

## Hf-Nd-Sr isotope relationships in spinel and garnet facies peridotite xenoliths: inferences for the age and evolution of the lithospheric mantle

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We report Hf-Nd-Sr isotopic compositions of cpx, garnet and amphibole separated from >30 spinel and garnet peridotite xenoliths in volcanic rocks from Siberia and Mongolia. Hf-isotope compositions were determined on a Nu Plasma MC-ICPMS instrument at the University of Brussels. The new data are considered together with results earlier reported for xenoliths from central and NE Asia [Baikal region and SE Siberian craton; Ionov et al. (2001); Blichert-Toft et al. (2000)]. The  $^{176}/^{177}\text{Hf}$  values in off-cratonic peridotites range from 0.2830 to 0.2842 and are negatively correlated with Hf abundances. The Hf-Nd-Sr isotope relationships define 3 major fields. (1) Depleted, poorly metasomatised peridotites have  $^{176}/^{177}\text{Hf}$  and  $^{143}/^{144}\text{Nd}$  similar to those in the N-MORB or higher. (2) Some metasomatised peridotites plot within the terrestrial Hf-Nd-Sr isotope array defined by MORB and OIB indicating uniform mixing between the depleted and enriched sources. (3) LREE-Sr-enriched peridotites with negative Hf anomalies plot above the Hf-Nd and Hf-Sr arrays. Some of the latter retain Lu-Hf relationships and Hf-isotope compositions imposed by the early depletion events and (as well as the depleted peridotites) yield Precambrian Lu-Hf model ages (>1Ga). The Hf-isotope compositions in those rocks are much less affected by metasomatism than those of Sr and Nd, either because Hf is more compatible (higher cpx/melt and garnet/melt partition coefficients) or because the metasomatic media are poor in Hf (i.e. have negative HFSE anomalies). Lu-Hf data for those rocks can, together with Re-Os isotope data, be used to infer depletion ages and the timing of the lithospheric formation. The Lu-Hf ages for coexisting cpx-garnet and cpx-amphibole pairs are either close to the eruption age of host volcanic rocks or indicate pre-eruption events or incomplete isotopic equilibration.

### References

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Ionov D., Chazot G., Prikhod'ko V. and Weis D. (2001), *J. Conf. Abs.* **6**, EUG XI.

## Tracer Test with As(III) and As(V) at the Cape Cod Site

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In spring and summer 2000, transport experiments with As(III) and As(V) were run in close cooperation with scientists of the USGS at the Cape Cod Site near Boston. The project was funded by the DFG and supported by the USGS Toxic Substances Program. The Cape Cod Site is a famous hydrogeological test site of the USGS. Following longterm contamination by sewage waters, a vertical redox zonation occurs in the aquifer due to the degradation of organic substance. Whereas the upper 3-4 meters are oxic, a suboxic zone and in 20 meters depth also an anoxic zone have developed.

In each redox zone a specific tracer experiment was run using bromide as ideal tracer. As(III) was injected into the oxic and the suboxic zones using a pulse injection method with high loads of As(III). The different geochemical environments lead to different transport and reaction behavior of both As species. In the oxic zone, a retardation of As(III) and a slow oxidation to As(V) could be observed. The formed As(V) was nearly immobile. In the suboxic test, As(III) was transport fast and also fast oxidation reactions occurred.

The reduction of As(V) was studied under iron reducing conditions injecting As(V) continuously into the anoxic layer of the aquifer. As(V) accumulated in the solid phase due to small amounts of injected oxygen which oxidized the ferric iron and bound the As(V). A mobilisation of As(III) could be observed when anoxic conditions reestablished. Sulfate reduction seems to submit the reduction of the arsenic and the iron, whereas specific arsenic reducing microorganisms or a significant mediation of hydrogen concentrations could not be detected.

Further studies will focus on laboratory studies of redox reactions at manganese and ironhydroxide surfaces. These studies will lead to the concepts which are necessary to obtain a transport-reaction-modell for the tracer tests.