Tungsten stable isotopes as fluid tracer: Insights from serpentinites

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Exploring mass-dependent isotope fractionation of heavy elements such as Mo or Tl is now possible thanks to advances in MC-ICPMS. Similarly, tungsten stable isotopes have been investigated for a few years. Tungsten abundances and stable isotope signatures bear potential to trace fluid-related processes due to prominent fluid-mobility of W [1, 2], selective leaching of W from rocks [3], and siginificant W isotope fractionation during adsorption on Fe-Mn-hydroxides [4].

In this study we present the first comprehensive data set for W stable isotopes and W/Mo abundance ratio variability in serpentinites from different geodynamic environments, i.e. from mid-ocean ridges (15°N Mid-Atlantic ridge and Hess Deep), Guatemala and Mariana forearcs, and subducted serpentinites (Almirez, Spain; Erro Tobbio, Italy). Considering the mostly low-*T* environments during serpentinisation and the fact that W isotopes fractionate during fluid-rock interactions [5] potentially large W isotope fractionation in serpentinites can be expected. These data will thus allow for a first evaluation of W stable isotopes as fluid source tracer in serpentinisation environments, and its potential to trace fluid-rock interactions in subduction zones.

Tungsten is separated from the matrix elements using the analytical procedure adapted from [6]. Isotope measurements are conducted with a ThermoScientific Neptune MC-ICPMS. Mass bias is corrected using standard-sample bracketing and Hf doping. Accuracy is monitored by analysing various geologic reference materials [7].

First measured W isotope variations are small among the investigated samples. More data are currently being acquired to conclude whether the isotope composition depends on the geological context or not.

[1] Kashiwabara et al. (2013)*, Geochim Cosmochim Ac, 106*, 64-378. [2] Peters et al., *Chem Geol, 466*, 654-666. [3] Kishida et al. (2004) *Earth Planet Sci Lett 222(3-4)*, 819-827. [4] Kashiwabara et al. (2017)*, Geochim Cosmochim Ac, 204*, 52-67. [5] Yin et al. (2017), Goldschmidt abstract 4405. [6] Breton and Quitté (2014), *J Anal Atom Spectrom, 29(12)*, 2284-2293. [7] Quitté et al. (2018), submitted Goldschmidt abstract.