

# Geochemistry of new hybrid diamondiferous kimberlites from Garnet Lake, West Greenland

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Kimberlites emplaced as stacked sills and dykes with associated thin stringers occur north of the Sukkertoppen icecap, West Greenland. This area lies on the margin of the Archean North Atlantic Craton. The largely ~600 Ma age kimberlites are often associated with zones of weakness along 2.0 Ga Kangamiut dykes.

Diamondiferous kimberlite was recovered from drill core and surface float associated with a ~4 m thick sheet extending at least 1 km N-S in the vicinity of Garnet Lake. A 2.6 x 2.3 x 2.3mm broken octahedron from a 159 kg sample is the largest diamond recovered in Greenland. The sample also contained 225 other stones. Diamond 'grades' from the main body are  $\leq$  112 ct/100 ton, in this case projected from a 30 kg sample.

Garnet Lake kimberlites exhibit a range of mineralogies, textures and degrees of alteration. Particularly for thinner stringers, carbonate mineralisation is common. Some samples contain olekminkite, apatite and monazite, characteristic of a carbonatite affinity. In the same rocks perovskite occurs with inclusions of baddeleyite.

Mantle xenoliths are present to widely varying degrees: some kimberlites are clast-supported 'xenolithites', dominated by dunite and with rare granular garnet lherzolites. However, the main diamondiferous body yields few xenoliths with mantle material being predominantly P-type G10D and E-type G3D and G4D garnet megacrysts (containing up to 0.52 wt% Na<sub>2</sub>O) surrounded by kimberlite matrix.

Individual samples down to a thin section-scale often show affinity with both classical orangeite and kimberlite mineralogies. Although there is some evidence for multiple intrusive events on a fine scale, even groundmass mineralogies reflect conflicting classification. Garnet Lake samples are typified by Mn-poor Cr-rich ilmenite, occasional Ni-sulphide and low Cr,Ti macrocrysts. Phlogopite – often only occasionally present – in some cases has Ba-rich rims. These observations are characteristic of kimberlite, whereas other samples yield tetra-ferri phlogopite and Fo-rich olivine phenocrysts characteristic of orangeite. Notably spinels often have compositions intermediary between kimberlite T1 and orangeite T2 trends. Such samples support the contention that the traditional and predominantly southern African-based kimberlite/orangeite classification scheme does not adequately describe diamondiferous Greenlandic ultramafic rocks and appears unrelated to diamond recovery.

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