Improved thermal decomposition system for the measurement of Hg isotope ratios in environmental reference materials

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Mercury is a harmful heavy metal that can cause neurological disorders such as Minamata disease when exposed to high concentrations in the human body. In order to track the source and the route of exposure of mercury, studies using mercury stable isotope ratios are increasing. Recently, the pretreatment method using the thermal desorption system is used to overcome the disadvantages of the existing pretreatment methods such as acid digestion. To develop the pretreatment method for Hg isotope analysis in the environmental samples, we examined the Hg recoveries and isotope ratios under various thermal system conditions (time, tempatarue, sample amount, etc). In addition three methods (acid and microwave digestion, thermal decomposition) were compared. As a results, the thermal decomposition method yielded optimal recovery efficiency and small mass fractionation. Hg recoveries were within the acceptable range of 85.8~108.6 % and the difference of Hg isotope ratios (δ^{202}Hg, Δ^{199}Hg) from the literature values were 0.01~0.12 ‰ under optimized pretreatment conditions. The results indicate that more accurate mercury stable isotopic compositions can be analyzed by applying optimal thermal desorption conditions for each matrix.