SmartNotes

Does the EA IsoLink Helium Management Module cause isotopic fractionation?

The helium management (He^M) Module **does not cause isotopic fractionation** in the Thermo Scientific™ EA IsoLink™ IRMS System.

Recently, laboratories have suffered from increasing analytical costs due to worldwide reduced availability and higher market prices of helium. Elemental Analyzer Isotope Ratio Mass Spectrometry (EA-IRMS) Systems traditionally use helium as a carrier gas in the analytical process and as a purge for the autosampler, but may also use helium as a reference gas for the Thermal Conductivity Detector (TCD). On Thermo Scientific™ EA-IRMS Systems, helium flow rates are normally between 80-120 ml/min for carrier gas and 100 ml/min for the reference gas of the Thermal Conductivity Detector (TCD) and autosampler purge. However, some EA-IRMS systems require an additional helium flow for the autosampler purge. There is therefore a demand for reduced helium consumption to ease demand and reduce cost per sample in EA-IRMS.

Figure 1. Thermo Scientific EA IsoLink IRMS System.

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Table 1. Simultaneous NCS data from 30 sequential replicates of peat soil.

Sample	*n*	Weight (mg)	He^M used?	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	$\delta^{34}S$ (‰)
Peat Soil	10	1.207 – 1.272	Yes	-18.09 ± 0.04	2.73 ± 0.10	-11.43 ± 0.19
Peat Soil	10	1.197 – 1.282	No	-18.02 ± 0.08	2.86 ± 0.07	-11.43 ± 0.18
Peat Soil	10	1.201 – 1.293	Yes	-18.04 ± 0.07	2.65 ± 0.12	-11.54 ± 0.17

Results from He^M experiment

A comparison of $\delta^{13}C$, $\delta^{15}N$ and $\delta^{34}S$ data from a sequence on the same EA IsoLink IRMS System, with and without the He^M activated, show that there is no isotopic fractionation caused by He^M.

Table 1 shows simultaneous $\delta^{13}C$, $\delta^{15}N$ and $\delta^{34}S$ values from 30 sequential replicates of peat soil. In the experiment, the first 10 samples were analyzed using He^M, the next 10 samples were analyzed without He^M and the final 10 samples were analyzed with He^M.

The analysis shows that measured $\delta^{13}C$, $\delta^{15}N$ and $\delta^{34}S$ values are not dependent on the He^M Module and are comparable with excellent accuracy and precision. In NCS analysis mode, the precision for $\delta^{13}C$ was ≤0.07‰, $\delta^{15}N$ is ≤0.12‰ and $\delta^{34}S$ is ≤0.19‰ (for <5µg S) for the peat soil samples analyzed.

The data presented in Table 1 are application data and are not warranted because they exceed product specifications. The warranted product specification for $\delta^{13}C$ is ±0.1‰ (1 sd) for 50 µg of carbon, $\delta^{15}N$ is ±0.15‰ (1 sd) for 50 µg of nitrogen and $\delta^{34}S$ is ±0.3‰ (1 sd) for 10 µg of sulfur measured on Sulfanilamide.

Summary

Given the lower cost per analysis gained, without analytical compromise, all EA IsoLink IRMS Systems include the He^M Module as standard.

Using He^M, each sample analysis used less than 1.5 liters of helium compared with greater than 4 liters of helium as on previous Thermo Scientific EA-IRMS Systems. Simultaneous NCS analysis per sample is achieved in less than 10 minutes.

The He^M Module reduces helium consumption by greater than 60% per NCS sample using a splitting technique and is completely automated through the Thermo Scientific™ Isodat™ Software Suite.

Find out more at **thermofisher.com/EAIsoLink**

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