

Atmos'Fair 2020

Measurement of Aldehydes such as
Formaldehyde in ambient air using airmoHCHO
analyzer

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Expertise

- Auto GC analyzers for online monitoring
- Automatic data validation and calibration
- Sensitive solutions (ppt/ppb/ppm)
- Compounds speciation
- Turnkey solutions (cylinders free)



Specific design

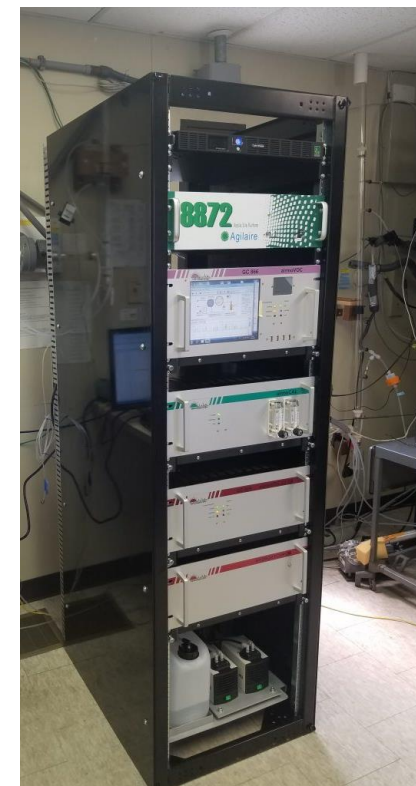
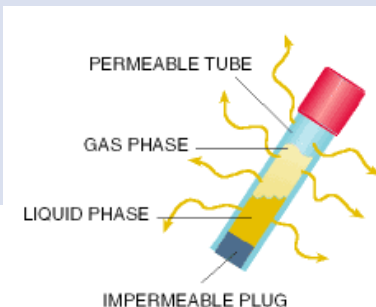
- Capabilities to design specific solution for specific application
- Expertise in VOCs (more than **120 VOCs @ppt in 30mins**, Sulfur compounds (H₂S, Mercaptans and more than **14 sulfurs @ppb levels**), Odors & NH₃

Provider of all-in-one analytical solutions

More than 40 years in autoGC

Your expertise with Chromatotec product line

- Turnkey solutions including
 - autoGC
 - Multiplexers
 - calibration system
 - gas generators
 - Specific enclosure to provide solutions for safe or hazardous areas
 - Data management – Web / Cloud / Dispersion / Modbus / PLC
- Design of solutions : GC PID, GC FID, GC TCD, GC MS, GC FPD, GC ED (SSWCD), GPC, HPLC and more) according market's needs.
 - Tracking ppt/ppb to % concentration levels in air or process
 - More sensitive than human nose on odorants offering odor correlation capabilities



*Example of USEPA
config for PAMS 56
monitoring*

Certification and recognition

Worldwide recognition with certifications relating to the relevant standards :



1996



2006



2009



2009



2010-C123

2010



2012



2013



2014

- US EPA validate Chromatotec solutions since 2009 and select our autoGC for online monitoring of VOCs in ambient air
 - The only **rack mounted** system **selected by US EPA**

- European MCERTS certification with full compliance to **EN 14662-3: 2015** for online monitoring of benzene and 12 other VOCs

- ATEX certification



VOCs and S VOCs

CH4 & THC	BTEX	88 VOCs	+120 VOCs	Terpenes	vPAHs	HCHO
<ul style="list-style-type: none">• Chroma THC(GC FID)	<ul style="list-style-type: none">• airToxicBTEX (GC PID)• airmoBTEX (GC FID)	<ul style="list-style-type: none">• airmOzone• 2 GC FID<ul style="list-style-type: none">• PAMS• TO14	<ul style="list-style-type: none">• airmoScan Xpert• GC FID MS<ul style="list-style-type: none">• PAMS / TO14• TO15	<ul style="list-style-type: none">• airmoVOC• FID	<ul style="list-style-type: none">• airmo VOC C6C20+ (GC FID) and GCMS	<ul style="list-style-type: none">• airmoHCHO (GC FID)

Sulfurs

H₂S, RSHs, DMS, DMDS, SO₂, CS₂, COS

- GC FPD for non hazardous areas @ ppb
- GC ED if no COS/CS₂

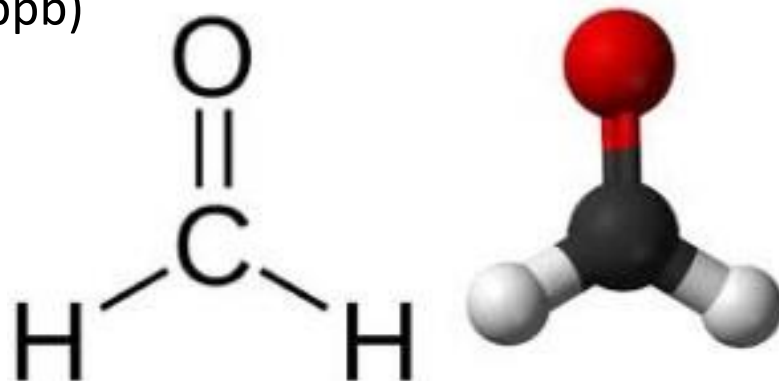
Odorants

Odor solutions

- H₂S, RSHs, DMS, DMDS, SO₂ (16 sulfurs) with tVOCs for safe or hazardous areas
- NH₃ with FTUV
- Total or individual VOCs

Why analyzing formaldehyde ?

- Formaldehyde is present in :
 - Chemical, pharmaceutical, funeral industries
 - Paper plants
 - Indoor air (paintings, coatings)
- Formaldehyde effects :
 - Irritating, breathing issues (<500 ppb)
 - Carcinogenic (>500 ppb)
 - Risk of death (> 20 ppm)



How to measure formaldehyde ?

