

Petrological and geochemical variations of the basement in the Northeastern Pacific at Sites 1224 and 1243 , ODP Legs 200 and 203

Satoru Haraguchi[1]; Teruaki Ishii[2]

[1] Ocean Floor Sci., Ocean Res. Inst., Univ. Tokyo; [2] Ocean Floor Geotec., Ocean Res. Inst., Univ. Tokyo

In the northeastern Pacific Ocean, DSDP and ODP operations have recovered igneous basement at few sites, and two recent ODP sites penetrated more than 100 m into igneous basement: Leg 200 Site 1224 and Leg 203 Site 1243. Studies of igneous basement at both sites are critical to constrain the temporal and geographical variation of mid-ocean volcanism at the East Pacific Rise (EPR).

The age of igneous basement at Site 1224 is about 45Ma, and the basement surface was inferred to be 28 m below seafloor. Basement lithology down to 170 meter below sea floor is divided into three major units: Unit 1 = massive flow, Unit 2 = pillow breccia, and Unit 3 = intermixed pillows and thin flows. At 1243 the age of igneous basement is about 12Ma, and the basement surface was inferred to be 117 m below seafloor. Basement lithology down to 195 meter below sea floor is pillow breccia.

The bulk compositions of Site 1224 rocks have high abundances of the high-field strength elements (HFSE) Y, Zr, and Nb relative to normal and even enriched mid-ocean-ridge basalts (MORB). Chemical stratigraphic differences among the three units at this site are clear. Unit 3 rocks have the highest FeO/MgO ratio and HFSE concentration and Unit 2 lavas have the lowest. Unit 2 lavas also have the highest Y/Zr ratios. Unit 1 is separated into lower and upper flow units based on differences in HFSE content. Clearly there were significant differences in the petrogenetic processes that created these units.

Chemical stratigraphic differences are also observed in Site 1243 basement, and these rocks show wider HFSE compositions than Site 1224 rocks. And some units show clearly different Y/Zr and Nb/Zr ratios from Site 1224 rocks. These different HFSE ratios are thought to result from a difference of magma generation environments.

At the Site 1224 chemostratigraphic and lithologic differences between the basement units correlate to differences in physical properties between the three units. Each lithologic unit displays different P-wave velocity, bulk density, and other physical properties. On the other hand, the result of physical analysis at Site 1243 shows weak difference among sub units. Therefore, physical properties are thought to be associated with large scale petrological features. And we assumed that these differences are associated with difference of production ratio of magma between massive flow and pillow breccia, and difference of environment of magma genesis.