Volatile concentrations and hydrogen isotope ratios of submarine glasses from Loihi and Kilauea

KENJI SHIMIZU[1]*, TAKAYUKI USHIKUBO[1] AND ICHIRO KANEOKA[2]

[1]Kochi Institute for Core Sample Research, JAMSTEC, Kochi 783-8502, Japan (*shimmy@jamstec.go.jp)
[2]Earthquake Research Institute, University of Tokyo, Tokyo 113-0032, Japan

Volatile concentrations and hydrogen isotope ratios were analyzed for fresh quenched glasses of Hawaiian submarine volcanoes from Loihi (eight samples) and the East Kilauea Rift (three samples) using Cameca IMS-1280HR at the Kochi Institute for Core Sample Research, JAMSTEC. Hydrogen isotope ratios of quenched glasses of mid-ocean ridge basalts (MORBs) from Pacific, Atlantic and Indian Ocean are also measured for a comparison. H_2O, CO_2, F, Cl and S concentrations of Hawaiian glasses are 0.4-2.5 wt%, 47-342 ppm, 392-874 ppm, 140-1447 ppm, and 899-2490 ppm, respectively. Three glass samples from Loihi with high H_2O content of >2 wt% are high in Cl/F (>2.5), indicating that they are affected by seawater or brine assimilation. Hydrogen isotope ratios (δDvsmow) of the glasses range from –78 to –108 ‰, except for bine assimilated glasses (δD of –59 to –55). Low δD values of the Hawaiian volcanic glasses are distinct from those of average MORB we measured (–64 ± 4 ‰, 1 s.d.) or Clog et al. [1] reported (–60 ± 5 ‰). The glasses with the lowest δD (–108 and –104 ‰) are from Loihi whose S contents are high (2367 and 2490 ppm, respectively). Whereas, glasses from Kilauea are higher in δD (–91 to –78 ‰) and lower in S content (900 to 1600 ppm).

Since $^3He/^4He$ ratios of MORBs, basalts from Kilauea and Loihi are ~8 Ra, 13-15 Ra and 20-35 Ra, respectively [2], hydrogen isotope ratios of source mantle reserviors may negatively correlate with $^3He/^4He$. The present result implies that the hydrogen isotope of the high ^3He Hawaiian mantle is low (e.g. δD < –110 ‰), but it may not be as low as <–220 ‰, which is recently suggested by olivine melt inclusions from the Baffin Island picrites [3].

[1] Clog et al. (2013) *EPSL*, **381**, 156-165. [2] Kaneoka et al. (2002) *Geophys. Monograph* **128**, *AGU*, 373-389. [3] Hallis et al. (2015) *Science*, **350**, 795-797.