Supplementary figures and tables for

Experimental cannibalization of plagioclase by alkaline basalt magmas

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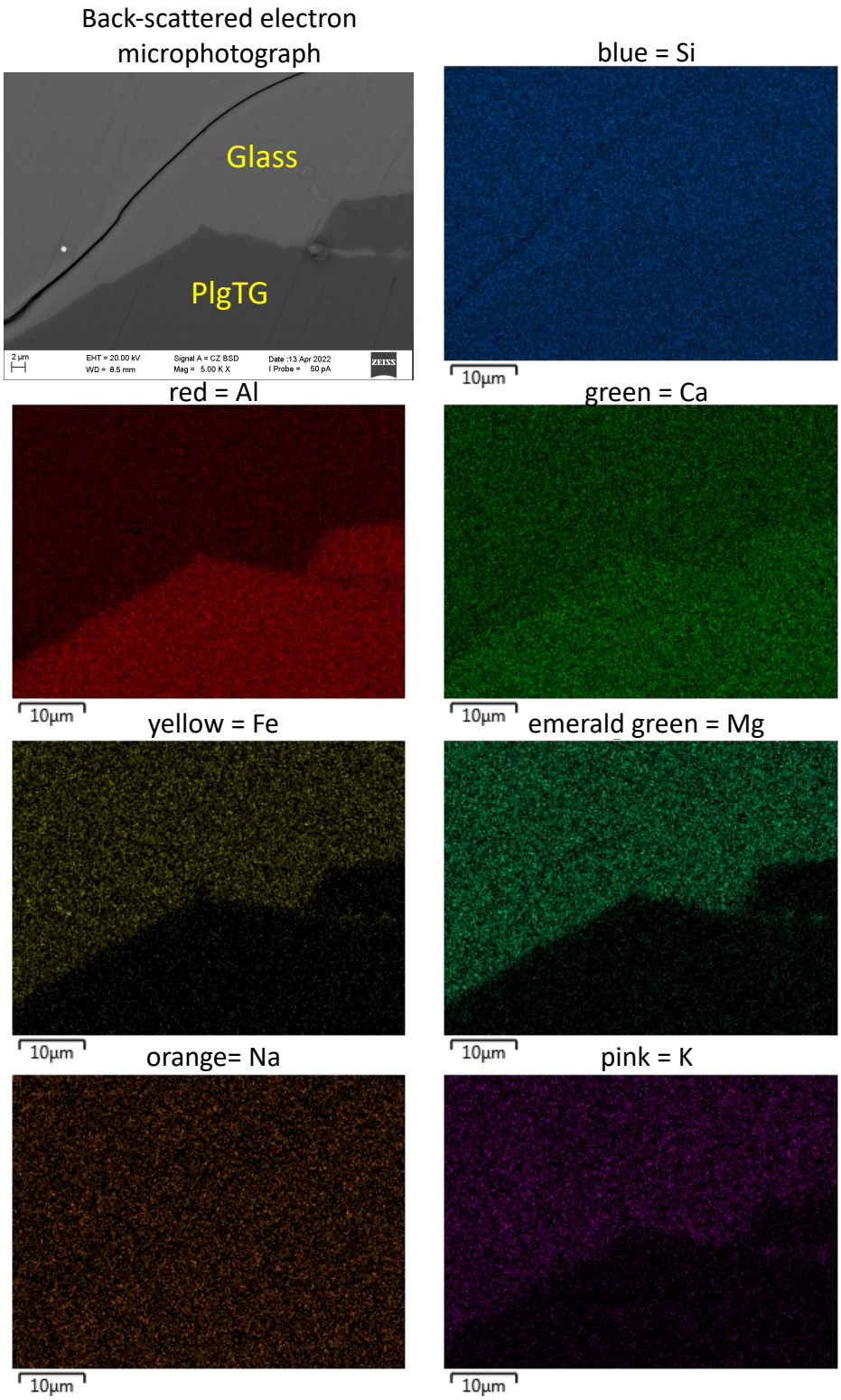

Figure S1. Crystal-melt interface BSE image and EDS composition maps of the experiment at 1225 °C and 3h dwell time. At this temperature, there is no clear evidence of dissolution processes at the edge of the plagioclase seed (PlgTG).

