

## Partial melting of rhyolites in the Chaltén Contact Aureole (Patagonia, Argentina)

S. SEITZ<sup>1\*</sup>, B. PUTLITZ<sup>1</sup>, L.P. BAUMGARTNER<sup>1</sup>,  
S. LERESCHE<sup>1</sup> AND P. NESCHER<sup>1</sup>

<sup>1</sup>Institute of Earth Sciences, University of Lausanne, 1015  
Lausanne, Switzerland (\* correspondence:  
susanne.seitz@unil.ch)

The Chaltén Plutonic Complex (CHPC) consists of mafic and granitic calc-alkaline intrusive rocks emplaced in several successive batches. High-precision U/Pb zircon dating yield ages between  $16.9 \pm 0.05$  Ma and  $16.37 \pm 0.02$  Ma [1]. The host-rocks are formed by a Paleozoic clastic sequence, Jurassic rhyolites and volcanoclastics, and a Cretaceous pelitic sequences. The intrusion of the CHPC post-dates major regional deformation.

Partial melting in the Chaltén contact aureole is limited to small zones at gabbro and tonalite contacts with rhyolites. Partial melting does not occur at the granite-rhyolite contact. The rhyolitic migmatites are characterized by an anastomosing network of veins of quartz, feldspar and almandine-rich garnet. This network is most prominent at 10m to 15m from the contact. Some cm-scale shear zones concentrated partial melt. On a microstructural scale partial melt is segregated along quartz-feldspar grain boundaries. They show typically cusped grain boundaries with melt penetrating along the edges. Petrologic investigations show that melting is to the result of biotite breakdown to cordierite or garnet.

Thermodynamic calculation for these peraluminous rhyolites indicate that first melt occurs at 650-700°C and pressures around 3kbar. Simple thermal calculations yield maximum temperatures of about 550°C at the mafic-rhyolite contact, which is 100-150°C lower than the required temperature for partial melting. Melting in the rhyolitic migmatites was intense enough to partially reset U/Pb ages as indicated by the younging of zircon ages (obtained by laser ablation). We are currently studying the mechanism of partial resetting of the zircon ages, as well as the kinetics of oxygen isotope exchange between quartz phenocrysts and the rhyolite matrix. Preliminary modeling suggests, that oxygen isotopes can be re-equilibrated dominantly by diffusion, while zircon most likely recrystallized.

[1] Ramírez de Arellano *et al.* (2012), *Tectonics* **31**, 1-18

## Silicate-natrocarbonate immiscibility in ijolites at Oldoinyo Lengai, Tanzania: Melt inclusion study

V.S. SEKISOVA<sup>1,2</sup>, V.V. SHARYGIN<sup>2\*</sup> AND A.N. ZAITSEV<sup>3</sup>

<sup>1</sup>Novosibirsk State University, Novosibirsk 630090, Russia  
<sup>2</sup>V.S. Sobolev Institute of Geology and Mineralogy SD RAS,  
Novosibirsk 630090, Russia (\*correspondence:  
sharygin@igm.nsc.ru)

<sup>3</sup>St. Petersburg State University, St. Petersburg 199034, Russia

Xenoliths of plutonic rocks (ijolite, jacupirangite, etc.) in the Oldoinyo Lengai pyroclastics are considered to be cumulates forming in an intermediate chamber from a parental olivine nephelinite magma [1].

Melt inclusions with silicate-carbonate immiscibility were found in nepheline and Ti-magnetite of olivine-mica ijolite. Other minerals (pyroxene, etc.) contains inclusions without immiscibility; fluorapatite bears natrocarbonatite inclusions. Phase composition of inclusions in nepheline (5-100  $\mu$ m) is silicate glass + vapor-carbonate globule  $\pm$  daughter/trapped crystals  $\pm$  sulfide bleb. Vapor-carbonate globule (up to 20  $\mu$ m) consists of gas bubble ( $\approx$ 60%) and nyerereite-rich carbonate aggregate ( $\approx$ 40%). Some inclusions may also contain numerous submicron carbonate globules in glass. Heating experiments with inclusions indicated the following events: (1) carbonate component melted instantaneously at 540-560°C; (2) melting of silicate glass occurred at 580-640°C; (3) all globules gradually coalesced into one large vapor-carbonate globule at 640-800°C; (4) homogenization in this globule occurred at 900-920°C; (5) complete homogenization (miscibility of carbonate and silicate liquids) was not achieved with temperature increase up to 1100°C.

Our study of inclusions advocates very complex history of the Lengai ijolite and evolution of initial silicate melt in an intermediate chamber. Crystallization of ijolites occurred in conditions of silicate-natrocarnatite immiscibility in very broad temperature (540-1100°C). During formation nepheline and other minerals trapped as inclusions at least two immiscible liquids. After entrapment additional carbonate fraction was separated from silicate liquid within inclusion with decreasing temperature. The immiscibility phenomenon was recently recorded in the Oldoinyo nephelinites [2-4].

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[1] Dawson *et al.* (1995) *J Petrol* **36**, 797-826. [2] Mitchell (2009) *Contrib Mineral Petrol* **158**, 589-598. [3] Mitchell & Dawson (2012) *Lithos* **152**, 40-46. [4] Sharygin *et al.* (2012) *Lithos* **152**, 23-39.