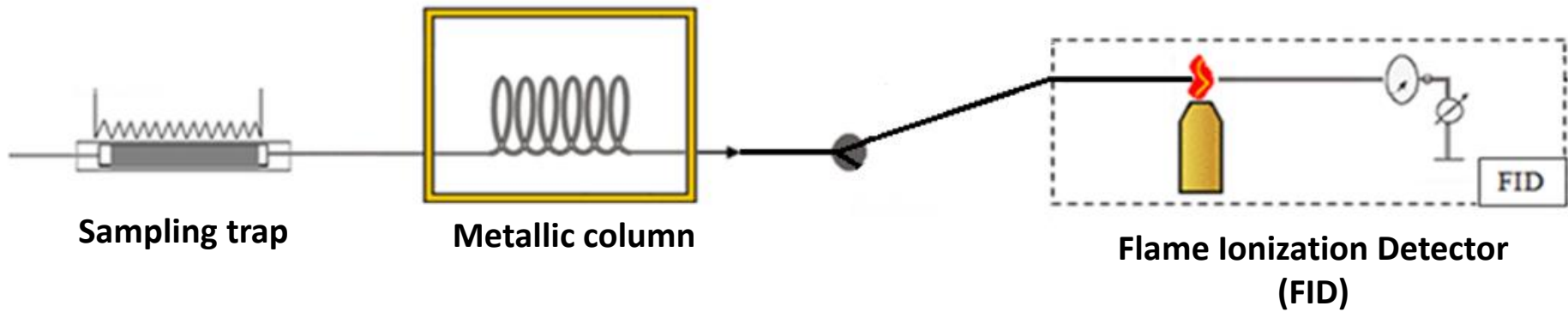
- Derivatization methods are state-of-the-art for the indoor analysis of formaldehyde, with the most important being DNPH
- Analytical system
 - DNPH preconcentration tube
 - HPLC
 - UV detection
- Advantages
 - Very low concentrations down to 1 ppt
- Disadvantages
 - All three have the drawback of long sampling times, typically 0.5-2 h
 - Costly to perform continuous measurement



How to measure formaldehyde ?

- On-line and continuous gas chromatograph for the monitoring of formaldehyde in ambient air
- Analytical system
 - Pre-concentration tube / thermodesorption
 - FID detector
 - Methanizer
- Need for continuous measurement of formaldehyde
 - Cylinder free for operation and for calibration
 - Sub ppb level monitoring
 - Cycle time 30 minutes or less
 - No need to send samples to the laboratory
 - Cost effective
 - Interference free

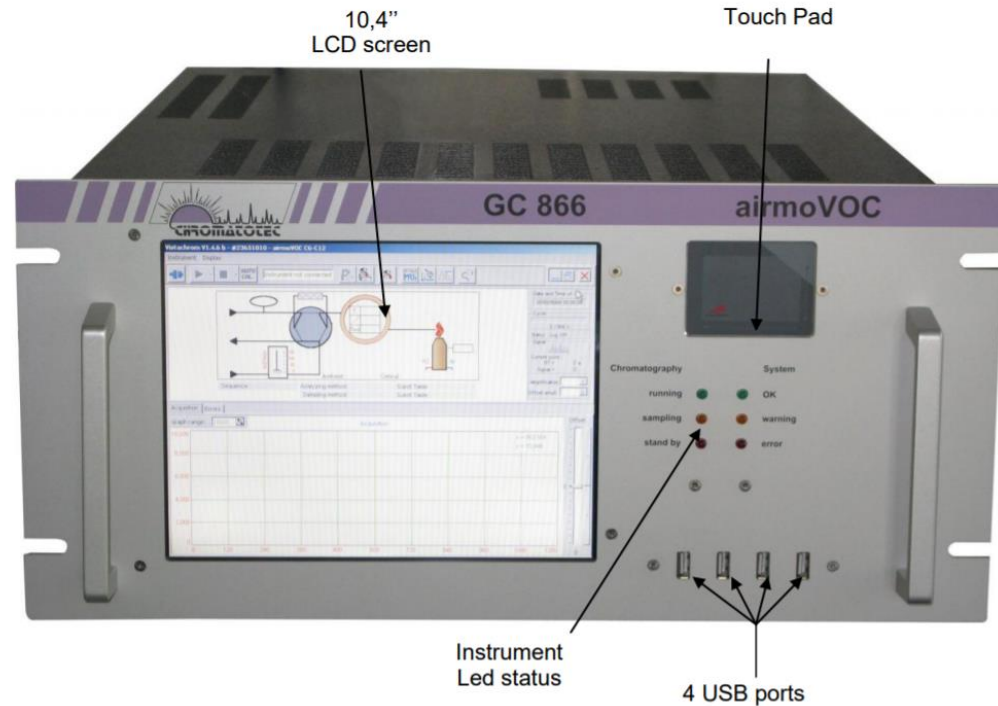
Measurement principle : GC FID



- Separative method
- Identification with retention time
- Linearity for every concentrations range

airmoHCHO external overview

- Auto GC-FID
- Embedded computer
- Integrated software
- Air, N₂, H₂ generators can be integrated or build in seperated racks
- Cabinet version
- Internal calibration with permeation tubes



