High precision $^{182}W/^{183}W$ isotopic compositions of terrestrial samples

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Tungsten (W) has five isotopes (M = 180, 182, 183, 184, 186), and ^{182}W isotope is a beta-decay product of derived from ^{182}Hf with the short half life of 8.9 m.y. Both Hf and W are highly refractory elements and are accumulated in the early stage of the proto-earth. As Hf and W are a lithophile and is a siderophile elements, respectively, ^{182}Hf-^{182}W system could give constraints on metal-silicate (core-mantle) differentiation especially core segregation in the very early Earth system because of its large fractionation between metal-silicate and the short half life of ^{182}Hf. Improvement of analytical techniques of W isotope analyses allows us to obtain highly precise $^{182}W/^{183}W$ ratios of vocanic rocks, which leads to findings of W isotope anomalies (mostly positive) in old komatiites (2.4 –3.8 Ga) and young volcanic rocks with positive anomalies of 12 Ma Ontong Java Plateau and 6 Ma Baffin Bay (Rizo et al., 2016) and with negative anamalies of those such as the Loihi basalt.

In our study, high-precision W isotope ratio measurement with MC-ICP-MS (Thermo co. Ltd., NEPTUNE PLUS) has been developed. We have measured W standard solution (SRM 3163) and obtained the isotopic compositions with a enough high precision of ±5ppm. However, the standard solution, which separated by cation or anion exchange resin, has systematical $^{183}W/^{184}W$ drift of -5ppm. These phenomena was also reported by Willbold et al. (2011). Therefore, we corrected the measured W isotope ratios of samples with the standard solution processed by the same method as that of the samples. This technique leads to the reproducible W isotopic compositions with reproducibility of several ppm. We have obtained the negative $^{182}W/^{183}W$ for the basalts with the high $^{3}He/^{4}He$ isotopic composition from the Loihi, Hawaii, through the developed analytical method. This result is consitent with that of Mundl et al., (2017). As negative anomaly of $^{182}W/^{183}W$ could be created by the early earth core segregation, it is probably a signature of core-mantle interaction.

Keywords: core-mantle interaction, W isotope, Ocean island basalt, high-precision isotope analysis

