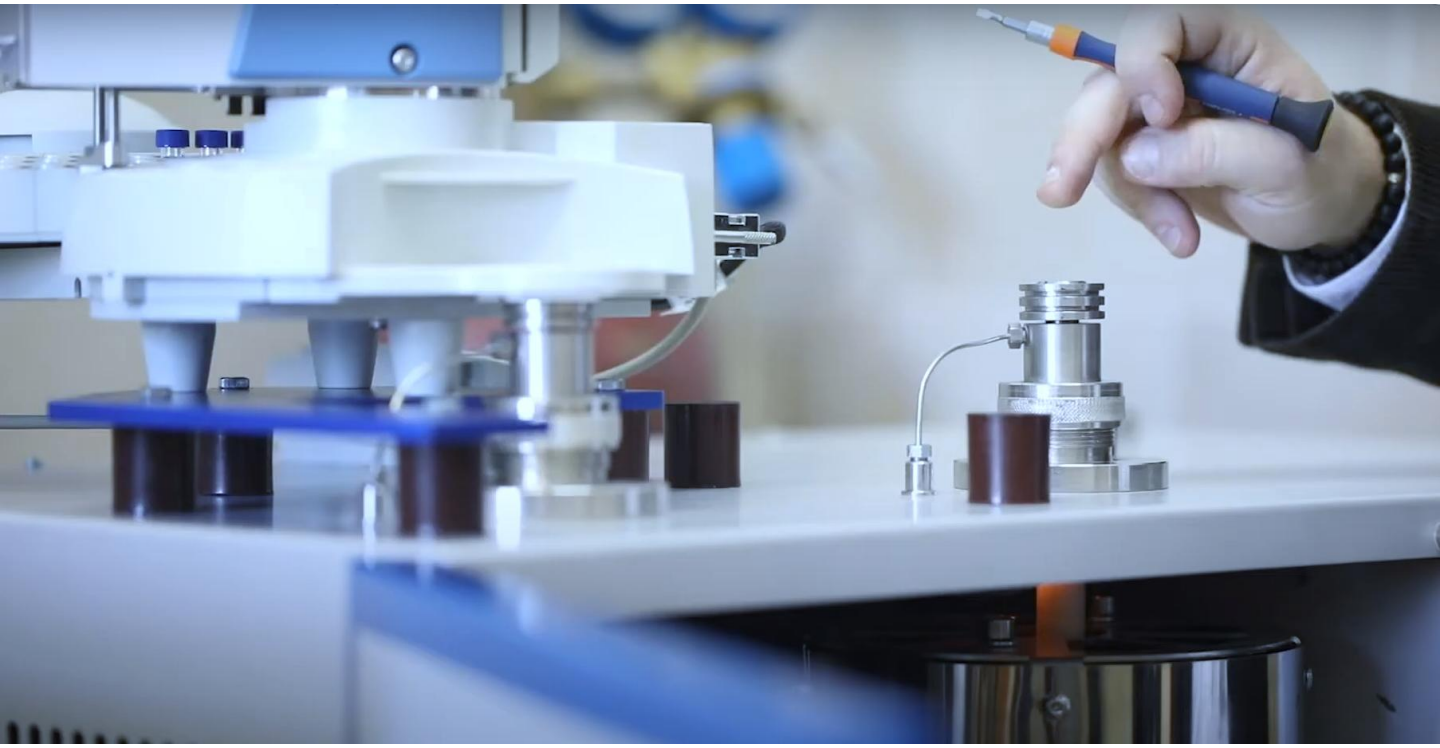
EIMPyro

A Part of the EIM-IRMS Technology

Revolutionary Solution for Wine, Honey, Fruit Juice, Strong Spirits and Milk Testing and Authentication



The Missing Link in Isotope Analysis

EIMPyro – A Single Perpheral Handling All Applications

Isotope Lab Systems DOO

www.isotopelabsystems.com
Specifications, terms and pricing are subject to change.
Please consult your local sales representative for details.

Problem & Solution

Until now, the only way to detect the presence of sugar of different botanical origin (from C3 and C4 plants) was using Nuclear Magnetic Resonance (NMR) technology or Pyrolysis.

