Geophysical Research Abstracts
Vol. 21, EGU2019-12721, 2019
EGU General Assembly 2019

Unusually high Nb/Ta ratio of fluid-precipitated jadeites from New Idria serpentinite body, California: Implications for extreme fractionation in slab fluids

Naoko Takahashi (1), Tatsuki Tsujimori (1,2), Qing Chang (3), and Jun-Ichi Kimura (3)

(1) Graduate School of Science, Tohoku University, Sendai, Japan (naoko.takahashi.t1@dc.tohoku.ac.jp), (2) Center of Northeast Asian Studies, Tohoku University, Sendai, Japan (tatsukix@tohoku.ac.jp), (3) Department of Solid Earth Geochemistry, JAMSTEC, Yokosuka, Japan (qchang@jamstec.go.jp, jkimura@jamstec.go.jp)

Nb-Ta and Zr-Hf pairs are conventionally thought as geochemical twins and thus Nb/Ta and Zr/Hf in the bulk silicate earth should be similar to chondritic value of 19.9 and 34.3, respectively (Münker et al., 2003). However, recent studies have revealed that extreme Nb/Ta fractionation of deep subduction-zone fluids from ultrahigh pressure eclogite (Liang et al., 2009) and metagranite (Chen and Zheng, 2015). In order to decipher Nb-Ta (and Zr-Hf) behavior of slab-derived fluids in shallower levels, we investigated a veined jadeitite from the New Idria serpentinite body, which is regarded as direct precipitates from slab-derived fluids at forearc depth. We applied *in-situ* measurements of trace element abundance of jadeites using a LA-ICP-QMS, which enables immediate determinations based on textures of the multiple-stage veins. The New Idria jadeites are characterized by remarkably high Nb concentration but depleted in Ta. Consequently Nb/Ta ratios vary from 10 to 115; Zr/Hf ratios also show a wide range of 38–164. Positive Nb-Ta and Zr-Hf correlations suggest coupling behaviors of those elemental pairs in fluids during the jadeitite vein formation. Although the extreme Nb/Ta and Zr/Hf fractionation can occur in seawater (Firdaus et al., 2011), oxygen isotope composition of New Idria jadeites (δ^{18}O = +8.4 to +9.9‰; Sorensen et al., 2006) rules out a possibility that jadeitite-forming fluid source was originated from pore fluids derived from seawater. Alternatively, the Nb-Ta behavior might be explained by breakdown of hydrous minerals with extreme Nb/Ta ratio such as phengitic mica and/or consequences of high degree of fluid-rock interaction in a case of $D_{Nb}/D_{Ta} > 1$ for fluid-rock system. New Idria jadeitite veins would provide lines of evidence for the presence of highly Nb/Ta fractionated fluids in serpentinized mantle wedge beneath forearc. In short, extreme Nb/Ta ratio is potentially common in shallow level of subduction zone environment.