Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.7996

Composition of carbonatite-related orthomagmatic fluids

EMANUEL MORORÓ[1], MARTA BERKESI[2] AND TIBOR GUZMICS[2]

[1]Eötvös Loránd University

[2]Lithosphere Fluid Research Lab, Eötvös University

Presenting Author: mororo.emanuel@gmail.com

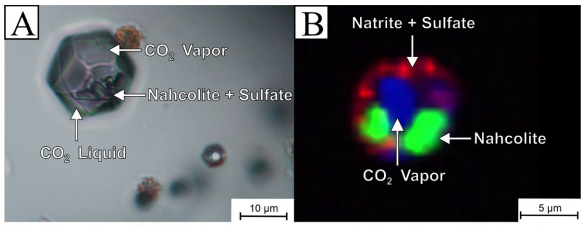

Fig. 1. *Quartz-hosted fluid inclusions at room temperature. A - Photomicrograph. B - Raman image.*

Composition of carbonatite-related orthomagmatic fluids

Emanuel Andrade Albuquerque Mororó[1], Márta Berkesi[1] and Tibor Guzmics[1]

[1] Lithosphere Fluid Research Lab, Eötvös Loránd University, Budapest, Hungary.

Abstract

Fluids that are associated to carbonatite magmatism are known to play a significant role in REE mineralization [1] and in the formation of highly peralkaline silicate melts/rocks [2]; occurring at Oldoinyo Lengai (OL) [3] and worldwide [4]. Moreover, these fluids can contribute to the formation of Na-carbonatite melts [2], as well. However, the characterization of carbonatite-related orthomagmatic fluids can be challenging as their composition can be easily changed [5] after a separation from carbonatite-silicate parent melt(s). Several studies suggested a NaCl-H_2O-CO_2 composition for fluids exsolved from carbonatites [6]. In contrast to this, fluids, coexisted with an immiscible silicate-carbonate melts rather support a H_2O-poor, S-bearing, alkali-carbonate-CO_2 composition [7]. These controversial results motivated us to study fluid inclusions from recently active OL volcano.

The studied fluid inclusions are secondary and hosted in quartz originated from a metamorphic xenolith that interacted with both fluid and melt from OL magmatism. At room temperature the fluid inclusions (n=30) consist of numerous daughter phases (sulfates, hydrocarbonates, carbonates) together with liquid-CO_2 and vapor-CO_2 (Fig. 1a). Raman microspectroscopy (n=200) showed that the overwhelming majority of daughter minerals are thenardite, arcanite, nahcolite and natrite. We carried out 3D Raman-imaging (n=5, Fig. 1b) to estimate the proportions of the daughter minerals and CO_2. During heating of the fluid inclusions, we observed a homogeneous fluid phase at 800-850 ^oC, confirmed by Raman spectroscopy. Our results show a H_2O-poor (up to 6 wt%), sulfate-rich, alkali-carbonate-CO_2 composition in the studied fluid inclusions at OL, supporting that such compositions are common in carbonatites instead of NaCl-H_2O-CO_2 fluids.

References

[1] Anenburg, M., et al. 2020. Science Advances 6(41).

[2] Berkesi, M., et al. 2020. Gondwana Research 85(76-83).

[3] Klaudius, J., Keller, J., 2006. Lithos 91(173-190).

[4] Marks, M.A.W., Markl, G. 2017. Earth-Science Reviews 173(229-258).

[5] Wang, Z., et al. 2020. Minerals 10(11):965.

[6] Walter, B., et al. 2021. Earth-Science Reviews 215:103509.

[7] Guzmics, T., et al. 2019. Geology 47(527-530).