NMR method presents number of challenges - it is very expensive, results take a long time, and the need for a reference database without which the results are unreliable. Key information about the origin of product is stored in the deuterium content. NMR does not show good differentiation.

Extraction of Ethanol δD value that is obtained by pyrolysis is not a reliable analytical parameter due to ethanol's hydroxyl group, which includes exchangeable Hydrogen atom. Results obtained by Pyrolysis of Ethanol are **NOT** reproducible, making it a non-reliable method.

We solved the problem of ethanol's hydroxyl exchangeable hydrogen!

- EIM-IRMS (Ethanol Isotope Measurement – Isotope Ratio Mass Spectrometry) technology is based on rapid and quantitative intramolecular dehydration of ethanol sample over proprietary EIM-catalyst prior to high precision isotope ratio measurement during a single analysis.
- EIM-IRMS technology is the ONLY method in the world capable of determining addition of sugar from C3 based plants during production and/or water addition to the product.
- EIM-IRMS technology can determine botanical origin of both known and unknown product samples.
- This technology has been proven to be significantly faster, more accurate and less expensive than the other techniques used for determining addition of sugar from C4 plants.
- It is used for detection of adulteration of wine, honey, strong alcoholic beverages, fruit juices, and milk.

The Missing Link in Isotope Analysis

EIMPyro peripheral for IRMS is the answer to the industry's problem in detection of adulterated products from C3, C4 plants, and addition of water

- EIMPyro peripheral gives high precision, repeatable and reproducible results by obtaining isotope ratio of non-exchangeable (D/H)n δDn value in ethanol sample during a single analysis using EIM-IRMS technology
- EIMPyro peripheral can be coupled to any standard and conventional Isotope Ratio MS which has the option of measuring Hydrogen stable isotopes
- EIMPyro replaces 6 other instruments used in isotope analysis
- The EIMPyro is a fully automated peripheral optimized for isotope analysis
- EIMPyro delivers unprecedented precision, quicker analysis times, better reliability and reproducibility. Results are obtained from sub-microliter amounts of ethanol with analytical time of only 5-6 minutes.

How EIMPyro Works?

Value of having 2 different columns. How are they used and when?

