

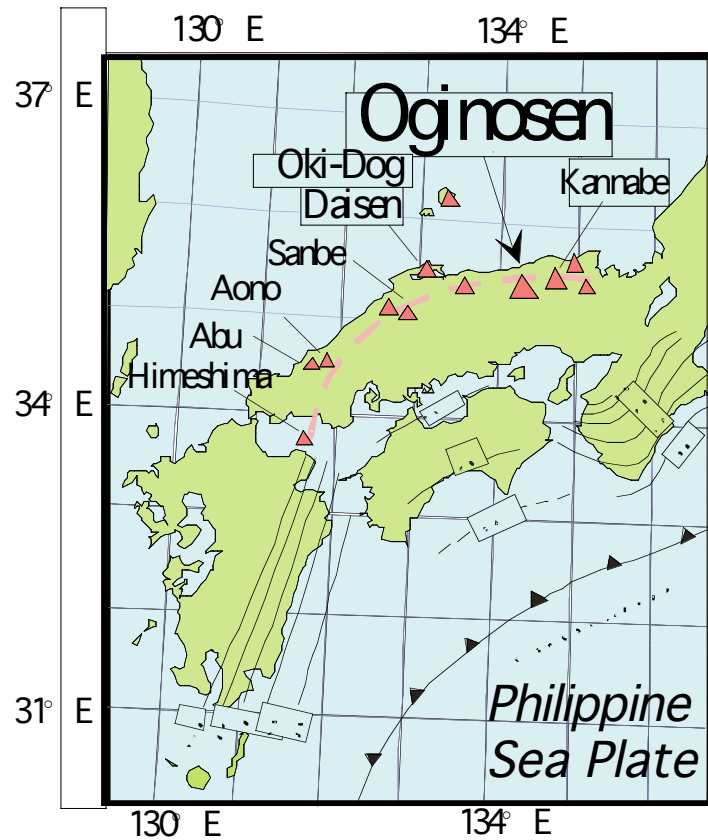
玄武岩についての1気圧溶融実験について
—アルカリ玄武岩とソレアイト質玄武岩における
相平衡関係と元素分配の検討—

本間 潮 (火山学研究室)

ONE-ATMOSPHERE MELTING EXPERIMENTS ON BASALTS OF
OGINOSHEN VOLCANO: PHASE RELATIONSHIP AND ELEMENT
PARTITIONING OF AN ALKALIC BASALT AND THOLEIITIC
BASALT

U. Honma

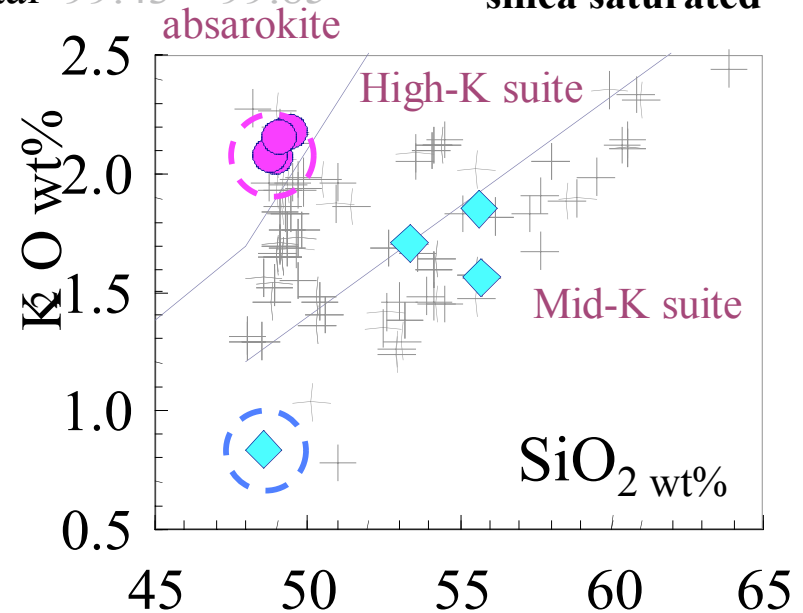
Starting Materials (1)



Depth distribution of Quaternary volcanoes and upper boundary of the subducting Philippine Sea plate (Ishida, 1989; Kimura et al., 2003; Sakiyama et al., 1995; Fruyama et al., 1993; Zhao et al., 1992; Tsukui et al., 1985; Matsui and Inoue, 1971).

	Type-1	Type-2
SiO ₂	48.86	48.84
TiO ₂	1.96	1.42
Al ₂ O ₃	16.98	16.85
Fe ₂ O ₃	10.42	11.95
MnO	0.15	0.17
MgO	6.21	6.61
CaO	7.89	9.42
Na ₂ O	3.95	3.39
K ₂ O	2.10	0.85
P ₂ O ₅	0.91	0.36
Total	99.43	99.85

- Type-1 basalt :
Tomieda unit
Alkalic basalt,
silica-undersaturated
- ◆ Type-2 basalt :
Ishiidani-1 unit
Tholeiitic basalt,
silica saturated

