Qualitative halogen analysis in antarctic MOR glass: A quest for the quantitative microanalysis

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Determinations of halogen elements such as F, Cl, Br, and I in volcanic rocks might be the key to understand "volatility" of volcanic eruptions and mantle dynamics of the Earth. Since the micro-analysis of anion in volcanic rocks is not well established compared to the "conventional" cation analysis, the geochemical behavior of halogens in solid Earth have been poorly understood. SIMS (Secondary Ion Mass Spectrometry) microanalysis of halogen in basaltic glass recovered from the KR1 Antarctic mid-ocean ridge (MOR), eastern end of Indian-Australian ridge, was attempted to understand the volatile behaviors in the mantle underneath the MOR.

The basaltic glasses contain minor plagioclase and olivine phenocrysts. For the SIMS halogen determination in the basaltic glasses, we characterized silicate glasses for the external Standard Reference Material (SRM). We tested qualitative halogen analysis of conventional SRMs such as BCR glass, NIST glass and the Antarctic MOR basaltic glass. The SIMS transient signals indicate that the conventional BCR and NIST glasses contain F, Cl, a little Br, but no I (below detection limit). The Antarctic basaltic glass contains all the halogen elements, and this indicates a possibility of quantitative determination of halogens in the natural basaltic glass, if we have well characterized external SRM.

Micro-analysis of halogens in the glassy earth materials will be applied to the study of mineral zonations and melt inclusions. For the future quantifications of halogens in natural glasses, we are synthesizing halogen-rich basaltic glass. Halogen contents and homogeneity will be characterized for an external SRM.