Preliminary studies on melt inclusions and volatile analysis in basalts recovered from Australian-Antarctic Ridge

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Introduction

Australian-Antarctic Ridge (AAR), located in the south of Tasmania, is extension of eastenmost Southeast Indian Ridge. In January 2013, Korea Polar Research Institute (KOPRI) dredged basaltic rocks from the axis and off-axis seamounts of the AAR using Icebreaker Araon. Collected rock samples contain fine subhedral or anhedral olivine, plagioclase, and pyroxene phenocrysts. Off-axis seamount basalts contain more olivine phenocrysts compared to axis basalts. Olivine phenocryst in the seamount basalt contains many inclusions. While some of the olivine contains "homogeneous" glassy inclusions, most of the inclusions were observed to be internally crystallized.

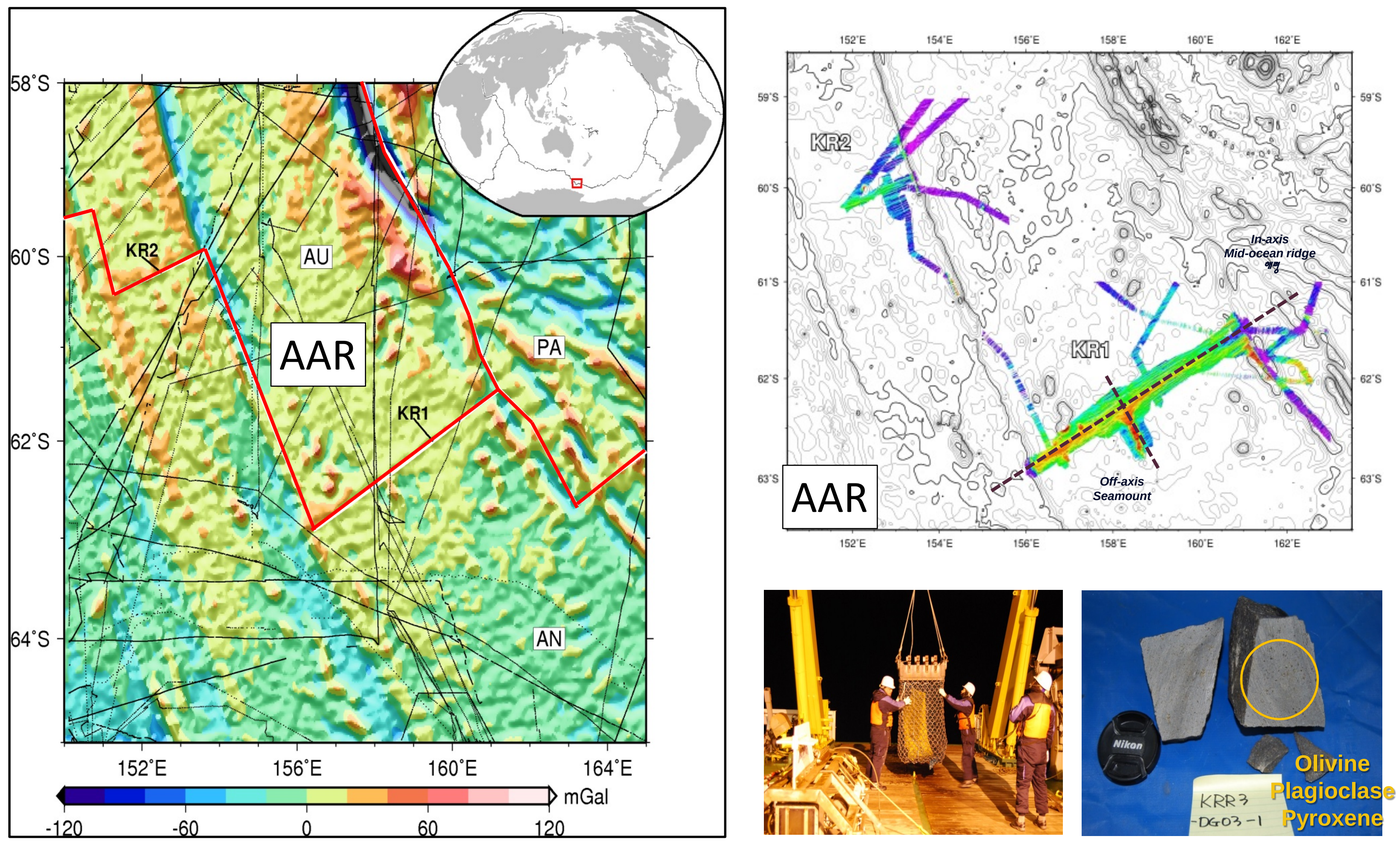

Fig. 1. Antarctic mid-ocean ridge (AAR included KR1,KR2) position and photographs for dredged basalt rocks

Petrography & Inclusion analysis with EPMA

We picked olivine grains containing glassy melt inclusions, and analyzed major elements. The qualitative EPMA spectrum of the inclusions show Al, Mg, Si, Ti, Cr, Fe, Ni element peaks.

