

MANTLE XENOLITHS FROM THE LETHLAKANE DIAMOND MINE, BOTSWANA

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Kimberlite pipes are one of the best sources to sample and explore the subcontinental lithospheric mantle (SCLM) due to their abundant incorporation of mantle xenoliths. In Botswana several large kimberlites are mined for diamonds but produce also a variety of xenoliths. Here we present different types of mantle xenoliths from the Lethlakane mining site, northeastern Botswana. Lethlakane is underlain by a thick sedimentary cover and unknown basement at the projected junction of the Kaapvaal and the Zimbabwe Craton and the Magondi and Limpopo proterozoic collisional belts. Although modern mining techniques do not allow the sampling of large pieces of peridotite - as is the case for the old mining dump sites in the Kimberley area, South Africa - a large number of c. 5 cm sized different mantle xenoliths could be sampled from an old recovery pile.

In total 50 samples were taken which can be subdivided in: (1) spinel-lherzolite, (2) spinel-harzburgite, (3) garnet-harzburgite, (4) porphyroclastic (sheared) garnet-lherzolites and harzburgites, and (5) spinel-dunite. All samples are infiltrated by melt veinlets, which are associated with newly formed minerals such as calcite, serpentine, phlogopite and clinopyroxene.

Spinel-lherzolite contains disseminated spinel crystals up to 1 mm in size distributed in a equigranular matrix consisting of olivine, clinopyroxene and orthopyroxene. Spinel-harzburgite is comparable in texture with spinel-lherzolite. Clinopyroxene is absent or very scarce but usually newly formed along the melt veinlets.

Garnet lherzolite consists of purple garnets with thick kelyphitic rims and in some cases with round olivine inclusions. The main modal composition is equigranular olivine, hypidimorphic intensely green clinopyroxene with spongy rims and orthopyroxene that forms colourless elongated crystals, with occasional round olivine inclusions. In one case garnet overgrowth of spinel is observed.

Garnet harzburgites bear garnet crystals up to 5 mm with thick kelyphitic rims. Equigranular olivine is the main modal component. Clinopyroxene is absent or rarely formed next to garnet. Some samples contain intergranular spinel.

Porphyroclastic (sheared) peridotites have a bimodal distribution in grain size. The fine grained olivine matrix contains orthopyroxene and garnet clasts, which are also affected by shearing and smaller in size compared to granular samples. Clinopyroxene is a rare fine-grained matrix constituent. Undulatory extinction and kink bands are typical for olivine.

Spinel-dunites contain equigranular olivines up to 98 % and small spinel grains in between. Phlogopite is not observed in all samples other than in close proximity to garnet as part of kelyphitic rims.