Ellutia
Chromatography Solutions

Limits of Detection for $CHCl_3$ and CCl_4 on an Ellutia GC200-ECD

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Detection Limits

Chlorination and chlorines are used to purify water. They are employed in low levels to greatly lower the risk of adverse health risks, however when chlorines react with organic compounds it can cause chloroform to form. Chloroform is a known cancer causing agent therefore monitoring the levels of chlorines in water is crucial.

The Ellutia 200 Series GC fitted with an ECD has been used to show the limits of detection regarding $CHCl_3$ and CCl_4.

Method

Standards of Carbon Tetrachloride and Trichloromethane (CCl_4 and $CHCl_3$) were made in varying concentrations in deionised water. These standards were analysed to ascertain the detection limits for these components on this particular Ellutia GC 200-ECD. Figure 1 shows the chromatogram of a 1 µl injection of a 1 $\mu g l^{-1}$ (1 ppb) standard mix of the two components.

GC Conditions	
Injector Temperature:	250°C
Liner Type:	Focus Liner with Wool
Carrier Gas Type:	Nitrogen
Carrier Gas Method:	Constant Pressure
Initial Pressure:	8.5 psi
Split Flow:	22 ml/min^{-1}
Injector Volume:	1 µm
Column Type:	EL-5
Column Lenght:	30m
Column Internal Diamter:	0.32mm
Column Film Thickness:	0.25 µm

Temperature Program	
Initial Temperature:	40°C (3.5 min hold time)
Temperature Ramp:	30°C min^{-1}
Final Column Temperature:	200°C (0 min hold time)
Detector Temp	300°C
ECD Current	10

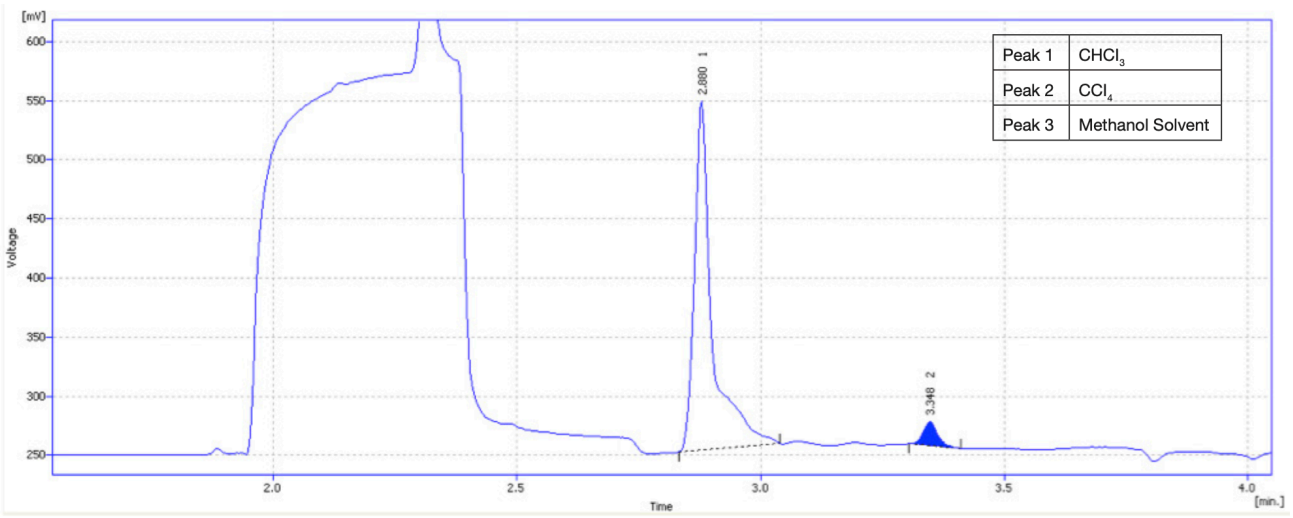

Figure 1 - 1 µl injection of 1 $\mu g l^{-1}$ $CHCl_3$ and CCl_4 mix standard, peak 1 - $CHCl_3$ and peak 2 - CCl_4. The un-labelled peak relates to the Methanol solvent.

Results

Even though peak 2 appears small, the noise level of the baseline was low at 1.0518 mV. Therefore, as the smallest peak obtained (relating to carbon tetrachloride) possessed a height of 22.67 mV showing potential detection limits well below 1 ppb (μgl^{-1}), under these chromatographic conditions.

Conclusion

These two components can be detected down to very low μgl^{-1} levels (potentially ngl^{-1} levels) on the Ellutia 200 Series GC, fitted with an ECD. Even though the separation takes place under the isothermal portion of the temperature programme, there were several residual artefacts within the standards not corresponding to either CCl_4 or $CHCl_3$, which needed to be cleaned from the column before a repeat analysis could be performed. The matrix components do not interfere or co-elute with the compounds of interest. If lower detection limits are required, changing the method from split to splitless and increasing the ECD current are two parameters that can be adjusted to achieve this.

Ordering Guide

Main Instruments	
Ellutia 200 Series Gas Chromatograph, ECD	(Part no. 20500330)
EL 5 30 m x 0.32 mm x 0.25 µm column	(Part no. 51100158)
Ellution Software - Single Instrument	(Part no. 23001001)
Liquid Autosampler	
Ellutia EL3100A Automatic Liquid Autosampler - 15 position	(Part no. 30500011)
Ellutia EL3000A Automatic Liquid Sampler - 121 position	(Part no. 30500010)
Ellutia EL3200A Automatic Liquid Sampler - 209 position	(Part no. 30500012)
Autosampler Control Software	(Part no. 23001012)
Accessories	
2ml Vials	(Part no. 20511101)
2ml Vial Screw Caps	(Part no. 20511107)
5 µl Liquid Syringe	(Part no. 20511202)

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To learn more about Ellutia's range of chromatography solutions, please visit:
www.ellutia.com

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