Geochemistry of spinel-hosted amphibole inclusions in abyssal peridotite : Embedded evidence for melt-peridotite reaction process?

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Trace-element compositions of spinel-hosted amphibole inclusions (20-40 μm) were determined by using LA-ICP-MS to more throughly understand the melt-peridotite reaction.

Spinel-hosted hydrous minerals (e.g., amphibole and phlogopite) have been documented in ultramafic rocks from the ocean floor and ophiolitic complexes [1, 2]. They are commonly observed in dunite, troctolite and chromitite, to which formation the melt-peridotite reaction contributed significantly. However, the role of formation of the inclusions has been ever constrained well within the framework of melt-peridotite reaction. Arai *et al.* [1] pointed out that the mineral inclusions are formed from a melt enriched in incompatible elements, e.g., TiO_2 and Na_2O, and H_2O, produced by zone refining effects in the melt-peridotite reaction. Until now, trace-element compositions of the inclusions have been rarely examined [2, 3] due to difficulty in establishing their geochemical systematics because of complicated multi-scale uncertainties on the reaction mechanisms, such as melt and rock compositions and geological setting.

A core interval (70 cm) of the residual harzburgite cut by gabbro recovered from the Atlantis Massif, Mid-Atlantic Ridge 30°N shows inhomogeneous compositions caused by reaction with melt forming the gabbro [4]. Pargasitic amphibole inclusions in concentric spinel grains are only observed in the harzburgite near the gabbro contact (10 cm) where depleted residual harzburgite reacted with N-MORB-like melt beneath the ridge. Because the geological and petrological context is well constrained there as above, the pargasite geochemistry will give us a good reference for the systematics of relevant reaction and origin of inclusions. Together with trace-element data of spinel-hosted amphibole inclusions in reacted rocks, we discuss the significances of inclusions on the melt-peridotite reaction processes.

[1] Arai *et al.* (1997) GCA 61, 671-675. [2] Schiano *et al.* (1997) *EPSL*, **146**, 489-497. [3] Morishita *et al.* (2011) *Geology*, **39**, 411-414. [4] Tamura *et al.* (2008) *CMP*, **155**, 491-509.

Mission invisible: residual mantle wedge contains phlogopite?

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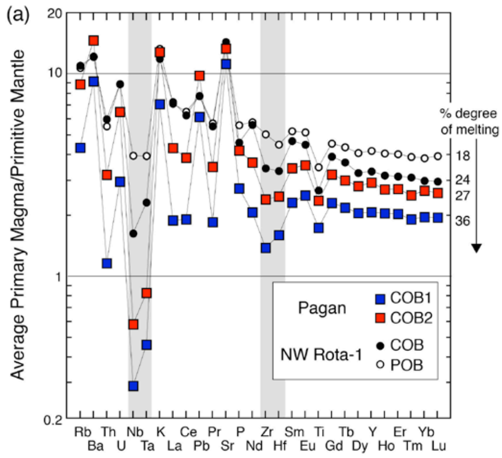
It is often mentioned that arc basalts are highly depleted in high-field strength elements (HFSE), such as Nb, Ta, Zr and Hf. In the spidergram, which shows four types of primary magmas in the Mariana arc (Tamura *et al.*, 2011; Tamura *et al.*, submitted) (Fig. 1), it is worth mentioning that North West Rota-1 (NWR1) POB, which is the driest and least depleted primary magma type among the four, is not as depleted in Nb, Ta, Zr and Hf as are the other three varieties and contains about 4x more of these HFSE than primitive mantle and are comparable to their HREE contents. On the other hand, the differences in Nb and Ta contents between NWR1 POB and more depleted COB are much larger than those expected from the different degrees of melting. This is also the case for Pagan COB1 and COB2 and comparing Pagan and NWR1. Apparently, Nb and Ta decrease unusually when the fraction of melting increases or when primary magmas become more hydrous from POB through COB and COB2 to COB1.

When the melting conditions are 'dry' as is true for POB,



phlogopite would not be present and Nb and Ta would become highly incompatible. It could be possible that highly depleted hydrous residual mantle wedge of the subduction zone could be phlogopite bearing dunite and harzburgite, which causes depletion of HFSE in wet and depleted arc magmas.

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