High precision tungsten isotope analysis using MC-ICP-MS and application for Earth's rock samples

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Tungsten has five isotopes (M = 180, 182, 183, 184, 186), and ^{182}W isotope is a rediogenic isotope produced by β-decay of ^{182}Hf. Its half life is short (a half-life of 8.9 million years), and ^{182}W isotope has been investigated to understand the early Earth geochemical evolution. Both Hf and W are highly refractory elements. As Hf is a lithophile and W is a siderophile elements, ^{182}Hf-^{182}W system could give constraints on metal-silicate (core-mantle) differentiation such as especially early Earth system because of its short half life. Improvement of analytical techniques of W isotope analyses leads to findings of W isotope anomaly (mostly positive) in old komatiites (2.4 – 3.8 Ga) and young volcanic rocks (12 Ma Ontong Java Plateau and 6 Ma Baffin Bay).

In our study, high-precision W isotope ratio measurement with MC-ICP-MS (Thermo co. Ltd., NEPTUNE PLUS @ Japan Agency for Marine Earth Science and Technology). We have measured W standard solution (SRM 3163) and obtained the isotopic compositions with an precision of ± 5ppm. The samples were decomposed by themethod of Toulboul and Walker(2012)*, followed by separation by cation or anion exchange resin. Ta was removed meso isobutyl ketone solvant extraction.

We applied these separation method and high precision tungsten isotope analysis for Earth's volcanic rocks suc as MORBs, OIBs and kimberites, which will be given in our presentation followedby discussion in analytical method in detail.

Reference

*Touboul, M. & Walker, R. J. High precision measurement of tungsten isotopes by thermal ionization mass spectrometry. Int. J. Mass Spectrom. 309, 109–117 (2012)