

Iso-Analytical Limited

Report of Analysis

Laboratory Standard IA-R064

IA-R064: ^2H & ^{18}O Water standard (ISW - Medium Natural Water)

This laboratory standard is intended to provide a sample of known isotope composition with $^2\text{H}/^1\text{H}$ and $^{18}\text{O}/^{16}\text{O}$ isotope ratios stated in parts per thousand difference (‰) from the V-SMOW (Vienna Standard Mean Ocean Water) isotope ratio standard. This laboratory standard is not certified, but is provided to allow routine checking of the overall quality of measurements performed by continuous-flow isotope ratio mass spectrometry, and may be used as part of a quality control program. It is not intended for use as a substitute for calibration materials or inter-comparison materials distributed by NIST or IAEA.

Analysis

The $^2\text{H}/^1\text{H}$ and $^{18}\text{O}/^{16}\text{O}$ isotope ratios of the laboratory standard were measured by continuous-flow isotope ratio mass spectrometry using V-SMOW2 and SLAP2 (Standard Light Antarctic Precipitation 2) calibration materials. IAEA-OH-14 and IAEA-OH-16 (water samples from the WICO 2011 inter-laboratory study [1]) were used as inter-comparison materials. The laboratory standard, V-SMOW2, SLAP2, IAEA-OH-14 and IAEA-OH-16 were prepared for $^2\text{H}/^1\text{H}$ and $^{18}\text{O}/^{16}\text{O}$ isotope ratio analysis by equilibration with hydrogen [2] for $^2\text{H}/^1\text{H}$ and carbon dioxide [3] for $^{18}\text{O}/^{16}\text{O}$. Measurement of $^2\text{H}/^1\text{H}$ and $^{18}\text{O}/^{16}\text{O}$ isotope ratios in the laboratory standard was undertaken five times on three separate occasions.

[1] Fourth inter-laboratory comparison exercise for $\delta^2\text{H}$ and $\delta^{18}\text{O}$ analysis of water samples (WICO2011), Final report by the International Atomic Energy Agency, Vienna, May 9, 2012.

[2] Iso-Analytical SOP No. 0303 - Preparation of liquids for H_2 Equilibration-CF-IRMS.

[3] Iso-Analytical SOP No. 0304 - Preparation of liquids for CO_2 Equilibration-CF-IRMS.

Isotope Abundance

V-SMOW is the isotope standard to which laboratory standard IA-R064 is compared. The $^2\text{H}/^1\text{H}$ and $^{18}\text{O}/^{16}\text{O}$ isotope ratio scales are defined in terms of V-SMOW and SLAP, such that the $^2\text{H}/^1\text{H}$ and $^{18}\text{O}/^{16}\text{O}$ isotope composition of SLAP relative to V-SMOW is -428 ‰ for ^2H and -55.5 ‰ for ^{18}O . The isotope composition of the laboratory standard in ‰ notation (relative to V-SMOW) can be found on the following page.

Nb. Although V-SMOW2 and SLAP2 were used for calibration, isotope values are still reported on the VSMOW/SLAP scale according to IAEA guidelines (20 June 2007).

Iso-Analytical Laboratory Standard IA-R064

| Laboratory Standard | $\delta^2\text{H}_{\text{V-SMOW}} (\text{‰})$ $\delta_m \pm \sigma_1$ | $\delta^{18}\text{O}_{\text{V-SMOW}} (\text{‰})$ $\delta_m \pm \sigma_1$ |
|---------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| IA-R064 (ISW Medium Natural Water) | -98.32 ± 1.13 | -12.34 ± 0.13 |

Note: $\delta_m = \sum_{i=1}^n \delta_i/n$; $\sigma_1 = \sqrt{\sum_{i=1}^n (\delta_m - \delta_i)^2/(n-1)}$; n = 15

Storage

It is recommended that the laboratory standard is stored upside down in a cool dark place to prevent evaporation. It is suggested that the laboratory standard is shaken before use, to ensure the contents are well mixed. In our experience the standards will remain viable for many years if stored in this way in the bottles they have been provided in.

Calibrated on August 21st 2014

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Steven T. Brookes
Director

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Director

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