GL Sciences

Application note : 124

Volatile Organic Compounds (VOC's) in Drinking Water

Key words: VOC's, CryoFocus, Water analysis, Headspace, Cryogenic trap, Vinyl Chloride, EPA624, Dichlorodifluoromethane

Introduction

Combination of headspace sample introduction and gas chromatography/mass spectrometry (HS/GC/MS) with cryogenic focusing provides an analyst with a powerful, fully automated technique for determination of trace volatile organic compounds (VOC's) in water.

In this application, we would like to show the advantages of the use of a cryogenic trap for this type of applications, especially for Dichlorodifluoromethane and Vinyl Chloride dissolved in water.

Analytical conditions:

Model GC:	GCMS-CP2010, Shimadzu Corp.
Detector:	Mass Spectrometer QP2010, Shimadzu corp.
Autosampler:	PAL3-RTC with Headspace option, CTC Analytics AG
Trapping:	CryoFocus-4 with LN_2 coolant, GL Sciences B.V.
Trapping Temperature:	-150°C (3 min)
Trap Heating Program:	50°C/sec up to 250°C
Column:	InertCap 624, 0.18 mm x 20 m, film thickness: 1 µm, GL Sciences B.V.
Column Temperature:	40°C(5 min) – 50°C/min – 120°C – 30°C/min – 170 °C – 60°C/min – 220°C
Injection mode:	Split, split ration 5:1
Injection volume:	1 mL
Column flow:	1 mL/min
Injection temperature:	250°C
Detector temperature:	200°C (ion chamber), 250°C (interface)

Results:

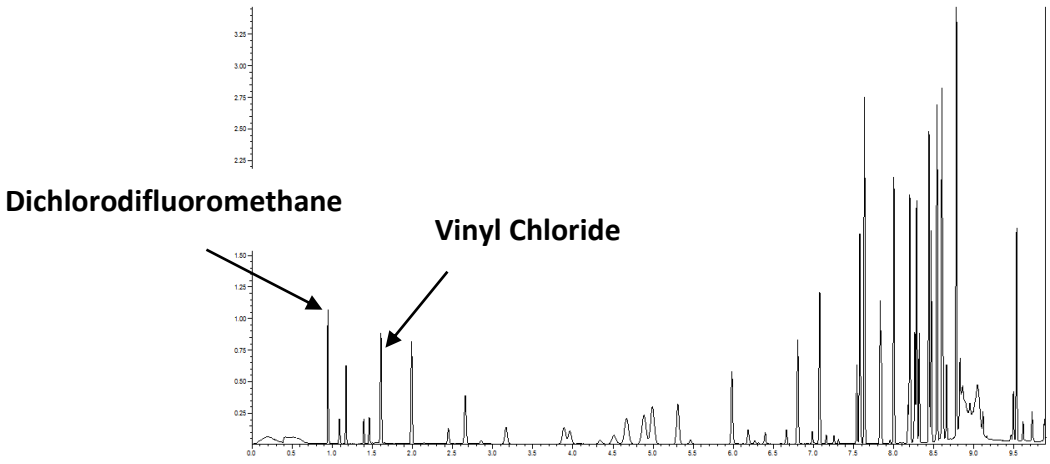

Figure 1. HS of VOC's in drinking water, 60 compounds in 10 min.

Dichlorodifluoromethane has a melting point of -131 °C. With the cryogenic trap, which can be cooled down to -150°C, it is easily trapped, separated and detected as a very sharp peak.

Peak Shape:

Graphs below illustrate the benefits of using a cryogenic trap for chromatographic separation of Vinyl Chloride (VC). Figure 2 shows that the trap lowest possible temperature is of significance. With the trap cooled down to -150 °C, the very narrow VC peak demonstrates an improved resolution and high sensitivity. If no trap is used, or when the trap temperature is limited (above -70 °C), the compound separation is problematic.

The trapping temperature in not the only factor influencing the GC separation. Figure 3 demonstrates the importance of the trap heating speed (temperature ramp rate). As it can be seen, the VC peak received at 50 °C/sec is very sharp, demonstrating higher much higher sensitivity compare to the measurements at lower ramp rates.

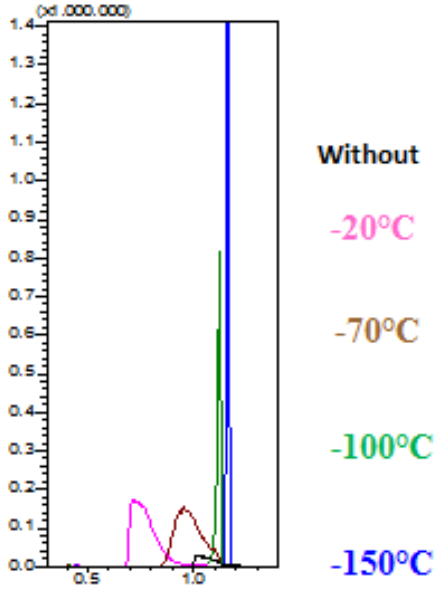

Figure 2. Influence of trapping temperature for Vinyl Chloride (M/Z = 62)

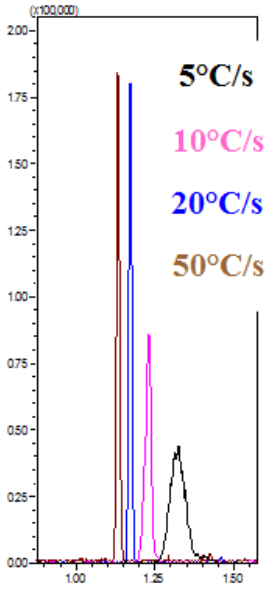

Figure 3. Influence of cryotrap heating ramp rate for Vinyl Chloride (M/Z = 62)

Conclusions:

The use of the cryogenic trap which is capable of cooling down to -150 °C and is able to rapidly released trapped compounds, brings significant improvement to detection limits (LOD). The demonstrated LOD for Vinyl Chloride (see Fig. 2) is approx. 500 times better than the stringent quality requirements for drinking water analysis in accordance with EPA624 and the German drinking water regulations.

Contact:

GL Sciences B.V.
+31 40 254 95 31
info@glsciences.eu
www.glsciences.eu