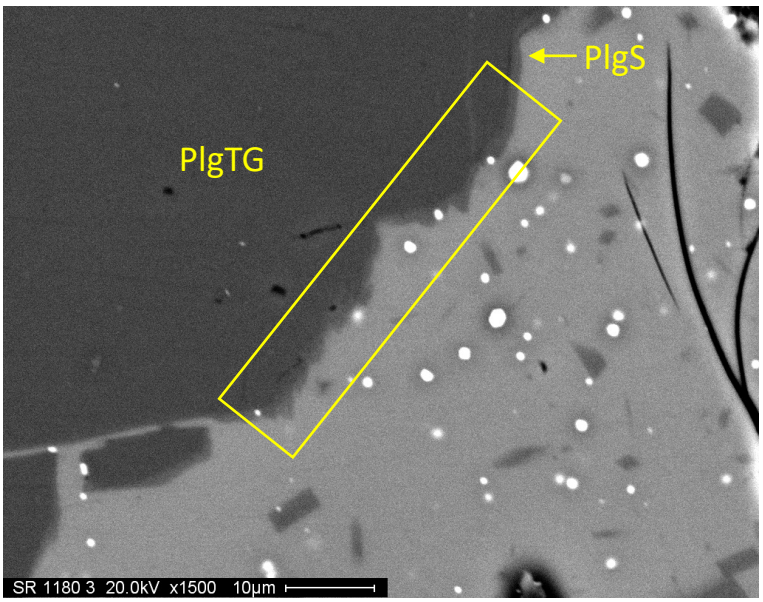

Figure S2. BSE image of experiment C1 (1180 °C – 0h dwell time). The newly rim (PlgS) visible by its lighter grey colour than the PlgTG one, shows irregularities and discontinuities in growth.

