EGU21-13667, updated on 02 Aug 2021
https://doi.org/10.5194/egusphere-egu21-13667
EGU General Assembly 2021

Trace element partition coefficients and petrogenesis of the 154 ka dacitic Haramul Mic lava dome (Ciomadul, Romania)

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Haramul Mic is a ~0.15 km^3 volume, crystal-rich, homogeneous, high-K dacite lava dome, which is one of the oldest ones in the Ciomadul Volcanic Complex (Romania, eastern-central Europe). The eruption that formed the lava dome occurred after about 200.000 years of quiescence. Eruption age of the dome determined by (U-Th)/He dating on zircon gave 154 +/- 16 ka that is in agreement with the youngest zircon U-Th outer rim date (142 +18/-16 ka). The apparently continuous crystallization of zircon between the eruption age and the 306 +/- 37 ka oldest zircon core date records a long-living magmatic plumbing system.

The Haramul Mic lava dome rock has 35-40% average crystal content and consists of plagioclase, amphibole, biotite and accessory zircon, apatite, titanite and Fe-Ti oxides. The groundmass is mainly built up by perlitic glass with some microlites and sheared vesicles. The dacite contains sparse mafic enclaves with K-rich, shoshonitic bulk composition, composed of plagioclase and biotite in addition to less amount of amphibole. Felsic crystal clots are more common and they comprise plagioclase, amphibole, biotite and interstitial vesicular glass.

Trace element content of the mineral phases and the groundmass glass was determined by LA-ICP-MS. All of the studied phases show homogeneous trace element compositions and along with the textural characteristics these imply general equilibrium state in the magma storage system before the eruption. Amphibole-plagioclase geothermometer and geobarometer calculations result in 700-800 ^oC crystallization temperature and 200-300 MPa crystallization pressure.

In order to reveal the magma chamber processes that triggered the eruption and formed the Haramul Mic lava dome after long quiescence time, it is necessary to understand better the behaviour of trace elements as the most sensitive indicators of magma reservoir mechanisms. We determined mineral-liquid trace element partition coefficients and evaluated the result in the context of crystal lattice strain model. They show many similarities with those proposed for the Fish Canyon Tuff dacite except for Li and Sc. The anomalous behaviour of Sc is clearly expressed by the elevated concentration in the glass phase and many times, there are some zonation in Sc from crystal core to rim. This could be explained either by inherently higher Sc content of the melt reflecting the nature of the primary magmas or by partial remelting of biotite just before the

eruption. Significant positive anomaly of Li content can be observed in biotite crystals of the mafic enclave compared with the dacitic host rock. Li content of plagioclase varies between 15-30 ppm with slight rimward depletion.

Eruption initiation cannot be explained by physical mixing of mafic recharge magma, but rather by volatile transfer or second boiling. The water-rich nature of the melt is reflected by the abundant vesicles in the glassy groundmass. Furthermore, the amphibole phenocrysts have sharp margin without resorption rim, which suggest hydrous melt phase and relatively fast magma ascent.

This research belongs to the NKFIH-OTKA K135179 project and was supported by the ÚNKP-19-1 New National Excellence Program of the Ministry for Innovation and Technology.