Rapid *in situ* analyses of hydrogen and sulfur isotope ratios in basaltic glass by SIMS and their appilications

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We developed rapid and accurate *in situ* analyses of hydrogen and sulfur isotope ratios of basaltic glass using high-resolution, multi-collection secondary ion mass spectrometry (CAMECA IMS-1280HR). Hydrogen and sulfur isotopes of standard basaltic glasses were determined by a high-temperature conversion elemental analyzer/isotope ratio mass spectrometer (IRMS) and IRMS, respectively. For the *in situ* analysis of sulfur isotopes, a defocused Cs beam (~0.5 nA; ~10 μm diameter) was used, but for hydrogen isotopes, we used a larger defocused beam (~5 nA; ~15 μm diameter) to decrease the hydrogen background. For analyses of D/H ($^{34}S/^{32}S$) ratios, ^{16}OH (^{32}S) and ^{16}OD (^{34}S) were measured in multi-detection mode with a Faraday cup and an axial electron multiplier, respectively. Each measurement lasted 6–7 minutes. Precisions (2 standard errors) for D/H and $^{34}S/^{32}S$ ratios were ~6 ‰(H_2O > 1 wt%) and ~0.6 ‰(S > 1000 ppm), respectively. Our developed method for rapid and high spatial resolution analysis can determine concentrations of volatiles, hydrogen and sulfur isotopes in a single small melt inclusion of ~30 μm diameter. Using this method, we analyzed hydrogen and sulfur isotope ratios of submarine basaltic glasses from mid-oceanic ridges and oceanic islands of Hawaii and confirmed that their D/H and S isotope ratios were consistent with reported values.

Keywords: SIMS, hydrogen isotope, sulfur isotope, basaltic glass

