Infiltration of K-Cl-rich fluid in mafic granulite from Austhovde

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Mafic granulite sample 84012223 from Austhavde, Lützo-Holm Complex in East Antarctica, is a heterogeneous rock ranging from eclogitic part to amphibolitic part. The eclogitic part is composed maily of clinopyroxene and garnet, the latter enclosing numerous inclusions including various felsite-nanogranite inclusions (FNIs). The eclogitic part is poor in K and a small amount of biotite occurs only as inclusions in garnet, although a trace amount of k-feldspar is present as lamellae in plagioclase and a constituent of FNIs in garnet. The amphibolitic part consists mainly of hornblende with lesser amounts of plagioclase, orthopyroxene, biotite and quartz. It is poor in Si and rich in K, Ba, Pb, Rb, and Sr (Table 1). Biotite shows a local concentration along a plane (Fig. 1), suggesting that K- and Cl-rich fluid infiltrated along a fracture. Hornblende in the biotite-rich part is heterogeneous; the outer part is locally enriched in K and Cl (Figs. 1 & 2 and Table 2). In addition, both hornblende and orthopyroxene in the biotite-rich part are more Fe-rich compared to those far from the biotite-rich part even in the same amphibolitic part. Plagioclase also shows various compositions (An_{38-80}) from garin to grain in the biotite-rich part (Fig. 1).

The distinct differences in the mode of occurrence and chemical compositions of minerals, especially biotite and hornblende, between eclogitic and amphibolitic parts indicate that FNIs in garnet in elcogitic part are not the products of K- and Cl-rich fluid infiltration, which introduced LILE into the rock. Similar fluid activity after the peak of granulite-facies regional metamorphism has been well documented in the Sør Rondane Mountains in East Antarctica (e.g. Higashino et al., 2019).

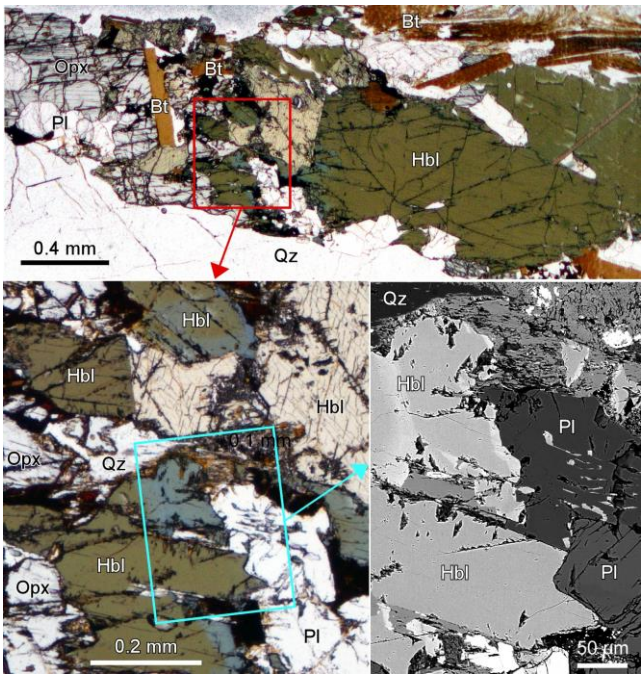

Figure 1. Biotite-rich part of amphibolitic part of mafic granulite sample 84012223 from Austhovde. Note heterogeneous hornblende.

Table 1. Bulk rock composition of amphibolitic part of mafic granulite sample 84012223

SiO_2	40.82	Ba	800
TiO_2	2.23	Ce	54
Al_2O_3	14.52	Cr	86
$Fe_2O_3^{\dagger}$	21.80	Ga	5
MnO	0.34	Nb	25
MgO	6.46	Ni	63
CaO	9.99	Pb	24
Na_2O	1.35	Rb	32
K_2O	1.99	Sr	226
P_2O_5	0.17	Th	17
H_2O	0.25	V	637
Total	99.92	Y	59
$X_{Mg}^{\#}$	0.370	Zr	106

Mole MgO/(MgO + total Fe as FeO)

Table 2. K-Cl-rich hornblende in biotite-rich part

SiO_2	36.24
TiO_2	0.62
Al_2O_3	14.72
Cr_2O_3	0.08
FeO	24.19
MnO	0.14
MgO	4.23
CaO	11.49
Na_2O	1.19
K_2O	2.63
F	0.05
Cl	3.68
-O	0.85
total	98.41

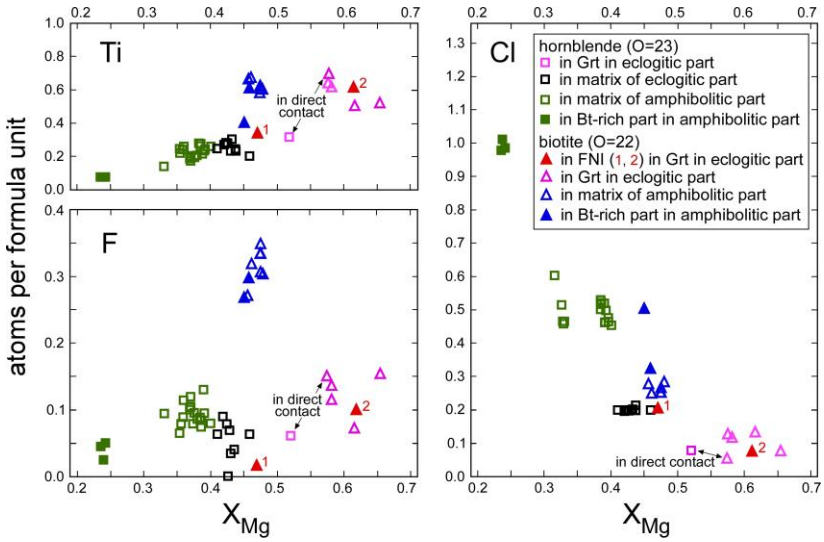

Figure 2. Compositions of hornblende and biotite in mafic granulite sample 84012223 from Austhovde.

Reference

Higashino et al., Brine infiltration in the middle to lower crust in a collision zone: Mass transfer and microtexture development through wet grain-boundary diffusion. Journal of Petrology, 60, 329-358, 2019.