# Evidence for wall-rock assimilation in carbonatites from the Kaiserstuhl (Germany)

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Contamination of carbonatites with crustal or cogenetic intrusive rocks is generally not considered to play an important role during carbonatite magmatism, because carbonatitic melts have low densities and viscosities, enabling them to rapidly ascend. Potential contamination by silicate rocks in carbonatites cannot easily be detected by means of radiogenic isotope data (such as Sr, Nd and Pb isotope data) as carbonatites often show high concentrations of these elements and their isotope systems are thereby "buffered" against contamination with silicate rocks.

Textural, mineralogical and geochemical observations in carbonatites from the Kaiserstuhl (Germany) provide evidence for the interaction of carbonatitic magma with previously emplaced nosean syenites. This caused replacement of alkali feldspar by haüyne and recrystallization of garnet and clinopyroxene in the xenoliths, which released larger amounts of K, Al, Si and Fe. As a result, blackwall-like mica seams around the xenoliths formed and and compositionally distinct mica and clinopyroxene crystallized in the surrounding carbonatite. Moreover, the local increase of silica activity during contamination enabled strong REE enrichment in apatite via a coupled substitution involving Si, which demonstrates the potential influence of Si contamination on REE mineralization in carbonatites. We further suggest that the presence and composition of clinopyroxene and mica in carbonatites may be useful indicators for contamination processes during their emplacement.

Mass-balance calculations based on experimental constraints for the solubility of Al and Si in carbonatitic magmas suggest that only minor amounts of mica can form from carbonatitic melt. Therefore, larger amounts of mica and mica-dominated lithologies (glimmerites) as observed in many carbonatite complexes suggest that some Si and Al in carbonatites may be sourced from surrounding host rocks. We hypothesize that assimilation and contamination processes in carbonatites may be the rule rather than an exception.