

Petrological and geochemical characteristics of basement rocks from the NW part of the West Philippine Basin

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West Philippine Basin (WPB) is inactive and the oldest back-arc basin occupying western half of the Philippine Sea Plate. The western part of WPB is characterized by relatively shallow water depths and undulate topography, compared with the eastern part. It has been suggested that mantle plume activity (represented by the Urdaneta Plateau and Benham Ridge) involved in the seafloor spreading of this part of basin. The other prominent bathymetric feature is the NE-SW orientating Okinawa-Luzon Fracture Zone (OLFZ), which extends from east of the Ryukyu Trench to Luzon Arc.

We determined major- and trace-element compositions and Sr-Nd isotopic ratios of rocks from the western WPB, in order to define petrological and geochemical characteristics of basement rocks from the NW part of the West Philippine Basin. These samples were collected during the KAIKO-KAIREI KR03-04 cruise in 2003, KAIKO-KAIREI KR99-07 cruise in 1999, and submersible SHINKAI 6500 dives in 1995, and also include DSDP Site 293 samples and dredged rocks at the southern Urdaneta Plateau by Shcheka et al. (1995).

We found that there is major difference in chemistry between rocks from the eastern and western area of the OLFZ. Samples are mainly basalts and dolerite, except for basaltic trachyandesite to trachyte which are recovered at the S Urdaneta Plateau. These samples have the range of 48 to 61 wt.% SiO₂, almost plotting near the boundary line between Low-K and Medium-K series in SiO₂- K₂O diagram. Rocks from the western part of OLFZ are particularly poor in K₂O, while rocks from the South Urdaneta plateau and KAIKO Dive291 site have higher K₂O. Compared with rocks west of OLFZ, rocks east of OLFZ have higher TiO₂ and lower MgO and CaO contents in MgO vs major element diagrams.

In N-MORB-normalized trace element pattern diagrams, the rocks west of OLFZ are N-MORB like and the rocks east of OLFZ are E-MORB and/or OIB like. Southern Urdaneta plateau samples display more enriched feature than typical OIB. Rocks east of OLFZ have $^{143}\text{Nd}/^{144}\text{Nd}$ (measure value) = 0.51284 to 0.51308 and $^{87}\text{Sr}/^{86}\text{Sr}$ (measure value) = 0.7034 to 0.7042; rocks from the southern Urdaneta plateau and Dive-291 sites are most enriched. These values plot in the field of OIB, dissimilar to N-MORB. By contrast, rocks west of OLFZ have Nd (0.51306 to 0.51323) and Sr (0.7027 to 0.7051) isotopic ratios similar to N-MORB; some higher Sr isotopic ratios are probably due to seawater contamination (via alternation). Therefore, we suggest that basement rocks west of OLFZ formed under the influence of enriched mantle plume upwelling, while rocks east of OLFZ originated from N-MORB-like depleted mantle