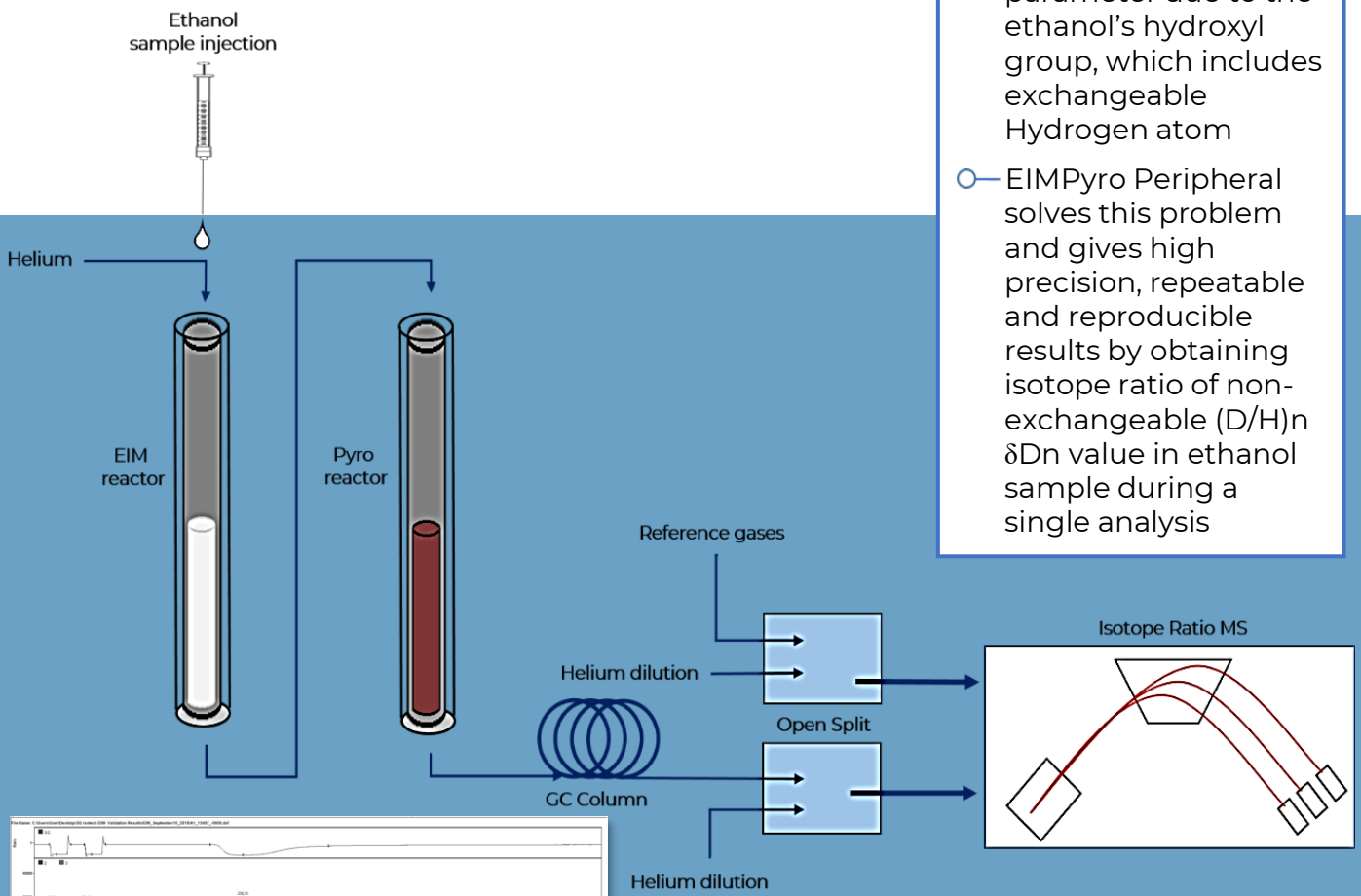
EIMPyro combines two instruments into one - EIM-reactor and Pyrolysis reactor. Reactors are configured in a continuous flow mode for analysis using EIM-IRMS technology but can also be used separately for pyrolysis only to measure H/O in samples.

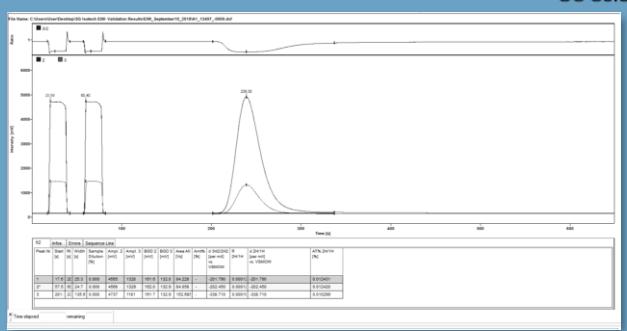
It has two injection ports that can be connected to an autosampler.

Principle of EIMPyro Operation

EIMPyro performs rapid and quantitative intramolecular dehydration of ethanol sample over custom made EIM-catalyst specially designed by SG Isotech, prior to pyrolysis and high precision isotope ratio measurement during a single analysis

- Ethanol δD value obtained only by Pyrolysis Conversion Elemental Analyzer or peripheral is not a reliable and repeatable analytical parameter due to the ethanol's hydroxyl group, which includes exchangeable Hydrogen atom
- EIMPyro Peripheral solves this problem and gives high precision, repeatable and reproducible results by obtaining isotope ratio of non-exchangeable (D/H)n δDn value in ethanol sample during a single analysis





How EIMPyro Works?

