

## Physical properties and chemical compositions of fore-arc basalt and boninite in Bonin forearc recovered by IODP Expedition 352

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The Izu-Bonin-Mariana (IBM) arc is a typical intraoceanic arc system and is the type locality for subduction initiation. IODP (International Ocean Discovery Program)-IBM project is aimed to understand subduction initiation, arc evolution, and continental crust formation. Expedition 352 is one of the IBM projects and that has the 4 drilled sites at the Bonin fore-arc (Reagan et al., 2015, Proceeding of IODP). Expedition 352 has successfully recovered fore-arc basalts and boninites. Fore-arc basalts and related rocks were collected from the sites U1440 and U1441 (the eastern deeper trench slope sites), whereas the boninites and related rocks were mainly recovered from sites U1439 and U1442 (the wearn shallower slope sites) (Reagan et al., 2015, Proceeding of IODP; Reagan et al., 2017, Int. Geol. Rev.).

We studied physical properties and bulk chemical composition of both the fore-arc basalt and the boninite samples. For the physical properties, we measured P-wave velocity, density, porosity, low-field magnetic susceptibility. Elastic wave velocities are affected by rock type, porosity, fluid saturation, temperature and pressure: in this study, we measured P-wave velocities under water-saturated condition at ordinary temperature and pressure.

As a result, the bulk densities of boninite group (U1439 and U1442) are 1.98~2.67 g/cm<sup>3</sup>. The porosities are in a range between 7.0 and 37.9 %. The P-wave velocities are in a wide range from 3.1 to 5.4 km/s and have a positive correlation to the bulk densities. The fore-arc basalt group (U1440 and U1441) has 2.13~2.90 g/cm<sup>3</sup> of bulk density with 5.2 -35.6 % of porosity and 3.0-5.5 km/s of P-wave velocity. The P-wave velocity represent similar to boninite group and have a positive correlation to the densities.

The low-field magnetic susceptibilities showed bimodal distributions so that the physical properties of boninite were classified into two groups: a high magnetic susceptibility group ( $0.2 \sim 2 \times 10^{-2} \text{ m}^3/\text{kg}$ ) and a low magnetic susceptibility group ( $0.01 \sim 0.7 \times 10^{-2} \text{ m}^3/\text{kg}$ ). The former is almost identical with the fore-arc basalt and boninite group samples with the higher correlation trend between the P-wave velocities and the densities, whereas the latter is only the boninite group samples with the lower correlation trend.

The bulk chemical compositions of boninite group samples that SiO<sub>2</sub> contents are between 43.8 and 62.4 wt.%, FeO\* contents are from 4.6 to 9.0 wt.% and K<sub>2</sub>O contents are 0.1~3.3 wt.%. SiO<sub>2</sub> contents of fore-arc basalt group rocks are between 46.7~53.6 wt.%, FeO\* contents are from 8.1 to 13.2 wt.% and K<sub>2</sub>O contents are 0.1~4.0 wt.%. The FeO\* contents are similar to both magnetic susceptibility groups.

Moreover, some high K<sub>2</sub>O contents samples have low P-wave velocity, suggesting that P-wave velocities of these rocks had been reduced by alteration.

Keywords: Izu-Bonin-Mariana, drilling, boninite, velocity, magnetic susceptibility