Crystal habit (tracht) of groundmass pyroxene crystals recorded magma ascent paths during the 2011 Shinmoedake eruption

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Online Resource 4: Quantitative pyroxene compositional data

Table S1. Chemical compositions of the pyroxene shown in Figure 5 obtained by STEM-EDS.

Position [a]	1	2	3	4	5	6	7
				Elements (at%) [c]			
O [b]	55.95	56.57	58.36	59.83	58.99	57.11	57.52
Si	21.57	19.97	19.25	18.55	18.72	20.14	19.79
Ti	0.06	0.17	0.22	0.33	0.35	0.13	0.27
Al	0.42	1.75	1.71	2.06	2.22	0.93	1.84
Fe	6.25	7.6	5.14	5.74	5.9	6.28	5.96
Mn	0.23	0.22	0.21	0.21	0.2	0.27	0.21
Mg	14.71	12.6	10.19	8.66	8.8	12.46	9.21
Ca	0.75	0.98	4.81	4.44	4.58	2.57	5.03
Na	0.06	0.14	0.11	0.18	0.22	0.12	0.16
Total	100	100	100	100	100	100	100
Wo [d]	3.5	4.6	23.9	23.6	23.8	12.1	24.9
En [d]	67.8	59.5	50.6	46.0	45.6	58.5	45.6
Fs [d]	28.8	35.9	25.5	30.5	30.6	29.5	29.5
				Cations on the basis of 24 oxygens [e]			
Si	7.86	7.44	7.46	7.42	7.35	7.61	7.5
Ti	0.02	0.07	0.08	0.13	0.14	0.05	0.1
Al	0.15	0.65	0.66	0.82	0.87	0.35	0.7
Fe	2.28	2.83	1.99	2.3	2.32	2.37	2.26
Mn	0.08	0.08	0.08	0.08	0.08	0.1	0.08
Mg	5.36	4.7	3.95	3.46	3.46	4.7	3.49
Ca	0.27	0.37	1.86	1.78	1.8	0.97	1.91
Na	0.02	0.05	0.04	0.07	0.09	0.04	0.06
Total	16.05	16.19	16.14	16.07	16.11	16.19	16.09

[a] Positions 1–7 are shown in Figure S4. The quantitative STEM-EDS analyses were performed with the *c*-axis tilted because an ultrathin specimen must be perpendicular to the electron beam for accurate quantification.

[b] The concentration of oxygen was quantified independently.

[c] Elemental concentrations were recalculated to Total 100%.

[d] Wo = Ca/(Ca + Mg + Fe) × 100 atom, En = Mg/(Ca + Mg + Fe) × 100 atom, Fs = Fe/(Ca + Mg + Fe) × 100 atom.

[e] The numbers of cations on a 24 oxygen basis were calculated from the molar fractions of cations.