airmoHCHO internal overview

Pressure regulator for permeation
flow adjustment

Pressure regulator for carrier
gas flow on the column

Permeation oven

Oven with programable
temperature and metallic
column inside

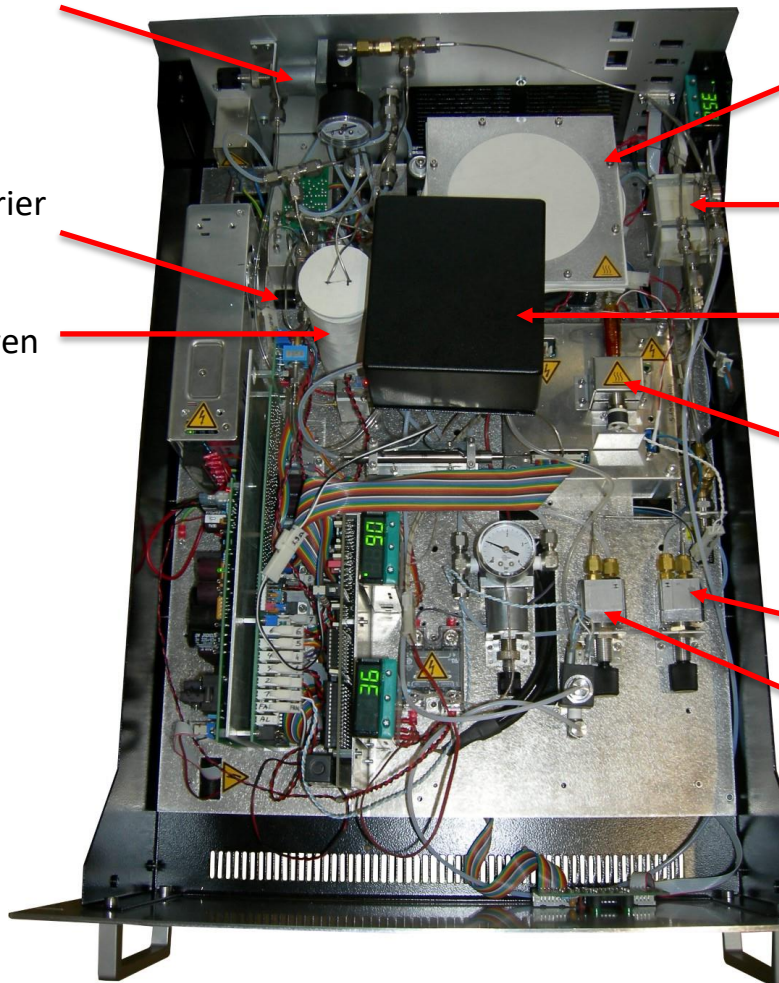
Methanizer

Injection valve 6-ports with
sampling trap and pre-column

FID Detector

H₂ flow regulator for flame

Air flow regulator for flame

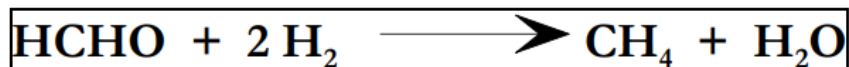


Measurement principle : analysis cycle

- Sampling step :
 - Pre-concentration of VOCs in the specific formaldehyde trap
 - Performed at the end of analysis cycle to reduce cycle time
- Analysis step :
 - Injection of trapped VOCs in the column by thermo desorption
 - Separation in analytical column
 - Methanization of VOCs
 - Detection by Flame Ionization Detector

- Principle

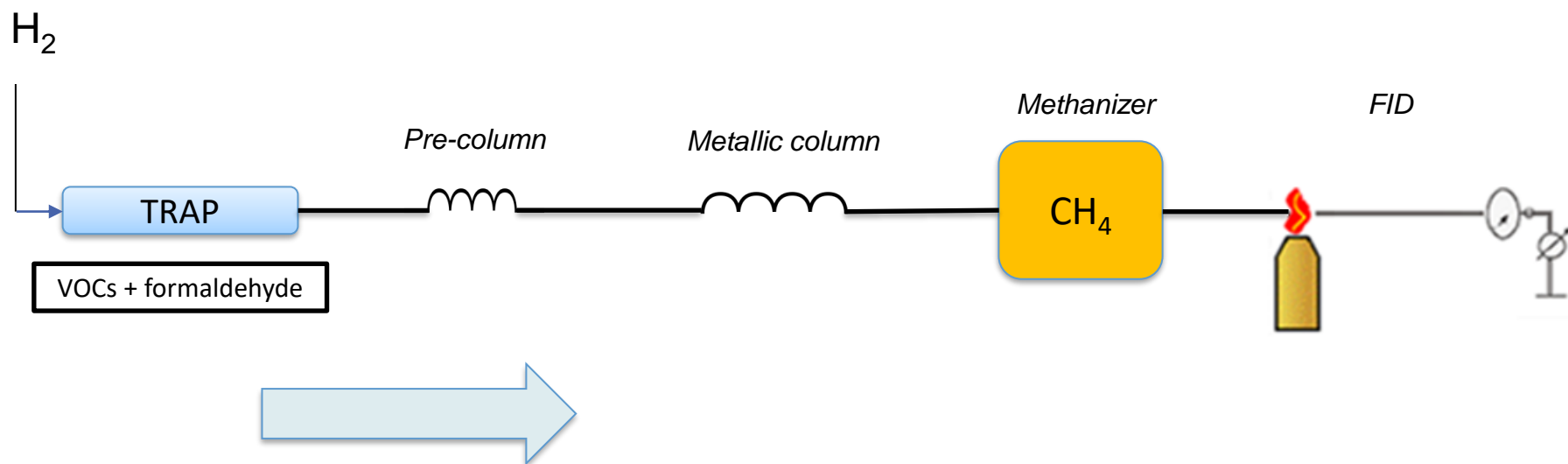
- Transform aldehyde compounds such as formaldehyde to methane
- Using methanizer manufactured at chromatotec