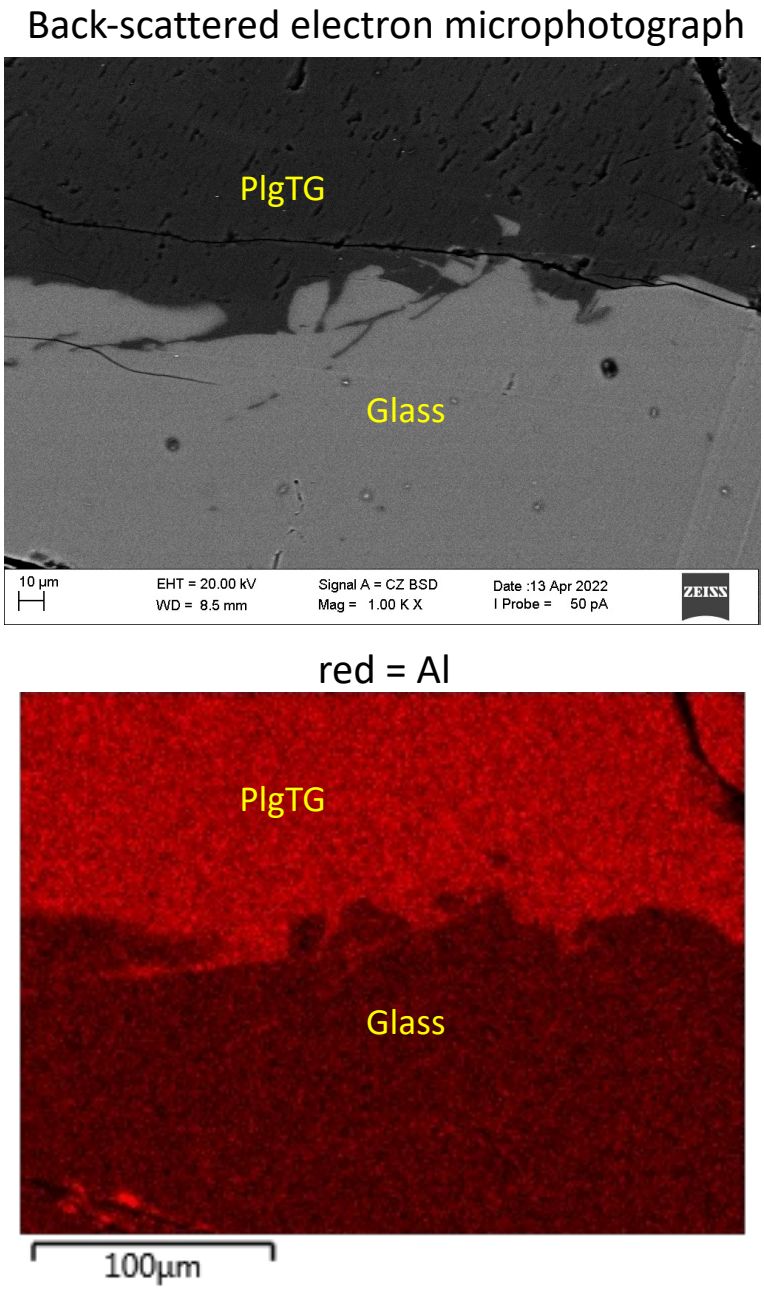

Figure S3. Crystal-melt interface BSE image of experiment D6 (1240 °C - 20h dwell time) showing a) the dissolution structures at the margin of plagioclase seed (PlgTG) and b) the EDS composition map for Aluminum in which no (diffusion-influenced) zoning pattern in PlgTG due to dissolution is evidenced.

