

# CHROMSHELL®



CHROMSHELL® extends the ARION® phases in the area of core-shell technology (SPP, Superficially-Porous Particles). These columns use an ultra high purity silica of 2.6 µm particles.

- Ultrapure silica with low metal content.
- Maximum pressure 600 bar.
- Temperature stability up to 90 °C.

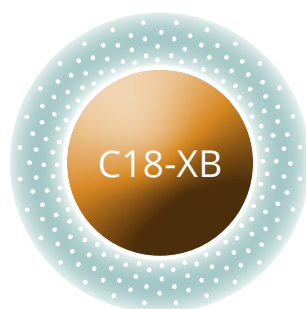
Metal content	<10 ppm
Temperature stability	100 °C
Mean Particle diameter	2.54 ± 0.18 µm
Proximity to the shape of a sphere	0.95 ± 0.04

CHROMSHELL® phases	Particle size (µm)	Pore size (Å)	Surface area (m <sup>2</sup> /g)	Carbon load	pH stability	100% aqueous mobile phase	Endcapping	USP code
C18 Plus	2.6	85	130	9 %	1.5 to 7.5	×	Single-step	L1
C18-XB	2.6	85	130	8 %	1.5 to 8.0	×	Single-step	L1
C18 Polar	2.6	85	130	6.5 %	1.5 to 7.0	✓	Mixed	L1



A C18 phase with a balanced retention profile with the highest hydrophobicity

<b>pH Range</b>	1.5 to 7.5
<b>USP Code</b>	L1



A hydrophobic C18 phase with a specific surface treatment for high temperature applications

<b>pH Range</b>	1.5 to 8.0
<b>USP Code</b>	L1



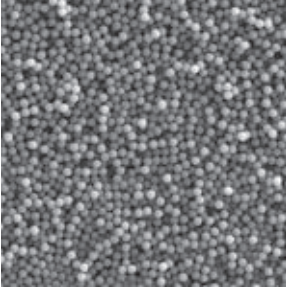
A polar end-capped developed for mid-polar and polar retention together with stability in the 100% aqueous mobile phase

<b>pH Range</b>	1.5 to 7.0
<b>USP Code</b>	L1

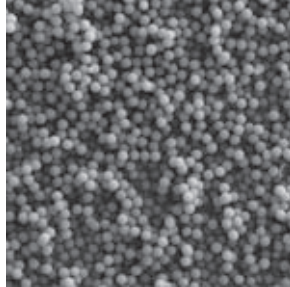
# CHROMSHELL®

## Up close

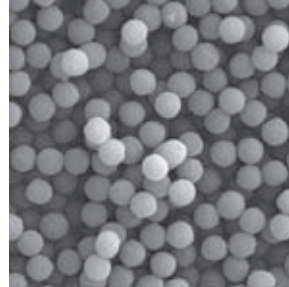
The 2.6-micron electron microscope field clearly shows the superlative quality of CHROMSHELL® particles.



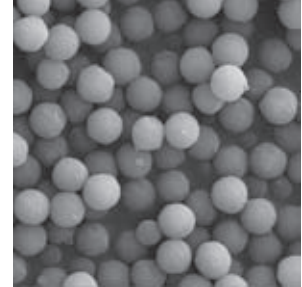
CHROMSHELL®  
(100 × 100 μm)



Competitor K  
(100 × 100 μm)



CHROMSHELL®  
(30 × 30 μm)

