

Case Study

Ambient Air Monitoring Applications

Analysis of VOC compounds in water by Purge & Trap or dynamic headspace

Context & Challenges

Volatile organic compounds (VOC) can be dissolved in water. Sometimes water is polluted and to study contamination of VOC in finished drinking water, VOC must be measured.

Chromatotec® Solutions

Chromatotec® has developed a specific system for the measurement of VOC in water: a Purge & Trap system, the airmoPURGE. The analyzer is coupled with a degassing system allowing the extraction of dissolved gases.

The complete system is based on:

- 502.2 method from US EPA – “Volatile organic compounds in water by purge and trap capillary column gas chromatography with photoionization and electrolytic conductivity detectors in series – Revision 2.1”.
- 524.2 method from US EPA – “Measurement of purgeable organic compounds in water by capillary column gas chromatography/mass spectrometry – Revision 4.0”.

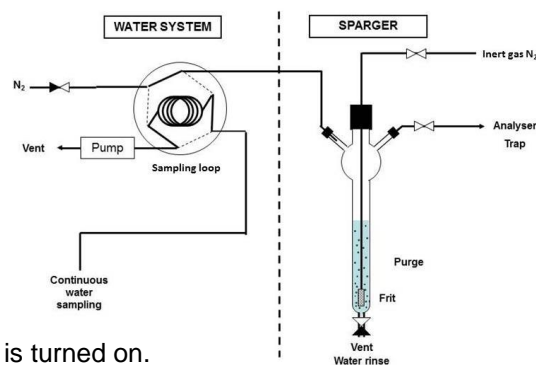
Technical information and results

A degassing system using an inert gas, nitrogen, was used to extract VOC from water. A constant volume of water is injected into the system. Then, the extracted gases will go to the analyzer to be evaluated.

Degasing system: Purge composition

The system is designed to extract VOC dissolved in water. The different parts of the degasing system are:

- A sparger to extract VOC from water
- A pressure regulator to adjust the N₂ inlet pressure (extraction with 40 ml/min)
- A 5 ml sampling loop
- A peristaltic pump to fill up the loop
- An injection valve to inject water inside the sparger
- Solenoid valves
- A pinch valve to evacuate water after extraction
- Ultra-High Purity (UHP) Nitrogen generator (Nitroxychrom)



The consumption of water is around 25 ml/min when the peristaltic pump is turned on.

Application and Results

This analyzer is used to continuously monitor VOC components in water.

Sample conditions: The sample could be:

- Environment: raw source water, river water, seawater, rain water
- Drinking water: treated drinking water, bottled water

The water sample must be filtered before being injected into the airmoPURGE system. A sample preparation system needs to be added for non-filtered water.

The measurement range – 0.02-200 µg/l – could be adapted thanks to the size of the sampling loop and the change of the amplification level.

Application: Cycle duration: 40 minutes in standard

Purge support: “Purge”

- Extraction of VOC from water with ultra-high purity Nitrogen (Nitroxychrom)
- Sample: VOC in water (502.2 standard)
- Water sample volume: 5 ml in standard
- Sampling duration: 11 minutes

airmoVOC C6-C12: “Trap”

- Carrier gas: ultra-high purity Hydrogen (Hydroxychrom)
- Detector: Flame ionization detector (FID)
- Trap: 3 phases
- Acquisition duration: 1420 seconds
- The Limit of Quantification (LOQ) for this system is around 10 ng/l of benzene in water.
- This analyzer has successfully passed MCERTS certification for EN 14662-3 for Benzene measurement

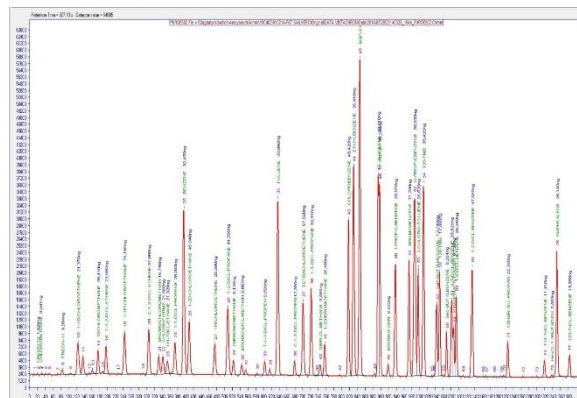
Conclusion:

Chromatotec® has developed a specific system for the measurement of dissolved VOC in water.

The Purge option can be coupled as well to our different analyzer ranges using different kind of detectors (TCD, PID, ELCD, MS...). The complete analytical system obtained will be the perfect tool for water characterization. If required, purge system can be replaced by dynamic headspace technology.

To analyze dissolved gases in water, this analytical solution can be coupled with our specific analyzer: chromaTCD with a loop injection for analysis of ppb level of oxygen in water.

Hydrogen sulfide H₂S and ammonia NH₃ can also be analyzed after “stripping” (extraction method).



A group for tri-halogen compounds is created: chloroform, bromoform, bromodichloromethane, dibromochloromethane

We have studied the retention time stability. The relative standard deviation on retention time over the selected period is below 0.5%.

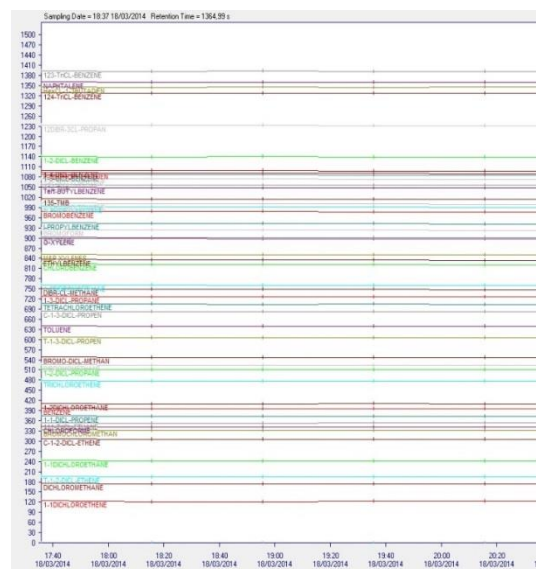


Fig 4: retention time stability on water samples