Amphibole-hosted fluid inclusion in mantle xenolith from the Eastern Transylvanian Basin

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There are five major volcanic areas in the Carpathian–Pannonian Region (CPR) where basalt volcanoes, active during the Neogene-Quaternary period, brought large numbers of upper mantle xenoliths to the surface (e.g., Szabó et al., 2004). The easternmost and youngest alkaline basaltic volcanic field of CPR is developed in the Perşani Mountains (Eastern Transylvanian Basin, Romania) and provides, similarly to the Styrian Basin, amphibole-bearing xenoliths to this study.

The amphibole appears as <0.5 mm sized disseminated grains (<5 % in modal composition) in lherzolite or forms >1 cm wide hornblendite veins. The peridotite contains small amounts of interstitial amphibole, whereas the hornblendite contain occasionally other OH-bearing minerals such as apatite and phlogopite. The amphiboles in spinel lherzolites are depleted in incompatible trace (LRE and HFS) elements, whereas in hornblendites elevated incompatible trace element content is characteristic.

Several primary 5-30 μm sized fluid inclusions are observed in the amphiboles from the hornblendite vein. We selected a 20 μm sized intact fluid inclusion for this study. The amphibole is too weak to perform microthermometry measurements, therefore the fluid inclusion was studied at room temperature with Raman spectroscopy and FIB/SEM technique. Based on the Raman spectroscopy, the inclusion contains vapour CO_2 and multiple solid phases: amphibole (as a daughter phase; Raman band: 1001 cm^{-1}), burbankite ($(Na,Ca)_3(Sr,Ba,Ce)_3(CO_3)_5$; 1076 cm^{-1}), rutile (TiO_2; 630 cm^{-1}), sulphate (992 cm^{-1}). The FIB/SEM exploration revealed that the fluid inclusion contains nahcolite, carbonate, quartz, Fe-bearing sulphate and different types of sulphides (Fe, Cu, Ni) (Fig. 1). The fluid is not related to brines, because the inclusion is not containing Cl, but the Na content is >5 wt%. Similar fluid composition was found (Aradi et al., 2019) in mantle xenoliths from the Styrian Basin (western part of the CPR).

These features indicate a complex volatile-rich melt-mantle interaction beneath the study area, which can be related to the subduction of the European plate beneath the Eastern Carpathians occurring in Neogene and supposedly causing extensive mantle metasomatism.

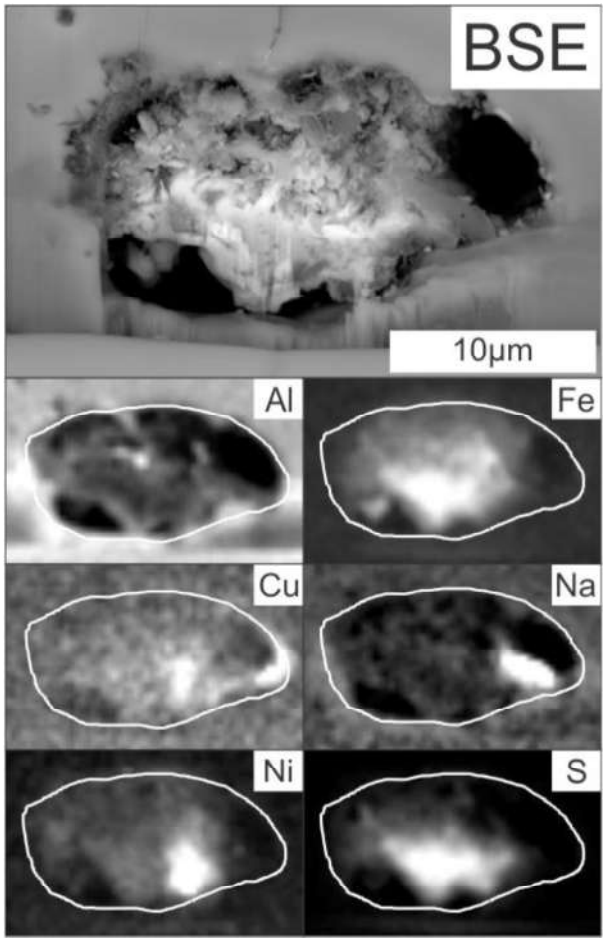

Fig. 1. *BSE image and element maps of the studied fluid inclusion.*

Acknowledgement

This work was supported in the ELTE Institutional Excellence Program (1783-3/2018/FEKUTSRAT) supported by the Hungarian Ministry of Human Capacities. The study was also supported by Bolyai Postdoctoral Fellowship Program grant awarded to M. Berkesi.

References

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