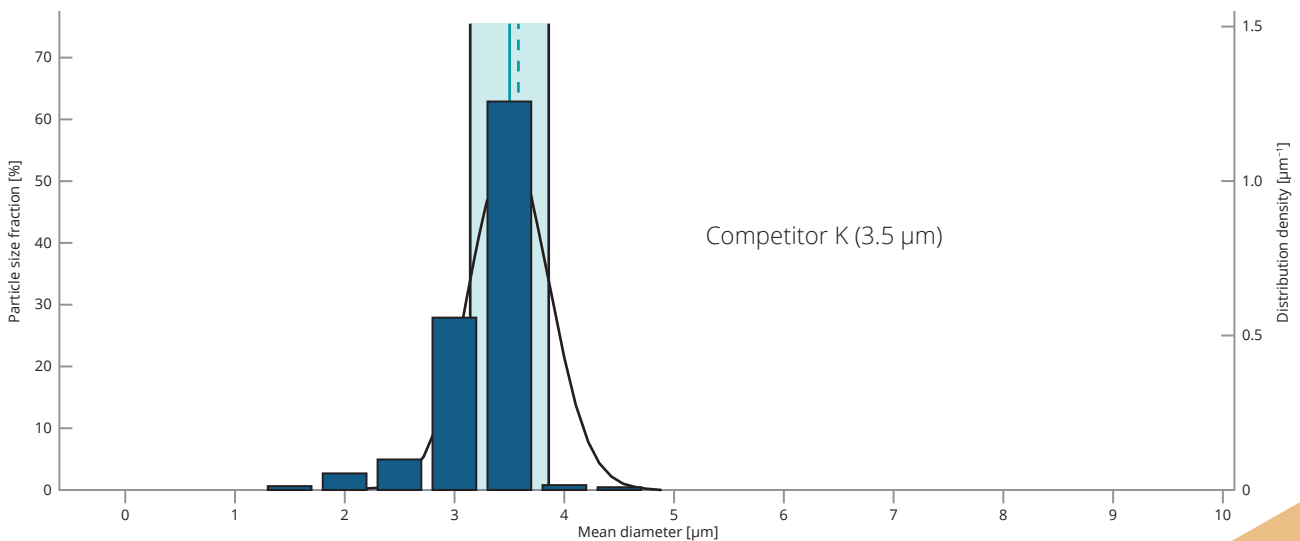
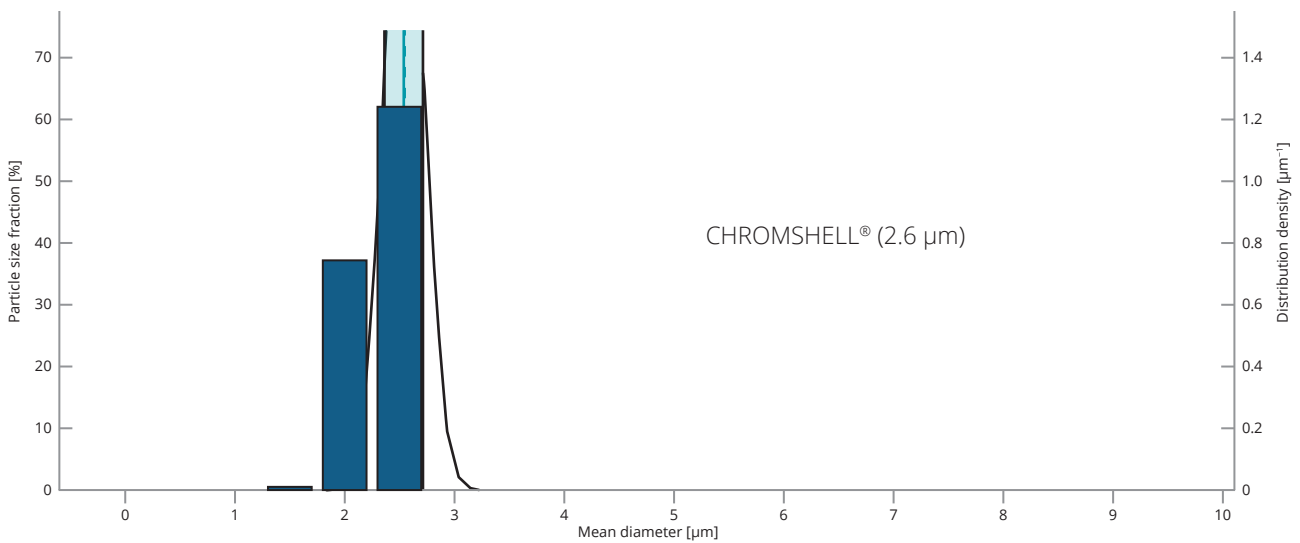


Competitor K  
(30 × 30 μm)

### The main particle characteristics:

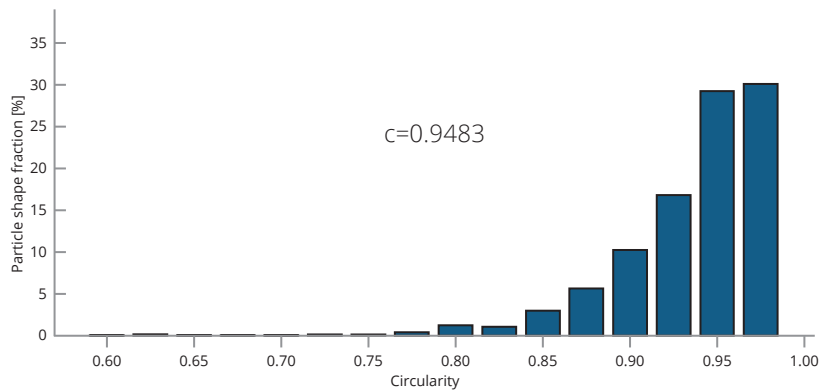
- High proximity to a sphere.
- Tight particle size distribution.
- No broken particles.
- No presence of clustered particles.
- Particle uniformity/homogeneity.

## Particle size distribution

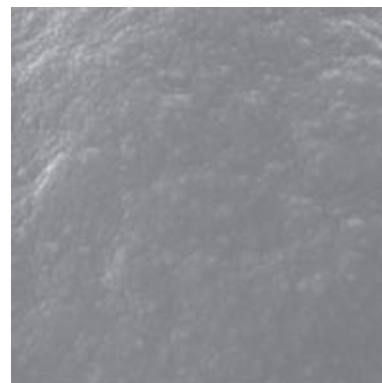


## Circularity & surface smoothness

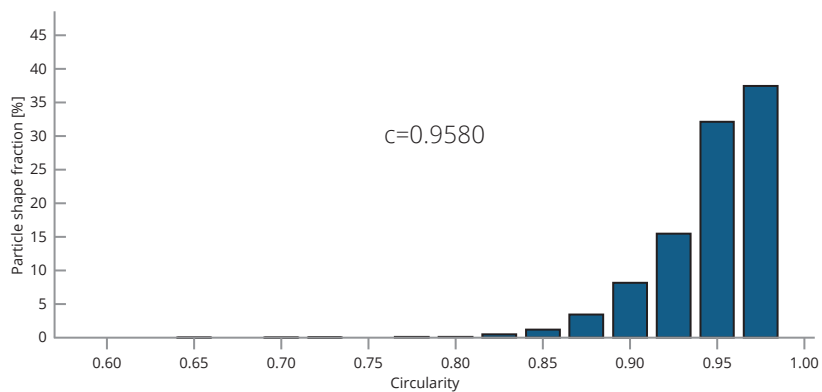
The core-shell particles were subjected to SEM analysis to determine circularity and surface smoothness.



