

Stable Isotopes for Petroleum Geochemistry



Key Benefits

- High analytical accuracy of the isotopic ratio, required composition and targeted isotope signature for various mixtures
- Increased analyzer calibration efficiency
- Isotopic composition adjusted for each of your products

Rely on an expert partner for your isotope ratio measurements

For more efficient upstream operations, from exploration to production, oil & gas companies need to increase recovery rates of existing fossil fuel reserves and better explore potential new sources. At the same time, their products must be processed safely and cleanly.

To more thoroughly understand the mechanisms of formation and the compositional evolution of gas accumulations on a geological subsoil/field, isotopic analysis is used to maximize information derived from each well, reservoir or field and assist in accurate exploration and production development planning.

Whether you are an oil & gas company, university or a quality control laboratory, Air Liquide provides a range of mixtures for equipment calibration and to help extract critical well information.

Air Liquide is the first and only gas supplier to propose a complete standardized offer for stable isotopic analysis worldwide.

With 30+ years of experience in specialty gases production and application, and strong, recognized R&D capabilities, you can trust Air Liquide to ensure product quality, availability and responsiveness.

A product range dedicated to stable isotopic analysis

Air Liquide's offer provides a high purity level and very precise specification of the isotopic ratio of the molecules to ensure accurate analysis and calibration.



Part of the **ALPHAGAZ™** product range, Air Liquide's premium brand of specialty gases for analytical applications, the Isotopes product range for Petroleum Geochemistry consists of multi-component, natural gas calibration mixtures up to C5 species with specific $\delta^{13}\text{C}$ and $\delta^2\text{H}$ ratios:

- **ALPHAGAZ™ Mix Isotope:** a range of calibration mixtures with different gas and isotopic compositions.
 - Biogenic mixtures
 - Thermogenic mixtures
 - Methane or carbon dioxide mixtures

On demand mixtures with customer specific molecular (from ppm to %) and isotopic compositions are also available:

- C1 with $\delta^{13}\text{C} = -69$ to 0 ‰
- C2 with $\delta^{13}\text{C} = -28$ ‰
- C3 with $\delta^{13}\text{C} = -32$ or -22 ‰
- C4 with $\delta^{13}\text{C} = -30$ ‰
- C5 with $\delta^{13}\text{C} = -25$ ‰

Other components such as H_2S , N_2 , N_2O , CO , H_2 , and CO with specific $\delta^{34}\text{S}$, $\delta^{15}\text{N}$, $\delta^{13}\text{C}$, $\delta^{18}\text{O}$ and $\delta^2\text{H}$ isotope ratios are offered upon request.

All **ALPHAGAZ™ products** are made to guarantee high accuracy and repeatability of analysis.

Simpler choices

- A straightforward range to meet the most common needs of our customers.
- A selected range of gas handling equipment to ensure high accuracy in use.

Quality you can depend on

- Dedicated expertise to offer accuracy and traceability.
- Delivered with Certificate of Analysis.

Reliable service

- Guaranteed reliable lead time to meet your requirements.
- Ready-to-ship standard products.
- Custom products with specific molecular and isotopic compositions can be designed upon request to satisfy your unique requirements.
- Experts and front office teams to support you from feasibility and quotation, to delivery at your facility.
- Commitment to move the industry forward, by bringing innovations into the labs and implementing new industry standards.

ALPHAGAZ™ Mix Isotope

Biogenic Mixtures

ALPHAGAZ™ Mix Isotope		CH ₄			C ₂ H ₆	C ₃ H ₈	Balance Gas
		High	Middle	Low			
Bio 1.0 in Air	Conc. (v/v)	2.5 %	2 500 ppm	250 ppm			Balance Air
	δ ¹³ C (‰ VPDB)	-69	-69	-69			
	δ D (‰ VSMOW)	-235	-235	-235			
Bio 2.0	Conc. (v/v)	95 %			1 %		Balance N ₂
	δ ¹³ C (‰ VPDB)	-69			-30		
Bio 3.0	Conc. (v/v)	95 %			0.9 %	0.1 %	Balance N ₂
	δ ¹³ C (‰ VPDB)	-69			-30	-30	

Thermogenic Mixtures

ALPHAGAZ™ Mix Isotope		CH ₄			C ₂ H ₆	C ₃ H ₈	nC ₄ H ₁₀	iC ₄ H ₁₀	nC ₅ H ₁₂	iC ₅ H ₁₂
		High	Middle	Low						
Thermo 1.1 in Air	Conc. (v/v)	2.5 %	2 500 ppm	250 ppm						
	δ ¹³ C (‰)	-45	-45	-45						
	δ D (‰ VS-MOW)	-150	-150	-150						
Thermo 1.2 in Air	Conc. (v/v)	2.5 %	2 500 ppm	250 ppm						
	δ ¹³ C (‰)	-25	-25	-25						
	δ D (‰ VS-MOW)	-120	-120	-120						
Thermo 2.0	Conc. (v/v)	80 %			15 %	5 %				
	δ ¹³ C (‰)	-40			-30	-25				
Thermo 3.0	Conc. (v/v)	75 %			10 %	8 %	3 %	2 %	1 %	1 %
	δ ¹³ C (‰ VPDB)	-40			-30	-28	-28	-30	-25	-25

ALPHAGAZ™ Mix Isotope

Carbon dioxide Mixtures

ALPHAGAZ™ Mix Isotope		CO ₂ *
CO ₂ 1.1 in Air	Conc. (v/v)	50%
	δ13C (‰ VPDB)	-40
CO ₂ 1.2 in Air	Conc. (v/v)	50%
	δ13C (‰ VPDB)	-25
CO ₂ 1.3 in Air	Conc. (v/v)	50%
	δ13C (‰ VPDB)	+25

* δ18O (‰ VSMOW) ratios in the range of -8 to +8

Convenient Packaging

Non refillable cylinders:

- Gas volume: 34 Liters (1.2CF)
- Water volume: 1 Liter
- Pressure: 500 psig (34bar)
- Weight: 0.4kg (0.8 lbs.)

Depending on your needs, appropriate cylinder packaging and configurations can be investigated and made available.

All of our cylinders are tracked by barcodes, ensuring an optimized inventory management.

A la carte services

- Local customer service with on-site cylinder management
- Express delivery
- Gas safety training
- Proficiency testing scheme

Check the availability of these services with your local sales representative.

Your local Stable Isotopes contact

Location	Contact name	Email	Phone
Americas	Matt Matthew	matt.matthew@airgas.com	+1 215 766 7407
Germany	Horst Lehmann	horst.lehmann@airliquide.com	+49 2151 954186
Spain & Portugal	Adelino Fernandes	adelino.fernandes@airliquide.com	+351 21 416 49 83
Nordics & Benelux	Jack de Jong	jack.dejong@airliquide.com	+31 20 794 6996
Japan	Shigeru Ideriha	shigeru.ideriha@airliquide.com	+81 3 6414 6701
China	Iris Shi	iris.shi@airliquide.com	+86 21 6090 3604
Other worldwide locations	Matt Matthew	matt.matthew@airgas.com	+1 215 766 7407

Air Liquide - IM-WBL
75 quai d'Orsay
75321 Paris Cedex 07 - France

www.airliquide.com



The world leader in gases, technologies and services for Industry and Health, Air Liquide is present in 80 countries with approximately 65,000 employees and serves more than 3 million customers and patients.