

The effect of low and high-T alteration on bulk composition observed in volcanic rocks from the Ogasawara and Kyushu-Palau Ridge

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Seafloor rocks show elemental behavior associated with hydrothermal alteration and low temperature seawater alteration. Therefore, it is need to consider elemental behavior under effect of alteration when compared to bulk rock composition.

Under the alteration process, primary minerals are changed into secondary minerals that are stable under new pressure-temperature condition. In the seafloor condition, primary minerals are changed into hydrous minerals under high and low temperature alteration. Therefore, it is considered that water content is important index of alteration. Petrological and geochemical characteristics of low and high temperature alterations were found from dredged volcanic rocks from the Ogasawara Ridge during the KT95-9 cruise and northern Kyushu-Palau Ridge during the KT94-10 cruise by R/V Tansei-Maru.

Volcanic rocks from the Ogasawara Ridge during the KT95-9 cruise show porphyritic texture and classified two-pyroxene basalt to andesite, and some rocks have phenocrysts replaced into secondary minerals. Fresh rocks, altered phenocrysts are not observed, show low content, fewer than 2%, of -H₂O and LOI. Therefore, it is considered that under 2% of -H₂O and LOI rocks have primary composition, and studied magma genesis using these rocks (Haraguchi et al., 1999, 2000, etc.). All analyzed rocks show wide range, up to 10%, of -H₂O and LOI. These data are classified under 2% intervals of -H₂O and LOI and compared bulk composition, SiO₂ and CaO show decreasing trends and MgO and K₂O show increasing trend with increasing water content in the rocks from the Ogasawara region. It is considered that these phenomena are associated with replaced glass into smectite by alteration. That is, smectite is considered to important factor of chamber of seawater magnesium, and increasing of K₂O is associated with growth of celadonite, one of potassium rich clay minerals (Nakamura et al., 2003; etc.). In the trace elements, Ba and Rb show similar trends to K₂O, and Sr show similar trends to CaO. It is important points that altered trends on the MgO-SiO₂ and CaO-SiO₂ plots are similar to fractionation trends of high-Mg andesite (boninite). K₂O show significant increasing during low temperature alteration. Therefore, inspection of alteration is important factor when compared bulk K₂O content.

Dredged rocks from the Kyushu-Palau Ridge during the KT94-10 cruise were classified low water rocks, high -H₂O rocks, and high LOI rocks. High -H₂O rocks show fresh phenocrysts and low altered groundmass minerals. However, groundmass glass show significant alteration, assumed replaced into clay minerals. Compared bulk composition, some incompatible elements show depart from fractionation trend. This phenomenon is considered that replaced glass into clay minerals is correspond to increasing -H₂O. On the other hand, high LOI rocks show completed re-crystallization. Increasing LOI is considered to associate with re-crystallization of amphibole and other hydrous minerals. Under high temperature alteration, many major and trace elements are decreasing (ODP Leg140, 148; Honnorez et al., 2003; etc.)

Therefore, It is considered that dredged rocks during KT94-10 and KT95-9 cruises show typical petrological and geochemical characteristics of low and high temperature alteration. It is need to investigate alteration signatures when compared to bulk composition, especially published data. And it is considered that -H₂O and LOI content are suitable indicator of low and high temperature alteration.