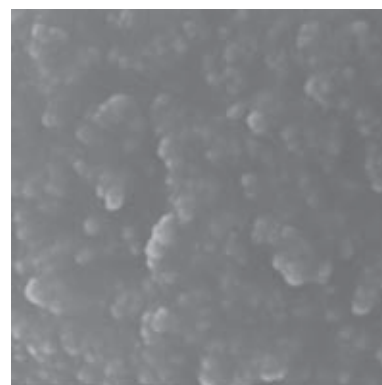
CHROMSHELL® (2.6 μm)



Detail view on pores



Competitor K (3.5 μm)






Detail view on pores up close

# CHROMSHELL®

## Ordering information




### 2.6 µm CHROMSHELL®

all dimensions in mm

Phase		30 × 2.1	50 × 2.1	75 × 2.1	100 × 2.1	150 × 2.1
C18 Plus		CSH-5722-GD21	CSH-5722-GG21	CSH-5722-GH21	CSH-5722-GI21	CSH-5722-GK21
C18-XB		CSH-5749-GD21	CSH-5749-GG21	CSH-5749-GH21	CSH-5749-GI21	CSH-5749-GK21
C18 Polar		CSH-5751-GD21	CSH-5751-GG21	CSH-5751-GH21	CSH-5751-GI21	CSH-5751-GK21




### 2.6 µm CHROMSHELL®

all dimensions in mm

Phase		30 × 3.0	50 × 3.0	75 × 3.0	100 × 3.0	150 × 3.0	250 × 3.0
C18 Plus		CSH-5722-GD30	CSH-5722-GG30	CSH-5722-GH30	CSH-5722-GI30	CSH-5722-GK30	-
C18-XB		CSH-5749-GD30	CSH-5749-GG30	CSH-5749-GH30	CSH-5749-GI30	CSH-5749-GK30	-
C18 Polar		CSH-5751-GD30	CSH-5751-GG30	CSH-5751-GH30	CSH-5751-GI30	CSH-5751-GK30	-

### 2.6 µm CHROMSHELL®

all dimensions in mm

Phase		50 × 4.6	75 × 4.6	100 × 4.6	150 × 4.6	250 × 4.6
C18 Plus		CSH-5722-GG46	CSH-5722-GH46	CSH-5722-GI46	CSH-5722-GK46	-
C18-XB		CSH-5749-GG46	CSH-5749-GH46	CSH-5749-GI46	CSH-5749-GK46	-
C18 Polar		CSH-5751-GG46	CSH-5751-GH46	CSH-5751-GI46	CSH-5751-GK46	-

### Chemicals of emerging concern (CECs) in river water

Chemical pollution causes enormous damage to the aquatic environment. The simultaneous determination of pollutants with different physico-chemical properties, such as pesticides, metabolites, personal care products, plastic-related chemicals, is always challenging. The application shows a sensitive LC/MS method for the fast determination of a diverse group of pollutants in river water.

<b>Substance</b>	<b>Deisopropylatrazine</b> , CAS number 1007-28-9
	<b>Hexazinon</b> , CAS number 51235-04-2
	<b>Simazine</b> , CAS number 122-34-9
	<b>Atrazine</b> , CAS number 1912-24-9
	<b>Terbuthylazine</b> , CAS number 5915-41-3
	<b>Terbutryn</b> , CAS number 886-50-0
	<b>Prometryn</b> , CAS number 7287-19-6
	<b>Metolachlor</b> , CAS number 51218-45-2
	<b>Metazachlor</b> , CAS number 67129-08-2
	<b>Diuron</b> , CAS number 330-54-1
	<b>Isoproturon</b> , CAS number 34123-59-6
	<b>Chlorotoluron</b> , CAS number 15545-48-9
	<b>Desethylterbuthylazine</b> , CAS number 30125-63-4
	<b>Acetochlor</b> , CAS number 34256-82-1
	<b>Tebuconazole</b> , CAS number 107534-96-3
	<b>Propiconazole</b> , CAS number 60207-90-1
	<b>Ametryn</b> , CAS number 834-12-8
	<b>Epoxiconazole</b> , CAS number 135319-73-2
	<b>Cybutryne</b> (Irgarol), CAS number 28159-98-0
	<b>Alachlor</b> , CAS number 15972-60-8
	<b>Chlorfenvinphos</b> , CAS number 470-90-6
	<b>Ethofumesate</b> , CAS number 26225-79-6
	<b>Linuron</b> , CAS number 330-55-2
	<b>Pendimethalin</b> , CAS number 40487-42-1
	<b>Fenthion</b> , CAS number 55-38-9
	<b>Dichlorvos</b> , CAS number 62-73-7

