

APPLICATION NOTE

GASERA ONE FORMALDEHYDE for investigations about efficiency of purification techniques



“Direct measuring from the air and easy use make it a helpful tool for formaldehyde measurement, already at lowest concentrations”

- Frédéric Dapozze, IRCELYON



Application

Formaldehyde HCHO is a volatile organic compound classified as irritant, carcinogenic and genotoxic. Its presence in indoor air at increasing rates is one of the major current concerns in terms of public health. In order to be able to assess the efficiency of air purification solutions, standardization tests have been set up at European level, using various equipment ranging from bench-top reactors to 40 m³ rooms. In this context, the Lyon Institute for Researches on Catalysis and the Environment (IRCELYON, a joint CNRS and University Lyon 1 unit) has a 1 m³ enclosure to simulate small enclosed spaces. Dedicated analytical systems make it possible to simultaneously quantify various target VOCs such as formaldehyde, acetaldehyde, acetone, toluene, etc. with a detection limit of around 10 ppbv. IRCELYON's research mainly focuses on devices using catalytic and photocatalytic purification techniques. IRCELYON has tested the GASERA ONE FORMALDEHYDE for the precise and selective measurement of Formaldehyde.



Figure 1: Test Chamber at IRCELYON

Technology

The GASERA ONE FORMALDEHYDE monitor enables selective real-time measurements of formaldehyde. It is based on combining the ultra-sensitive cantilever enhanced photo-acoustic detection technology with a Quantum Cascade Laser source operating at a Mid-IR fundamental spectral absorption line for formaldehyde.

A major advantage of the photoacoustic effect is that sensitivity is not dependent on the absorption path length. This allows high sensitivity from a short absorption path length, and a highly linear response over a wide dynamic measurement range, all with very low sample volumes (typically only a few millilitres). The monitor provides enough sensitivity to reliably measure also ambient background levels of formaldehyde in real-time and does not require any consumables. It also gives an exceptionally high level of stability with a recommended re-calibration period of 12 months. Thus it offers a low total cost of ownership.

Measurements

IRCELYON's test chamber is made of PMMA. It has injection ports (dry air, wet air, gas VOC, septum for liquid VOC) on the left, the measurement (GC, pumps, sample cartridges) and drain ports on the right, and ports annex (T, P, recirculation) above. There are 2 cable glands, one of which is connected to a controllable internal fan to homogenize the atmosphere in the room. GASERA ONE FORMALDEHYDE sample line can easily be connected (tube size 6 mm outer diameter).

Graph in figure 2 shows linearity check with IRCELYON's Gas Chromatography.

Besides the good correlation at ppb levels, the graph shows good linearity over the complete linear measurement range, covering 5 orders of magnitude, starting at a detection limit of < 1 ppb and ending at 10 ppm or even a little higher.

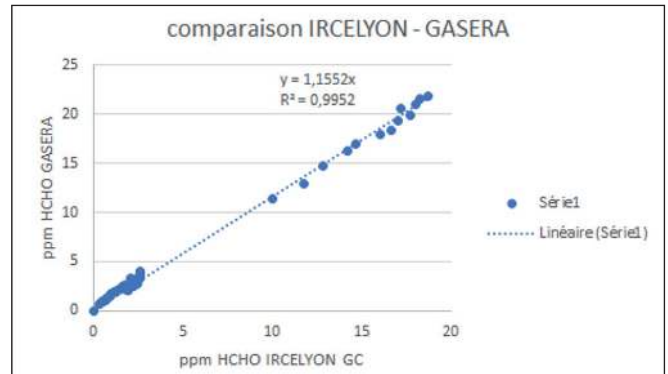


Figure 2: Linearity Check

Conclusions

The test measurements with the GASERA ONE FORMALDEHYDE at IRCELYON laboratory did show good results. The monitor is sensitive, linear and it has a quite fast response time for formaldehyde concentration measurements over a wide measurement range. Direct sampling, ease of operation with no need for consumables make it a reliable tool for real time formaldehyde measurements.

GASERA ONE FORMALDEHYDE

- High sensitivity enabling the measurement of very low formaldehyde concentrations, LoD < 1 ppb @ 60 s
- Dynamic range: Over 5 orders of magnitude (i.e. 100 000 times the detection limit)
- Precision/Repeatability: Less than 1 % of measured value in operational conditions at the calibration concentration
- Ease of use
- No consumables, long time between calibrations
- Temperature and pressure stability: changes in ambient temperature or pressure will not cause drift