

## Use of Environmental Certified Reference Materials for Quality Control of Precise Isotopic Measurements

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Environmental Certified Reference Materials (CRMs) are utilized to evaluate new analytical methods and to control the accuracy of pretreatment and instrumental analyses. Measurement of pollutants and indicator substances in the environment is very important to understand the status of pollution and the effects of countermeasures. However, since most environmental samples have complex compositions, it is difficult to obtain accurate values by using simple standard solutions. In such cases, it is possible to confirm the validity of the analysis method and values by using a reference material that is similar in composition to the measurement target. In recent years, accuracy control and reliability assurance of chemical analysis have become important issues in various fields, and reference materials are very useful in ensuring the traceability of the measurements. It is important for reference material producing organizations to add reference values in response to social and researcher needs. As an example, reference values are required to be added to environmental reference materials to contribute to the recent development of isotope analysis, such as mercury (Hg) isotope analysis.

There are seven stable isotopes of Hg, and the abundance varies depending on the biogeochemical processes occurring in the environment. By using this feature, it is possible to identify the source of mercury in environmental samples and to infer the processes related to its accumulation. For example, mass independent fractionation of odd isotopes ( $\Delta^{199}\text{Hg}$  and  $\Delta^{201}\text{Hg}$ ) in human hair varies with the type and quantity of the food, particularly seafood consumed, it can be used to estimate the sources of exposure. In addition, absorption of mercury, mostly in the form of methylmercury, by the human organism was shown to induce mass dependent fractionation of  $\sim +2\%$  for  $\delta^{202}\text{Hg}$ , implying that the isotopic composition of Hg in human hair is as expected following its ingestion and distribution in the body. Furthermore, Hg isotopes in atmospheric samples (gaseous and oxidized Hg) are known to be indicators of their emission sources and chemical reactions occurring in the atmosphere.

This study reports the reference values of mercury and other isotopes assigned to two CRMs (NIES CRM No. 13 Human Hair and NIES CRM No. 28 Urban Aerosols) and how they are utilized.

Keywords: Environmental Certified Reference Materials, Quality Control, Isotopic measurement, NIES CRM