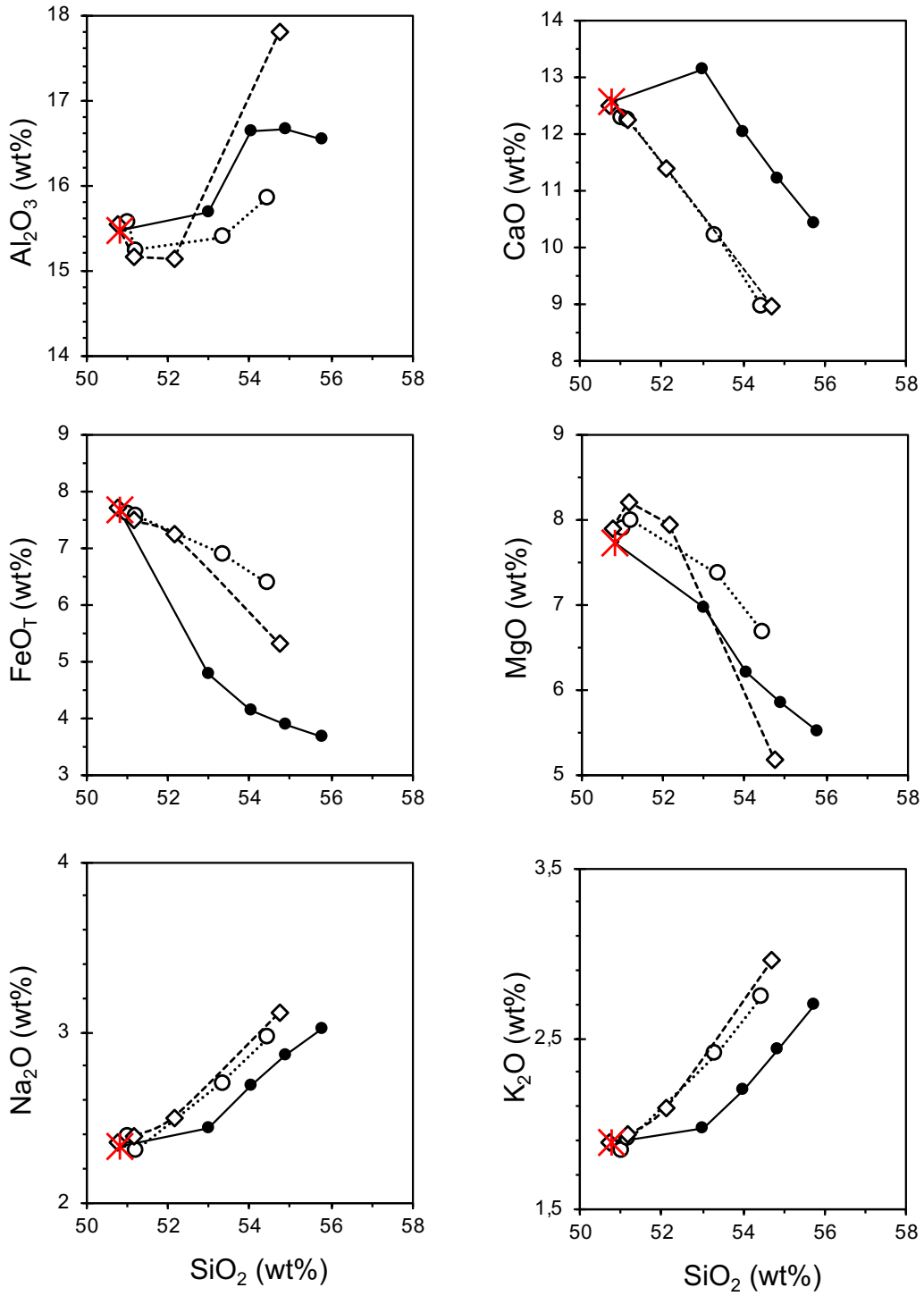

Figure S4. Composition of residual glasses from the experiments at 3h (empty diamond) and 15h (empty circle) of isothermal dwell time plotted in the diagrams for major elements versus SiO2 compared with the compositional range of liquids returned by Rhyolite-MELTS modeling (full circle). Red star = starting material PST9.

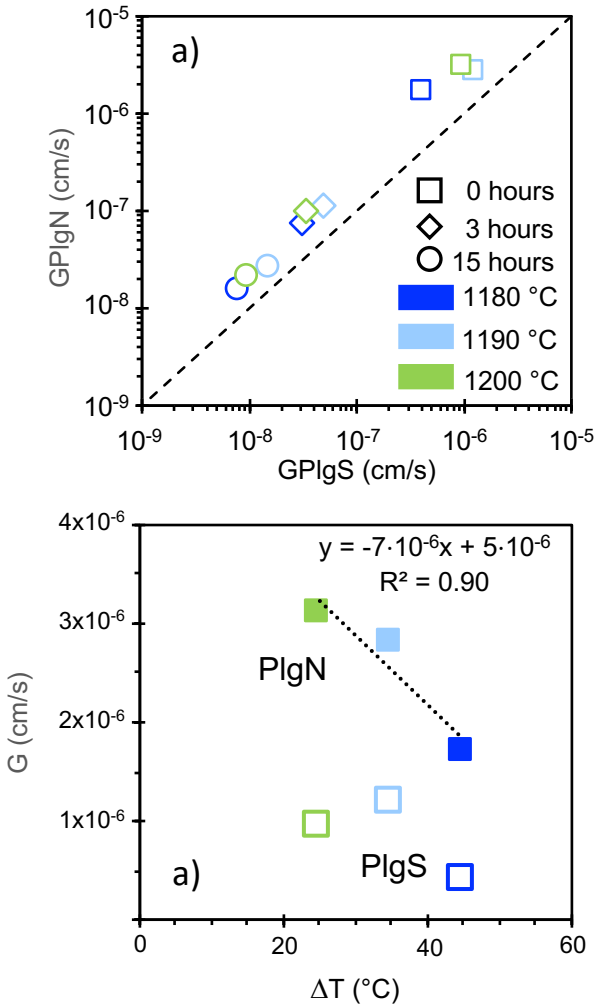

Figure S5. Comparison of maximum growth rate as a function of ΔT for newly plagioclases (full symbols) and for overgrowth rims (empty symbols).