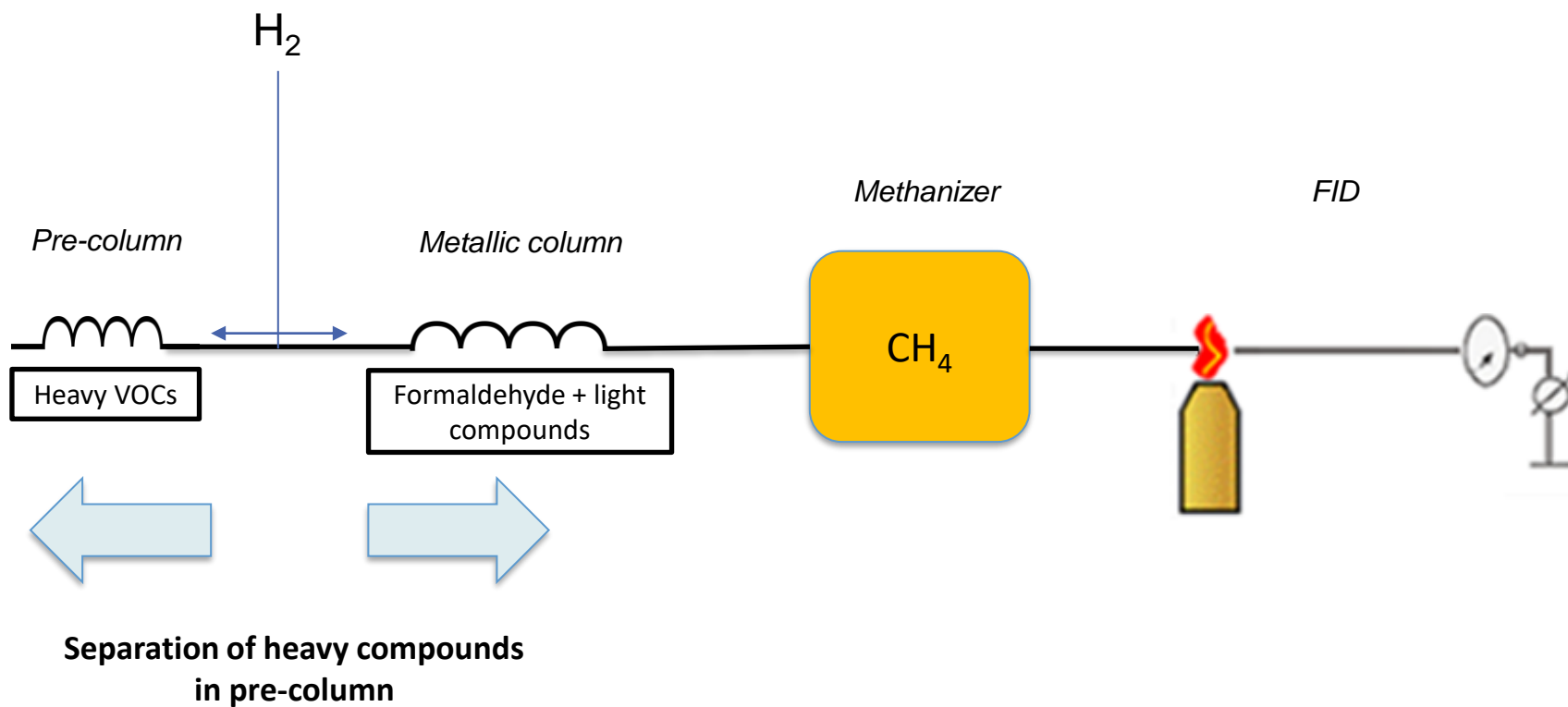
- Advantages

- HCHO has a bad response with FID Detector
- CH₄ is well detected by FID

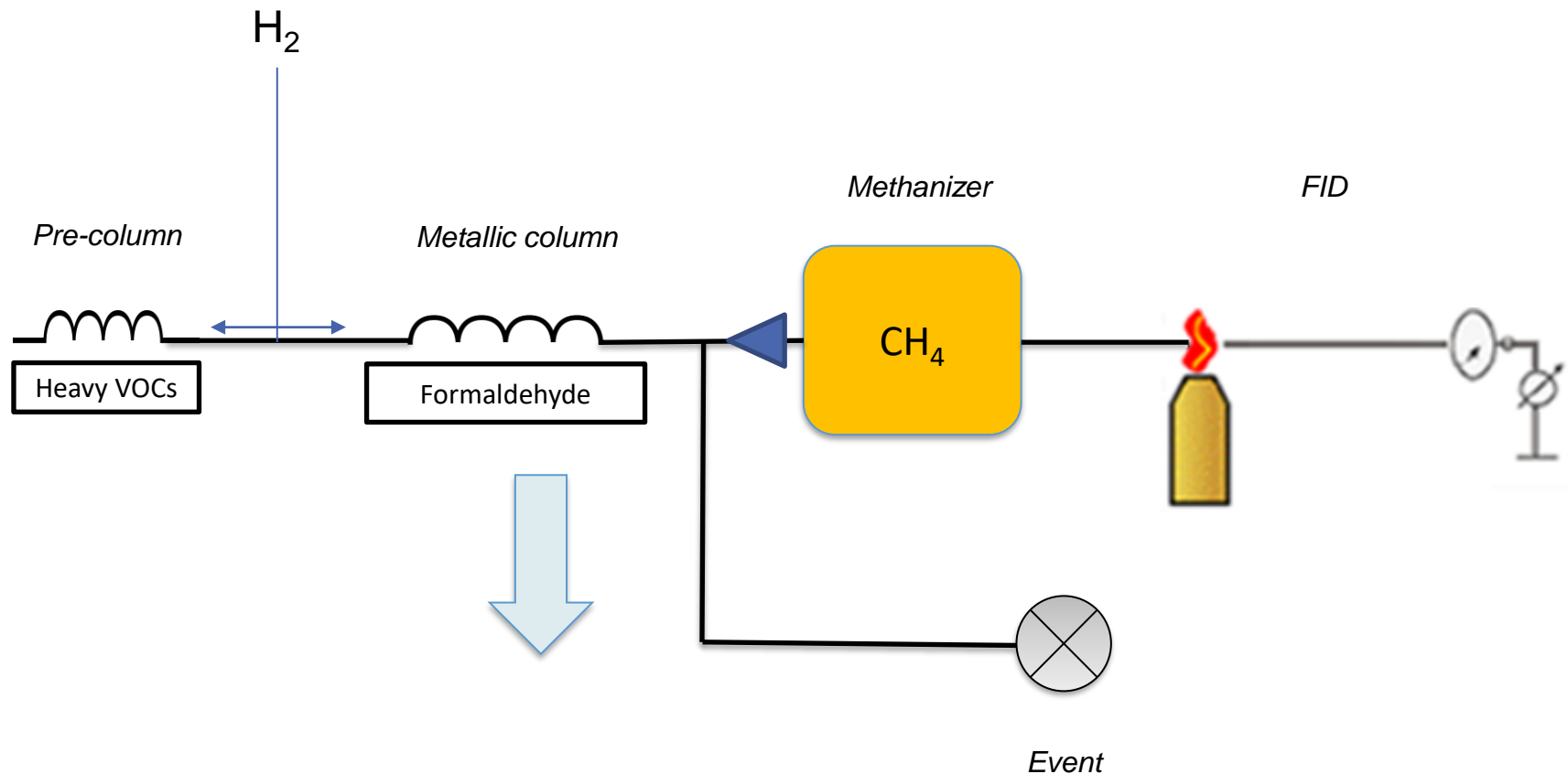
Step 1 : Thermo-desorption



Step 2 : First separation

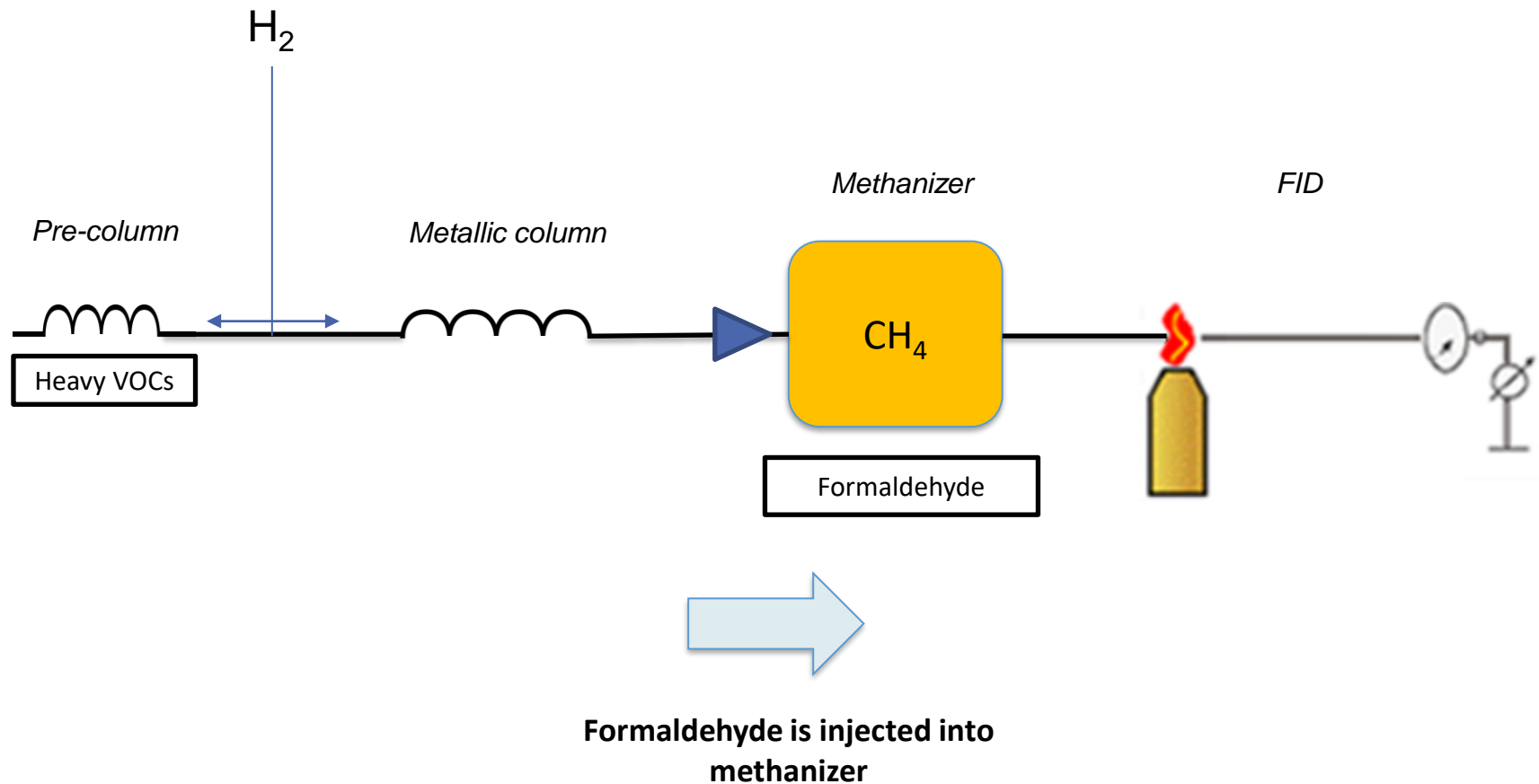


Step 3 : Separation of light compounds

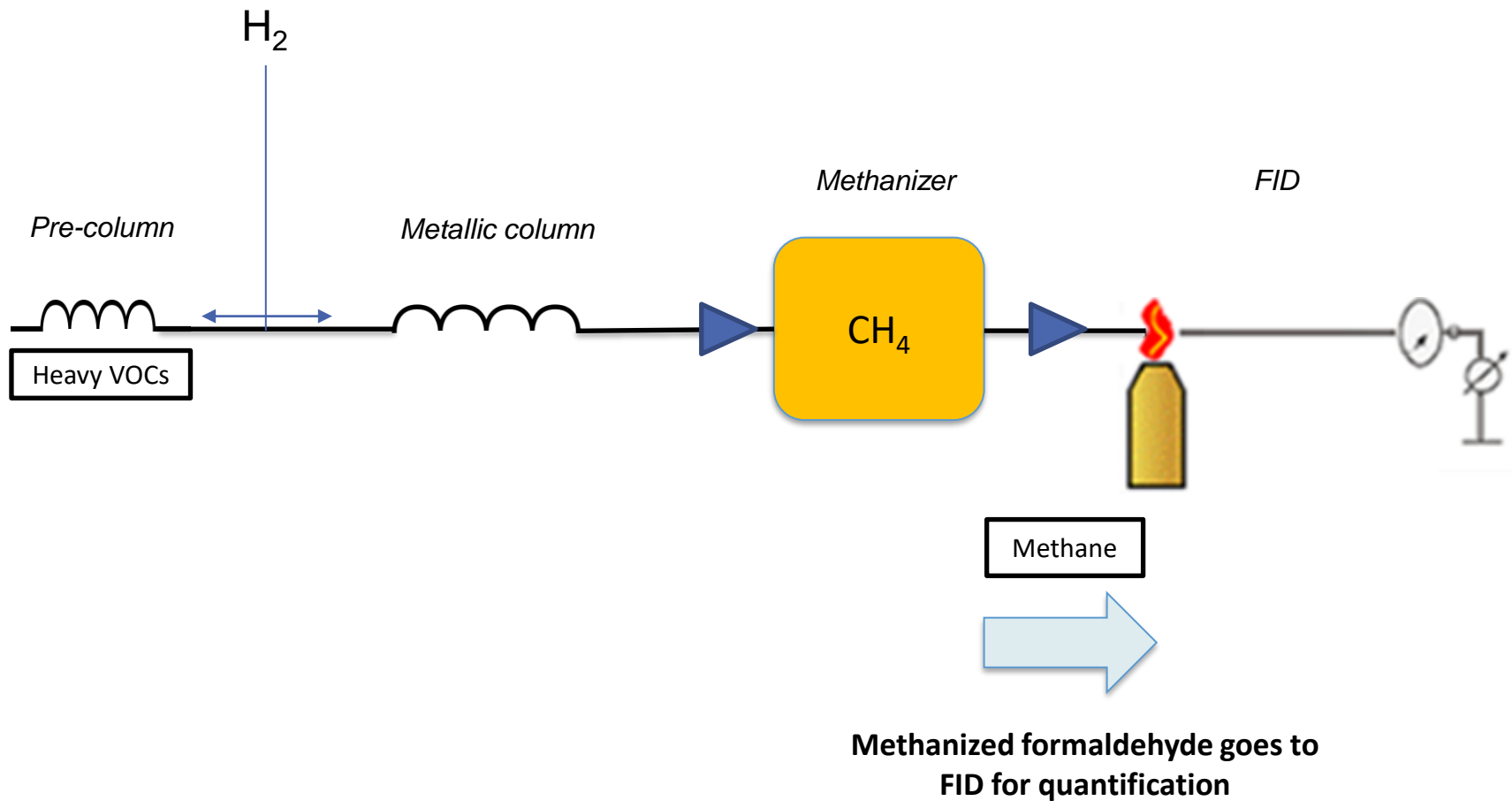


