.00	0.00	0.00	2.66	0.82	1.51	1.51	3.85	2.40	0.74
FeO	11.77	11.62	12.71	11.97	8.00	9.37	43.25	42.91	42.26	18.38	17.14	15.18	8.36	15.60	18.41	13.91
MnO	0.50	0.51	0.58	0.40	0.56	0.56	2.15	1.45	2.17	0.32	0.35	0.50	0.00	0.19	0.44	
MgO	10.10	10.55	10.14	10.38	10.45	10.21	1.65	2.55	3.03	8.60	9.69	12.29	13.02	10.11	8.46	12.07
CaO	21.99	23.16	22.85	23.97	24.73	23.85	0.45	1.25	0.45	11.64	11.41	11.87	9.69	10.11	11.65	10.51
Na ₂ O	0.29	0.37	0.35	0.24	0.29	0.37	0.00	0.14	0.05	1.33	1.02	0.60	2.67	1.27	1.70	1.09
K ₂ O	0.00	0.02	0.00	0.02	0.00	0.00	0.01	0.11	0.02	1.24	1.21	0.42	1.89	1.84	1.39	0.67
H ₂ O										1.97	1.96	2.03	2.08	1.99	1.94	1.95
ZrO ₂	0.02			0.10	0.00	0.07	0.05			0.00	0.06	0.05				
Total	96.45	100.18	100.30	99.54	100.30	100.60	96.08	97.52	96.79	99.36	97.68	99.07	100.28	99.21	98.68	94.07
(p.f.u.)																
Si	2.00	1.98	1.98	1.98	1.92	1.92	2.10	2.06	2.09	6.66	6.92	7.47	5.96	6.62	6.47	7.48
Ti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.17	0.03	0.61	0.27	0.19	0.09
Al	0.04	0.03	0.04	0.03	0.02	0.04	0.02	0.04	0.01	1.58	1.37	0.71	2.47	1.47	1.66	0.77
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	
Fe ₃	0.00	0.03	0.02	0.02	0.16	0.14	0.00	0.00	0.00	0.31	0.09	0.17	0.17	0.44	0.28	0.09
Fe ₂	0.39	0.37	0.40	0.36	0.26	0.30	1.57	1.53	1.52	2.36	2.20	1.88	1.02	1.98	2.40	1.81
Mn	0.02	0.02	0.02	0.01	0.02	0.02	0.08	0.05	0.08	0.04	0.05	0.06	0.00	0.02	0.06	0.00
Mg	0.59	0.60	0.58	0.59	0.59	0.58	0.11	0.16	0.19	1.97	2.22	2.72	2.82	2.29	1.96	2.79
Ca	0.93	0.94	0.93	0.98	1.01	0.97	0.02	0.06	0.02	1.91	1.88	1.89	1.51	1.65	1.94	1.75
Na	0.02	0.03	0.03	0.02	0.02	0.03	0.00	0.01	0.00	0.40	0.30	0.17	0.75	0.37	0.51	0.33
K	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.24	0.24	0.08	0.35	0.36	0.28	0.13	
Total	3.99	4.00	4.00	4.00	4.00	4.00	3.90	3.93	3.91	15.59	15.45	15.19	15.66	15.51	15.76	15.23
Mg#	0.60	0.62	0.59	0.62	0.70	0.66	0.06	0.10	0.11	0.45	0.50	0.59	0.74	0.54	0.45	0.61