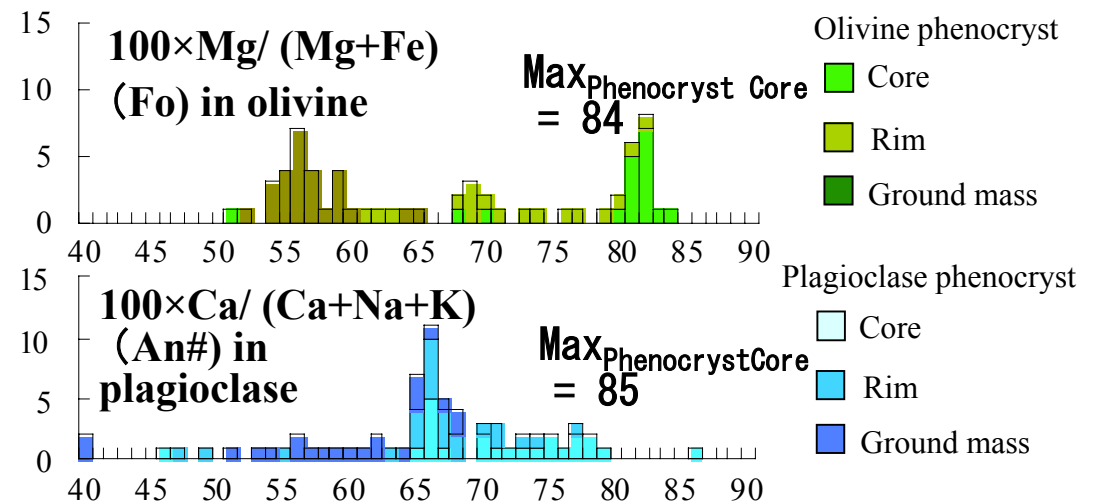
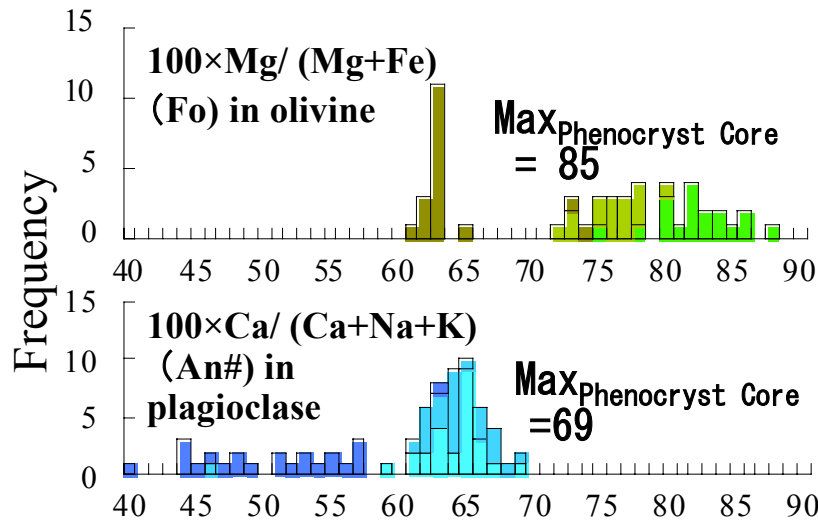
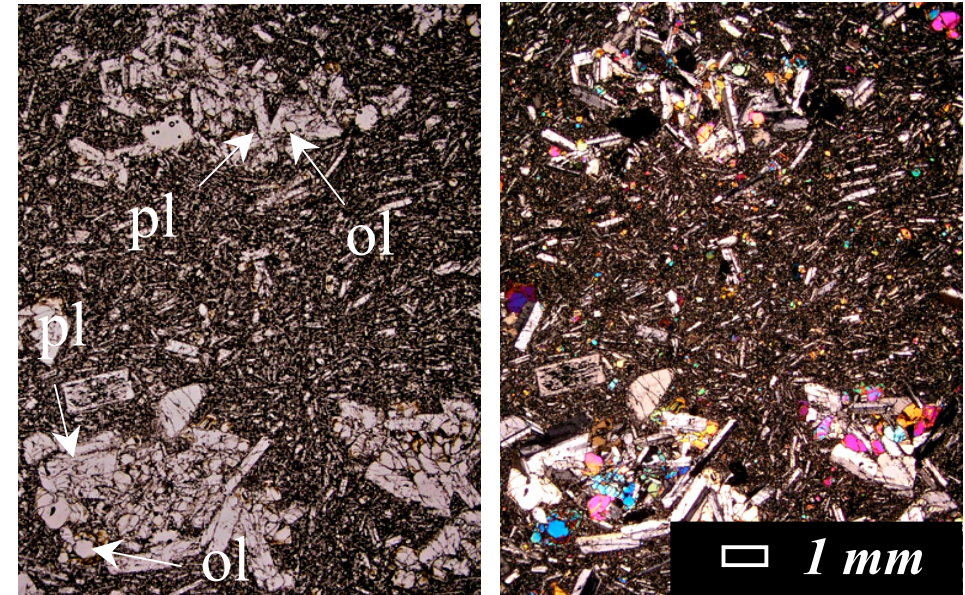
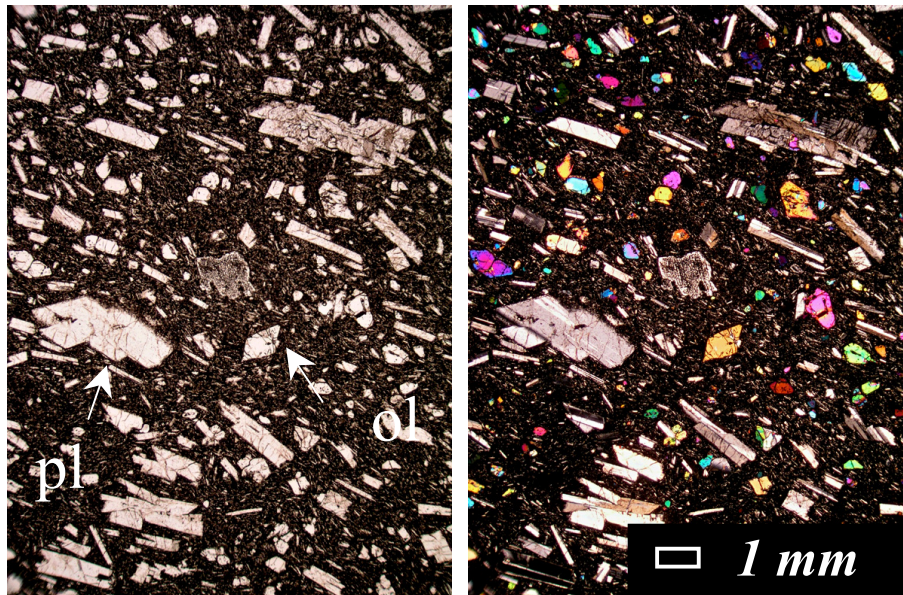


