Os isotopic systematic of magmatic sulfides in abyssal peridotites

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Abyssal peridotites, though to be representative of the MORB source mantle, show a large range of Os composition ($0.115 \leq {}^{187}Os/{}^{188}Os \leq 0.160$). The reasons for such spread toward unradiogenic and radiogenic composition is still debated. LA-ICP-MS study [1] recognized the coexistence of two magmatic sulfide populations in abyssal peridotites: one residual after melting showing low Pd/Ir and one representing a trapped Cu-Ni- rich sulfide melt having high Pd/Ir. In-situ determination of the Os isotopic composition by LA-MCICPMS [2] show that these two populations are characterized by unradiogenic (0.114-0.128) and radiogenic (0.129-0.159) Os composition, respectively. The mixing at the hand sample scale of these two sulfide populations, which coexist at the micrometer scale, fully explain the whole rock composition in term of PGE abundance and Os isotopic composition. This is also true in samples showing whole-rock ${}^{187}Os/{}^{188}Os > 0.130$. We also note that 1, altered sulfide show similar Os composition that their unaltered counterpart and 2, that Os content in hydrothermal sulfides is 3 order of magnitude lower than in magmatic sulfides. Features which suggest that some of the radiogenic Os compositions of abyssal peridotites (i.e ≥ 0.127 [3,4]) are not due to sea water weathering or hydrothermalism.. Thus at least some of the radiogenic Os compositions shown by abyssal peridotites are inherited from the mantle. Consequently the 'isotopic gap' (e.g. [5]) between the MORB and their mantle source is now significantly reduced. Further, our study demonstrate that the isotopic heterogeneity of the abyssal peridotites worldwide is also found and preserved at the sample scale.

References

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