Combined HR-Raman and FIB-SEM analyses of carbonate melt inclusions from Kerimasi jacupirangite (Tanzania)

RÉKA KÁLDOS[1], TIBOR GUZMICS[1], TAMÁS VÁCZI[1], ADRIENN BARIS[1], MÁRTA BERKESI[1], CSABA SZABÓ[12], KÁROLY HAVANCSÁK[2] AND ZOLTÁN DANKHÁZI[2]

[1]Eötvös University Budapest, Hungary, rekakaldos@gmail.com

[2]Eötvös University Budapest, Faculty of Science, Research and Instrument Core Facility, cszabo@elte.hu

An interesting quasi-paradox of carbonatite rocks is that the primary water soluble minerals are missing, although their presence is unambiguously expected by experiments [1] [2]. Hence finding of all mineral phases in the melt inclusions (MI) is essential to the description of petrogenesis of carbonatite rocks as properly as possible. For this purpose, we carried out high-resolution Raman spectrometry (HR-RS) including Raman mapping and Focused Ion Beam SEM (FIB-SEM) analyses on unexposed diopside-hosted carbonate melt inclusions in jacupirangite from Kerimasi Volcano (East African Rift). HR-RS point measurements revealed the presence of perovskite, apatite and several alkali carbonates (e.g. nyerereite, shortite, burbankite) and hydrocarbonates such as nahcolite. Raman mapping was applied on the MI parallel to the surface of the host diopside (spectra were taken in every 200 nm) in different depths in order to get information about the distribution of these mineral phases. FIB-SEM stepwise exposure process was performed on the previously Raman mapped MI perpendicular to the surface of the host diopside. Exposure steps were made in every 200 nm, thus distribution of mineral phases can be observed in extremely high spatial resolution (1-4 nm) including those ones, which are not Raman active, as well. FIB-SEM also allowed to obtain EDS spectra or even EBSD analyses from each exposed mineral phase of the MI. Combining these techniques we could 1/ create a 3D model of the MI, hereby 2/ attain the spatial distribution of mineral phases (even submicron sized), and 3/ calculate their volume ratio. Applying our results can be essential in determination of melt and fluid properties even the determination of H_2O content of alkaline and carbonatite systems, therefore it can contribute to our understanding of petrogenesis of alkaline and associated carbonatite rocks.

[1] Guzmics *et al.* (2011) *Contrib Mineral Petrol* **161**:177-196. [2] Mitchell (2009*) Contrib Mineral Petrol* **158**:589–598.