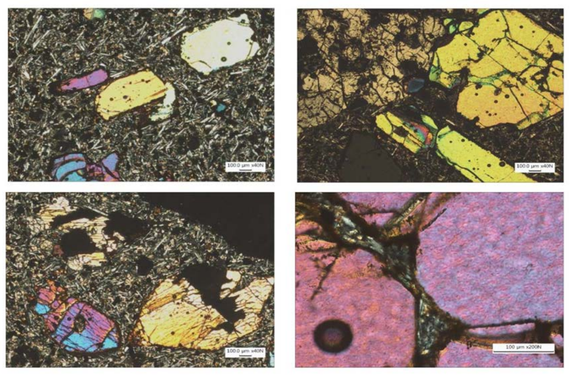

Fig. 2. petrography of off- axis basalt

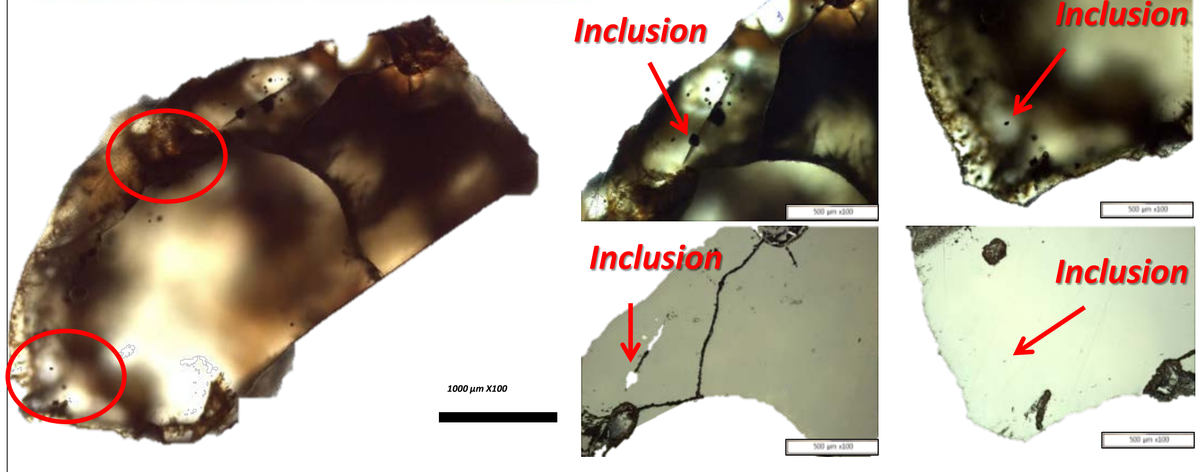

Fig. 3. Inclusion in olivine

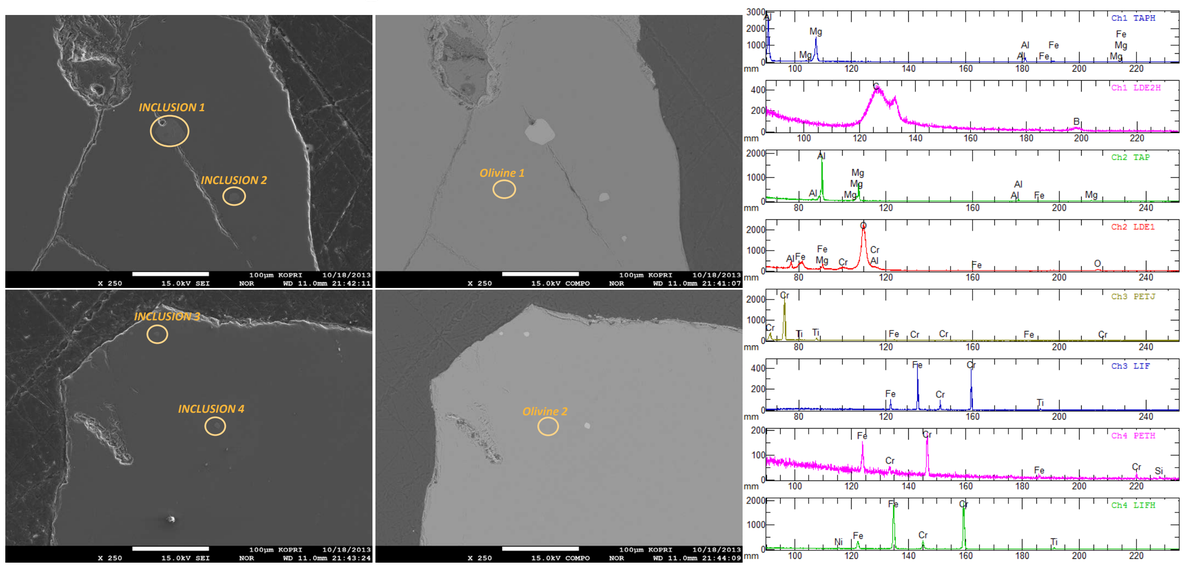

Fig. 4. SE & BSE Image and qualitative analysis in Inclusion 1

Sample name	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	Cr2O3	NiO	Total
Melt inclsion 1	0.14	1.75	23.14	25.13	0.21	12.12	0.00	0.00	0.00	0.00	33.62	0.15	96.25
Melt inclsion 2	2.92	1.73	22.33	24.04	0.24	14.29	0.02	0.00	0.00	0.01	27.52	0.17	93.26
Melt inclsion 3	19.58	1.60	16.10	19.16	0.22	29.97	0.18	0.00	0.00	0.02	12.65	0.19	99.67
Melt inclsion 4	7.55	1.69	20.52	22.78	0.22	18.79	0.06	0.00	0.00	0.01	24.60	0.17	96.39
Olivine1	39.07	0.02	0.04	13.95	0.21	45.08	0.29	0.01	0.00	0.01	0.09	0.22	98.98
Olivine2	38.99	0.00	0.05	14.05	0.23	45.14	0.30	0.01	0.00	0.01	0.06	0.24	99.09

Fig. 5. Quantitative analysis in inclusion & olivine

Inclusion analysis with LA-ICP-MS

We analyzed trace elements and found inclusions have two types. The one have higher Cr and consistent with the EPMA analysis. Another one have higher Al, Na, K and lower Cr. The previously melt inclusion studies is similar elements composition.