Starting Materials (2)

Type-1 basalt ol : pl : gm = 0.7 : 3.7 : 95.6

Type-2 basalt

ol : pl : gm = 3.6 : 13.4 : 83.0



Histograms of mineral compositions

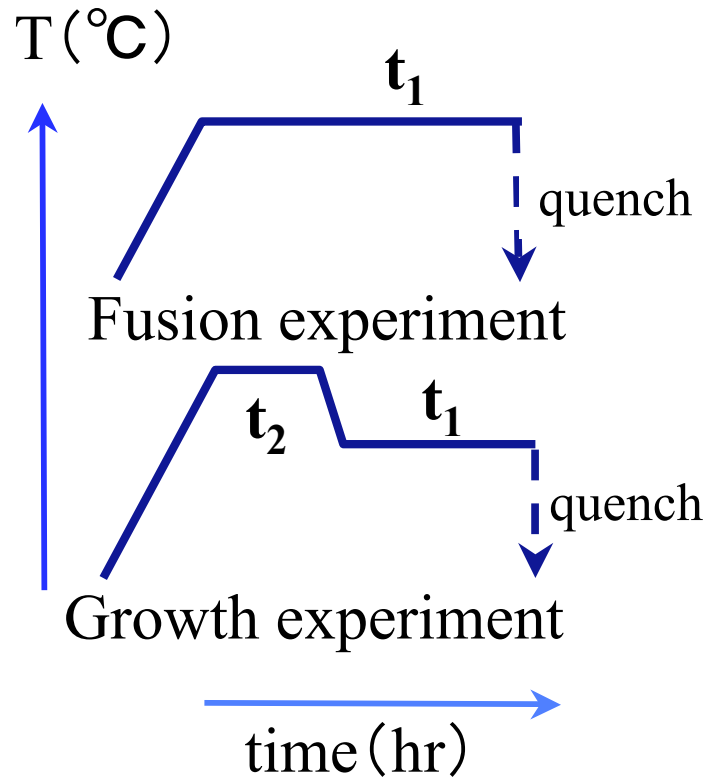
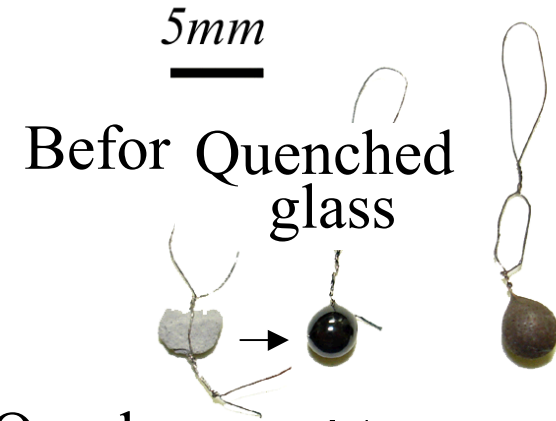
Experimental Method:

Electronic furnace (SiC heating elements)

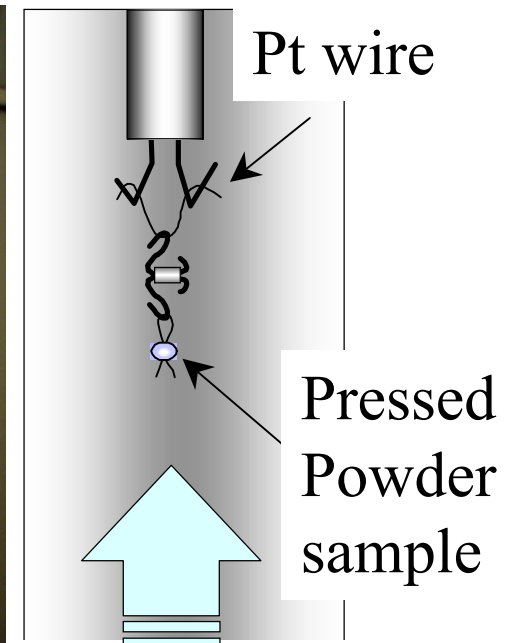
Wire loop method (Donaldson et al., 1975)

Atmosphere : H_2-CO_2 Mixed gas \Rightarrow NNO redox conditions

Temperature calibration : melting point of Au ($1064.43\text{ }^\circ\text{C}$)



