Supplementary material

Section S1: Procedure for major and trace element concentration measurements

The analytical procedure is described in (Ionov et al., 1992; Godard et al., 2000). Approximately 100 mg of sample was dissolved using HF and HClO4. For (HR-)ICP-MS analysis, samples were diluted by a factor of 1000 in 2% HNO3, similar to the dissolution procedure outlined by Ionov et al. (1992) and Godard et al. (2000). Calibration curves were constructed using mixed Merck multi-element standard solutions of different concentrations that were measured at the beginning of the analytical session. Indium and Bismuth were used as internal standards. During HR-ICP-MS sessions, most elements were measured in low-resolution mode ($m/\Delta m \sim 400$), except Co, Ni, Zn and Cu that were analyzed in medium resolution mode ($m/\Delta m \sim 4000$) and As, measured in high resolution mode ($m/\Delta m \sim 10000$). During the ICP-MS session, most elements were measured with an Ar flux except for Li, As, Co, Ni, Cu and Zn for which the He flux was used to limit interferences. Reference serpentinite UB-N was analyzed as unknown to assess the precision and accuracy of the analyses (Table S1). Our results show good agreement between measured values and expected values, and reproducibility is generally better than 1 % at concentrations > 1 ppm; it is within 1-5% for concentrations of 10-1000 ppb, and 10 % for concentrations less than 10 ppb.

Section S2: Procedure for isotopic measurements

Prior to fluorination and reaction, samples were heated to 200°C overnight under high vacuum to remove interlayer and adsorbed surface water. $\delta^{18}O$ values of the whole-rock

samples were determined by laser fluorination techniques following the *Macaulay et al.* [2000] modification of the procedure established by *Sharp* [1990]. To extract oxygen, approximately 1 mg was reacted with ClF_3 whilst heated with a CO_2 laser. The resultant oxygen was purified, converted to CO_2 and the yield measured by a capacitance manometer. The oxygen isotope composition of the CO_2 was measured by a dual-inlet mass spectrometer with a working standard gas calibrated against international reference materials. The precision and accuracy of the measurement are ± 0.2‰ (1σ) and NBS28 gives $\delta^{18}O$ value of +9.6‰. Hydrogen isotope compositions were measured on the 14 serpentinized peridotites sample (Table 3). They are reported as δD values in ‰ relative to the Vienna Standard Mean Ocean Water (V-SMOW). The extraction method is from *Fallick et al.* [1993], modified by an overnight *in vacuo* degassing at 200°C rather than 120°C prior to dehydroxylation in order to reduce the likelihood of exchangeable interlayer water contributing to the hydrogen yield. The reduction furnace used to convert the released H_2O to H_2 was in chromium instead of uranium. Analytical precision of δD is ± 3‰ (1σ) and NBS30 gives δD = -65‰ relative to V-SMOW.

References

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