

Various source compositions in the early stage of Kilauea, Hawaii

T. HANYU^{1*}, J.-I. KIMURA² AND M. KATAKUSE²

¹Institute for Research on Earth Evolution, JAMSTEC,
Yokosuka 237-0061, Japan

(*correspondence: hanyut@jamstec.go.jp)

²Department of Geoscience, Shimane Univ., Matsue 690-8504, Japan

New noble gas and radiogenic isotopic compositions, along with major and trace element data, are presented for the rocks from the submarine Hilina bench, south flank of Kilauea volcano. A special attention has been given to the Hilina bench, where the early Kilauea lavas might be exposed, and wide variety of rock types, including alkali, transitional and tholeiite basalts, were collected from this region during Japan-US collaborative research cruises using submersibles by JAMSTEC in 1998-2002.

Undegassed glass samples and olivine separates show large variation in $^3\text{He}/^4\text{He}$ ratios; three samples from one dive site have 24-26 Ra and the others have between 11 and 26 Ra. Elevated $^3\text{He}/^4\text{He}$ ratios contrasts to those of post-shield and rejuvenated alkalic lavas, clearly demonstrating that alkali and transitional basalts at Hilina correspond to the early Kilauea magmas.

Pb-Sr-Nd isotopic compositions also show wide variation. Majority of samples have $^{206}\text{Pb}/^{204}\text{Pb}$ ratios between 18.6 and 18.7, which are higher than those of subaerial Kilauea tholeiites, and even plot at the most radiogenic end among Hawaiian samples in Pb isotope diagrams [1]. Minor Mauna-Loa like samples with less radiogenic Pb isotopes were found in breccia collected from the bottom of Hilina bench. The point to notice is that three transitional pillow fragments with highest $^3\text{He}/^4\text{He}$ (24-26Ra) have similar Pb-Sr-Nd isotopic compositions as well as low-SiO₂ and low-Zr/Nb features to the pre-shield stage lavas represented by Loihi Seamount.

The new data indicate that the rocks at Hilina were produced in a transitional stage between pre-shield and shield stages, when contribution of less-degassed lower mantle component to the magma source was being reduced, as majority of samples show moderately high $^3\text{He}/^4\text{He}$ (less than 18Ra) compared to Loihi (higher than 20Ra). Dominant source at this stage was the pure component with the most radiogenic Pb isotopic compositions, although Loihi and Loa melts were occasionally supplied into the magma source. Eventually, contribution of Loa component against Kea was increased, forming shield stage tholeiites as seen in the present subaerial Kilauea lavas.

[1] Kimura *et al.* (2006) *JVGR* **151**, 51-72.

The effect of microbial activities on sorption behavior of organic ^{14}C

AKIHIRO HARA¹, TAMOTSU KOZAKI¹, SEICHI SATO¹,
TOSHIYUKI NAKAZAWA² AND HIROYASU KATO³

¹Division of Energy and Environmental Systems, Graduate School of Engineering, Hokkaido University, Hokkaido, Japan (yuan59@eng.hokudai.ac.jp,

kozaki@eng.hokudai.ac.jp, sato@qe.eng.hokudai.ac.jp)

²Mitsubishi Materials Corporation, Naka Energy Research Laboratory, Ibaraki, Japan (tnakazaw@mmc.co.jp)

³Mitsubishi Materials Corporation, Energy Project & Technology Center, Saitama, Japan (hiro@mmc.co.jp)

For the safety assessment of the sub-surface disposal of low-level radioactive waste in Japan, sorption behaviors of organic ^{14}C on sedimentary rock or bentonite samples were studied under various microbial states. A new batch sorption experiment using a double bottle system was carried out in this study. The system consists of two bottles with different sizes; an external bottle contains CO₂ absorbent (0.1 M NaOH solution) and an internal bottle having the solid sample, synthetic groundwater with sodium acetate spiked with ^{14}C , and magnetic stirring bar. The external bottle was tightly capped but the internal bottle was opened so as to allow CO₂ (generated by microbial metabolism in the internal bottle) to be sorbed with the CO₂ absorbent. The radioactivities of ^{14}C both in the groundwater and NaOH solutions were determined as a function of the reaction period of time.

Neither the CO₂ generation and the distribution of ^{14}C to the solid phase was observed for the sterilized solid samples, but both were observed for non-sterilized samples soon after the reaction started. This means that microbial activities could influence the distribution of ^{14}C between the solid and the liquid phases, probably due to (i) assimilation and/or (ii) catabolism (including the followed chemical reactions such as carbonate formation). In addition, the experimental results suggest that the conventional batch experiment, in which distribution coefficient is determined only from a drop in tracer concentration in liquid phase, tends to overestimate the distribution coefficient of organic ^{14}C for the non-sterilized samples. In this study, these effects of the microbial activities on the sorption behavior of acetate ^{14}C will be discussed in detail.