Sample assemblage

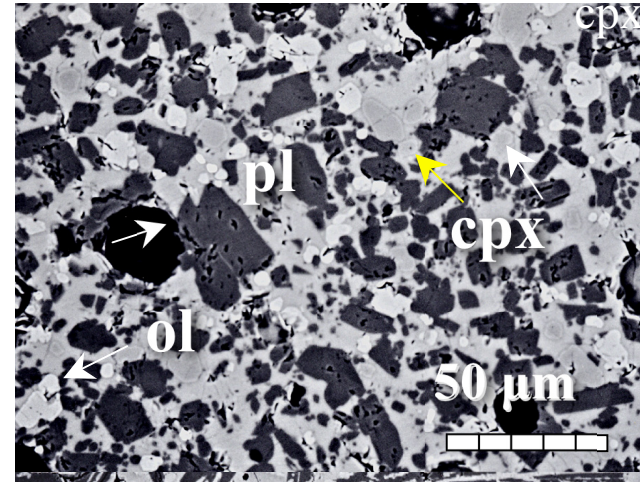
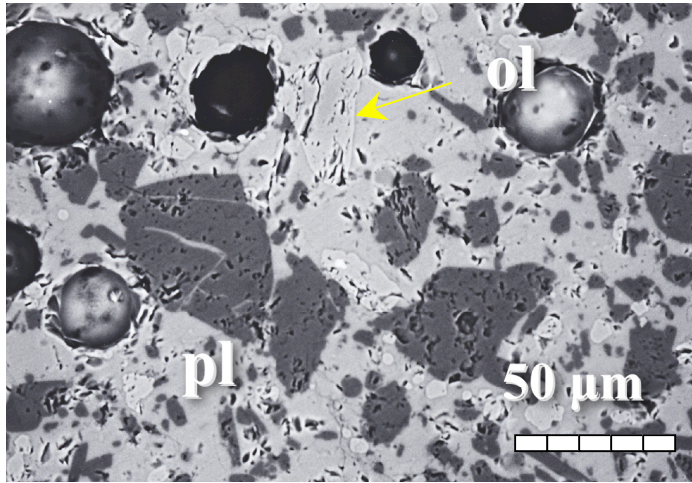


H_2+CO_2
Mixed gas

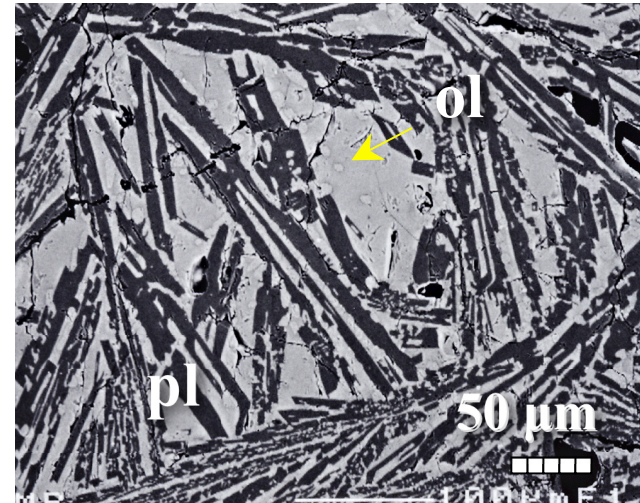
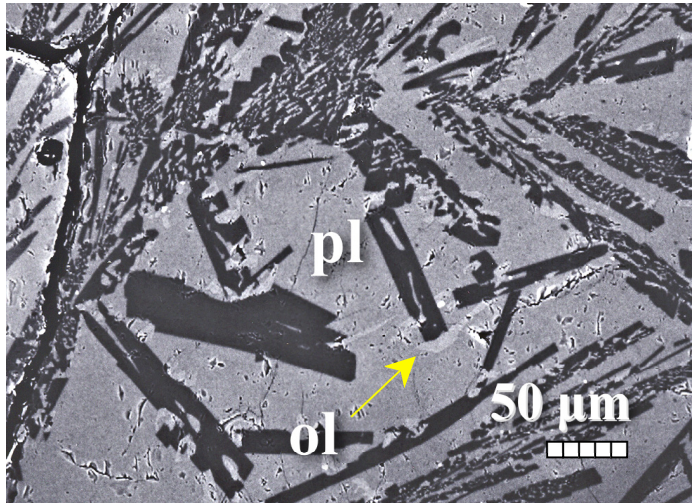
Run products (1100°C, 10 hr)

