Oral | Symbol S (Solid Earth Sciences) | S-GC Geochemistry

[S-GC56_30PM2]Solid Earth Geochemistry, Cosmochemistry

Convener:*Gen Shimoda(Geological Survey of Japan, AIST), Katsuhiko Suzuki(Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology), Katsuyuki Yamashita(Graduate School of Natural Science and Technology, Okayama University), Chair:Katsuyuki Yamashita(Graduate School of Natural Science and Technology, Okayama University), Gen Shimoda(Geological Survey of Japan, AIST)

Wed. Apr 30, 2014 4:15 PM - 5:45 PM 415 (4F)

"Solid Earth Geochemistry, Cosmochemistry" session aims at evaluating processes during the 4.6 billion years of the solar system and the Earth. Any approaches to this issue is welcomed, including, geochemistry, geophysics, geology, mineralogy and petrology.

5:30 PM - 5:45 PM

[SGC56-P01_PG]Helium and halogen compositions in MORB vesicles

3-min talk in an oral session

*Takanori KAGOSHIMA[1], Naoto TAKAHATA[1], Yuji SANO[1] (1.Atmosphere and Ocean Research Institute, University of Tokyo)

Keywords:Mid-ocean ridge basalt, Helium, Halogen, Flux, Geochemical cycle

Degassing behavior of halogens through submarine volcanism is not well understood. We determined helium and halogen compositions of MORB vesicles to constrain halogen flux at ridges. Samples collected at 8 sites (13oN-17oS on EPR; 15oN-37oN on MAR; 24-25oS on CIR) were crushed in dilute NaOH or NH_3 solution at liquid nitrogen temperature and volatiles were extracted from vesicles. Helium isotope compositions were determined with a VG-5400 MS and F and Cl contents were measured with ICS-2100 ion chromatography. For glass matrix, concentration of F and Cl were determined with a NanoSIMS.For vesicles, the average ^{3}He concentration was (4.5+/-2.1)x10^{-15} mol/g of sample and the average F/^{3}He and Cl/^{3}He ratios were (1.4+/-0.5)x10^6 and (2.9+/-0.6)x10^7. This provides F and Cl flux of (7.1+/-2.8)x10^8 mol/y and (1.5+/-0.4)x10^{10} mol/y at ridges calibrating against the known ^{3}He flux of 530 mol/y. They may be defined as lower limits of MOR flux because F and Cl contents in glass matrix are >7000 and >100 times higher than those in vesicles and dissolution of only a small part of volatiles staying in oceanic crust into the ocean will increase volatile flux significantly. The large difference between F/Cl ratios in vesicles and glass matrix reflects difference in vesicle/glass partition coefficients of these elements, which suggests that they have significantly different degassing behavior at ridges. From the data of the noble gas method on MORB in literature, Br/Cl and I/Cl ratios in vesicles were calculated to be (1.8+/-0.1)x10^{-3} and (5.4+/-0.1)x10^{-5} which are almost equivalent with those in glass matrix [1], suggesting their vesicle/glass partition coefficients are similar in submarine basaltic magma. Br and I flux at ridges were calculated to be (2.7+/-0.8)x10^7 mol/y and (8.3+/-2.4)x10^5 mol/y based on the Cl flux estimated in this study. They are the first estimate of Br and I flux obtained by indirect calibration against ^{3}He flux and may be lower limits of MOR flux by the same reason as Cl. Combination of the method in this study and the noble gas method on the same sample will give us new insight into degassing behavior and geochemical cycles of halogens.

Reference: [1] Kendrick et al. (2012) GCA 81, 82-93.