<b>Substance</b>	<b>Quinoxifen</b> , CAS number 124495-18-7
	<b>Thiamethoxam</b> , CAS number 153719-23-4
	<b>Imidacloprid</b> , CAS number 138261-41-3
	<b>Clothianidin</b> , CAS number 210880-92-5
	<b>Fenpropimorph</b> , CAS number 67564-91-4
	<b>Carbendazim</b> , CAS number 10605-21-7
	<b>Thiacloprid</b> , CAS number 111988-49-9
	<b>Spiroxamine</b> , CAS number 118134-30-8
	<b>Metamitron</b> , CAS number 41394-05-2
	<b>Propazine</b> , CAS number 139-40-2
	<b>Thiophanate-methyl</b> , CAS number 23564-05-8
	<b>(4-Chloro-2-methylphenoxy)acetic acid</b> (MCPA), CAS number 94-74-6
	<b>Mecoprop</b> (MCPP+MCP-p), CAS number 93-65-2
	<b>2,4-Dichlorophenoxyacetic acid</b> (2,4-D), CAS number 94-75-7
	<b>4-(4-Chloro-2-methylphenoxy)butanoic acid</b> (MCPB), CAS number 94-81-5
	<b>Dichlorprop</b> (2,4-DP), CAS number 120-36-5
	<b>Bentazone</b> , CAS number 25057-89-0
	<b>2,4,5-Trichlorophenoxyacetic acid</b> (2,4,5-T), CAS number 93-76-5
	<b>Perfluorooctanesulfonic acid</b> (PFOS), CAS number 1763-23-1
	<b>Desethylatrazine</b> (Desethyl-atrazine), CAS number 6190-65-4
	<b>Methiocarb</b> , CAS number 2032-65-7

<b>Column</b>	CHROMSHELL® C18 Plus, 2.6 µm		
<b>Dimensions</b>	50 mm × 2.1 mm		
<b>Part number</b>	CSH-5722-GG21		
<b>Mobile phase</b>	A: 5mM ammonium formate in water B: 5mM ammonium formate in MeOH		
<b>Gradient elution</b>	<b>Time (min)</b>	<b>%A</b>	<b>%B</b>
	0	100	0
	2	100	0
	7	0	100
	8	0	100
	8.1	100	0
	11	100	0
<b>Flow rate</b>	0.350 mL/min		
<b>Temperature</b>	40 °C		
<b>Detection</b>	MS/MS Low Mass		
<b>Injection volume</b>	100 µL		
<b>Analytes</b>	See MS/MS method		

### Chemicals of emerging concern (CECs) in river water

Validation parameters	LOD, µg/L	LOQ, µg/L
desethylatrazine	4.6	15.5
hexazinon	2.9	9.7
simazine	3.5	11.6
atrazine	2.1	7.1
terbuthylazine	3.8	12.6
terbutryn	3.5	11.7
prometryn	3.7	12.3
metolachlor	4.9	16.2
metazachlor	3	9.8
diuron	3.8	12.8
isoproturon	4	13.2
chlorotoluron	2.8	9.3
desethylterbuthylazine	6.3	21
acetochlor	4	13.4
tebuconazole	3.2	10.8
propiconazole	5	16.8
ametryn	3.4	11.4
epoxiconazole	2.7	8.9
cybutryne	3.9	12.8
alachlor	4.3	14.3
chlorfenvinphos	3	10
deisopropylatrazine	5.6	18.5
ethofumesate	2.7	8.9
linuron	4.7	15.6
pendimethalin	5.1	16.9
fenthion	2.3	7.6
dichlorvos	8.9	29.7
quinoxifen	3	10.1
thiamethoxam	3.3	11
imidacloprid	3.3	11
clothianidin	5.8	19.3
fenpropimorph	3	9.9
carbendazim	4.5	15.1
thiacloprid	4.4	14.6
spiroxamine	3.6	12.1
metamitron	2.9	9.5
propazin	3.5	11.8
thiophanate-methyl	5.2	17.4
(4-chloro-2-methylphenoxy)acetic acid	5.1	16.8
mecoprop	6	20.1
2,4-dichlorophenoxyacetic acid	3.8	12.7
4-(4-chloro-2-methylphenoxy)butanoic acid	6	20.1
dichlorprop	6	20
bentazone	3	9.9
2,4,5-trichlorophenoxyacetic acid	3.4	11.2
methiocarb	4.9	16.4
perfluorooctanesulfonic acid	5.4	18.1

\* The LOD and LOQ were calculated from real surface river water samples, not pure standards.

### Chemicals of emerging concern (CECs) in river water

**Internal standard are used:**

Bentazone D6 RT: 4.22

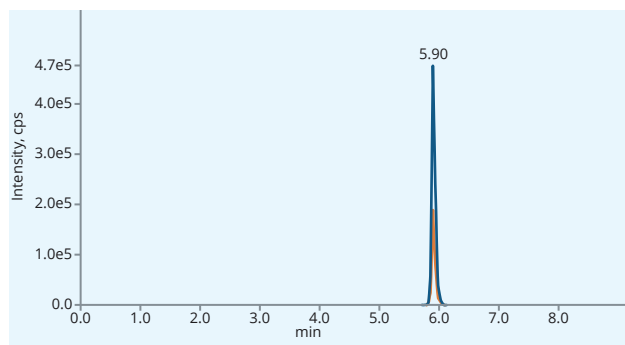
Isoproturon D6 RT: 6.35

Simazine D10 RT: 5.84

(-) Qualifier 244.9 > 132.0 [-38.0 V], Quantifier 244.9 > 181.0 [-30.0 V]