Methanizer is closed when O_2 and CO_2 elute from the column

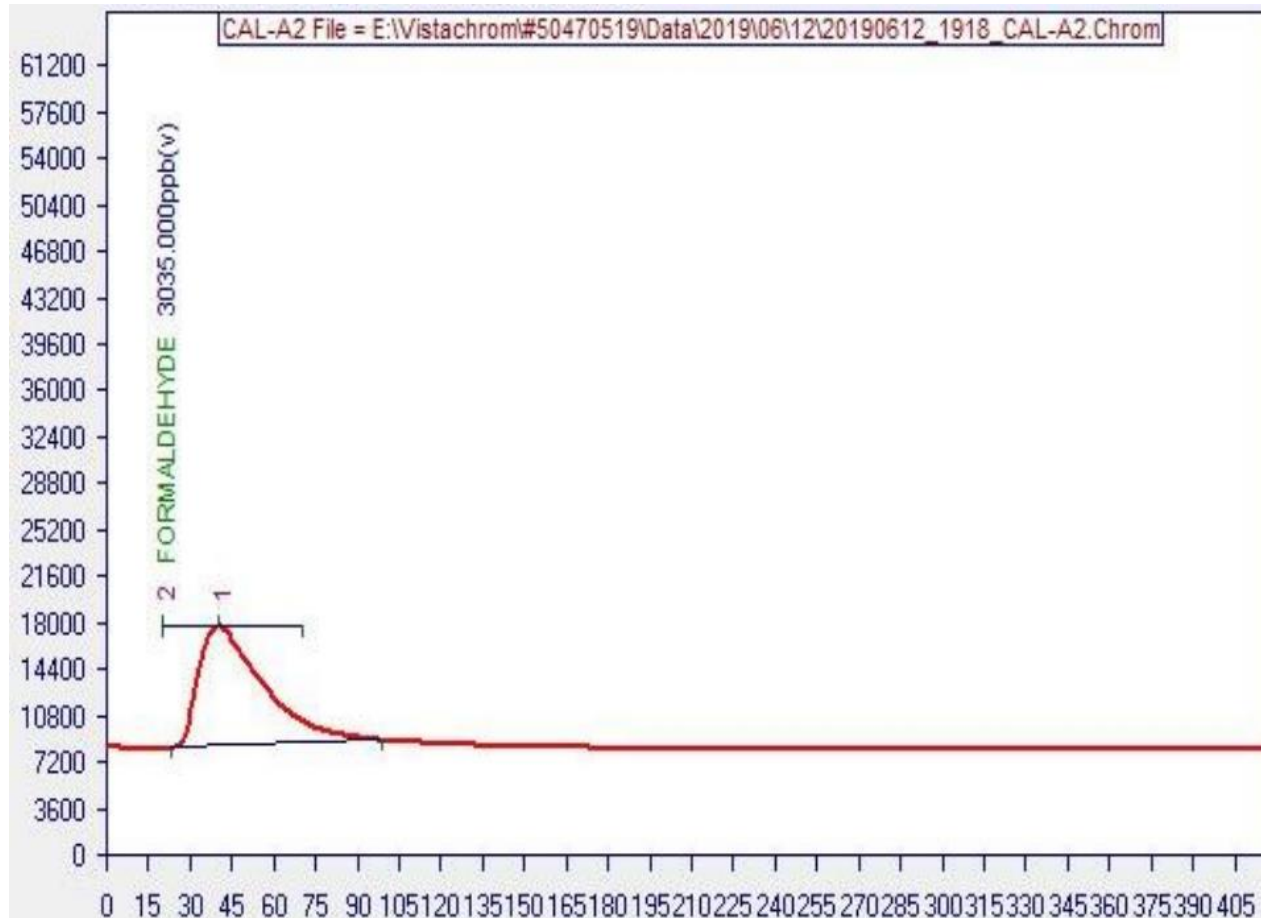
Step 4 : Methanization of formaldehyde



Step 5 : Detection of formaldehyde

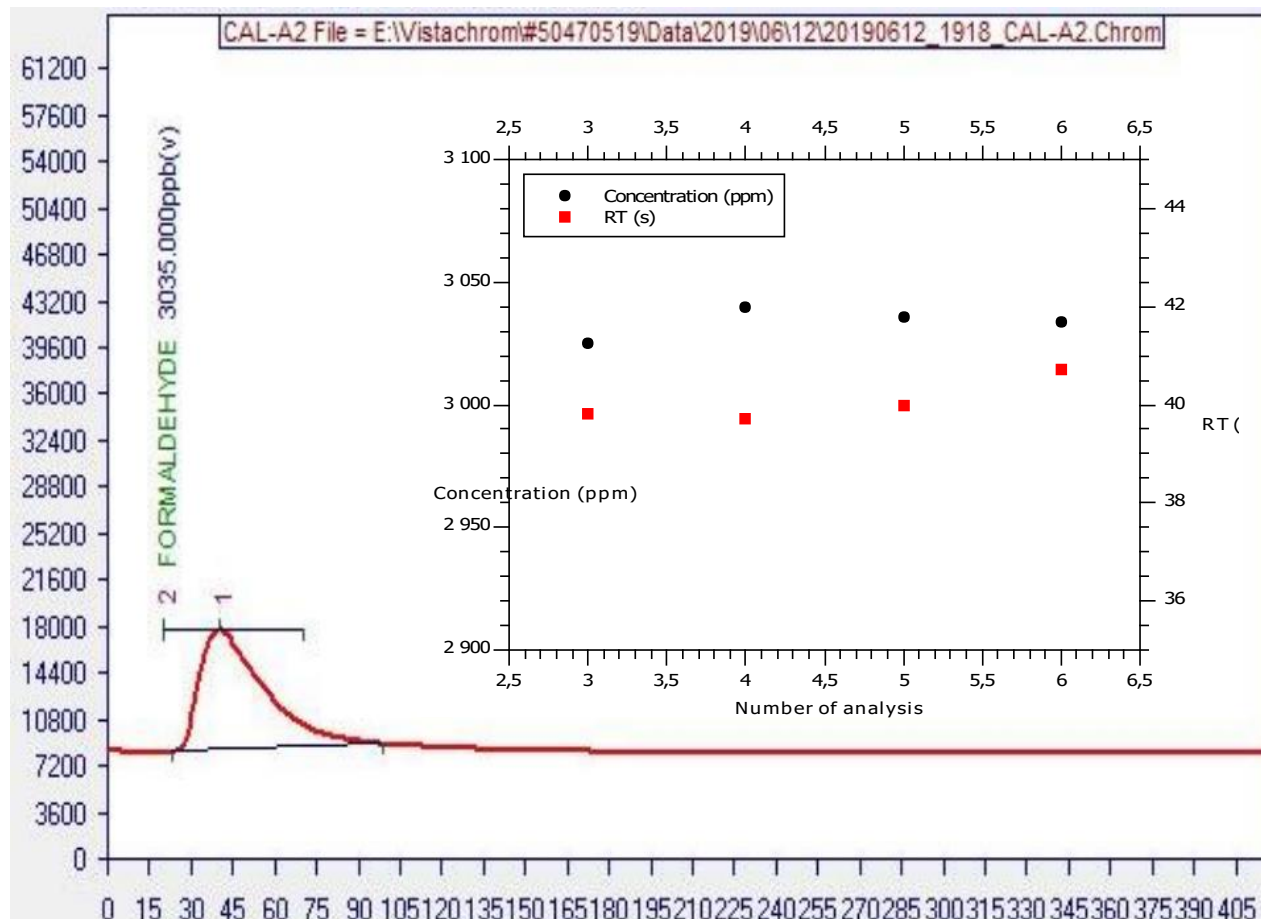


Results for permeation tube analysis



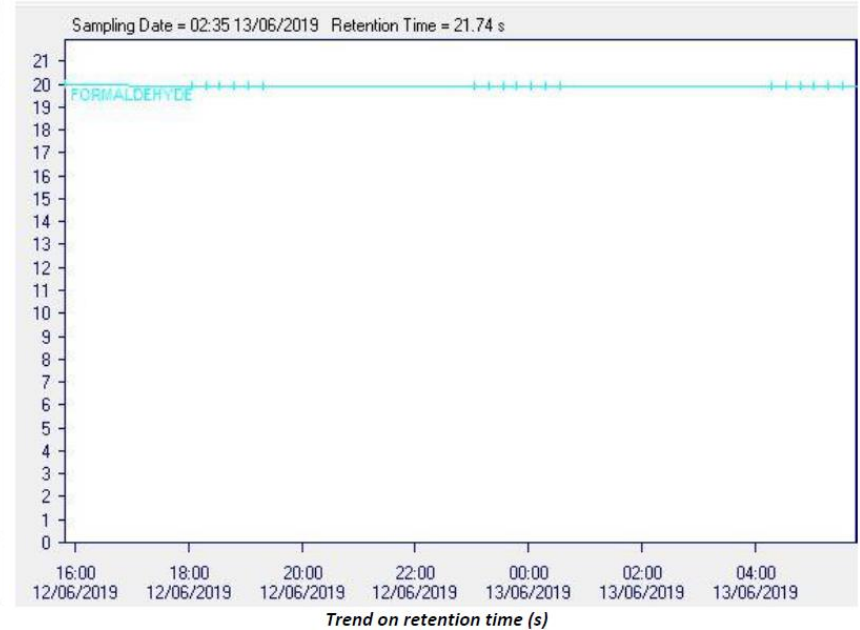
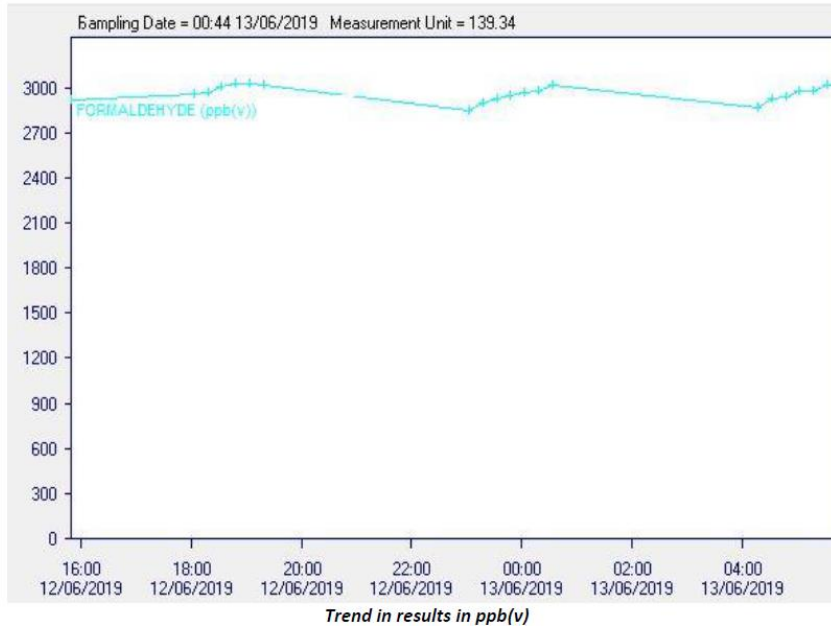
