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## The hydrothermal alteration and contact metamorphism on the tonalite and volcanics of the Komahashi-Daini Seamount

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At the Komahashi-Daini Seamount (SMT) in the northern Kyushu-Palau Ridge (KPR), acidic plutonic rocks (tonalite) were recovered by research cruises of Japanese Geodynamics Project (GDP) during 1970's and R/V Tansei-Maru, Ocean Research institute, during 1990's. Haraguchi et al. (2003) considered that this tonalite was produced by fractional crystallization of the basaltic magma during the arc volcanism before spreading of the Shikoku backarc basin. This study was selected fresh samples. However, many altered plutonic rocks were recovered with fresh ones during these cruises. Volcanic rocks were recovered with plutonic rocks. These volcanics exhibit highly alteration. In this study, we research these highly altered plutonics and volcanics by petrographical, geochemical and mineralogical processes using chemical analysis by electron microprobe analyses (EPMA) and identification by X-ray diffraction (XRD). And we consider alteration processes during intrusion of acidic plutonic body.

Plutonic rocks from the Komahashi-Daini SMT are divided into hornblende- and biotite-hornblende tonalite. Highly altered tonalite were recovered with both tonalites. Alteration is prominent in colored minerals. Many colored minerals are replaced into chlorite identified by EPMA and XRD analyses. Fresh tonalites not altered of colored mineral are about 1/10 amount of all recovered plutonic rocks. Plagioclase resist from alteration compared to colored mineral, however, albitization is observed in some high-altered tonalites. K-feldspar is rare in altered tonalites.

Volcanic rocks were recovered from all sites dredged plutonic rocks, and exhibit highly alteration. The alteration ratio of these volcanics is from surviving to modifying of primary igneous textures. Plagioclase phenocrysts exhibit albitization, and albite and chlorite are identified, similar to plutonic rocks. Quartz is also identified by XRD and EPMA analyses. These secondary minerals are difficult to identify by microscope observation. We considered that the analyses of mineral composition are the effective tools of identification of fine mineral phases.

The mineral assemblage of chlorite, albite and quartz in the altered plutonic and volcanic rocks indicate alteration under 150 to 200C or higher than this temperature. We considered this alteration was caused by hydrothermal circulation between intrusive rock and host rocks. We also considered that the volcanic rocks had effected under contact metamorphism because these volcanics exhibits prominent re-crystallization.

The bulk composition of volcanics exhibit 54-64 wt% of SiO<sub>2</sub>, and we assumed that the prominent re-movement of alteration-resistant elements. These volcanics exhibit similar chemical characteristics to tonalites, especially, HFSE exhibit similar depleted contents and ratios. The other volcanics from the northern KPR, considered to products of rifting volcanism associated with spreading of the Shikoku Basin, exhibit enriched composition, and these enriched volcanics is not found from arc volcanism before rifting activity. Therefore, we considered that volcanics from the Komahashi-Daini SMT is the products of arc volcanism before rifting activity, assumed to earliest stage volcanics of the KPR. The earliest stage of arc volcanism in the KPR was only reported from the Palau Islands. Therefore, this volcanics is important to indicate the environment of early stage arc volcanism in the KPR. Hydrothermal alteration textures observed in the tonalites and volcanics at the Komahashi-Daini SMT is also important because these textures indicate the existence of hydrothermal activities during the early stage of arc volcanism in the proto-IBM arc and possibility of hydrothermal ore depositions in the KPR.

Keywords: Kyushu-Palau Ridge, Arc volcanism, Acidic plutonic body, Secondary mineral assemblage, Hydrothermal alteration, Contact metamorphism