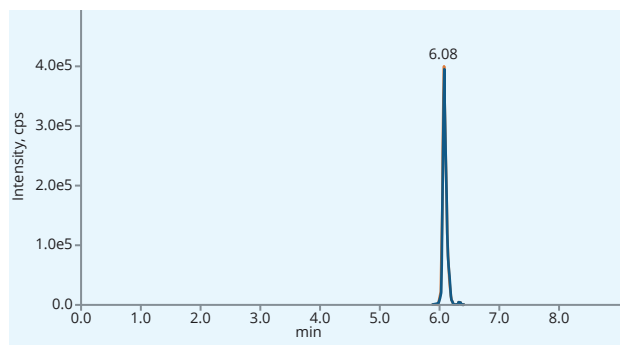
(+) Qualifier 213.3 > 78.2 [27.0 V], Quantifier 213.3 > 52.2 [31.0 V]

(+) Qualifier 212.1 > 137.1 [25.0 V], Quantifier 212.1 > 134.2 [25.0 V]



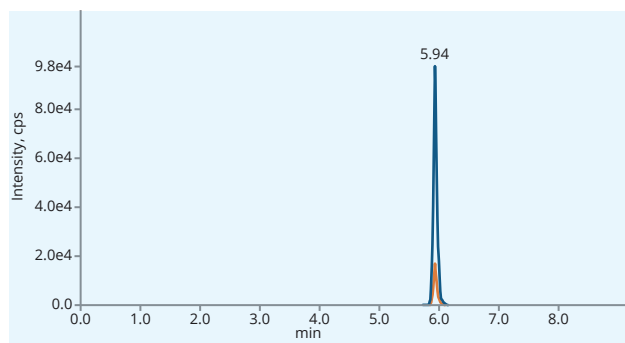
Mecoprop RT: 5.91

(-) Qualifier 213.0 > 141.0 [-18.0 V],  
Quantifier 215.0 > 143.0 [-18.0 V]



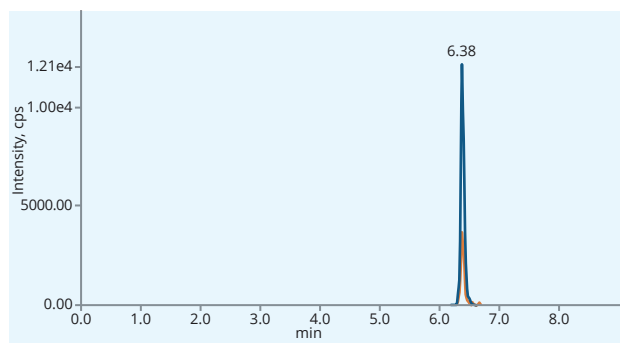
2,4,5-Trichlorophenoxyacetic acid RT: 6.07

(-) Qualifier 252.7 > 194.9 [-16.0 V],  
Quantifier 254.7 > 196.8 [-16.0 V]



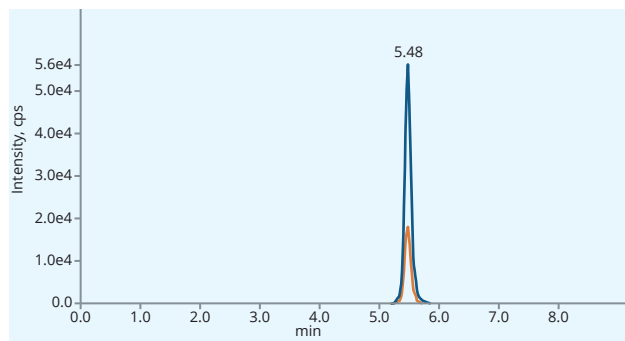
Dichlorprop RT: 5.92

(-) Qualifier 233.0 > 161.0 [-18.0 V],  
Quantifier 233.0 > 125.0 [-32.0 V]



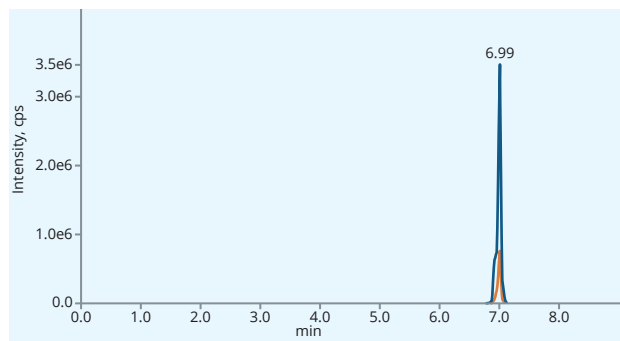
4-(4-Chloro-2-methylphenoxy)butanoic acid RT: 6.5

(-) Qualifier 227.0 > 141.0 [-12.0 V],  
Quantifier 229.0 > 143.0 [-12.0 V]



(4-Chloro-2-methylphenoxy)acetic acid RT: 5.48

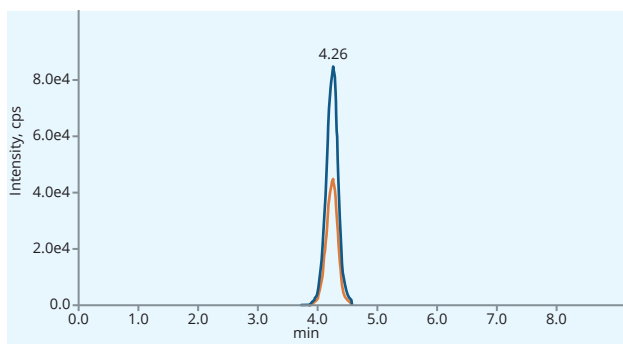
(-) Qualifier 199.0 > 141.0 [-20.0 V],  
Quantifier 201.0 > 143.0 [-20.0 V]



