

## **Carbonatite-alkaline silicate rock complexes reflect highly oxidized conditions in their upper mantle source**

S. BRAUNGER<sup>1\*</sup>, M. A. W. MARKS<sup>1</sup>, T. WENZEL<sup>1</sup>,  
L. CHMYZ<sup>2,3</sup>, R. G. AZZONE<sup>4</sup> AND G. MARKL<sup>1</sup>

<sup>1</sup>Eberhard-Karls-Universität Tübingen, 72074 Tübingen, Germany (\*correspondence: [simonbraunger@hotmail.com](mailto:simonbraunger@hotmail.com))

<sup>2</sup> Université de Montpellier, 34090 Montpellier, France

<sup>3</sup> Universidade Federal do Paraná, 81531-970 Curitiba, Brazil

<sup>4</sup> Universidade de São Paulo, 05508-080 São Paulo, Brazil

Alkaline complexes consist of variable mantle-derived silicate rocks, ranging from primitive alkali basalts, melilitites, nephelinites and basanites towards tephrites and more evolved phonolites, respectively their plutonic equivalents. This lithological variance is also expressed by a wide range of redox conditions that vary by several log units around the synthetic fayalite-magnetite-quartz (FMQ) buffer. However, only some of these complexes are characterized by the occurrence of carbonatites which must be related to specific formation conditions.

Based on textural, mineralogical and geochemical observations, we calculated the redox conditions of carbonatites and associated silicate rocks for seven alkaline complexes (Kaiserstuhl, Sokli, Kovdor, Palabora, Magnet Cove, Oka, Jacupiranga) which are considered to represent typical carbonatite-alkaline silicate rock associations. In combination with a comprehensive literature review, we demonstrate that carbonatite-bearing alkaline complexes formed under highly oxidized conditions and hence, belong to the most oxidized alkaline rocks at all.

This is consistent with the prerequisite of a carbonated mantle as the source region for carbonatite complexes, which requires redox conditions distinctively above that for mean lithospheric or asthenospheric mantle. Carbonatite-metasomatized peridotites also show high redox conditions and might not only reflect an interaction between peridotite and carbonatitic melts/fluids, but at least partly represent the carbonated mantle source for crustally emplaced carbonatite complexes. We therefore suggest that the oxidation state of carbonatites and associated silicate rocks provides direct information about an extraordinary oxidized parental mantle source.