ol : olivine
pl : plagioclase
cpx : clinopyroxene

Fusion experiment

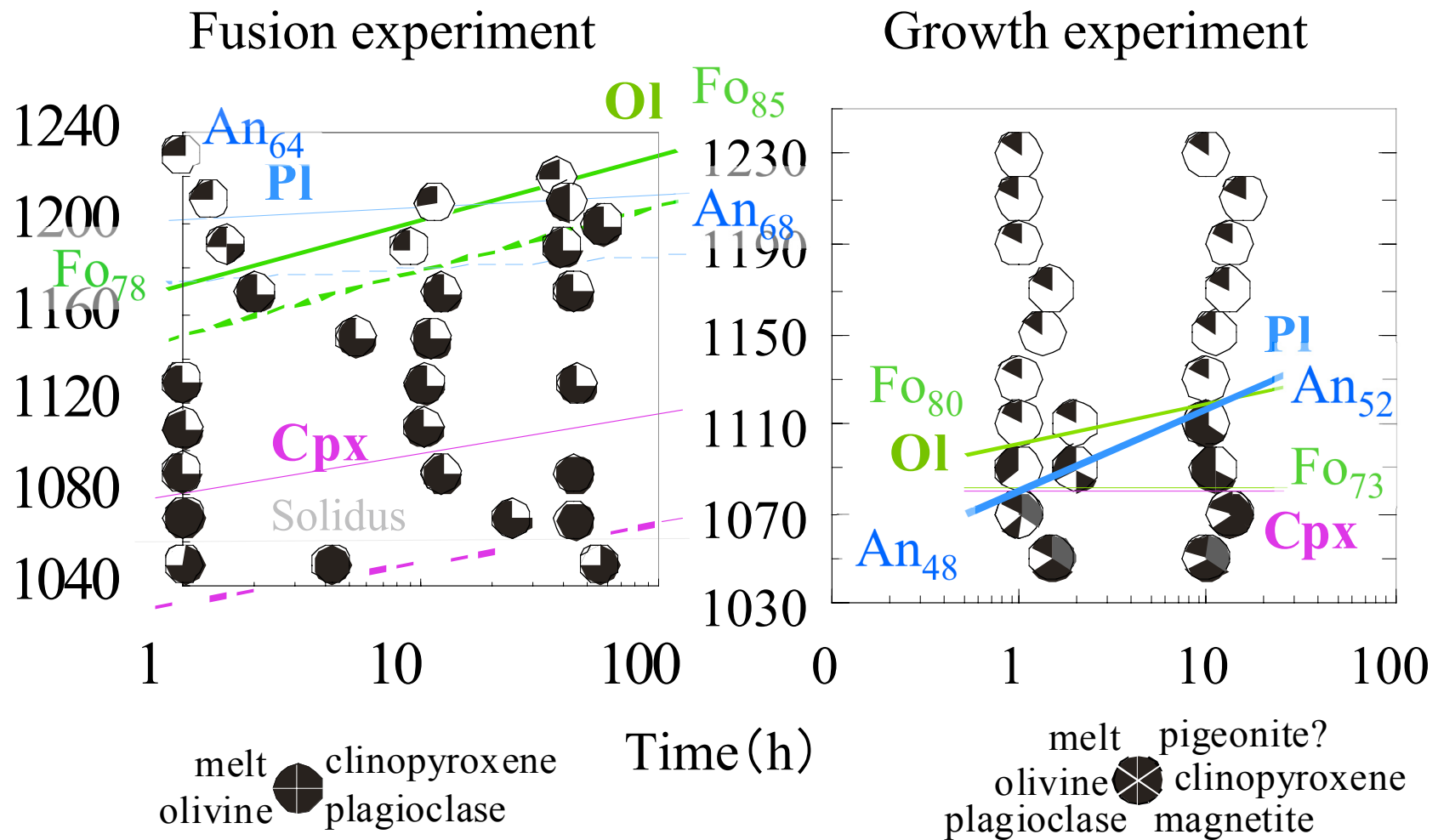


Growth experiment

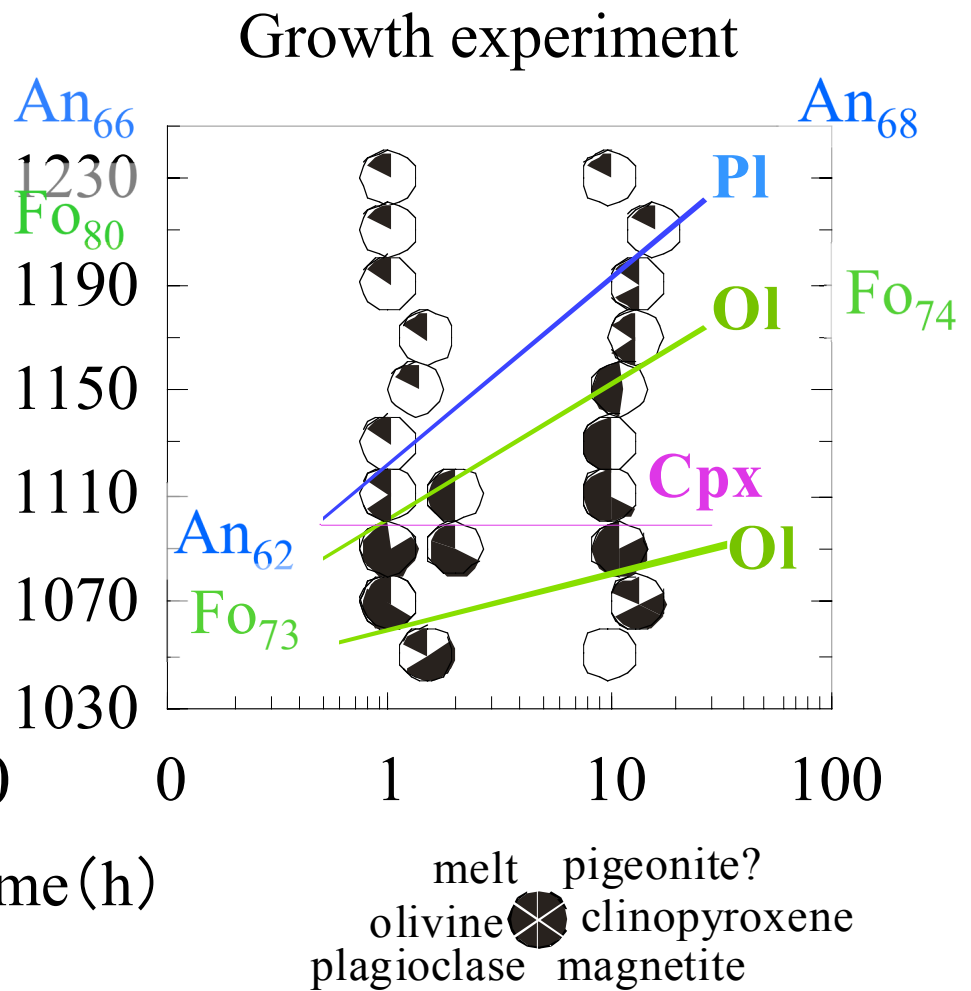
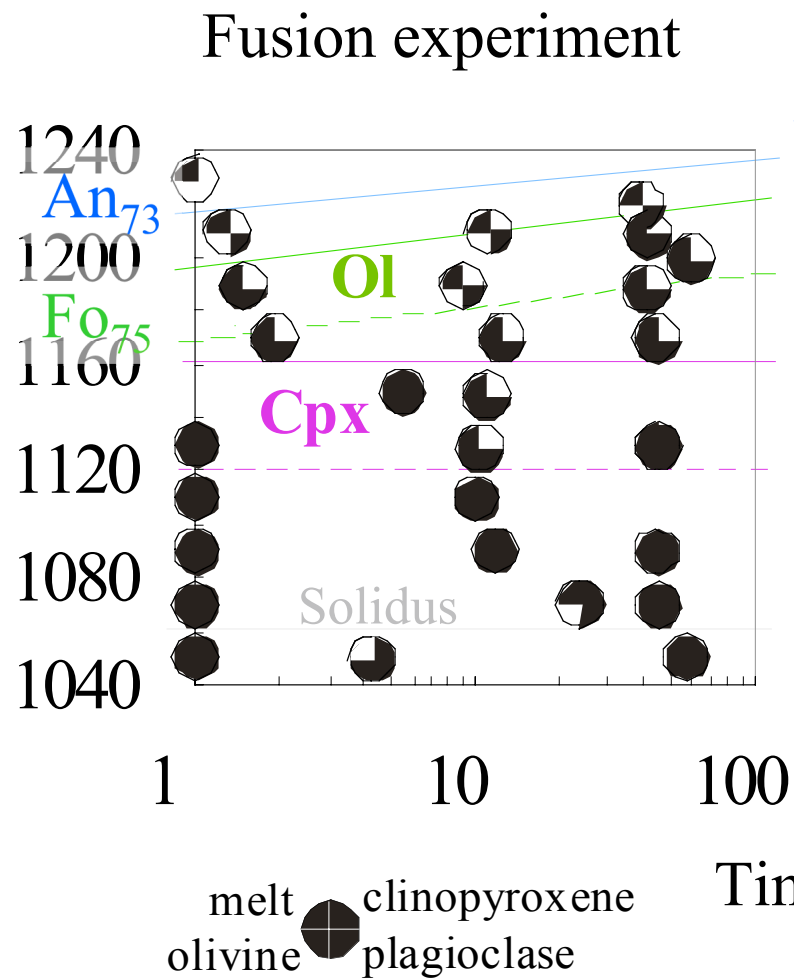