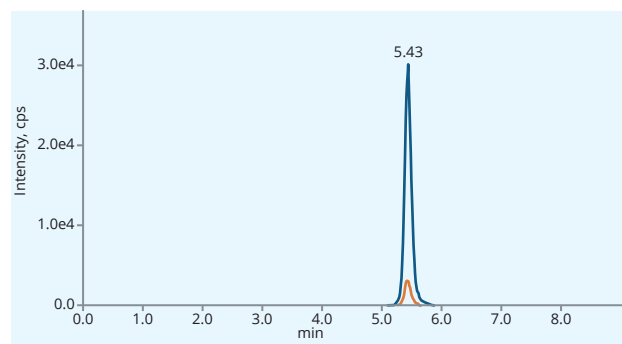
Perfluorooctanesulfonic acid RT: 7.0

(-) Qualifier 498.8 > 79.8 [-118.0 V],  
Quantifier 498.8 > 98.8 [-98.0 V]

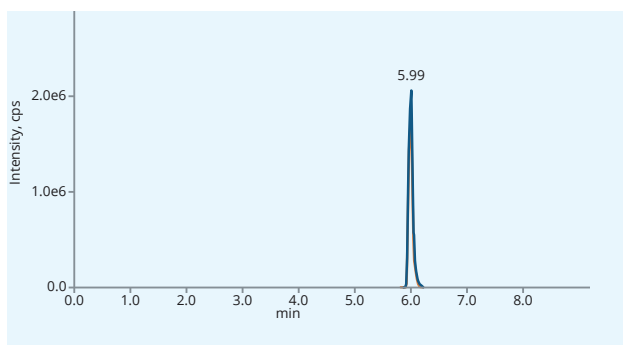
### Chemicals of emerging concern (CECs) in river water



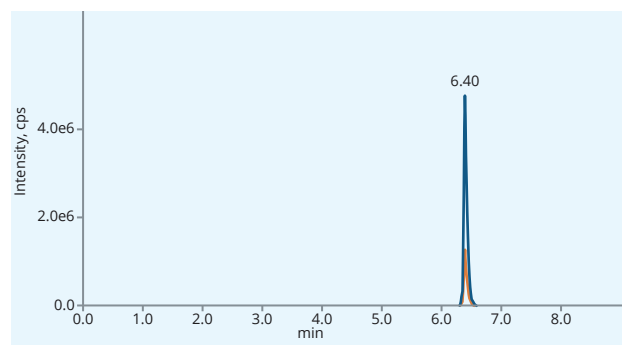
Bentazone RT: 4.22  
(-) Qualifier 239.0 > 132.0 [-36.0 V],  
Quantifier 239.0 > 197.0 [-30.0 V]



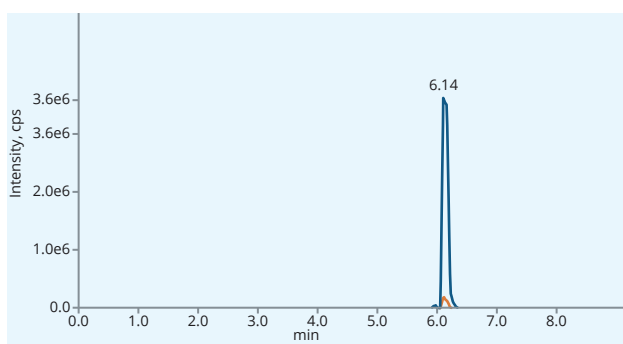
2,4-Dichlorophenoxyacetic acid RT: 5.44  
(-) Qualifier 219.0 > 161.0 [-18.0 V],  
Quantifier 219.0 > 125.0 [-36.0 V]



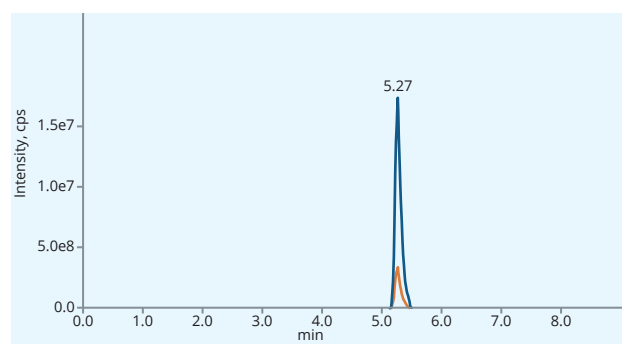
Simazine RT: 5.9  
(+) Qualifier 202.1 > 132.1 [25.0 V],  
Quantifier 202.1 > 124.3 [25.0 V]



Isoproturon RT: 6.35  
(+) Qualifier 207.2 > 72.1 [29.0 V],  
Quantifier 207.2 > 46.1 [31.0 V]