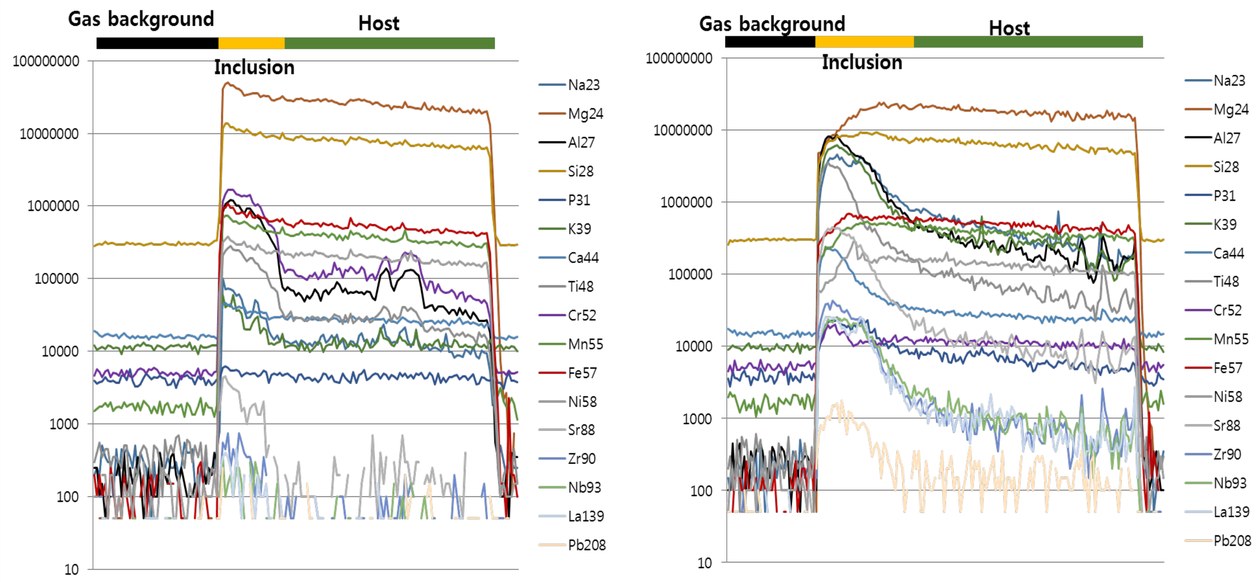

Fig. 6. Qualitative analysis in Inclusions with LA-ICP-MS and processing the SILLS program

Standard Reference Material (SRM) for halogens

We synthesized homogeneous and halogen-rich basaltic glasses for external Standard Reference Material (SRM). Basalt powder was mixed with compounds such as KI, NaI, CaCl2, KCl, FeS_2, CaF_2, Fe_3O_4, LiBr to produce the halogen and sulfur-rich glass beads. Double polished glass beads were checked for its halogen and sulfur contents, and its homogeneity.

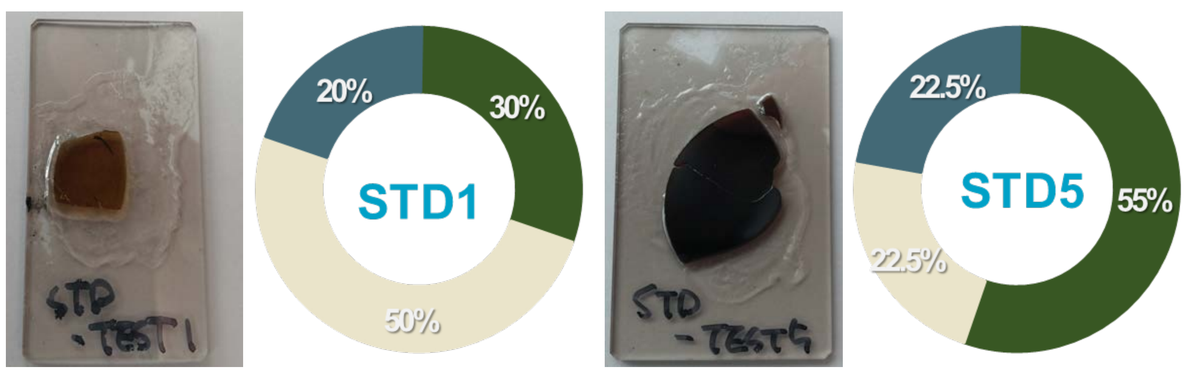

Fig. 7. Standard Reference Material (SRM) glass bead and component's contribution