- Configuration permeation tube :
 - [HCHO] = 3028 ppb
 - Gas Temperature : 90° C
 - Gas flow : 83.3 ml/min
 - Sampling time : 300s
 - Acquisition time : 420s
- Results :
 - [HCHO] = 3035 ppb
 - Theoretical deviation : 0,2%

Results for permeation tube analysis



mean Concentration (ppm)	3033.8	40.1
STDEVA (%)	6.3	0.5

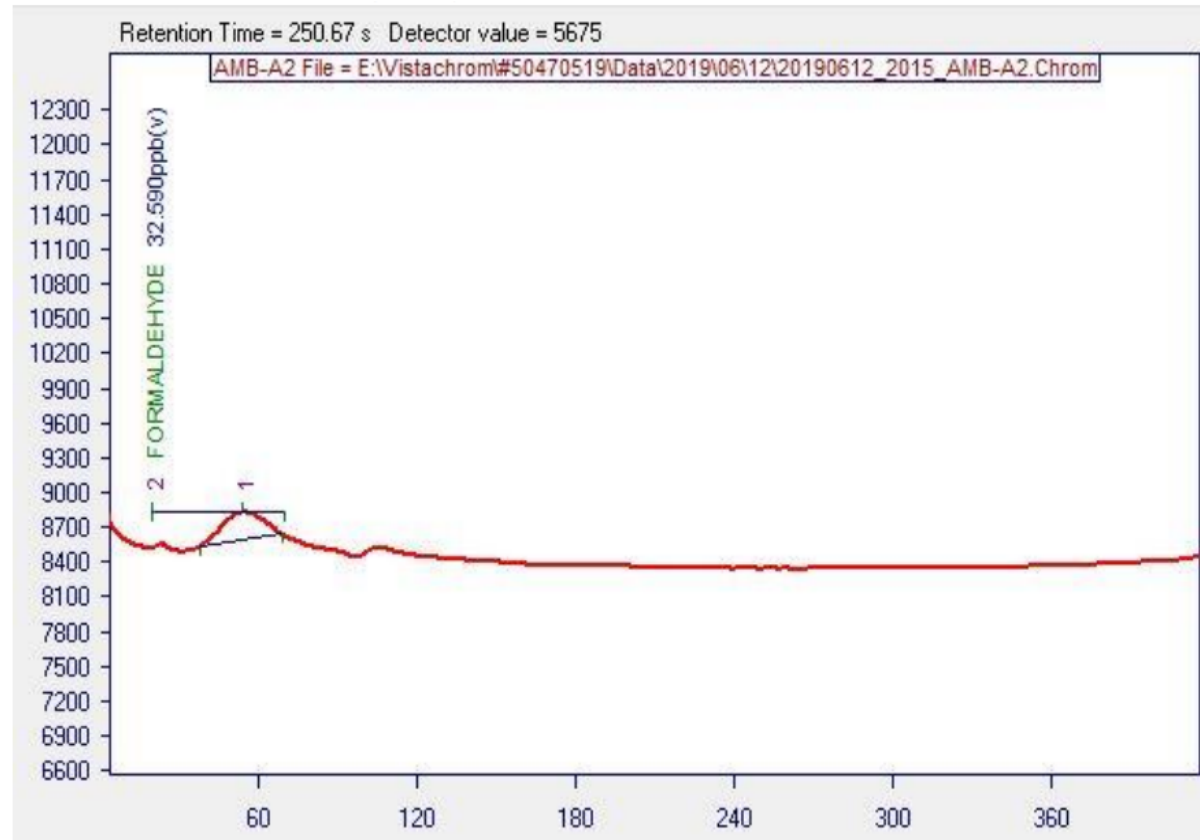
Results for permeation tube analysis



Stability for 48h of analysis – permeation tubes are certified for 6 months

Ambient air analysis

- Cycle time : 30 min
- Concentration : 32.6 ppb
- Limit of Detection : 3.8 ppb



Advantage of this solution

- Short cycle time (15 min) compared to ISO 16000-3:2011
- Automatic solution
- No interferent with PAMS and TO15 molecules
- Visualization of data

Conclusion

- Crucial need to monitor formaldehyde
- Using GC-FID for online measurement
- airmoHCHO is a fully autonomous system
- Possibility to measure acetaldehyde and methanol



Thank you for your attention

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