AERODYNE RESEARCH, Inc.

Clumped Isotope Monitor for CH_4 Gas Samples

Direct Non-Destructive Spectroscopic Measurement of $^{13}CH_3D$ with No Isobaric Interference.

- Direct measurement of $\delta\,^{13}CH_4$, $\delta\,^{12}CH_3D$, and $\delta^{13}CH_3D$
- Precision for $\delta\,^{13}CH_3D$ better than 0.2 ‰ (1σ) in 60 minutes with 5 ml STP sample
- Low operating costs
- Suitable for pure CH_4 samples of any source

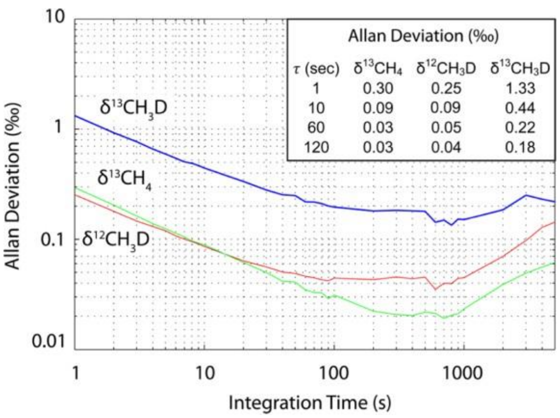
Rugged, field-ready instruments

Direct absorption spectroscopy allows for highly specific and accurate gas detection

Mid-IR detection enables maximum measurement sensitivity

TILDAS TECHNOLOGY

Aerodyne instruments use tunable infrared laser direct absorption spectroscopy (TILDAS) at mid-IR wavelengths to probe molecules at their strongest "finger-print" transition frequencies. We further enhance sensitivity by employing a patented multi-pass broad-band absorption cell that provides long optical path lengths. Direct absorption spectroscopy allows for fast (<1 sec) absolute trace gas concentrations without need for elaborate calibration procedures. Moreover, TILDAS instruments are relatively free of measurement interference from other molecular species, enabling extremely specific detection.



APPLICATIONS

- Clumped methane thermometry.
- Methane source attribution.
- Non-equilibrium clumped isotope signatures in microbial methane.

AERODYNE CLUMPED CH_4 ISOTOPE ADVANTAGES

- Measurement precision comparable to much larger and more expensive IRMS instruments.
- Powerful TDLWintel software provides flexible instrument control, and real-time data analysis.
- Valve control capable of complex scheduling and automatic background and calibrations.
- Optional automated sample handling systems.
- Turn-key design allows unattended operation.

Clumped Isotope Monitor for CH_4 Gas Samples

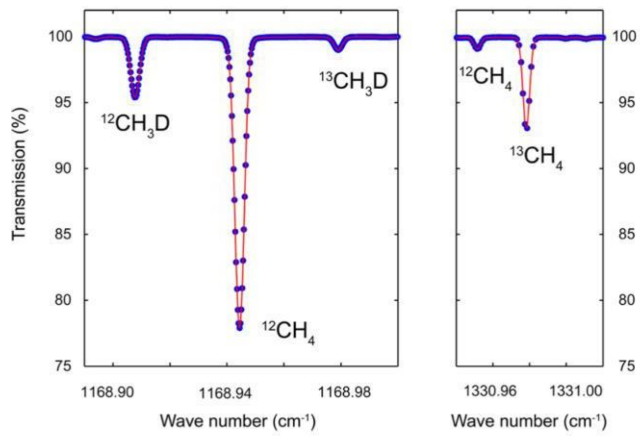
SPECIFICATIONS

Discrete Sample Specifications for CH_4 Clumped Isotope Monitor

	CH_4	$\delta\,^{13}CH_3D$
One sample: 22 μ-moles CH_4 6 min measurement cycle	Pure 0.53 ml STP	0.6 ‰
10 Samples: 220 μ-moles CH_4 60 min measurement cycle	Pure 5.3 ml STP	0.2 ‰

Note: These measurements are normalized to a working reference and the time to do so is included in the quoted measurement time. The working reference has a mixing ratio, pressure and matrix composition similar to the sample.

Infrared Spectroscopy for Clumped Isotope Determination



Related Instruments

Dual laser isotope monitor for $\delta\,^{13}CH_4$ and $\delta\,^{12}CH_3D$ of CH_4

Dual laser isotope monitor for $\delta\,^{13}CH_4$ and $\delta\,^{12}CH_3D$, $\delta\,^{13}CH_3D$, $\delta\,^{12}CH_2D_2$ of CH_4

Data Outputs

RS-232, USB drive, ethernet

Size, Weight, Power

Dimensions: 560 mm x 770 mm x 640 mm (W x D x H)
Weight: 75 kg
Electrical Power: 250-500 W, 120/240 V,
50/60 Hz (without pump)

Installation

19” rack mountable or benchtop

Instrument Operations

Operating temperature: 10 to 35 ^{o}C

Instrument Components

Core instrument
Thermoelectric chiller
Keyboard, mouse, and monitor
Vacuum pump (customer specified)
Inlet sampling system (customizable)

Aerodyne specializes in collaboration and custom design. Please contact us if you would like to discuss additional measurement options and applications.

REFERENCES

Ono, S., Wang, D. T., Gruen, D. S., Sherwood Lollar, B., Zahniser, M. S., McManus, B. J., Nelson, D. D., Measurement of a Doubly Substituted Methane Isotopologue, 13CH3D, by Tunable Infrared Laser Direct Absorption Spectroscopy. Analytical Chemistry, 86(13), pp. 6487-6494, 2014.

Gonzalez, Y., Nelson, D. D., Shorter, J. H., McManus, J. B., Dyroff, C., Formolo, M., Wang, D. T., Western, C. M., Ono, S., Precise Measurements of 12CH2D2 by Tunable Infrared Laser Direct Absorption Spectroscopy. Analytical Chemistry, 91(23), pp. 14967-14974, 2019.