**SUPPLEMENTARY MATERIAL 3**

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**Description of xenolith samples containing the clinopyroxenes used for the analytical test**

Sample FRB1031 is a high-T garnet lherzolite xenolith from the Jagersfontein kimberlite, South Africa, which was studied by Boyd and Mertzman (1987). It shows a mosaic porphyroclastic texture, with garnet porphyroclasts reaching 1 cm in size and orthopyroxene, clinopyroxene and olivine porphyroclasts never exceeding 5 mm. The matrix is mainly composed by serpentinized olivine neoblasts. Clino- and orthopyroxene porphyroclasts are often fractured or completely broken. For the test we selected an unzoned clinopyroxene fragment with $a_{Cr}$ = 0.0092 apfu and Cr# = 0.27.

Sample KGG-65 is a clinopyroxene-bearing garnet harzburgite xenolith from the Gibeon kimberlite, Namibia, which was studied by Franz et al. (1996). It shows a coarse equant texture. Garnet, often with small kelyphitic rims, can reach 5 mm in size, while the other minerals never exceed 2 mm. Orthopyroxene grains are granoblastic to short prismatic. Most of the clinopyroxenes have serrated spongy rims containing numerous fine melt inclusions, but the cores are homogeneous and compositionally unzoned. For the test we have selected a clinopyroxene core with $a_{Cr}$ = 0.0188 apfu and Cr# = 0.39.

Sample Uv-61/91 is a high-T sheared garnet lherzolite xenolith from the Udachnaya kimberlite, Yakutia, Russia, which was previously studied for petrology (Boyd et al. 1997), redox conditions (Canil et al. 1994), and isotope geochemistry (Pearson et al. 1995). Garnets are round and mm-sized, and are usually mantled by kelyphite. Orthopyroxenes are segregated into bands, giving the rock foliation. Partially serpentinized olivine neoblasts (0.1–0.3 mm) compose the groundmass and olivine porphyroclasts are often broken into a mosaic of grains (0.5–1.0 mm). Primary clinopyroxene porphyroclasts commonly have a blotchy alteration along margins and fractures. The clinopyroxene grain studied here was taken from a mineral separate, which was kindly supplied by D.G. Pearson. Preliminary EMP analyses indicated that the individual clinopyroxene grains had slightly different compositions. For the test we selected an homogeneous area in a grain with $a_{Cr}$ = 0.0081 apfu and Cr# = 0.51.

Single-clinopyroxene *P–T* estimates (Nimis and Taylor 2000) for the three xenoliths compare well with those obtained using a combination of the Taylor (1998) two-pyroxene thermometer and the Nickel and Green (1985) orthopyroxene–garnet barometer (with modifications after Carswell 1991) on published mineral compositions for the same samples (Table A1).

*References not listed in the manuscript*

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