Researching of alkali-element enrichment using the SEM-EDS mapping analyses of BABB at the site C0012, IODP EXP 333 in the northern Shikoku Basin

*Satoru Haraguchi[1], Koichiro Fujinaga[2,3], Kentaro Nakamura[3], Asuka Yamaguchi[4], Teruaki Ishii[5]

1.Japan Agency for Marine-Earth Science and Technology, 2.Chiba Institute of Technology, 3.Faculty of Engineering, University of Tokyo, 4.Atmosphere and Ocean Research Institute, 5.Fukada Geological Institute

The Shikoku Basin is a back arc basin located westside of the Izu-Ogasawara (Bonin) arc, spreading was from 25 to 15 Ma. The backarc basin basalts (BABB) of the Shikoku Basin were recovered by drilling of DSDP, ODP and IODP researches. The BABB of the Site C0012, south of the Kii Peninsula, operated during the IODP Exp 333, show prominent enrichment of alkali elements. Haraguchi et al. (2015) reported that the identification of host-phase of alkali element by XRD method, and considered alteration environments. In this study, we consider secondary mineralization using mapping analyses by SEM-EDS method, and system of alkali element enrichments.
SiO_2 and MgO contents of these basalts are 47-55 and 5-8 wt%. These basalts show wide variation of enrichment of alkali elements, 2.3-7.5 and 0.4-4.2 wt% of Na_2O and K_2O. Na_2O+K_2O contents show 2 wt% higher trends than other BABBs in the Shikoku Basin at the same SiO_2 contents. The XRD results indicate that the analcime is found from the extremely Na-enriched, more than 4 wt% samples, and thomsonite is also found from many samples. The host phases of K are mainly identified into K-feldspar.
The one of weak point of the XRF analyses is the identification of feldspar. That is, identification of end-member, Ca, Na and K, is difficult because of the peak pattern among these end-member show similar characteristics. Especially, discriminate between anorthite and albite is difficult. Therefore, we attend the mapping analyzed of SEM-EDS method for discrimination of feldspar.
The results of SEM-EDS analyses, feldspar show high Na and K intensity, and the remarkable point is very low intensity of Ca. Therefore, feldspar is considered to completely replacing into alkali feldspar. In the high-Na samples, most feldspars are replaced into albite, on the other hand, high-K samples show K-enriched layer on the rim and clack of feldspar crystals. This K-enriched layer is considered to K-feldspar, equal to the result of XRF method. These observation indicate that the main alkali element-enriched process is albitization. The albitization occur under more than 100°C (e.g. Alt et al., 1986), and albite and K-feldspar occur under higher and lower temperature. The zeolite and clay mineral assemblages support this temperature (e.g. Miyashiro & Shido 1970).
Compared to the lithostratigraphy, the Na and K enrichments are prominent in the layer of low- and high-recovery ratios. And precipitation of zeolite is prominent in the High-Na, equal to low-recovery layers. Therefore, we consider that the Na enrichment occurred under high water/rock ratio with active hydrothermal circulation because of high water permeability of pillow lava. We also assume that the temperature at the path of hydrothermal fluids was high and that at the basement far from the path was low. Under this environment, basement was altered under zeolite facies alteration plagioclase was replace into alkali feldspar and result to enrichment of bulk alkali element enrichments.

Keywords: backarc basin basalts, hydrothermal activity, albitization, mapping analyses