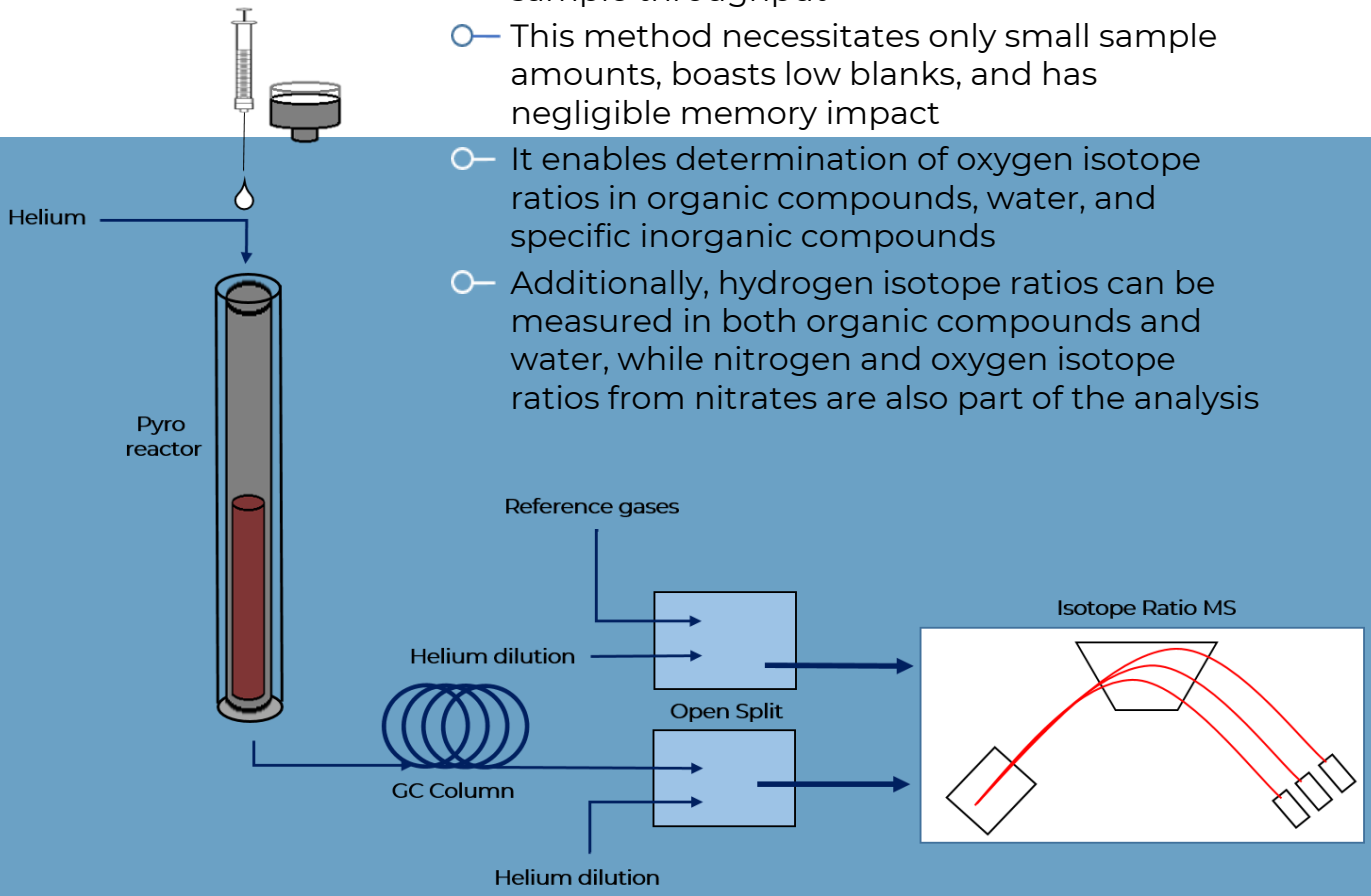
Value of having 2 different columns. How are they used and when?

Principle of Stand Alone Pyrolysis Operation

Pyrolysis is an innovative method wherein the oxygen within a compound transforms into CO, and the hydrogen within a compound transforms into H_2. This process occurs rapidly and with high precision in a reducing environment at elevated temperatures, typically surpassing 1400 ˚C

- Absence of fractionation
- Minimal memory usage
- No limitations on organic sample types
- Applicable to specific inorganic samples
- Peak referencing achieved through the use of reference gas for each peak

- Analysis of $^{18}O/^{16}O$ and D/H in both organic and inorganic samples is conducted directly, featuring automated processes with a high sample throughput
- This method necessitates only small sample amounts, boasts low blanks, and has negligible memory impact
- It enables determination of oxygen isotope ratios in organic compounds, water, and specific inorganic compounds
- Additionally, hydrogen isotope ratios can be measured in both organic compounds and water, while nitrogen and oxygen isotope ratios from nitrates are also part of the analysis



Advantages of EIMPyro

A single peripheral that supports all your isotope testing needs.

