Genji Saito · Kozo Uto · Kohei Kazahaya ·
Hiroshi Shinohara · Yoshihisa Kawanabe ·
Hisao Satoh

Petrological characteristics and volatile content of magma from the 2000 eruption of Miyakejima Volcano, Japan

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In the original online publication and the print version of this article, Tables 1 and 2 were unfortunately omitted. We apologise for this error. The tables are printed below.

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G. Saito (✉) · K. Uto · K. Kazahaya · H. Shinohara ·
Y. Kawanabe
Geological Survey of Japan, National Institute of Advanced
Industrial Science and Technology,
Central 7, Higashi 1-1-1,
Tsukuba, Ibaraki 305-8567, Japan
e-mail: saito-g@aist.go.jp
Tel.: +81-29-861-3893
Fax: +81-29-856-8725

H. Satoh
Faculty of Science, Tohoku University,
Aoba-ku,
Sendai 980-8577, Japan

Table 1 Major element composition of eruptives on 18 August 2000 of Miyakejima volcano

Sample No.	Bomb 819B1	Lapilli 1-a	Lapilli 2-b	Lapilli 3-c	Lapilli 3-d ¹	Lapilli 3-f	Lapilli 4-b	Black ash ² 4-5
SiO ₂	50.63	50.70	50.67	50.49	50.77	50.63	50.90	50.36
TiO ₂	1.12	1.11	1.12	1.12	1.16	1.12	1.13	1.17
Al ₂ O ₃	17.73	17.84	17.64	17.73	17.65	18.02	17.82	16.77
FeO*	11.14	11.06	11.14	11.18	11.29	11.21	11.23	11.34
MnO	0.17	0.17	0.17	0.17	0.18	0.17	0.17	0.18
MgO	4.01	3.99	4.02	4.00	4.15	4.17	4.05	4.18
CaO	10.97	11.03	10.94	10.93	10.94	10.95	10.96	10.54
Na ₂ O	2.34	2.40	2.40	2.30	2.37	2.38	2.42	2.31
K ₂ O	0.40	0.40	0.40	0.40	0.41	0.39	0.40	0.42
P ₂ O ₅	0.11	0.12	0.12	0.12	0.13	0.11	0.12	0.12
Total	98.62	98.82	98.62	98.44	99.05	99.15	99.20	97.39

FeO*, total iron as FeO.

A Bomb (819B1) was collected as Miyake-Village stock farm (see Fig. 1). Sampling points for lapilli and ash are as follows; 1-a and 2-b at an observation point C in Fig. 1, 3-c, 3-d and 3-f at a point D, and 4-b and 4-5 at a point F (see Fig. 1).

Analytical errors for each element were shown in Saito et al. (2002).

¹Out side part of a cored bomb, which contains a fragment of old lava inside.

²Black ash particles (1–2 mm) having similar texture to the bomb (819B1).

Table 2 Descriptions and chemical analyses of representative melt inclusions in lapilli and groundmass of a bomb by the 18 August eruption of Miyakejima volcano