Table S1 - Representative analyses of experimental minerals and compositions of residual glasses (wt%)

Run	T (°C)	ΔT (°C)	t (h)	n	Phases	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	An	ΔAn	Wo	En	Fs	Uspl
C1	1180	45	0		PlgN	50.67	0.09	30.12	1.08	0.01	0.13	13.99	2.97	0.56		70	-4.5				
				3	Gl	51.04 (08) ‡	0.90 (01)	15.33 (02)	7.70 (17)	0.19 (02)	8.01 (02)	12.22 (01)	2.28 (05)	1.89 (01)	0.42 (01)						
C2	1180	45	3		PlgN	50.33	0.05	31.11	1.08	0.03	0.16	14.55	2.68	0.36		73	6.1				
					Cpx	52.56	0.72	2.70	7.83	0.22	15.54	21.14	0.29	0.03				43	44	13	
					Cpx	49.55	0.72	3.90	8.04	0.27	15.17	21.33	0.33	0.04				44	43	13	
				4	Gl	54.73 (86)	1.06 (17)	17.79 (71)	5.32 (17)	0.20 (02)	5.19 (99)	8.95 (86)	3.11 (03)	2.96 (44)	0.69 (09)						
C3	1180	45	15		PlgS	49.74	0.04	29.76	2.28	0.05	0.35	14.84	2.50	0.30		75	12.1				
					PlgN	51.72	0.08	29.69	1.28	0.00	0.18	12.99	3.22	0.57		67	3.5				
					Cpx	46.89	0.82	7.08	9.41	0.17	14.78	20.95	0.33	0.01				43	42	15	
				2	Ox		1.14	4.35	83.45		2.55										3.42
				4	Gl	54.45 (11)	1.14 (07)	15.85 (17)	6.36 (17)	0.18 (03)	6.68 (35)	8.96 (19)	2.97 (03)	2.74 (05)	0.67 (08)						
C4	1190	35	0		PlgN	50.24	0.09	29.51	1.81	0.00	0.40	14.40	2.78	0.53		72	-1.4				
				4	Gl	51.05 (27)	0.87 (03)	15.30 (07)	7.53 (12)	0.20 (03)	8.02 (02)	12.23 (11)	2.39 (08)	1.92 (04)	0.49 (06)						
C5	1190	35	3		PlgS	49.01	0.04	30.79	2.05	0.02	0.27	15.64	2.19	0.21		79	8.6				
					PlgN	51.67	0.09	29.56	1.18	0.00	0.23	13.63	3.12	0.67		68	-2.3				
					PlgN	48.90	0.06	30.37	2.40	0.09	0.29	15.39	2.23	0.29		78	7.7				
					Cpx	44.81	0.99	7.84	10.31	0.15	13.49	21.17	0.36	0.05				44	39	17	
				3	Gl	52.13 (19)	0.97 (05)	15.12 (51)	7.22 (10)	0.17 (08)	7.94 (35)	11.39 (19)	2.49 (03)	2.09 (07)	0.49 (05)						
C6	1190	35	15		PlgS	49.12	0.06	30.23	2.23	0.01	0.33	15.53	2.30	0.28		78	10.6				
					PlgN	52.03	0.09	29.50	0.99	0.00	0.15	13.41	3.19	0.56		68	0.6				
					PlgN	49.26	0.05	30.35	2.43	0.00	0.34	15.52	2.25	0.29		78	10.8				
					Cpx	45.64	0.88	7.32	9.73	0.10	13.89	21.46	0.30	0.00				44	40	16	
					Cpx	47.24	0.64	6.77	9.36	0.14	14.57	21.41	0.33	0.02				44	41	15	
				2	Ox		0.92	7.39	79.16	0.07	5.68										2.46
				3	Gl	53.32 (23)	1.03 (02)	15.39 (04)	6.88 (08)	0.18 (01)	7.37 (03)	10.21 (08)	2.70 (04)	2.40 (07)	0.51 (03)						
C7	1200	25	0		PlgN	48.14	0.09	31.90	1.38	0.06	0.30	16.27	1.99	0.29		80	6.1				
				3	Gl	50.90 (04)	0.87 (04)	15.51 (03)	7.61 (02)	0.18 (01)	7.90 (02)	12.37 (06)	2.39 (04)	1.82 (01)	0.45 (02)						

Table S1 (continued)

