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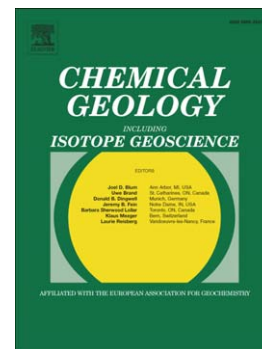
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Different types of liquid immiscibility in carbonatite magmas: a case study of the Oldoinyo Lengai 1993 lava and melt inclusions

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Abstract

Oldoinyo Lengai is situated within the Gregory Rift Valley (northern Tanzania) and is the only active volcano erupting natrocarbonatite lava. This study investigates the texture and mineralogy of the June 1993 lava at Oldoinyo Lengai, and presents petrographic evidence of liquid immiscibility between silicate, carbonate, chloride, and fluoride melt phases. The 1993 lava is a porphyritic natrocarbonatite consisting of abundant phenocrysts of alkali carbonates, nyerereite and gregoryite, set in a quenched groundmass, composed of sodium carbonate, khanneshite, Na-sylvite and K-halite, and a calcium fluoride phase. Dispersed in the lava are silicate spheroids (<2 mm) with a cryptocrystalline silicate mineral assemblage wrapped around a core mineral. We have identified several textural features preserved in the silicate spheroids, melt inclusions, and carbonatite groundmass that exhibit evidence of silicate-carbonate, carbonate-carbonate and carbonate-halide immiscibility. Rapid quenching of the lava facilitated the preservation of the end products of these liquid immiscibility processes within the groundmass. Textural evidence (at both macro- and micro-scales) indicates that the silicate, carbonate, chloride and fluoride phases of the lava unmixed at different stages of evolution in the magmatic system.

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