

Origin of variable $\text{CaO}/\text{Al}_2\text{O}_3$ in olivine-hosted melt inclusions from Kibblewhite Volcano, Kermadec Arc

*Yasuhiro Hirai¹, Yoshihiko Tamura², Kaj Hoernle³, Christian Timm⁴, Folkmar Hauff³, Reinhard Werner³, Takeshi Hanyu², Bogdan Vaglarov², Qing Chang², Takashi Miyazaki², Jun-Ichi Kimura²

1. Graduate School of Natural Science and Technology, Kanazawa University, Japan, 2. Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka, Kanagawa, Japan, 3. GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany, 4. GNS Science, Lower Hutt, New Zealand

During R/V SONNE expedition SO-255 mafic basaltic to magnesian andesitic lavas containing melt inclusion hosting forsteritic olivines ($\text{Fo}_{90.3-92.4}$) were recovered from Kibblewhite Volcano, southern Kermadec Arc. The re-homogenized melt inclusions have compositions similar to primitive basalt (49.6–52.0 wt.% SiO_2 ; 12.7–15.9 wt.% MgO). Their $\text{CaO}/\text{Al}_2\text{O}_3$ values, however, range from 0.9 to 1.6, which cannot be explained by melting of lherzolite. Moreover, $\text{CaO}/\text{Al}_2\text{O}_3$ values in the melt inclusions correlate negatively with Ni contents of their host olivines suggesting that the high $\text{CaO}/\text{Al}_2\text{O}_3$ values result from interaction between mafic melts and subarc lithospheric mantle. Prior to the interaction the mafic magma must have had high Ni contents and low $\text{CaO}/\text{Al}_2\text{O}_3$ values, thus they crystallized high Ni olivines trapping low $\text{CaO}/\text{Al}_2\text{O}_3$ melt inclusions. During the interaction the olivines crystallized from the mafic magmas and its latent heat assimilated pyroxenes from the surrounding lithospheric mantle. This assimilation of pyroxenes allowed the Ni content of the melt to decrease and $\text{CaO}/\text{Al}_2\text{O}_3$ to increase while buffering the Mg-number of the mafic magmas during the ascent. Thus, magmas during and after the interaction could crystallize low Ni olivines bearing high $\text{CaO}/\text{Al}_2\text{O}_3$ melt inclusions.

Keywords: Subduction zone, Kermadec Arc, Kibblewhite Volcano, SO-255, Olivine-hosted melt inclusion