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ボヘミア山塊 Moldanubian 帯 Nove Dvory 産超高圧エクロジャイト中に発見された 3 種類の Ca 角閃石とその起源について
3 types of Ca-Amp found from Nove Dvory UHP eclogites and their origin, Moldanubian Zone of the Bohemian Massif

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The upper-stability limit of Ca/Na amphibole (Amp) in meta-mafic rocks are considered to be around 2-3 GPa in pressures (Schmidt & Poli, 1998). Thus, most Ca-Amp in (ultra)-high pressure metamorphic rocks have been considered as retrograde products. The peak metamorphic conditions of Nové Dvory eclogites are estimated to be 4.5-4.9 GPa and 1050-1150^{o}C. However, some Ca-Amp inclusions in Grt are likely to be interpreted as prograde relicts survived the ultra-high pressure metamorphism. This paper reports the mode of occurrence and the chemical compositions of Ca-Amp and the coexisting minerals in Nové Dvory eclogite, and discusses when Ca-Amp crystalized. Investigated two eclogite samples, ND0107 and ND120, collected from the same outcrop, are composed mainly of garnet (Grt) and Omphacite (Omp) with minor amounts of apatite (Apt) and rutile (Rt) at the UHP stage, and suffered hydration reactions, represented by Ca-Amp and plagioclase (Pl) formation, with various degree during the exhumation stage.

Ca-Amp in studied eclogite can be classified into 3 types based on their modes of occurrence; Type 1 Amp occurs in sporadic euhedral shaped polyphase mineral aggregates (PMAs) in Grt along with Omp, Rt, and Apt. Type 1 Amp is identified only from ND0107, and is classified as pargasite (Prg) or kaersutite (Krs). Omp inclusions associated with Type 1 Amp are homogeneous and have high X_{Jd} of 40-45, suggesting that the associated Omp did not suffer retrogressive reactions. On ACF diagram, Type 1 Amp is plotted between the associated Omp and host Grt. It suggests that Type 1 Amp could be a relict of the following reaction, Amp=Omp+Grt+W, during the subduction stage. Type 2 Amp is identified as a member of PMAs in Grt along with spinel (Spl) and diopside (Di). Those PMAs with Type 2 Amp show unidiomorphic shapes and straight alignment in Grt. They are classified as Prg or magnesio-hastingsite (Mg-Hs). Type 3 Amp is a member of the symplectite along with Omp. Di, Spl, and Pl developed at Grt rim. These facts suggest that Type 2/3 Amp were formed during the exhumation stage reacted with infiltrated fluids to the host eclogite.

The different stage origins of Type1/2 Amp mentioned above is supported by F and Cl contents in them. Type 1 Prg contains 0.21-0.30 wt% of F, but is almost free from Cl (<0.01wt%). Type 2 Prg contains 0.43-1.17wt% of Cl. Type 2 Prg in ND0107 with Type 1 Amp contains 0.05-0.29wt% of F. On the other hand, Type 2 Prg in ND120, which is free from Type 1 Amp, is scarce in F (<0.05wt%). Type 3 Amp is free from Cl.

It is generally considered that Ca-Amp enriched in $(Na+K)^A$, ^{IV}Al, and $^{VI}Fe^{2+}$ can incorporate more Cl (Makino, 2000). However, Type 1/2 Amp have a similar major element compositions such as $(Na+K)^A$=0.79-0.95 pfu (for O+OH+F+Cl=24 basis), ^{IV}Al=2.01-2.45 pfu, and $^{VI}Fe^{2+}$=0.56-0.97 pfu, in spite of a scarce but significant difference in Cl content among them. Cl-free Type 3 Amp contains similar amount of $(Na+K)^A$ (0.75-0.96 pfu) and ^{IV}Al (1.95-2.38 pfu), but less in $^{VI}Fe^{2+}$ content (<0.47pfu) compared with those of Type 1/2 Amp.

As a present stage conclusion, Type 1 Amp crystalized under F-bearing and Cl-poor environment during the prograde stage, and Type2/3 Amp crystalized during the retrograde stage along with supply of Cl from outside of the rock. F identified in Type 2 Amp in ND0107 with F-bearing Type 1 Amp could be supplied from the Type 1 Amp through the retrogressive reactions.

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