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Water partitioning in spinel and garnet lherzolites xenoliths from the same kimberlite pipe (Premier Mine, Kaapvaal, South Africa).

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The speciation and amount of OH in olivines, enstatites, diopsides and garnets from two garnet lherzolites and two spinel lherzolites from the same kimberlite pipe of the Premier Mine from the Kaapvaal craton in South Africa have been measured using micro-FTIR.
The total water content of the xenoliths is between 30 to 40 ppm H2O. It is two to three times less than the values measured in xenoliths from younger kimberlites (Grant et al., 2007). However, as noticed in this previous study, we observe a strong change of partition coefficients of OH between pyroxenes and olivine at the garnet-spinel transition, while the partition of OH between pyroxenes remains constant. The partition coefficient between olivine and enstatite can increase up to a factor of 10 in the garnet lherzolites facies.
Our xenoliths were transported by the same magma, thus the transition observed previously between lherzolites spinel and garnet lherzolites from different origins is not due to a modification in contact with the magma. It demonstrates that xenoliths can preserve the specific OH signatures acquired from their original lithospheric mantle environment. The speciation of water in olivines from deep lithosphere is higher than in the shallower lithosphere above 80-90 km depth.

Grant et al. (2007) Contrib. Mineral. Petrol. 154, 15-34