Sample	<i>Melt inclusions in plagioclase</i>									
Inclusion No. ^a	1-a-1-1	1-a-2-1	1-a-3-1	1-b-1-1	1-gs-4-1	1-gs-1-1	2-b-2-1	2-b-3-1	2-b-4-1	2-b-4-2
Host chemistry ^b	An87	An88	An87	An89	An88	An88	An88	An87	An84	An88
Inclusion size (μm)	150×60	80×50	80×50	80×60	130×30	>30×40	160×90	160×50	70×50	80×50
Bubble in inclusion ^c		5b(4)	1b(2)	2b(15)	2b(15)		4b(23)	5b(23)	1b(18)	3b(11)
Bubble (vol%) ^d	0	0.03	0.004	2	3	0	1	5	2	0.9
Overgrowth (vol%) ^e	2	10	10	9	14		3	11	16	6
SiO ₂	51.44	50.29	51.52	51.21	52.54	n.a.	50.26	51.94	51.67	51.32
TiO ₂	1.36	1.40	1.26	1.26	1.31	n.a.	1.27	1.39	1.44	1.32
Al ₂ O ₃	13.26	12.92	12.64	12.84	12.06	n.a.	13.44	12.67	11.31	12.61
FeO ^f	12.93	13.80	13.60	13.37	13.21	n.a.	13.56	14.39	13.13	12.83
MnO	0.29	0.13	0.17	0.22	0.25	n.a.	0.26	0.31	0.24	0.23
MgO	4.67	5.16	5.33	5.10	5.43	n.a.	5.04	5.07	5.32	5.25
CaO	8.02	7.94	8.13	8.81	8.51	n.a.	8.90	8.78	8.14	8.68
Na ₂ O	2.95	2.32	2.85	2.23	2.39	n.a.	2.11	2.62	2.19	2.30
K ₂ O	0.54	0.65	0.63	0.64	0.70	n.a.	0.52	0.71	0.71	0.53
P ₂ O ₅	0.16	0.14	0.15	0.11	0.10	n.a.	0.07	0.12	0.07	0.09
H ₂ O ^g	1.25	1.21	1.32	1.22	1.22	1.55	1.33	1.01	0.90	1.37
CO ₂ (ppm) ^h	<41	38/42	50/51	74/630	<66/<660	<94	<47/<200	<31/<500	<47/<300	<53/<200
S (ppm)	570	860	1190	1180	900	n.a.	1230	910	850	1050
Cl (ppm)	690	640	630	640	630	n.a.	680	680	620	670
Total	97.01	96.11	97.76	97.19	97.86		96.94	99.14	95.26	96.70
Sat. Press. (MPa) ⁱ	24	23/24	28/28	31/150	<29/<150	<45	<28/<62	<17/<115	<18/<73	<30/<63
Sample										
Inclusion No. ^a	2-b-4-3	2-b-5-1	2-gs-2-1	2-gs-3-1	2-gs-3-2	2-gs-4-1	2-gs-6-1	3-a-2-1	3-a-2-2	4-gs-3-1
Host chemistry ^b	An85	An87	An89		An87	An84	An84	An89	An88	An88
Inclusion size (μm)	80×70	90×70	40×30	40×30	40×30	120×60	160×60	160×110	70×50	120×60
Bubble in inclusion ^c	1b(25)	2b(7)	1b(18)	1b(14)	1b(14)	1b(28)	1b(19)	1b(27)	1b(15)	4b(22)
Bubble (vol%) ^d	2	0.1	13	9	8	6	1	1	2	3
Overgrowth (vol%) ^e	8	16	10		24		4	7	12	5
SiO ₂	52.73	50.56	53.69	n.a.	51.55	n.a.	51.97	52.14	51.88	52.39
TiO ₂	1.34	1.75	1.46	n.a.	1.19	n.a.	1.12	1.24	1.57	1.33
Al ₂ O ₃	12.68	9.13	11.77	n.a.	8.41	n.a.	13.62	13.60	12.94	13.54
FeO ¹	12.91	16.32	14.57	n.a.	18.95	n.a.	13.04	13.30	12.73	13.38
MnO	0.26	0.34	0.23	n.a.	0.31	n.a.	0.21	0.26	0.22	0.23
MgO	5.05	6.39	5.24	n.a.	6.80	n.a.	4.88	4.93	5.14	5.24
CaO	8.74	8.91	8.80	n.a.	7.97	n.a.	8.84	8.78	8.68	9.05

Table 2 Continued.

