Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19803

3D Raman mapping of fluid and melt inclusions in amphibole-rich upper mantle xenoliths from the Styrian Basin (NW Hungary).

JUSTINE LEONARD MYOVELA[1,2], LASZLO ARADI[3,4], TAMÁS SPRÁNITZ[3,5], JÁNOS KOVÁCS[1] AND MÁRTA BERKESI[3,6]

[1]University of Pécs
[2]University of Dodoma
[3]Lithosphere Fluid Research Lab, Eötvös Loránd University
[4]University of Padua
[5]Institute of Earth Physics and Space Science (EPSS)
[6]Institute of Earth Physics and Space Science MTA FI FluidsByDepth Research Group

Presenting Author: justine1@gamma.ttk.pte.hu

The Styrian Basin, representing a possible supra-subduction setting is situated in the westernmost unit of the Carpathian-Pannonian region, in the intermediary zone between the Pannonian Basin and the Eastern Alps[1,2]. The evolution of the Styrian Basin was influenced by the dynamics of the Carpathian-Pannonian region. The Plio-Pleistocene alkali basalts brought mantle xenoliths to the surface derived from the subcontinental lithospheric mantle beneath the basin. Several xenoliths are amphibole rich, which indicates extensive modal metasomatism at mantle depth[1,2]. Our study focuses on strongly amphibolized harzburgite where enstatite hosts fluid and melt inclusions (Figure 1). The studied secondary inclusions (1-30 µm) show irregular to negative crystal shapes in the host enstatite, whereas the melt inclusions are rounded to negative crystal shaped and glass-rich (Figure 1).

Preliminary results of Raman spectroscopy, SEM-EDS, and FIB-SEM have shown that the fluid dominantly consists of CO_2 (0.71 g/cm^3) and liquid H_2O. Besides the identified fluid phases, solid phases (i.e., sulfides, magnesite, sulfates, quartz, and glass) were also identified in the inclusions. Furthermore, it has been revealed that the glass is SiO_2-rich and often occurs together with a bubble within the melt inclusion. With the Raman we were capable to map in 3D not only the solid phases within the inclusions but also the CO_2-rich and the H_2O-rich phases.

These initial findings imply that CO_2-H_2O fluid (where the amount of H_2O is high relative to mantle fluids) and SiO_2-rich coexisting melt could have been circulating in the mantle above a subducted slab and could have played role in amphibole formation as well.

This research was supported by the NKFIH_FK research fund nr. 132418 and MTA FI FluidsByDepth Lendület Research Group (LP2022-2/2022).

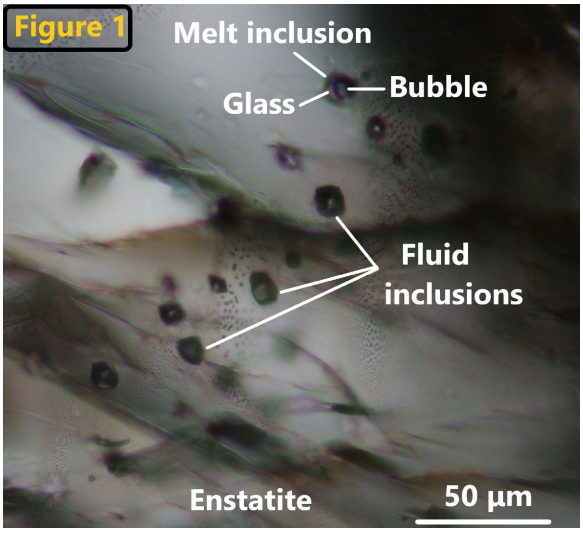

Figure 1. Photomicrograph of fluid and melt inclusions hosted in enstatite in amphibolized harzburgite from the Styrian Basin (NW Hungary).

References

[1] Aradi et al., 2019; Földtani Közlöny, 149 (1). pp. 35-49. ISSN 0015-542X

[2] Aradi et al., 2017; Tectonics, 36, 2987–3011. https://doi.org/10.1002/2017TC004702