

Fluid-Mineral interaction and REE mineralization in the Palabora Carbonatite Complex

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The Palabora Carbonatite Complex (PCC) in South Africa intruded at 2060 Ma into Archean basement. The tripartite pipe-like intrusion is represented by a northern and southern pyroxenite and the central Loolekop pipe. Carbonatites and phoscorites of the Loolekop pipe experienced at least 4 stages of mineralization, recrystallization and redistribution reflected by an (1) orthomagmatic, (2) late-magmatic, (3) sulphide and (4) post-magmatic phase (Giebel et al., 2017). These four stages exhibit considerable variability of REE mineralization and especially stages 2 and 4 show intense fluid-rock interaction textures.

We present microtextural and compositional data on apatite and phlogopite along a 2 km depth profile through the Loolekop pipe and investigate how these data reflect fluid-mineral interaction with depth during stage (2). A special focus lies on understanding the behaviour, sources and sinks of REE elements.

While fluid-apatite interaction causes a dissolution of apatite coupled with a precipitation of monazite at apatite rims, the fluid-phlogopite interaction induces a chloritization of phlogopite and an occasional formation of britholite along strongly dissolved phlogopite rims. We suspect that REE are transported into the system by this late-magmatic fluid rather than being released by the dissolution of orthomagmatic REE-bearing minerals.

Combining these observations with fluid inclusion textures and microthermometry, we will investigate the nature and composition of the involved fluids and will try to model REE mineralisation processes during late-magmatic fluid-mineral interaction.

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