Empower yourself and your team to overcome diverse laboratory challenges, enhance workflow efficiency, and minimize downtime. The Isotope Lab Systems EIMPyro utilizing the upgraded and modified Pyrolysis Method, provides a flexible solution that broadens your H/O analysis capabilities with over 10 different applications for authenticity testing of food products. The robust software ensures automated and precise reporting, streamlining tasks for you and your team.

Standard Deviation for δDn ethanol value less than 1 ‰

24/7 automated operations

Single peripheral for all isotopic analysis

Can be coupled with various IRMS instruments from different producers

What makes the EIMPyro a preferred choice?

- New analytical parameter δDn ethanol value for relative ratio of non-exchangeable hydrogen stable isotopes in ethanol
- EIMPyro provides precise results and quicker analysis times are attained on submicroliter amounts of ethanol
- Analytical time of 5 – 6 minutes
- Standard deviation of less than 1 ‰
- Can be used with various IRMS instruments

- Single peripheral replaces 6 other instruments
- A precise and dependable system that ensures accurate results
- Simple maintenance procedures
- User-friendly interface to minimizes the need for extensive staff training
- Rapid return on investment due to the system's modular nature, and low cost of analysis

- EIMPyro provides rapid and quantitative intramolecular dehydration of ethanol sample over custom made
- EIM-catalyst, prior to high precision isotope ratio measurement during a single analysis
- Single peripheral for measurement of stable isotopes of non-exchangeable hydrogen in ethanol

- The EIMPyro enables unattended operation, allowing analyses to run 24/7, providing complete results anytime and anywhere
- Controlled by the dedicated Data Handling Software, the system manages all analytical parameters
- Supports various autosamplers such as Thermo's AS 3000, AI 1310 or GC PAL EIM 9000 software for data calculation
Increased productivity

EIMPyro Analytical Kits

As an added bonus, we have created specialized analytical kits based on type of analysis performed to help with process . These kits contain everything a user will need to perform a sample analysis.

Analytical kits

- Based on application
- Ensure reliability
- Improve performance
- Simplify the process
- Kits of various sizes

ISOTOPE LAB SYSTEMS
INSTRUMENTING INNOVATION

1 Instrument for ALL ISOTOPIC ANALYSIS

	EQUIPMENT NEEDED						
Tests	SNIF-NMR / Cadiot column distillation system	NMR-profiling	$\delta^{13}C$ EA-IRMS	HPLC-IRMS	LC-HRMS	$\delta^{18}O$ Equilibration Peripheral IRMS	EIM-PADS/ EIMPyro-IRMS
WINE							
Addition of C3 - sugar/ethanol for wine with geographical origin							✓
Addition of C3 - sugar/ethanol for wine without geographical origin							✓
Addition of C4 - sugar/ethanol for wine with geographical origin			✓				✓
Addition of C4 - sugar/ethanol for wine without geographical origin			✓				✓
Dilution with water (prior, during and after alcoholic fermentation)						partial	✓
Determination of geographical origin	✓						✓
HONEY							
C4 sugars			✓	✓	✓		✓
C3 sugars				partial	✓		✓
Tailor-made Syrups					✓		✓
Illegal Processing		✓					✓
FRUIT JUICE							
Addition of C4 - sugar			✓				✓
Addition of C3 - sugar							✓
Freshly squeezed juice vs. reconstituted from fruit concentrate						partial	✓
Fruit Juice vs. Fruit Nectar						partial	✓
Verification of fruit content in fruit nectar							✓
FRUIT CONCENTRATE							
Addition of C4 - sugar			✓				✓
Addition of C3 - sugar							✓
STRONG SPIRITS - Fruit Brandies / Fruit Distillates / Whiskies							
Presence of C4 Ethanol	partial		✓				✓
Presence of C3 Ethanol	partial						✓
Isotopic fingerprint	✓		✓			✓	✓
MILK							
Fresh milk vs. reconstituted milk from milk powder						partial	✓
Addition of water to milk						partial	✓
Origin of fat in milk (plant or animal)							✓

ISOTOPE LAB SYSTEMS

EIMPyro Applications

Explore additional applications and establish yourself as the benchmark laboratory in your field

Regardless of the path you choose, your laboratory and equipment will seamlessly adjust to support any strategy. With the EIMPyro coupled to your IRMS, your laboratory can effortlessly manage diverse sample types, perform different determinations, optimize sample throughput while ensuring precise and reproducible results.

