

## Development of the tellurium stable isotope proxy

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Tellurium (Te) concentration data and Te/Se ratios provide constraints on sedimentary [e.g. 1] and mantle processes [e.g. 2], as well as potentially the late veneer [2,3]. Non-traditional stable isotope systems have become powerful geochemical proxies. High-precision mass-dependent Te isotope data, however, are scarce and limited to Te-rich samples such as Te ore-minerals [4] and chondritic meteorites [5]. Tellurium isotope analyses of terrestrial sedimentary and magmatic samples are challenging due to the generally low Te contents. In this study, existing methodologies utilising a Te double-spike procedure [5] were further improved and tested using terrestrial ores, sediments and magmatic samples.

Tellurium is isolated from the sample matrix using a multi-step anion-exchange method based on and improved from existing methods [6]. Isotope compositions of Te were measured on Neptune and Neptune Plus MC-ICPMS instruments. A Te double spike is used for mass bias correction to derive Te mass-dependent isotope data. The accuracy of results is verified using unspiked sample aliquots and internal normalisation for mass bias correction of Te.

New Te mass-dependent isotope data were obtained for three ores and six sediment samples displaying an overall spread of 0.89 ‰ for <sup>130/125</sup>Te. These results provide the first evidence for Te isotope fractionation in the marine environment based on results for two ferromanganese nodules, two shales and one mud rock sample that show variations of 0.85 ‰. Tellurium (IV) and Te (VI) can exist in seawater and experimental studies demonstrated that abiotic and biotic redox processes can produce mass-dependent Te isotope fractionation [7]. Hence, the new results highlight the potential of Te isotopes as a sedimentary redox proxy.

[1] Hein *et al.* (2003) *GCA* **67**, 1117-1127. [2] König *et al.* (2014) *EPSL* **385**, 110-121. [3] Wang and Becker (2013) *Nature* **499**, 328-331. [4] Fornadel *et al.* (2017) *GCA* **202**, 215-230. [5] Fehr *et al.* (2013) *Min. Mag.* **77**, 1070. [6] Fehr *et al.* (2004) *Int. J. Mass Spectrom.* **69**, 5099-5112. [7] Smithers and Krouse (1968) *Can. J. Chem.* **46**, 583-591.