Run	T (°C)	ΔT (°C)	t (h)	n	Phases	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	An	ΔAn	Wo	En	Fs	Uspl
C8	1200	25	3		PlgS	48.90	0.00	31.97	0.99	0.04	0.16	15.91	2.36	0.22		78	5.1				
					PlgN	48.24	0.03	30.14	2.50	0.01	0.32	15.61	2.27	0.33		78	4.9				
					PlgN	49.45	0.09	30.62	1.59	0.00	0.15	15.10	2.40	0.37		76	3.2				
				4	Gl	51.16 (15)‡	0.91 (01)	15.15 (01)	7.47 (06)	0.12 (02)	8.21 (02)	12.24 (01)	2.39 (09)	1.93 (06)	0.42 (04)						
C9	1200	25	15		PlgS	48.94	0.06	31.73	1.25	0.00	0.23	15.69	2.23	0.26		78	4.6				
					PlgN	49.22	0.05	30.45	1.77	0.04	0.25	15.38	2.45	0.36		76	2.3				
				3	Gl	51.20 (12)	0.91 (04)	15.24 (01)	7.56 (07)	0.17 (03)	8.00 (02)	12.23 (10)	2.30 (09)	1.91 (04)	0.48 (05)						
C11	1220	5	3	3	Gl	50.75 (33)	0.79 (05)	15.54 (38)	7.70 (51)	0.17 (04)	7.90 (50)	12.49 (32)	2.35 (13)	1.88 (07)	0.42 (03)						
C12	1220	5	10		PlgN	47.62	0.12	32.25	1.47	0.07	0.50	16.32	1.84	0.29		82	6.7				
				3	Gl	50.99 (47)	0.88 (02)	15.67 (35)	7.55 (22)	0.19 (03)	7.86 (10)	12.23 (13)	2.43 (04)	1.84 (14)	0.37 (03)						
C13	1220	5	20		PlgTG*	49.19	0.02	32.53	0.46		0.20	15.71	2.44	0.21		77	2.8				
				3	Gl	51.02 (11)	0.92 (09)	15.56 (06)	7.60 (11)	0.13 (03)	7.89 (04)	12.26 (10)	2.38 (02)	1.84 (04)	0.39 (03)						
D1	1230	-5	3		PlgTG*	49.48	0.09	31.94	0.41		0.14	15.88	2.52	0.16		77	2.2				
				5	Gl	50.98 (13)	0.81 (03)	15.71 (34)	7.61 (20)	0.16 (03)	7.88 (07)	12.23 (10)	2.39 (04)	1.84 (03)	0.38 (03)						
D2	1230	-5	10		PlgTG*	49.36	0.05	32.06	0.39	0.08	0.16	15.50	2.55	0.14		76	0.1				
				4	Gl	50.90 (22)	0.78 (03)	16.19 (24)	7.52 (25)	0.14 (07)	7.67 (03)	12.18 (16)	2.36 (11)	1.86 (04)	0.40 (06)						
D3	1230	-5	20		PlgTG*	49.08	0.03	32.16	0.37	0.01	0.04	15.85	2.36	0.09		78	1.9				
				4	Gl	51.04 (22)	0.91 (04)	16.06 (06)	7.50 (04)	0.18 (05)	7.68 (10)	12.19 (05)	2.31 (06)	1.80	0.32 (04)						
D4	1240	-15	3		PlgTG*	49.13		32.13	0.49		0.11	15.77	2.36	0.11		78	2.8				
				5	Gl	50.92 (18)	0.82 (04)	15.96 (48)	7.57 (38)	0.16 (03)	7.84 (11)	12.12 (21)	2.39 (05)	1.85 (02)	0.36 (01)						
D5	1240	-15	10		PlgTG*	48.72	0.05	32.02	0.72	0.03	0.26	15.51	2.20	0.28		78	1.2				
				4	Gl	50.86 (21)	0.83 (02)	16.40 (42)	7.43 (26)	0.17 (07)	7.65 (22)	12.14 (16)	2.36 (04)	1.80 (04)	0.36 (06)						
D6	1240	-15	20		PlgTG*	48.83	0.06	31.63	0.94	0.00	0.33	15.69	2.25	0.31		78	1.0				
				5	Gl	50.80 (14)	0.82 (03)	16.42 (30)	7.32 (22)	0.13 (04)	7.71 (16)	12.20 (12)	2.36 (06)	1.88 (05)	0.36 (02)						