Type-1

Type-2



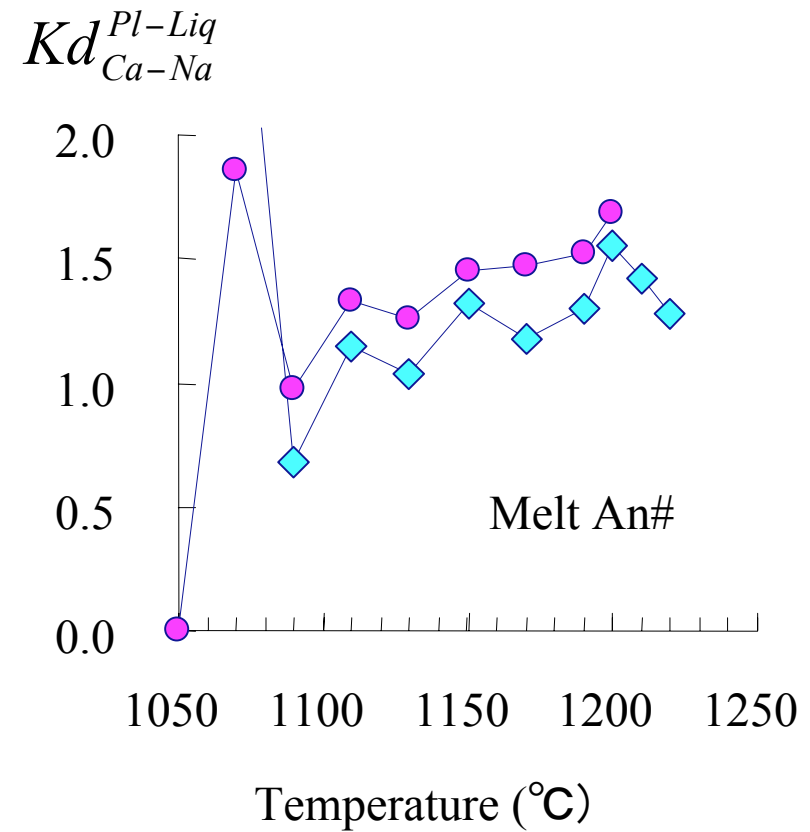
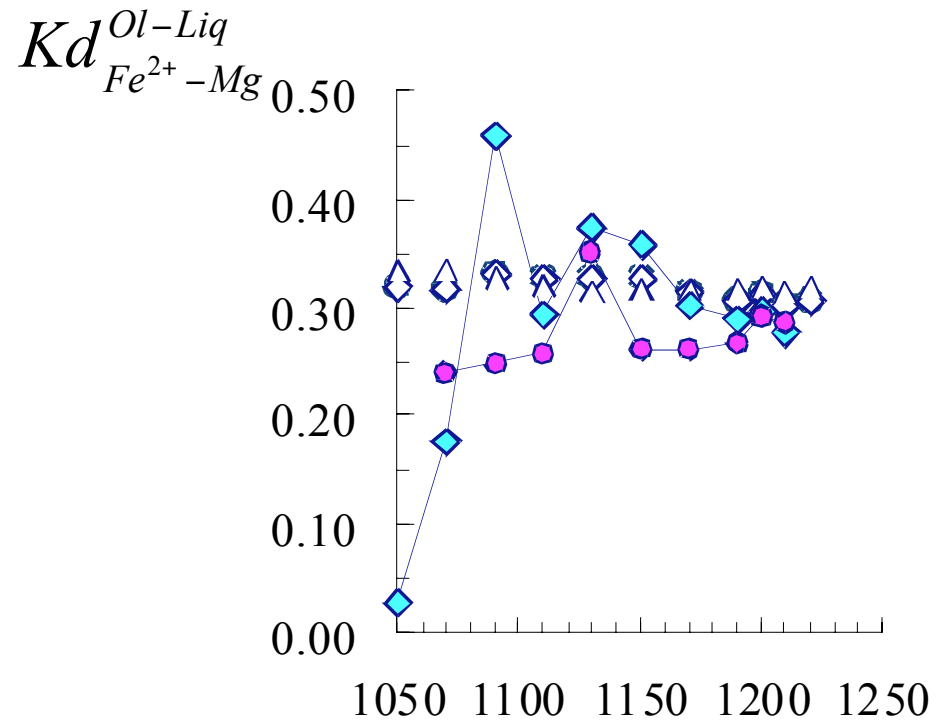
Temperature-Time diagram (Type-1)



