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Genesis of Virunga leucite basanites: Mantle metasomatism or crustal contamination?

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The Western Branch of the East African Rift is a region with classic occurrences of ultra-potassic magmatism (Bailey, 1974; Eby et al., 2003; Foley et al., 1987; Rosenthal et al., 2009). The trace element geochemistry of these ultrapotassic rocks indicates derivation from an enriched mantle source (e.g. Eby et al., 2003).
We focused on an investigation of leucite basanites and kamafugites from Visoke and Mahavura volcanoes within the Virunga province, northern part of the Western Branch of the East African Rift. Some ugandites and their derivatives - melaleucitite and leucitite, from Visoke volcano in the Virunga were included in this study as well.
Studied leucite basanite lavas are enriched in LILE and according to chemical composition are far from primitive melts (Mg# - from 0.50 up to 0.59). Leucite basanites from the Visoke and Mahavura volcanoes differ from the previously studied Toro-Ankole kamafugites not only in chemical and mineral but in isotope composition as well. They are enriched in radiogenic Sr and can not be regarded as primary-mantle rocks.
The leucite basanite phenocryst composition varies in some range: olivine from Fo55 to Fo90 with 0.01 - 0.4 % wt. NiO content; clinopyroxene Mg# - from 0.65 up to 0.86 with $Cr2O_3$ 0.02 – 1.5% wt., plagioclase corresponds to labrador (50 – 70% An). The ore minerals occurred are titanomagnetite and ilmenite. The evaluation of T-fO_2 phenocryst crystallization based on titanomagnetite and ilmenite composition (Sauerzarpf et al, 2008) shows that it taked place under QFM buffer.
The presence of quartz and rutile xenocrysts in the Visoke leucite basanite lava together with phenocrysts of Fo88 olivine indicates to the contamination of this melt by crustal material. At the same time, nonequilibrium megacrysts of high-magnesian olivine (Fo90) from another sample of Visoke leucite basanite have been resulted of leucite-basanite magma mixing with a more primitive melt. Thus we identified two melts formed from different mantle sources within single Visoke volcanic system: ugandite and its possible derivatives are generated from mantle source while leucite basanites enriched in radiogenic strontium and cannot be regarded as primary-mantle rocks despite on whole rock isotope composition lies on trend being explained by processes of mantle metasomatism (Muravyeva et al., 2014).