Notes: $\Delta T = T_{liquidus} - T_{experiment}$, undercooling (+)/overheating (-) value. t = time elapsed at isothermal conditions. n= number of microprobe analyses. An= 100 · at. Ca/ (Ca+Na+K) in plagioclase. Wo=100 · at. Ca/(Mg+Fe+Ca) En= 100 · at. Mg/(Mg+Fe+Ca), Fs=100 · at. Fe/(Mg+Fe+Ca), in clinopyroxene. Uspl= ulvospinel component calculated after Stormer (1983). Disequilibrium degree of plagioclase $\Delta An = An_{measured} - An_{estimated}$ according with Namur et al. (2012). Glass analyses normalized to 100% anhydrous, with all Fe as FeO. ‡One standard deviation in terms of digits. Gl= glass; Ox= oxides; PlgS= plagioclase overgrown rim; PlgN= newly plagioclases; Cpx= clinopyroxene microlites; PlgTG=Tiger Gabbro plagioclase seed. *Microprobe analyses near to the crystal rim.

Table S2 - Phase compositions (wt%) obtained by Rhyolite-MELTS modelling.

Temperature (°C)	1220	1200	1190	1180
Liquid				
% *	94.8	84.27	75.4	67.1
SiO_2	53.01	54.01	54.87	55.78
TiO_2	0.87	0.91	0.95	1.00
Al_2O_3	15.67	16.62	16.64	16.53
FeO_t	4.75	4.12	3.88	3.66
MnO	0.22	0.25	0.27	0.30
MgO	6.97	6.20	5.86	5.53
CaO	13.11	12.03	11.20	10.43
Na_2O	2.43	2.68	2.86	3.01
K_2O	1.97	2.20	2.44	2.70
P_2O_5	0.50	0.56	0.62	0.69
Oxide				
% *	5.2	5.6	5.8	6.5
TiO_2	0.68	0.82	0.96	1.11
Al_2O_3	9.19	10.02	9.89	9.59
FeO_t	62.12	61.08	61.00	61.08
MnO				
MgO	21.17	21.36	21.43	21.49
% Uspl	0.04	0.05	0.06	0.07
Clinopyroxene ($T_{liquidus}$=1210°C)				
% *		10.13	15.2	19
SiO_2		45.25	45.86	46.45
TiO_2		0.51	0.56	0.61
Al_2O_3		6.90	6.61	6.28
FeO_t		9.73	9.03	8.41
MnO				
MgO		13.34	13.78	14.22
CaO		22.92	22.87	22.81
Na_2O		0.28	0.29	0.30
Wo		47	47	46
En		38	39	40
Fs		15	14	13
Plagioclase ($T_{liquidus}$=1192°C)				
% *			3.6	7.4
SiO_2			48.57	49.25
Al_2O_3			32.98	32.51
Na_2O			15.88	15.33
K_2O			2.36	2.65
P_2O_5			0.22	0.26
An mol%			78	75

Notes: * in grams

Table S3 - Comparison of mineral proportions (vol%) obtained by image analyses and Rhyolite-MELTS modelling.

				Image analyses					Rhyolite-MELTS*			
Run	T (°C)	ΔT (°C)	Dwell time (h)	ϕ_{ox} (%)	ϕ_{plg} (%)	ϕ_{cpx} (%)	ϕ_{glass} (%)		Ox (%)	Plg (%)	Cpx (%)	Gl (%)
C2	1180	45	3	3.8	1.8	21.4	73.0					
C3	1180	45	15	1.7	7.9	13.1	77.3		3.7	8.2	16.2	71.9
C5	1190	35	3	0.5	8.3	8.3	82.9					
C6	1190	35	15	0.6	12.2	14.3	72.9		3.3	4.0	12.8	80.0
C8	1200	25	3	0.5	3.4		96.2					
C9	1200	25	15	0.5	2.4	trace	97.0		3.1		8.4	88.5
C11	1220	5	3	0.1	0.3		99.7					
C13	1220	5	20	0.2			99.8		2.8			97.2

Note: *The volume proportions of minerals were recalculated using the excel workbook proposed by Abers and Hacker (2016); for melt we used average densities of 2.6-2.7 $g \cdot cm^{-3}$ from the model of Lange and Carmichael (1987)

Table S4 - Nucleation and growth rates of plagioclase microlites estimated according with a multi-step type experiments.

