

SPECIALTY GAS REFERENCE STANDARDS

Stable isotope analysis measures the relative abundance of isotopes within a sample. These measurements can help researchers investigate gas origins, assess food authenticity and study atmospheric processes.

An isotopic reference gas has a specified isotope signature as well as a defined chemical composition. Selecting both parameters helps laboratories calibrate their analysers and check measurement performance across the range relevant to their samples.

CAC Gas can help you identify a suitable mixture, pure gas or natural air standard and discuss compatible gas handling equipment.

APPLICATIONS



Petroleum geochemistry

Calibrate isotope measurements used to investigate the formation, origin and evolution of natural gas accumulations.

Biogenic and thermogenic gases • Reservoir and well gas analysis
• Hydrocarbons up to C₅



Food authentication

Support isotope ratio testing used to assess authenticity and investigate adulteration in food and beverage samples.

Quality control laboratories • Food and beverage testing • Pure isotopic reference gases



Environmental monitoring

Support atmospheric measurements and research into greenhouse gas sources using natural air reference standards.

Atmospheric CO₂ analysis • Greenhouse gas research • Adjusted natural air standards



Custom Gas Mixtures

Gas Control

Gas Generators

Leaders in Specialty Gas Solutions.

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STABLE ISOTOPES FOR PETROLEUM GEOCHEMISTRY

Biogenic Mixtures		CH ₄			C ₂ H ₆	C ₃ H ₈	Balance Gas
		High	Middle	High			
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		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	High						
Thermo 1.1 in Air	Conc. (v/v)	2.5 %	2 500 ppm	250 ppm						
	δ ¹³ C (‰ VPDB)	-45	-45	-45						
	δ D (‰ VS - MOW)	-150	-150	-150						
Thermo 1.2 in Air	Conc. (v/v)	2.5 %	2500 ppm	250 ppm						
	δ ¹³ C (‰ VPDB)	-25	-25	-25						
	δ D (‰ VS - MOW)	-120	-120	-120						
Thermo 2.0	Conc. (v/v)	80 %			15 %	5 %				
	δ ¹³ C (‰ VPDB)	-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



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STABLE ISOTOPES FOR FOOD AUTHENTICATION

Pure Gases		Element	Delta value	Uncertainty	Official methods
CO ₂ 2.1	CO ₂	δ ¹³ C (‰ VPDB)	- 25 and - 26	± 0.3	International Organization of Vine and Wine (OIV) OENO 17/2001 and OENO 7/2005
	CO ₂	δ ¹³ C (‰ VPDB)	- 6.4	± 0.3	
	CO ₂	δ ¹³ C (‰ VPDB)	- 11	± 0.3	
CO ₂ 2.4	CO ₂	δ ¹³ C (‰ VPDB)	- 28 and - 29	± 0.3	International Organization of Vine and Wine (OIV) – OENO 343-2010
CO ₂ 2.5	CO ₂	δ ¹³ C (‰ VPDB)	- 29 to -17	± 0.3	CEN (Comite Europeen de Normalisation, Brussels (Belgium) CEN/TC174 N° 108, 1996
O ₂ 2.1	O ₂	δ ¹⁸ O (‰ VSMOW)	- 12 to - 3	± 0.5	CEN (Comite Europeen de Normalisation, Brussels, Belgium) CEN/TC174 N° 109, 1996
H ₂ 2.1	H ₂	δ ² H (‰ VSMOW)	- 80 to - 9	± 0.5	CEN (Comite Europeen de Normalisation, Brussels (Belgium) CEN/TC174 N° 110, 1996
CO ₂ 2.6	CO ₂	δ ¹³ C (‰ VPDB)	- 31 to -22 AND - 20 to - 11	± 0.3	AOAC (Association of Analytical Communities) Methods 978.17, 991.41; 998.12; 981.09; 982.21; 984.23; 992.09; 2004.01

Custom Pure Gases & Mixtures	Element	Delta value Range
CO ₂	δ ¹³ C (‰ VPDB) δ ¹⁸ O (‰ VPDB)	- 44 to + 20 - 24 to + 20
CO	δ ¹³ C (‰ VPDB) δ ¹⁸ O (‰ VSMOW)	- 300 to + 20 - 150 to +10
N ₂	δ ¹⁵ N (‰ Air)	- 10 to + 20
H ₂	δ ² H (‰ VSMOW)	- 400 to + 10



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STABLE ISOTOPES FOR ENVIRONMENTAL MONITORING

Natural Air Standard Products	Composition	Delta value
Natural Air	CO_2 360 ~ 450 ppm CH_4 1700 ~ 2100 ppb CO 30 ~ 300 ppb N_2O 320 ~ 335 ppb SF_6 8 ~ 10 ppt H_2 450 ~ 600 ppb SO_2 < 60 ppt NO_2 < 50 ppt NO_x < 50 ppt NO < 50 ppt	$\text{CO}_2, \delta^{13}\text{C} = -7.5 \sim -9.5\text{‰ VPDB}$ $\text{CO}_2, \delta^{18}\text{O} = -2 \text{ to } +2\text{‰ VPDB}$
CO_2 in Natural Air	250 to 520 ppm of CO_2	$\text{CO}_2, \delta^{13}\text{C} = -7.5 \text{ to } -9.5 \text{‰ VPDB}$ $\text{CO}_2, \delta^{18}\text{O} = -2 \text{ to } +2\text{‰ VPDB}$
Natural Air without CO_2	< 50 ppb of CO_2	N/A
Standard Package	Cylinder: Aluminum 20L, 50L Valve: Rotarex D200 Connection: DIN14	

Custom Products

Elements	Delta Ratio of	Range	Gas Selections
C	$\delta^{13}\text{C} \sim \text{‰ VPDB}$	-70 to +20	Air, CH_4 and mixtures
C	$\delta^{13}\text{C} \sim \text{‰ VPDB}$	Please inquire	C_2H_6 , C_3H_8 , n- C_4H_{10} , i- C_4H_{10} , n- C_5H_{12} , i- C_5H_{12}
O	$\delta^{18}\text{O} \sim \text{‰ VSMOW}$	-30 to +10	CO , CO_2 , Air and mixtures
H	$\delta^2\text{H} \sim \text{‰ VSMOW}$	-300 to +100	CH_4 and mixtures
H	$\delta^2\text{H} \sim \text{‰ VSMOW}$	Please inquire	C_2H_6 , C_3H_8 , n- C_4H_{10} , i- C_4H_{10} , n- C_5H_{12} , i- C_5H_{12}
N	$\delta^{14}\text{N} \sim \text{‰ AIR}$	-20 to +20	N_2 , N_2O , NO_x , Air and mixtures
S	$\delta^{34}\text{S} \sim \text{‰ VCDT}$	-20 to +20	SO_2 , H_2S and mixtures
S	$\delta^{34}\text{S} \sim \text{‰ VCDT}$	-25 to +25	SF_6 and mixtures (under development)



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