Petrogenesis of carbonatites, lamprophyres, and nepheline syenites and related metasomatic sodalite deposits

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Mesoproterozoic ferrocarbonatites, lamprophyres and nepheline syenites (1140-1120 Ma) occur as dykes in anorthosites of the Kunene Intrusive Complex, Namibia/Angola. Metasomatic interaction between carbonatite-derived fluids and the anorthosites led to the formation of economically important sodalite occurrences, confined to an area of about 100 km^2.

Our research focused on the mineralogy, petrology and geochemistry of the ferrocarbonatites and the bordering metasomatic zones and on the fluid characteristics of the different metasomatic mineralization styles related to the carbonatite emplacement. One of the main goals of this project was to characterise the source and igneous evolution of the carbonatites and nepheline syenites. To solve these questions, we have applied a variety of mineralogical/geochemical methods, i.e. microscopy, electron-microprobe analysis, major and trace element geochemistry, REE analysis, mass balance calculations, laser-ablation ICP-MS analysis, and oxygen and carbon isotope geochemistry. Combining microthermometry with synchrotron-micro XRF and LA-ICP-MS analysis, we were furthermore able to elucidate the mechanisms of fluid-rock interaction that led to the metasomatic formation of the conspicuous sodalite deposits and associated REE ores of Swartbooisdrif. Last, but not least a petrographical and sulphur isotope study of the hydrothermal sulphide mineralization associated with the ferrocarbonatites, allowed to resolve their source and the physicochemical conditions during their formation.

Futher information:

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Drüppel K. (2005): Von der Mantelschmelze zum Namibia Blue: die komplexe Entstehungsgeschichte eines außergewöhnlichen Natursteinvorkommens.- Mitteilungen der Österreichischen Mineralogischen Gesellschaft 151: 13-46.

Drüppel K., Hoefs J., Okrusch M. (2005): Fenitizing processes induced by ferrocarbonatite magmatism at Swartbooisdrif, NW Namibia.- Journal of Petrology 46: 377-406.

Von Seckendorff V., **Drüppel K.**, Okrusch M., Littmann S., Cook N. (2000): Oxide-sulphide relationships in sodalite-bearing metasomatites of the Epembe-Swartbooisdrif Alkaline Province, North-West Namibia.- Mineralium Deposita 35: 430-450.