Petrographic study of jacupirangite from Kerimasi volcano, Tanzania

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Carbonatites and associated silicate rocks are one of the most exciting and complex branch to examine petrographically and geochemically. The study of these igneous rocks has an outstanding significance as they are of important mineral sources of rare earth elements (REE+Y) and some high field strength elements (HFSE) such as Zr, Nb, Ti, Ta.

The Kerimasi volcano is located in the Gregory Rift Valley along the East African Rift System, in the northern part of Tanzania, near to the Oldoinyo Lengai volcano. Jacupirangite, like other plutonic rocks in Kerimasi, occur as blocks in the volcanic agglomerates (Dawson, 2008).

For detailed petrographic study we carried out optical microscopy, scanning electron microscopy and HR-Raman microanalyses on the samples. The jacupirangite is a plutonic rock that shows cumulate texture and consists of dominantly clinopyroxene (diopside) with abundant amount of magnetite and calcite. Accessory minerals are phlogopite, apatite, olivine and pyrrhotite. Calcite forms euhedral crystals or appears interstitially. In some cases dolomite can be observed as intergrowth of calcite. Based on the optical microscopic and SEM observations, both the diopside and magnetite are rich in crystal and irregular shaped, randomly distributed melt inclusions (10-50 µm). SEM and HR-Raman spectroscopic measurements proved that diopside contains magnetite, apatite, calcite, phlogopite, badelleyite and Na-Ca-K carbonates, whereas magnetite contains diopside, apatite, phlogopite, calcite, dolomite, badelleyite, perovskite and Na-Ca-K carbonates as crystal inclusions. Apatite in diopside and magnetite is strongly zoned displayed on CL images (Fig 1).

Selected double-polished single grains of diopside were heated up to 1000 ˚C in a heating stage to determine the homogenization temperatures of melt inclusions that occurred between 800-950 ˚C with the homogenization of the fluid bubble into the melt phase. Furnace technique was applied on magnetite grains to produce homogeneous melt in the inclusions. The quenched inclusions were exposed and analysed by SEM. Magnetite hosted melt inclusions are Na-Ca-K carbonate melts, sometimes containing accidentally trapped crystal phases (apatite, phlogopite, and perovskite) (Fig. 2).

The absence of silicate melt inclusions in magnetite suggests that during the formation of magnetite a carbonate melt phase was present. Based on previous studies by Guzmics *et al*. (2011) we assumed that these carbonate melts in magnetites could represent the parental melt of Kerimasi calciocarbonatite.

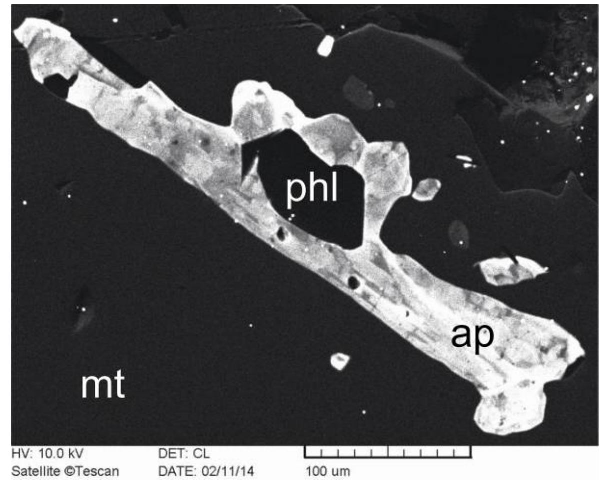

Figure: 1. Cathodoluminescence image of magnetite hosted zoned apatite inclusion with phlogopite crystals in the middle. (mt – magnetite, ap – apatite, phl – phlogopite)

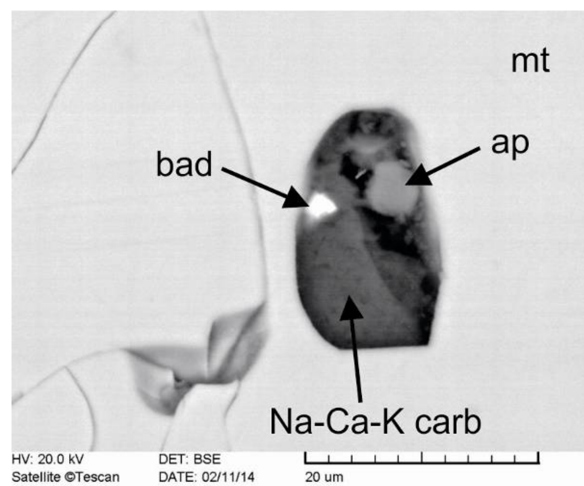

Figure: 2. Scanning electron microscope image of magnetite hosted melt inclusion. (mt - magnetite, ap - apatite, bad - badelleyite, carb - carbonate)

Dawson, J. B. (2008): Geol Soc Memoir, No. 33.
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