Selenium isotope composition of mantle peridotites

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The chalcophile and volatile ultra-trace elements selenium (Se) and tellurium (Te) show excess abundances in the Earth's mantle relative to predictions from experimental metal/silicate distribution coefficients and core-mantle differentiation models. This excess has often been ascribed to the addition of late-accreted meteoritic material ('Late Veneer'), mainly based on the near-chondritic ratios of S-Se-Te in fertile mantle peridotites [1]. However, these ratios can also be explained by refertilization models [2], which together with the non-chondritic S isotopic signature of the upper mantle [3], challenge this late-accretion model. Here we report the first high-precision analyses of Se stable isotopes on peridotites via double spike HG-MC-ICP-MS [4], together with Se-Te concentrations obtained from the same sample digestions [5]. Samples range from fertile to highly refractory peridotites from post-Archean orogenic massifs and mantle xenoliths. We have also included sieved size fractions of peridotites containing variable proportions of metasomatic versus residual base metal sulfides [6]. These new data enable us to assess possible fractionation processes related to Se isotopes and Se/Te ratios, besides providing a first high-precision estimate of the Se isotopic composition of the upper mantle. Together with the most recent Se isotopic data of chondrites [7], the results of this study contribute to a better understanding of terrestrial volatile element origin and evolution.

[1] Wang & Becker (2013) *Nature* **499**, 328-331. [2] König *et al*. (2014) *EPSL* **385**, 110-121. [3] Labidi *et al.* (2013) *Nature* **501**, 208-211. [4] Kurzawa *et al.* (2017) *Chem. Geol.* **466**, 219-228. [5] Yierpan *et al.* (2018) *Geochem. Geophys. Geosyst.* **19**. [6] König *et al*. (2015) *Chem. Geol.* **396**, 16-24. [7] Labidi *et al.* (2018) *EPSL* **481**, 212-222.