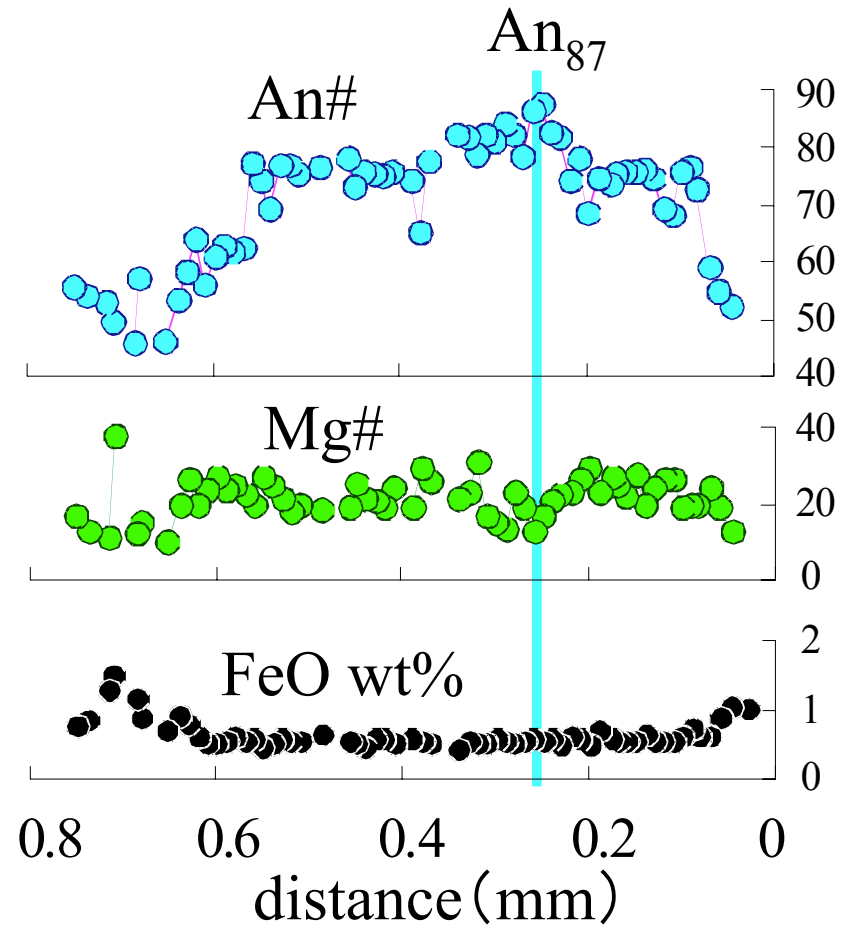
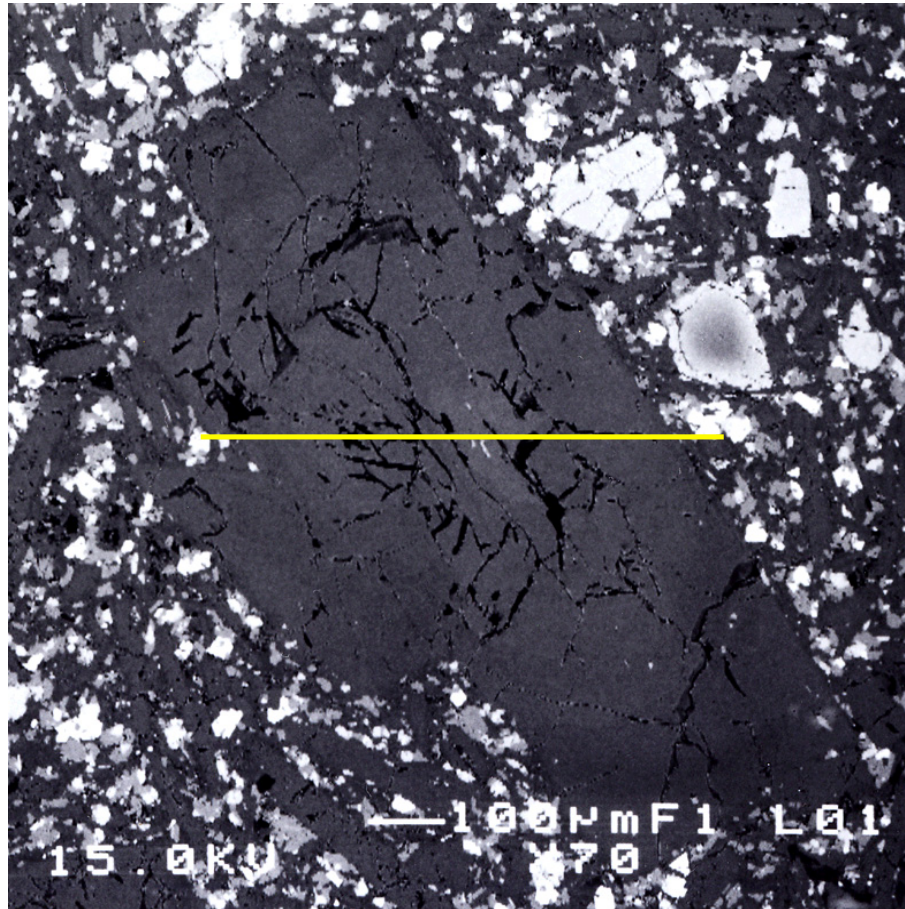
Temperature-Time diagram (Type-2)

