Residence times of xenocrysts in the Ontong Java Plateau magma: constraints from olivine zonation in the ODP Leg 192 lavas

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The Ontong Java Plateau (OJP), covering an area of four times of Japan, is located in the westcentral Pacific Ocean (Coffin and Eldholm 1993). Since the OJP is the world's most voluminous igneous province, this plateau is important to understand mass and energy transfer from the Earth's interior to its surface that is different from the mid-ocean ridge-dominated model of the Cenozoic.

During Ocean Drilling Program (ODP) Leg 192, the OJP basement lavas were obtained from five sites (Mahoney et al. 2001). The basement lavas are classified into two types, the Kwaimbaita type and the Kroenke type, according to phenocryst assemblage and whole-rock composition. The phenocryst assemblage of the Kwaimbaita type is olivine, plagioclase and augite, whereas the Kroenke type has only olivine phenocryst. The Kwaimbaita type has more differentiated compositions compared with the Kroenke type. The Kroenke type lavas overlie the Kwaimbaita type lavas at the eastern edge of the plateau.

A study of zoning profiles of phenocryst phases makes it clear that olivine phenocrysts in the Kroenke type basalt are divided into normal zoning and reverse zoning types. While cores of the normal zoning olivine have compositions that are in equilibrium with whole-rock composition, cores of the reverse zoning olivine have compositions that are not in equilibrium with whole-rock compositions. The reverse zoning olivine crystals are inferred to have been xenocrsyts assimilated from the solidified Kwaimbaita type basalt. Assuming that zoning in the reverse olivine is due to diffusion after assimilation, residence times of the reverse zoning olivine in the Kroenke type magma are calculated to be a few months to a few years.