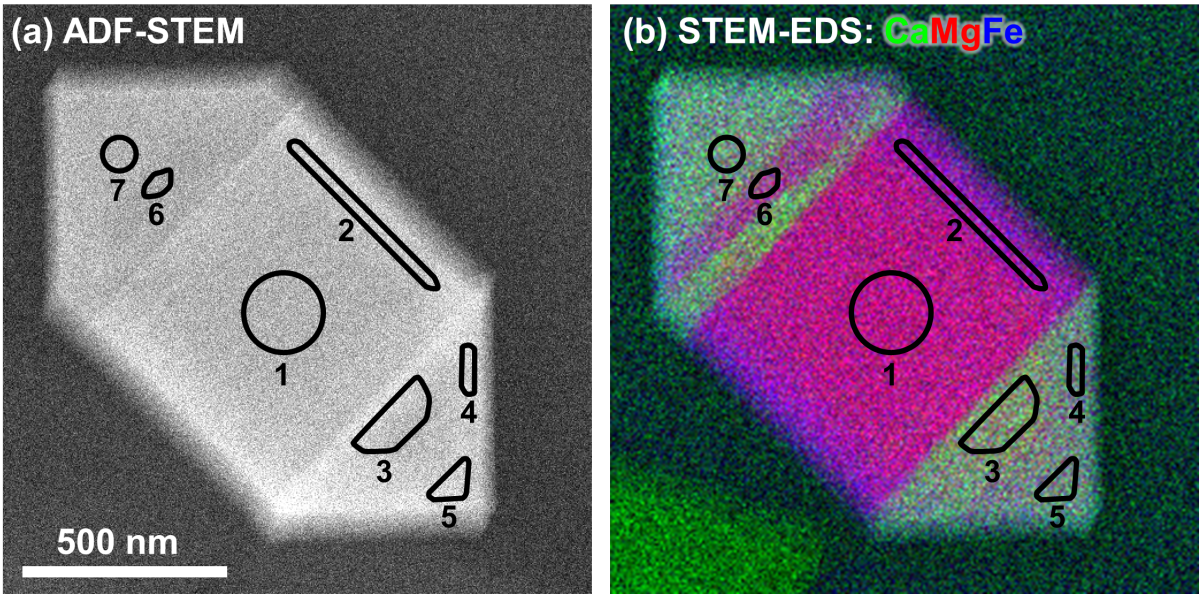

Figure S4. (**a**) ADF-STEM image and (**b**) STEM-EDS map, showing the positions analyzed in Table S1. Images of this crystal observed along its *c*-axis are shown in Figure 5. In (**b**), the concentrations of Ca, Mg, and Fe are shown in green, red, and blue, respectively.

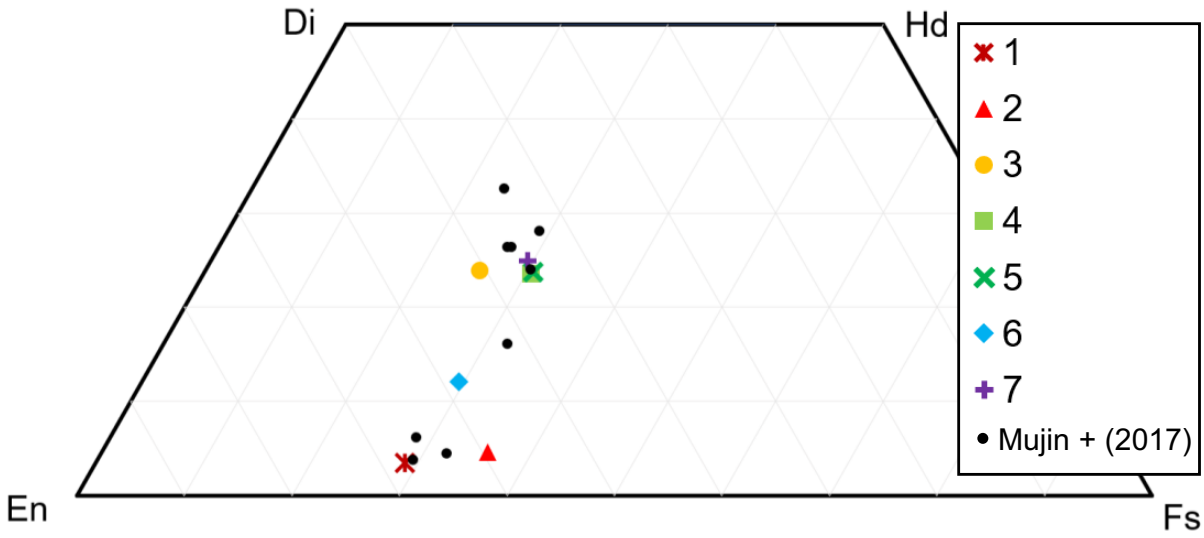

Figure S5. Compositions from Table S1 plotted in the pyroxene quadrilateral. Data for three pyroxene nanolites in a dense juvenile fragment of the 2011 Shinmoedake eruption (Mujin et al. 2017) are also plotted for comparison.

Reference cited

Mujin, M., Nakamura, M., and Miyake, A. (2017) Eruption style and crystal size distributions: Crystallization of groundmass nanolites in the 2011 Shinmoedake eruption. American Mineralogist, 102, 2367–2380. https://doi.org/10.2138/am-2017-6052CCBYNCND