Characteristics of fluid in a subduction zone during the formation of jadeite-quartz rocks

MAYUKO FUKUYAMA[1], TATSUHIKO KAWAMOTO[2], MASATSUGU OGASAWARA[3]

[1]Akita University, 1-1 Tegata-gakuen-machi, 010-8502 Akita, Japan, (*correspondence: mayuko@gipc.akita-u.ac.jp)
[2]Institute of Geothermal Sciences, Graduate School of Science, Kyoto University
[3]Geological survey of Japan, National Institute of Advanced Industrial Science and Technology

Jadeite-quartz rcoks in Kanto Mountains, Japan occur as tectonic blocks within serpentinite melange. The rocks had formed through metasomatic replacement in a subduction zone [1, 2]. Primary two phase (liquid + vapor) fluid inclusions are observed in jadeite, quartz, albite, and zircon.

We examined the trace element composition of fluid inclusions to understand the characteristics of fluids during the formation of the jadeite-quartz rocks in the subduction zone. The fluid inclusions are composed of H_2O with or without CH_4, and show two distinct types of salinities: low salinity (1.9-4 wt.% $NaCl_{eqv.}$) and high salinity (10.4-16.6 wt.% $NaCl_{eqv.}$). The variation of salinities probably shows multi-stage fluid uptake during metasomatism that formed jadeite-quartz rocks. Trace element analytical results of fluid inclusions using LA-ICP-MS show that the fluids are enriched in LILE, Li, B, HFSE and some transition metals. Although the orders of magnitude are different, trace elemental patterns of fluids normalized to the composition of the primordial mantle [3] are similar to those of antigorite-breakdown fluid in subduction zones reported by previous studies [4, 5]. The minimum temperature and pressure conditions of the formation of the jadeite-quartz rocks were estimated 730 ºC at 1.8 GPa from Zr contents of fluids and mineral assemblage of jadeite-quartz rocks. High concentrations of HFSE in fluids are the same characteristics of jadeite-quartz rocks, which are enriched in HFSE and depleted in LILE. This indicates that HFSE from HFSE-enriched fluid can be sequestered into jadeite-quartz rocks prior to fluid moving up into a mantle wedge. Residual fluid after the formation of jadeite-quartz rocks can be relatively depleted in HFSE and enriched in LILE.

[1] Yui & Fukuyama (2015) *JAES* **108**, 58-67. [2] Fukuyama et al. (2013) *JAES* **63**. 206-217. [3] McDonough & Sun (1995) *Chem. Geol.* **120**. 223-253. [4] Scambelluri et al. (2004) *Int. Geol. Rev.* **46**. 595-613. [5] Scambelluri et al. (2015) *EPSL* **429**, 45-59.