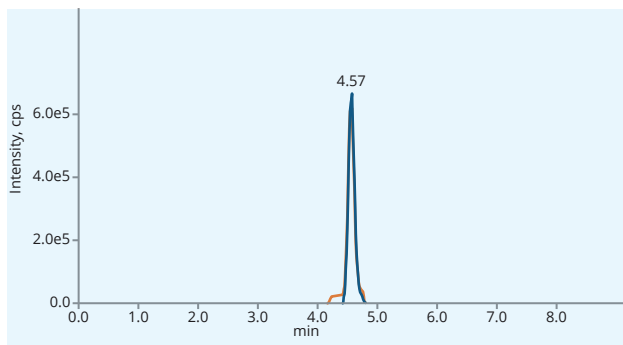


Desethylterbutylazine RT: 6.1  
(+) Qualifier 202.1 > 146.0 [23.0 V],  
Quantifier 202.1 > 79.0 [50.0 V]

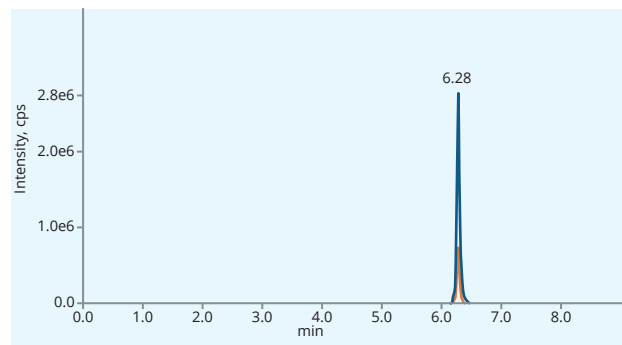


Carbenrazim RT: 5.14  
(+) Qualifier 192.2 > 160.2 [27.0 V],  
Quantifier 192.2 > 132.1 [41.0 V]

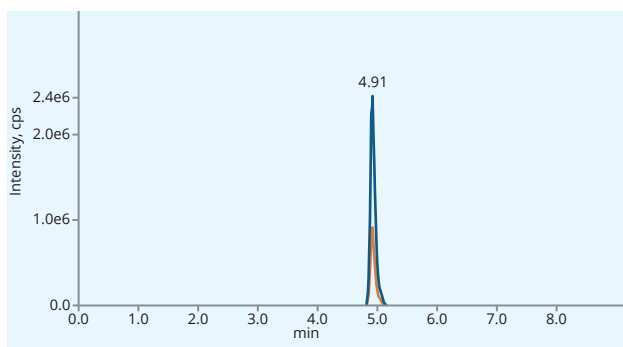
### Chemicals of emerging concern (CECs) in river water



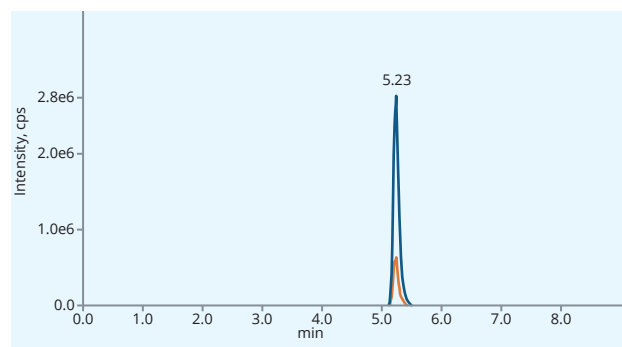
Deisopropylatrazine RT: 4.38  
(+) Qualifier 174.1 > 104.1 [31.0 V],  
Quantifier 174.1 > 96.1 [27.0 V]



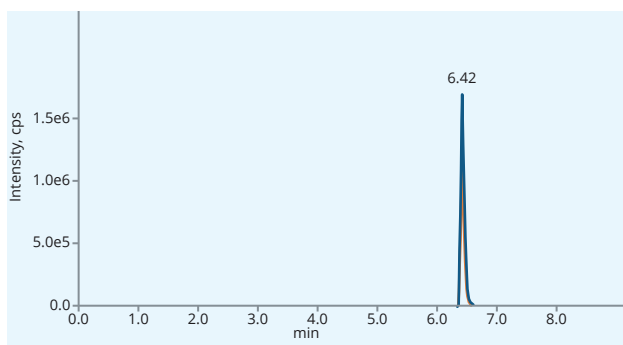
Chlorotoluron RT: 6.21  
(+) Qualifier 213.1 > 72.2 [31.0 V],  
Quantifier 213.1 > 46.2 [27.0 V]



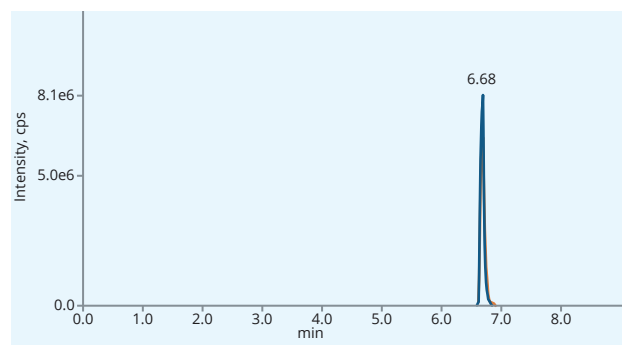
Metamitron RT: 4.8  
(+) Qualifier 203.2 > 175.1 [23.0 V],  
Quantifier 203.2 > 104.1 [33.0 V]



Desethylatrazine RT: 5.1  
(+) Qualifier 188.1 > 146.2 [21.0 V],  
Quantifier 188.1 > 104.1 [33.0 V]

