

Tellurium stable isotopes: Constraining the composition of the BSE and the late veneer

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Tellurium (Te) is a siderophile element expected to have partitioned strongly into the Earth's core [1]. To explain the overabundance of Te in the mantle today, compared to predicted contents after core formation, an addition during a late veneer was proposed [e.g. 1, 2]. An enstatite chondrite-like late veneer is suggested based on nucleosynthetic Ru isotope data [3]. However, the Se isotope composition of the mantle matches carbonaceous and ordinary chondrites [4], in agreement with the CI-chondrite like S-Se-Te ratios of mantle lherzolites [5]. This in turn is at odds with the non-chondritic S isotope composition of the mantle [6]. Furthermore, the S-Se-Te ratios of mantle rocks can be altered by refertilisation processes [7]. To reconcile these contradictions, this study aims to further constrain the composition of the late veneer by determining the Te isotope composition of the BSE using peridotites, basalts and various sediments.

A Neptune Plus MC-ICPMS and a ¹²⁵Te-¹²⁸Te double spike were used to obtain mass-dependent Te isotope data [8]. Samples were bracketed to the Alfa Aesar metal Te standard (Std). Analyses of the SRM 3156 Te Std give a $\delta^{130/125}\text{Te}$ of -0.13 ± 0.07 (2SD, n = 79). The sediments range in their $\delta^{130/125}\text{Te}$ over 1‰, in good agreement with [8]. Basalts from Iceland and Hawaii show an even larger spread (over 1.4 ‰) in their $\delta^{130/125}\text{Te}$, indicating crustal contamination and/or more likely significant Te isotope fractionation associated with magmatic degassing. To derive the Te isotope composition of BSE, peridotites from four different localities and six samples from the Lherz Massif with variable Al₂O₃ and Te contents were analysed. The BSE Te data show good agreement with the data of carbonaceous chondrites [8].

[1] Rose-Weston *et al.* (2009) *GCA* **73**, 4598-4615. [2] Yi *et al.* (2000) *J. Geophys. Res.* **105**, 18,927-18,948. [3] Fischer-Gödde & Kleine (2017) *Nature* **541**, 525-527. [4] Yierpan *et al.* (2019) *GCA* **249**, 199-224. [5] Wang & Becker (2013) *Nature* **499**, 328-331. [6] Labidi *et al.* (2013) *Nature* **501**, 208-211. [7] König *et al.* (2014) *EPSL* **385**, 110-121. [8] Fehr *et al.* (2018) *GCA* **222**, 17-33.