Mantle-wedge processes recorded in peridotite xenoliths from Avacha volcano, Kamchatka arc

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Peridotite xenoliths from Avacha (Avachinsky) volcano were examined petrologically to understand the mantle-wedge processes. They are mainly harzburgite, and are classified into two types in terms of grain size and texture; coarse-grained (C-type) and fine-grained (F-type) as defined for peridotite xenoliths from Iraya volcano by Arai et al. (1996). Hornblendite selvage and veinlet are frequently found. The Avacha xenoliths frequently have secondary orthopyroxene, replacing olivine. The secondary orthopyroxene occasionally exhibits radial aggregation. Clear glass is frequent, interstitial to the secondary orthopyroxene.

Harzburgite of C-type has olivine with Fo90.8-92.8 and chromian spinel with Cr#(=Cr/(Cr+Al) atomic ratio) of 0.50-0.73. One dunite of F-type examined has similar olivine and spinel compositions. The other F-type peridotite (difficult to identify dunite or harzburgite) have olivine with Fo90.6-93.8 and chromian spinel with Cr# of 0.19-0.64, which is low relative to Fo value of olivine. The secondary orthopyroxene replacing olivine is lower in CaO, Al2O3, and Cr2O3 than the primary one of C-type peridotites. The interstitial glass with the secondary orthopyroxene is high in SiO2 (61.7-63.8wt%), Al2O3 (around 20wt%) and CaO (7.0-8.4wt%) contents. We suggest that the reaction, Olivine+ Melt (Fluid)1= orthopyroxene+ Melt (Fluid)2.

It is noteworthy that this secondary melt is similar in major-element chemistry to some adakite. This type of reaction is one of the important processes of the sub-arc mantle.