Petrography of the Torishima volcano, Izu-Bonin arc

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Torishima, located about 600km south of Tokyo, is an isolated active Quaternary island volcano of the Izu-Bonin arc. The island, which is about 2.7km in diameter; 800m high from the seafloor, is accompanied by several knolls, such as Torishima knoll, and Dai-ichi Higashi Torishima knoll. The total volume of the Torishima volcano is 466km3, which is the second largest volcano in the Izu-Bonin arc after the Miyakejima volcano.

Upper half (400m) of the volcano is above the sea level, and consists of double volcano structure. Caldera rim and outer slope is only preserved on the east and west side of the island, whereas northern and southern caldera wall is lost and has become steep cliff that exceed 200 to 300m high. The northern cliff on the island is considered to be formed by phreatomagmatic eruption. There are two central cones inside the caldera; one of them is Io-yama (394m), which is the highest point in the island.

Because the Torishima was an isolated uninhabited island until 1886, and is uninhabited again at present, there are no precise volcanic activity records. In recent years, the volcano has erupted in 1902, 1939, and in August 2002. In 1902 eruption, previous center cone was lost by phreatomagmatic eruption and also created horseshoe-shaped crater on the northern shore of the island, which killed all 112 inhabitants on the island. 1939 eruption has created a new center cone (Io-yama), accompanied by two major lava flow. The most recent eruption was on August 2002, which erupted from the southwestern slope of the Io-yama, and ash cloud has reached to an altitude of 200 to 300m.

In December 2002, the R/V KAIREI research cruise was used to collect Sea Beam bathymetric / side-scan sonar surveys, single-channel seismic surveys, and dredge hauls around the Torishima area. The results outlined the basic underwater structures of the volcano. In September 2003, we performed precise fieldwork and sampling on the Torishima volcano.

In this study, we will report the petrography and geochemistry of the rocks from the Torishima volcano, which will help us to understand the magma genesis and magma process in the Izu-Bonin volcanic arc.