Determination of stable isotope ratio of tungsten in seawater using chelate resin column extraction

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Tungsten (W) has a uniform vertical distribution from the surface to the bottom with a concentration of about 49 pmol/kg in the modern ocean. However, W is highly concentrated in submarine hydrothermal fluids and in metropolitan coastal waters [1, 2]. Tungsten has five stable isotopes; ^{180}W, ^{182}W, ^{183}W, ^{184}W, and ^{186}W, of which natural abundance is 0.12%, 26.50%, 14.31%, 30.64%, and 8.43%, respectively. Since the stable isotope ratio of W varies via various geochemical processes [3], the isotope ratio with concentration can be useful to evaluate precisely the fluxes from continents, sediments, hydrothermal activity, and artificial pollution. However, no reliable report has been made yet on the isotope ratio of dissolved W in seawater. To measure the isotope ratio by MC-ICP-MS, W must be concentrated about 5000 times from 5 kg of seawater. It is necessary to collect W quantitatively in order to prevent isotope fractionation during concentration and separation operations. Furthermore, it is necessary to separate W from major elements in seawater and to keep the blank low for accurate isotope ratio measurement. This study is aimed at the development of an accurate and simple analytical method for stable isotope ratio of W in seawater.

We have found that chelate resin with 8-hydroxyquinoline group (TSK-8HQ) is useful to extract W from a large amount of seawater at a high flow rate of ~8 mL/min. In the procedure, first, W is preconcentrated 15 times and separated from major elements in seawater by using a TSK-8HQ chelate resin column. Subsequently, the eluate is introduced into an AG1-X8 anion exchange resin column for purification of W. Finally W is concentrated about 5000 times via evaporation-redissolution. We will discuss the quantitative concentration and purification of W.

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