Sample Inclusion No. ^a	2-b-4-3	2-b-5-1	2-gs-2-1	2-gs-3-1	2-gs-3-2	2-gs-4-1	2-gs-6-1	3-a-2-1	3-a-2-2	4-gs-3-1
Na ₂ O	2.79	1.54	1.96	n.a.	1.63	n.a.	2.49	2.35	1.77	2.38
K ₂ O	0.62	0.55	0.63	n.a.	0.69	n.a.	0.60	0.66	0.70	0.59
P ₂ O ₅	0.08	0.08	0.17	n.a.	0.14	n.a.	0.16	0.08	0.16	0.23
H ₂ O ^g	1.60	1.27	>0.6	>0.9	>0.6	>1.2	1.43	1.53	1.66	1.92
CO ₂ (ppm) ^h	<53/<440	<45/<64	n.a.	n.a.	n.a.	n.a.	<70/<400	<58/<280	<56/<390	<100/<200
S (ppm)	900	1110	1400	n.a.	1510	n.a.	970	1030	880	1090
Cl (ppm)	650	670	770	n.a.	770	n.a.	740	670	620	660
Total	98.94	97.02	98.73		97.86		98.52	99.03	97.60	100.45
Sat. Press. (MPa) ⁱ	<37/<120	<26/<30					<36/<110	<36/<83	<40/<110	60/280
Sample	<i>Melt inclusions in olivine</i>						<i>Melt inclusions in cpx</i>		<i>Groundmass of a bomb^k</i>	
Inclusion No. ^a	1-gs-2-1 ^m	2-gs-5-1	3-c-1-1	3-c-2-1	4-gs-2-1	1-a-4-1 ^j				
Host chemistry ^b	Fo73	Fo71	Fo76	Fo71	Fo71	Wo40En43(Mg#73)				
Inclusion size (μm)	50×50	60×40	60×60	30×20	70×50	10×10				
Bubble in inclusion ^c					1b(12)					
Bubble (vol%) ^d	0	0	0	0	1	0				
Overgrowth (vol%) ^e	8	2	10 ^l	5	3	21				
SiO ₂	50.75	55.89	50.23	53.23	54.16	57.57			53.39 (0.90)	
TiO ₂	1.40	1.37	1.33	1.42	1.40	1.23			1.31 (0.14)	
Al ₂ O ₃	14.19	15.20	18.20	16.09	15.13	17.56			14.99 (1.05)	
FeO ^f	10.27	11.43	10.33	10.47	11.48	8.97			12.32 (0.68)	
MnO	0.12	0.22	0.23	0.19	0.24	0.24			0.22 (0.08)	
MgO	3.38	3.07	3.06	2.75	3.54	1.60			5.03 (0.36)	
CaO	8.88	10.34	12.46	10.79	9.68	6.53			9.44 (0.51)	
Na ₂ O	2.93	2.40	2.71	2.36	2.66	3.22			2.61 (0.60)	
K ₂ O	0.72	0.50	0.33	0.58	0.59	0.77			0.58 (0.11)	
P ₂ O ₅	0.12	0.24	0.07	0.09	0.21	0.24			0.10 (0.08)	
H ₂ O ^g	>0.9	1.39	>n.a.	>n.a.	>1.37	>n.a.				
CO ₂ (ppm) ^h	n.a.	<73	n.a.	n.a.	<84/<360	n.a.				
S (ppm)	790	660	1710	1060	650	640				
Cl (ppm)	730	950	580	720	830	840				
Total	92.91	102.19	99.18	98.14	100.60	98.07			100.00	
Sat. Press. (MPa) ⁱ		<35			<37/<96					

In weight percent except for CO₂, sulfur and chlorine concentrations; n.a. = not analysed.

^aFirst numbers represent sampling locations. Sampling locations are as follows; 1 and 2 at an observation point C in Fig. 1, 3 at a point D and 4 at a point F. Second alphabet is for identification of each lapilli. Third and fourth number of each sample are to distinguish each phenocryst and each inclusion.

^bChemical composition of host phenocrysts near the melt inclusions. An = anorthite content (mol%) in the plagioclase, En = enstatite content (mol%) in pyroxene, W = wollastonite content (mol%) in clinopyroxene.

^cNumbers with b represent the number of bubbles in each melt inclusion. Numbers in parentheses represent size of bubbles (μm).

^dVolume percent of bubble in inclusion. See text.

^eExtent of overgrowth in inclusion. See text.

^fAll iron calculated as FeO.

^gValues of volatile concentrations (H₂O, CO₂, S and Cl) were corrected for the overgrowth (see text). The correction was as follows; if the overgrowth was × vol%, the analytical value was multiplied by (1-0.01×) to be the corrected value. Water concentrations of Nos. 2-gs-2-1, 2-gs-3-1, 2-gs-3-2, 2-gs-4-1 and 1-gs-2-1 are minimum estimates because these samples were single side polished.

^hx/y: x is FTIR analysis, y is based on reconstruction of bulk inclusion composition by adding equilibrium gas (bubble) volume (see text).

ⁱSaturation pressure calculated from H₂O and CO₂ concentrations of melt inclusions using VolatileCalc program (Newman and Lowenstarn, 2002): x/y: x is values for glass only; y is based on the corrected values in regard with bubble in inclusion. If CO₂ concentration of the glass is below the detection limit, y is maximum estimate.

^jThe inclusion contains an opaque mineral whose major component is iron oxide. Size of the mineral is 3 μm.

^kGroundmass of the bomb (819B1) whose whole-rock chemistry was determined (Table 1). Recalculated to 100% on a water free basis. Values in parenthesis represent the standard deviation of analyses.

^lEstimation based on back-scattered electron image of the inclusion. See text.

^mThe low total value of this inclusion is probably due to charge up of electron beam. Analysis of its host phenocryst also gave low total, but similar Fo% with the other type A olivine and correct value for ratio of cation to oxygen. As this suggests that ratios among major elements of the inclusion analysis are equal to the original values, we used the major element composition of the inclusion on discussion after it was recalculated to 100 wt.% on a water free basis.