Trace element signature for fluid-inclusion bearing olivine in the Pinatubo harzburgite xenolith

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Peridotitete xenoliths brought up by subduction-zone magmas often record metasomatism in the mantle wedge. Amphibole-bearing peridotite xenoliths were observed within the Pinatubo 1991 dacite pyroclastic flow deposits [1]. Pinatubo volcano is located at the volcanic front of the Luzon arc, the Philippines. Abundant fluid inclusions are found in olivine and orthopyroxene. Microthemometry and Raman spectroscopy of these inclusions indicate that they are composed mainly of saline aqueous solution (5.1 ± 1.0 wt% NaCl equivalent), suggesting the involvement of hydrous fluids as metasomatic agents in the mantle wedge [1]. We analyzed trace element compositions of olivine crystals including fluid inclusions of a spinel harzburgite xenolith using solutin mode ICP-MS to discuss the origin and geochemical compositions of the fluid inclusions.

The most noteworthy features of the olivine trace element compositions are positive anomaly of Pb and enrichment of highly incompatible elements such as Ba, Th and La relative to heavy rare earth elements on the primitive mantle normalized diagram. These features are similar to those of trace element patterns of estimated fluids equilibrated with amphiboles in the Pinatubo harzburgite xenoliths [2]. This similarity suggests a genetic link between the fluids to form amphiboles and fluid inclusions in the olivines. Trace element and Sr-Nd isotopic compositions of the amphiboles suggested that these amphiboles were formed by fluids derived from subducted oceanic crust [2]. The halogen and noble gas compositions of fluid-inclusion bearing olivine of the same harzburgite show sedimentary pore fluids and serpentinite signature [3]. These oservations reveal that metasomatism beneath the Pinatubo volcano was induced by aqueous fluids released from subducted oceanic lithosphere.

[1] Kawamoto et al. (2013) *PNAS*, **110**, 9663-9668. [2] Yoshikawa et al., *under review*. [4] Kobayashi et al. (2013) *MinMag*, 77, 1484.