Extremely low-Al orthopyroxene in the Horoman peridotite, Japan: as a key to evolution of metasomatising fluids

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We discuss origin of extremely low-alumina orthopyroxenes in a spinel lherzolite from the Horoman Peridotite Complex, Japan. The low-Al opx were formed by a very local reaction between peridotite with fluids. The fluids to form the low-Al opx were residual fluids after formation of hydrous minerals by a reaction between peridotites and the primary fluids caused by dehydration of subducted slab.

We discuss origin of extremely low-alumina orthopyroxenes in a spinel lherzolite from the Horoman Peridotite Complex, Japan. The low-Al opx occur in two ways; the first occurs at margin of a large orthopyroxene porphyroclast in contact with olivine and the other occurs at grain boundary between clinopyroxene and olivine. Al_2O_3 and Cr_2O_3 contents in the low-Al opx are nearly nil. CaO content (< 0.2 wt. %) in the low-Al opx is also apparently lower than in opx porphyroclasts. On the basis of petrographic observations combined with a inferred P-T history of the Horoman peridotite, the low-Al opx were formed by a very local reaction between peridotite with fluids. The fluids to form the low-Al opx were residual fluids after formation of hydrous minerals by a reaction between peridotites and the primary fluids caused by dehydration of subducted slab. Preservation of the low-Al zone adjacent to aluminous pyroxenes may suggest that the low-Al opx formed at later stage of upraise of the Horoman complex, i.e. plagioclase stability filed, and that the peridotite has been continuously cooling down to still lower-temperature conditions (< 500 C). We envisage that low-Al opx may be constantly formed by reaction between peridotite and fluids which has evolved by fractionation due to formation of hydrous minerals mainly in mantle wedges, but their chemical signatures would be usually eliminated by homogenization at mantle conditions.