Run	T (°C)	ΔT (°C)	Dwell time (h)	G_{PlgN} max (cm s^{-1})	σ	J_{PlgN} (cm^{-3} s^{-1})	S_{PlgN} (cm)	Nv (cm^{-3})	J_i (cm^{-3} s^{-1})	G_i (cm s^{-1})
C1	1180	45	0	$1.7 \cdot 10^{-6}$	$3 \cdot 10^{-7}$	$1.2 \cdot 10^{3}$	$3.6 \cdot 10^{-3}$	$2.2 \cdot 10^{5}$		
C2	1180	45	3	$7.3 \cdot 10^{-8}$	$3 \cdot 10^{-9}$	$1.8 \cdot 10^{2}$	$6.9 \cdot 10^{-3}$	$5.5 \cdot 10^{4}$	$-1.6 \cdot 10^{1}$	$-7.3 \cdot 10^{-4}$
C3	1180	45	15	$1.6 \cdot 10^{-8}$	$6 \cdot 10^{-9}$	$9.6 \cdot 10^{1}$	$2.5 \cdot 10^{-3}$	$5.2 \cdot 10^{6}$	$9.5 \cdot 10^{1}$	$8.8 \cdot 10^{-4}$
C4	1190	35	0	$2.8 \cdot 10^{-6}$	$6 \cdot 10^{-7}$	$7.9 \cdot 10^{5}$	$6.5 \cdot 10^{-4}$	$1.1 \cdot 10^{8}$		
C5	1190	35	3	$1.1 \cdot 10^{-7}$	$1 \cdot 10^{-8}$	$1.2 \cdot 10^{3}$	$1.9 \cdot 10^{-3}$	$1.3 \cdot 10^{7}$	$-9.2 \cdot 10^{3}$	$-4.2 \cdot 10^{-1}$
C6	1190	35	15	$2.7 \cdot 10^{-8}$	$4 \cdot 10^{-9}$	$2.9 \cdot 10^{2}$	$2.0 \cdot 10^{-3}$	$1.6 \cdot 10^{7}$	$4.9 \cdot 10^{1}$	$4.6 \cdot 10^{-4}$
C7	1200	25	0	$3.1 \cdot 10^{-6}$	$2 \cdot 10^{-7}$	$3.1 \cdot 10^{5}$	$6.6 \cdot 10^{-4}$	$3.1 \cdot 10^{7}$		
C8	1200	25	3	$9.9 \cdot 10^{-8}$	$1 \cdot 10^{-8}$	$1.6 \cdot 10^{3}$	$1.3 \cdot 10^{-3}$	$1.7 \cdot 10^{7}$	$-1.3 \cdot 10^{3}$	$-6.1 \cdot 10^{-2}$
C9	1200	25	15	$2.2 \cdot 10^{-8}$	$2 \cdot 10^{-9}$	$1.7 \cdot 10^{2}$	$1.4 \cdot 10^{-3}$	$9.2 \cdot 10^{6}$	$-4.1 \cdot 10^{2}$	$-3.8 \cdot 10^{-3}$

Notes: $\Delta T = T_{liquidus} - T_{experiment}$, undercooling value; ϕ = microcrystals area fraction determined by image analyses; G= growth rate; J= nucleation rate; S= characteristic crystal size; Nv= volumetric number density; J_i and G_i =incremental nucleation rate and incremental growth rate that consider the effects of cooling step and isothermal step on the nucleation process in the experiments of this study (Couch, 2003); PlgN= plagioclase microcrystals.