

北西太平洋に存在するプチスポットマグマの成因を実験岩石学で制約しようプロジェクト：第2弾

Experimental constraint on magma genesis for petit-spot in the northwestern Pacific: the second step

町田 嗣樹^{1*}; 小木曾 哲²; 平野 直人³
MACHIDA, Shiki^{1*}; KOGISO, Tetsu²; HIRANO, Naoto³

¹ 早稲田大学環境資源, ² 京都大院人間環境, ³ 東北大東北アジア研
¹Waseda University, ²Kyoto University, ³Tohoku University

Plate deformation owing to the outer-rise induces eruption of magma forming diminutive volcanoes compared to hotspots and large igneous provinces, so called petit-spot volcanism. Even if unique geochemistry of alkaline basalts suggest that they are originated from partial melts in the heterogeneous asthenosphere, detailed melt production process for petit-spot volcanism is still not constrained. We thus conduct melting experiments to define phase relations for the petit-spot primary magmas. Our first experiment (Machida et al., 2013, JpGU) for the youngest knoll situated in flexed region of the northwestern Pacific plate (sample KR04-08 D08-002) showed that the primary magma is saturated with olivine and orthopyroxene or clinopyroxene at about 2.1 GPa and about 1280 °C. Therefore, when we consider that the depth of the lithosphere-asthenosphere boundary (LAB) for the northwest Pacific (WP2) is 82 km (Kawakatsu et al., 2009, Science), equilibrated pressure corresponds to the lower lithosphere. This result looks like resisting a conventional hypothesis that the petit-spot volcano was formed by exuding of magma existing in the upper asthenosphere, place deeper than approximately 90 km, through the lithosphere (Hirano et al., 2006, Science). To verify the universality of the result, we further select two samples as the second targets. Sample 6K 879-R3A was collected from a knoll in flexed region of the northwestern Pacific plate (approximately 2 km north of youngest knoll for the first experiment) during cruise YK05-06 of *R/V Yokosuka*. Sample 10K 56-R001 was collected from a knoll distributed at the Japan Trench ocean-ward slope during cruise KR97-09 of *R/V Kairei*. Based on the ⁴⁰Ar/³⁹Ar age of sample 10K 56-R001 and the present absolute plate motion, the erupting location corresponds to flexed region of the northwestern Pacific plate, same as the other two samples.

We conducted melting experiments using 1/2-in.-diameter piston cylinder type high-temperature and high-pressure apparatus at Kyoto university. Starting materials were prepared from mixture of pre-dried reagents of oxide, hydroxide, and carbonate representing major element compositions of primary magmas equilibrated with Fo=90 olivine (obtained by the olivine maximum fractionation model), and including 10% CO₂ and 1% H₂O (Okumura and Hirano, 2013, Geology). The other experimental procedures are same as those of Machida et al. (2013, JpGU). As results of our experiments, sample 6K 879-R3A is multiply saturated with olivine, orthopyroxene, and clinopyroxene at about 1.8 GPa and about 1280 °C, and sample 10K 56-R001 is multiply saturated with olivine and orthopyroxene at about 1.4 GPa and about 1275 °C. Therefore, it is a common condition, regardless of the difference of eruption position and age, that petit-spot magmas were equilibrated with depleted peridotite at the lower part of lithosphere.

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