

## Abstract

Carbonatites are unique and enigmatic magmatic rocks of unclear origin, with very specific mineralogy and geochemical properties. They are predominantly composed of magmatic calcite or other carbonate minerals (Le Bas 1987) and have low content of SiO<sub>2</sub> (Le Maitre 2002). Origin of these peculiar magmas is still not clear but they appear to represent an important “window” into processes in Earth’s mantle. They are considered either as residual melts from a fractionated carbonated nephelinite or melilitite (Gittins 1989; Gittins and Jago 1998), as immiscible fractions of CO<sub>2</sub>-saturated silicate melts (Freestone and Hamilton 1980; Amundsen 1987; Kjarsgaard and Hamilton 1988, 1989; Brooker and Hamilton 1990; Kjarsgaard and Peterson 1991; Church and Jones 1995; Lee and Wyllie 1997; Dawson 1998; Halama et al. 2005; Brooker and Kjarsgaard 2011), or as primary melts which were generated from CO<sub>2</sub>-bearing peridotite through partial melting (Wallace and Green 1988; Sweeney 1994; Harmer and Gittins 1998; Harmer et al. 1998; Ying et al. 2004).

Abundances of rare earth elements (REE) are often high in carbonatites because carbonatitic magmas can dissolve these elements much easier than silicate magmas (Nelson et al. 1988). Carbonatitic magma can also dissolve large quantities of Sr, Ba, P and mainly Zr and Nb, which (together with high solubility of REE) makes some carbonatite bodies an economic source of these elements.

In this study, two carbonatite bodies with associated alkali and silicate rocks – Samalpatti and Sevattur from Tamil Nadu, India, were investigated to gain new knowledge about the distribution of trace elements in carbonatites. These tasks were achieved using the Laser Ablation Inductive Coupled Plasma Mass Spectrometry (LA-ICPMS) and Electron-Probe Micro Analyzer (EPMA). EPMA was used for mineral identification and studying the relationships between the mineral phases in thin section, combined with the determination of major element compositions. LA-ICPMS was used for accurate determination of trace element abundances in selected mineral phases, mainly apatite, calcite and dolomite, into some extent in titanite and minor phases such as kosmochlor and Mckelveyite-(Nd). From the study of Ackerman et al. (2017), whole rock chemical analyses were used in order to link and compare the chemistry of main mineral phases with the whole rock chemistry. Further, modal proportions of minerals were used for calculation of the distribution coefficients of REE for apatite, calcite and dolomite coexisting with a carbonatite host rock. Distribution coefficients for dolomite in carbonatitic host rock presented here are the first such values reported from this system.