Amphibolitic rocks from the Omachi Seamount, frontal Izu-Ogasawara Arc

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[Introduction]

Ultramafic rocks are known to occur on the Omachi Seamount, near volcanic front of the Izu-Ogasawara Arc (Yuasa et al., 1999). These rocks, covered by Paleogene volcanics and limestone, are thought to have comprised upper mantle beneath the 'Paleo-Izu-Ogasawara Arc', which existed before the opening of the Shikoku and Parece Vela Basins. Amphibolitic rocks and serpentine schists were obtained through the dives by the submarine 'Shinkai 6500' (chef scientist: T. Watanabe) during the JAMSTEC Yk01-04 cruise. This was the first finding of 'crustal' high-grade metamorphic rocks from the Omachi Seamount, except hornblendite in peridotite reported by Niida et al. (2001). We present occurrences and petrology of the amphibolitic rocks.

[Dive Results]

The Omachi Seamount consists of andesitic to dacitic volcanics in the northern 'main part', and of volcanics and overlying sedimentary rocks in the southern 'peninsula part'. The peninsula part is ended by the fault scarp exceeding 1000m height, at base of which ultramafic rocks expose overlain by the volcanics. Three dives (6k#608-610) were made on the northern part of the fault scarp. Serpentine schist and amphibolitic rocks were obtained during the dive 609 at 29deg7.5'N, whereas the volcanics occupied down to the base of the scarp at dive 608 and 610, north from the dive 609.

Along the route of dive 609, the scarp rises from basin floor at 3480m below sea surface, and comprises apron to talus slope until 3240m, steep slope of serpentinite cliff and talus between 3240m and 3160m, gently sloped terrace between 3240m and 3160m followed by cliff of stratified volcanic breccia.

Amphibolitic rocks, all of which are floats, were obtained from the apron (sample R002 at 3481m, R004-006 at 3340m) and steep slop (R012 at 3340m). The sample R012 is from the foot of a serpentinite cliff, and is thus inferred to have been contained within serpentine schist.

[Amphibolitic rocks]

The sample R002, R004, R005, and R006 are epidote-albite-amphibolite consisting of green hornblende + albite + epidote + titanite. They are fine-grained, and have weak schistosity. Their massive and fine-grained textures suggest that they originate basalt to fine-grained dolerite. Relatively coarse albite grains, most of which are replaced by analcime, exhibit spotted schist -like texture in R002.

The sample R012 is coarser-grained amphibole schist consisting dominantly of amphibole + epidote with subordinate chlorite, biotite, plagioclase, titanite, and garnet. It is inferred to originate from rather undifferentiated gabbroic rock, in terms of bulk-rock composition and coarse-grained texture. Garnet occurs as porphyroblasts, most of which are decomposed to pseudomorphic clots of amphibole + chlorite + biotite + plagioclase. Plagioclase, dominantly replaced by natrolite, limitedly occurs at rim of relict garnet or within the pseudomorphs. Relic garnet, which has ca. 30 mol% of grossular component and 25-30% of pyrope component, is cut by meshwork of numerous microfractures along which pyrope component decreases to ca. 15% (more almandine-rich). Amphiboles, generally poor in Ti, have pronounce composition zoning: actinolitic hornblende (Si=7-7.5) through more actinolitic (Si=7.5-7.8) to pargasitic (Si=6.1-7) from core to rim. Amphiboles as inclusion of garnet are actinolitic, whereas ones enclosing relic garnet are pargasitic.

Mineral assemblages of the amphibolitic rocks suggest medium-pressure type metamorphic conditions. Fracturing of garnet with decreasing Mg, and decomposition of garnet porphyroblasts are considered to represent retrograde processes probably accompanied by decompression. Pronounce zoning of amphiboles may also reflect the retrograde metamorphism. The amphibolitic rocks are regarded to have recorded the exhumation event of deep crustal to mantle rocks, which must have occurred during the initiation and rifting of the Paleo-Izu-Ogasawara arc-trench system.