

## Development of Tellurium Stable Isotope Analysis for Submarine Ferromanganese Crusts

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Tellurium (Te) is concentrated in submarine ferromanganese crusts (Fe-Mn crusts) by a factor of  $10^4$  relative to the continental crusts [1]. Cobalt and platinum is also highly enriched in the Fe-Mn crusts, therefore, are expected to be one of the mineral resource of rare metal in the future. For geochemical interests, Fe-Mn crusts retain information for the changes in the ocean environment during their growth. Recently, the adsorption structure for the Te in the marine ferromanganese oxides has been revealed [2]. For better understanding of the genesis of the Fe-Mn crusts, we developed determination method for precise stable isotope ratios of Te for the marine ferromanganese oxides. The stable isotope ratio study of Te is still in an infant stage. For example, a few reports on the Au-Ag-Te minerals [3] and the meteorites [4] have been published. In addition, they used their own in-house standards as the reference of the Te isotope composition. Hence, no certified standard is available. There is no report regarding the difference in Te isotope compositions in different Te standard reagents supplied from different suppliers or from different batches of the same supplier. In this study, we developed an analytical method of stable isotope ratios of Te using the double spike mass spectrometry, and then measured Te stable isotope compositions in four different Te standard reagents.

Isotope analysis was performed by MC-ICPMS with a desolvating nebulizer sample solution introduction system. Measurement results of standard reagents indicate that the Te isotope compositions of the source materials differed or isotope fractionation differed in their manufacturing process. The reported values of the Te stable isotope compositions from different laboratories may differ from each other in the range of  $\sim 1\%$ . Therefore, it is required to prepare the certified standard solution and carry out inter-laboratory calibration for wide geochemical application of Te stable isotope.

[1] Hein *et al.* (2010) *Oceanography* **23**, 184-1889.  
[2] Kashiwabara *et al.* (2014) *GCA* **131**, 150-163. [3] Fornadel *et al.* (2014) *JAAS* **29**, 623-637. [4] Fehr *et al.* (2014) *77th Annual Meteorit. Soc. Meeting*, #5290.