Mineral-melt partition coefficients

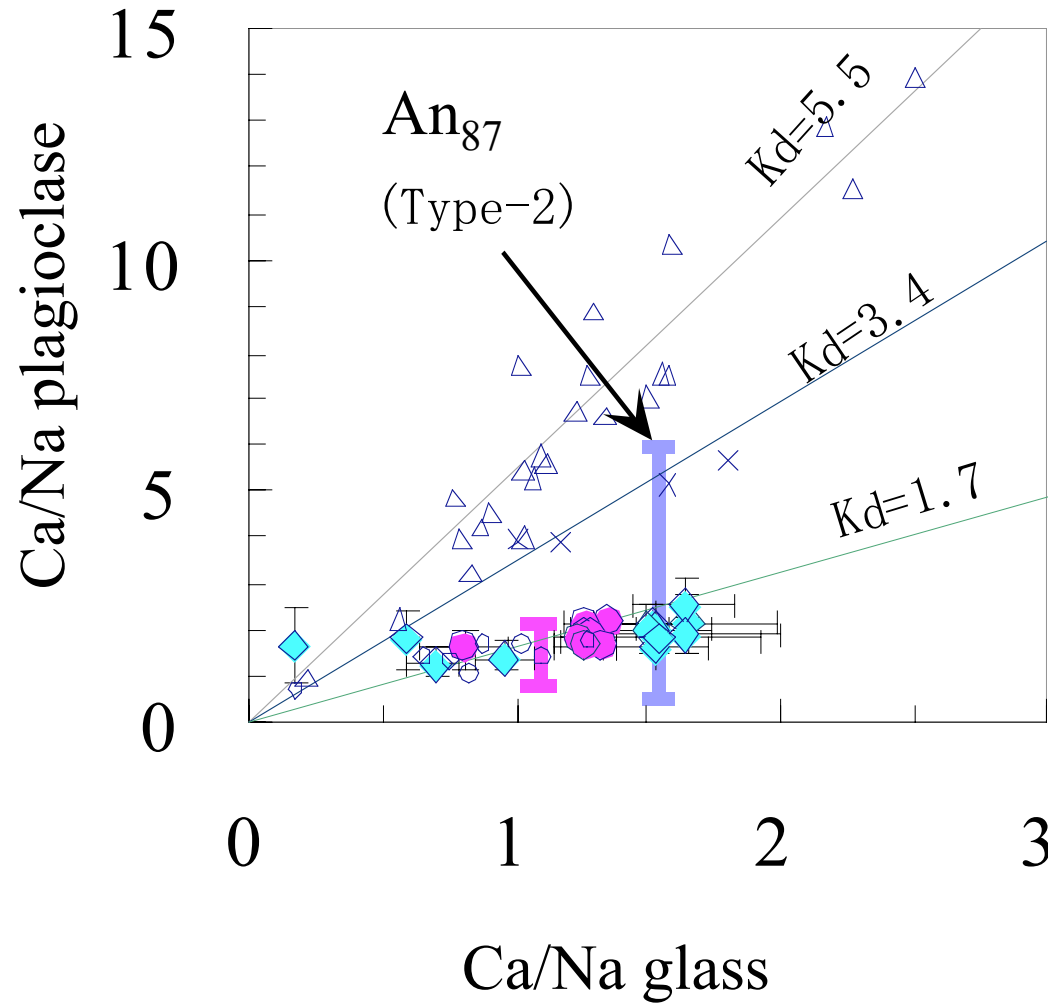
- Run products
- Kd (Takahashi, 1986)
 - ◆ Kd (Carmichael and Ghiorso, 1990)
 - △ Kd (Gee and Sack, 1988)
- Type-1
- ◆— Type-2



Origin of high-An plagioclase (An₈₇) in Type-2 basalt



$$Kd_{Ca-Na}^{Pl-Liq}$$



This experiment

● **Type-1**

◆ **Type-2**

Sisson and Grove
(1993)

○ 2% H₂O

× 4% H₂O

△ 6% H₂O

I Type-1 plagioclase-
bulk rock composition

I Type-2 plagioclase-
bulk rock compositions

Summary

1 . Phase relations and element partition relations were examine experimentally under NNO redox conditions at 1 atm. for both alkalic and tholeiitic basalts of Oginosen volcano.

2 . Fusion experiments gave equilibrium liquidus, whereas the growth experiments show markedly undercooled conditions with dendritic crystal textures.

3 . An (Ca/Ca+Na ratio) content of plagioclase in Type-1 basalt corresponds to that of experimental charges, while An content of plagioclase in Type-2 basalt is much higher than that of experimental plagioclase, suggesting high H₂O content of melt during crystallization of the plagioclase phenocryst.