Wine

- Determination of botanical origin by measuring addition of sugar and/or water prior, during or after alcoholic fermentation to known and unknown samples
- Verification of authenticity
- Forensic science
- Geographical origin

Fruit Juices

- Determination of botanical origin of sugar
- Determination of water origin in fruit juices
- Verification of labeling statements
- Differentiation between reconstituted and freshly squeezed juices
- Differentitation between fruit juices and fruit nectars
- Determination of labeled fruit content in fruit nectars

Mapple Syrups

- Determination of botanical origin of sugar C4 and C3
- Detection for presence of oligosaccharides
- Verification of authenticity
- Forensic science
- Geographical origin

Fruit Concentrates

- Determination of botanical origin of sugar
- Detection for presence of oligosaccharides
- Verification of authenticity
- Forensic science

Honey

- Determination of botanical origin of sugar C4 and C3
- Detection for presence of oligosaccharides
- Verification of authenticity
- Forensic science
- Geographical origin

Fruit Brandies, Fruit Distillates, Whiskies

- Determination of ethanol botanical origin
- Verification of authenticity
- Isotopic fingerprinting of each produced batch number (LOT number)
- Forensic science

Milk

- Determination of water origin in milk
- Differentiation between fresh and reconstituted milk from milk powder
- Determination of fat origin in milk (plant vs. animal)

Specifications and Installation Requirements

Instrument Description

- Base unit EIMPyro (two furnaces) with temperature control display
- Software regulation of temperature and Helium flow
- Can be connected to AS 3000, AI 1310 Liquid Autosampler or GC Pal Autosamplers for liquid samples
- The EIMPyro can be connected to any current continuous flow Open Split universal interface coupled to Isotope Ratio MS

Gases

- Helium: 99.999% purity
- Reference gases (CO and H2) with pressure regulators
- To utilize the EIMPyro with CO and H_2 reference gas, the laboratory needs to have detectors specifically for CO and H_2

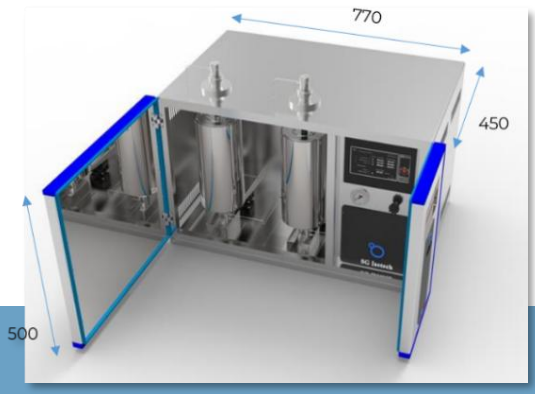
Power supply

- 230 V, 50/60 Hz, 2600 VA

Dimensions and Weight

- 770 x 450 x 500 mm (w x d x h)
- 65 kg (net value)

EIMPyro Dimensions (in mm)



- Standard Deviation for δDn ethanol value less than 1 **‰**

No.	Sample	Number of injections	Ethanol δDn Average Value (‰ vs. AAWES*)	St. Dev. (‰)
1.	Wine ethanol – Sample 1	3	-213.84	0.77
2.	Wine ethanol – Sample 2	3	-210.31	0.97
3.	Wine ethanol – Sample 3	3	-213.96	0.67
4.	Wine ethanol – Sample 4	3	-211.63	0.55
5.	Wine ethanol – Sample 5	3	-214.10	0.94
6.	Wine ethanol – Sample 6	3	-214.49	0.34
7.	Wine ethanol – Sample 7	3	-213.17	0.44

*AAWES – Authentic Afusali Wine Ethanol Standard

Service And Warranty

While you focus on growing your business, we focus on the science.

For any enquiries please contact:
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