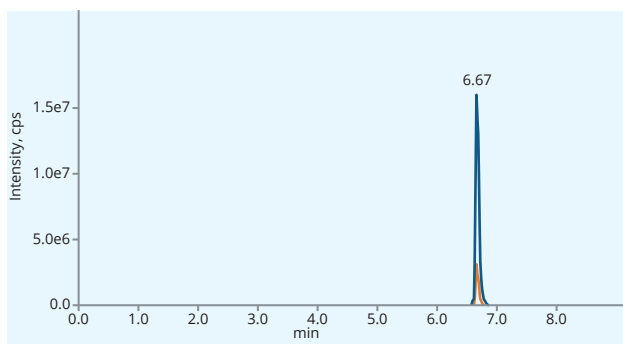


Diuron RT: 6.35  
(+) Qualifier 233.1 > 72.0 [33.0 V],  
Quantifier 235.1 > 72.1 [37.0 V]

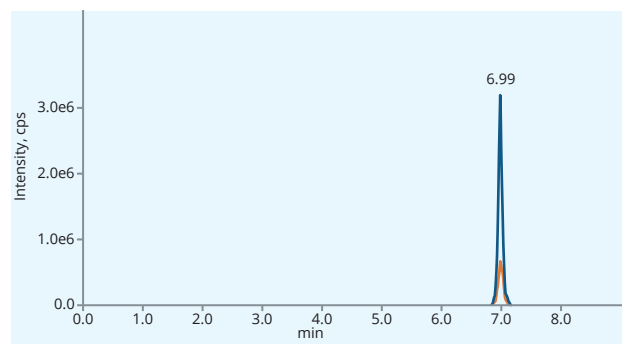


Propazin RT: 6.33  
(+) Qualifier 230.1 > 188.0 [25.0 V],  
Quantifier 230.1 > 146.0 [33.0 V]

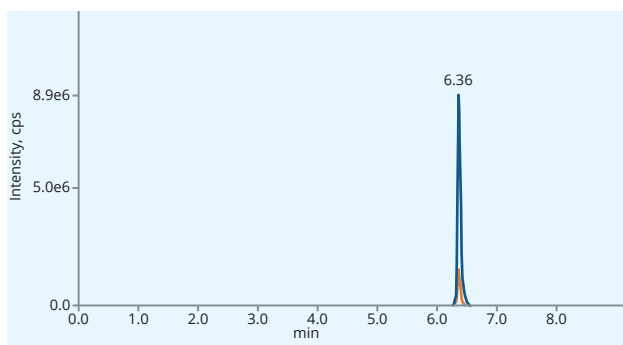
### Chemicals of emerging concern (CECs) in river water



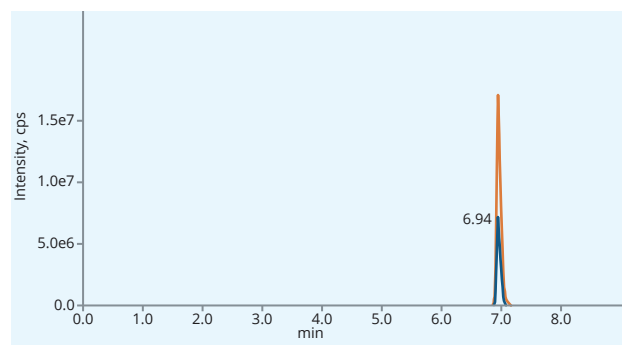
Ametryn RT: 6.63  
(+) Qualifier 228.2 > 186.2 [23.0 V],  
Quantifier 228.2 > 96.1 [33.0 V]



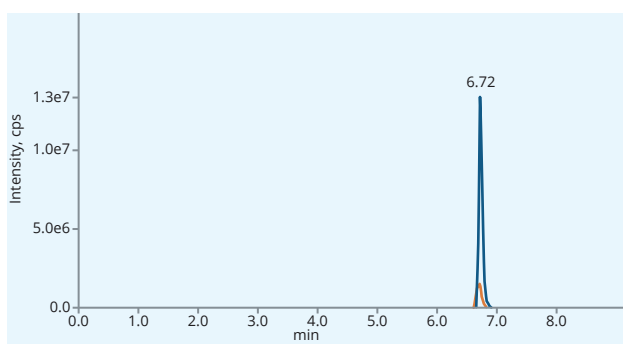
Acetochlor RT: 6.59  
(+) Qualifier 224.1 > 148.1 [27.0 V],  
Quantifier 270.0 > 224.0 [27.0 V]



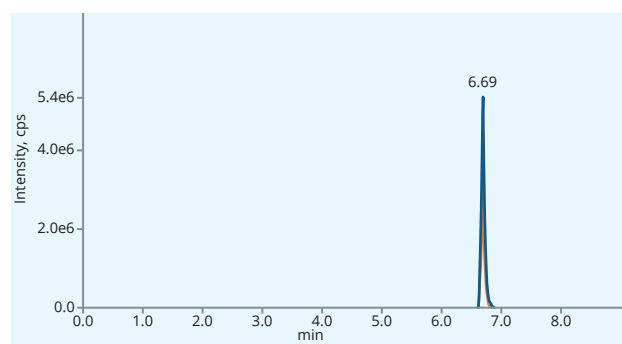
Atrazine RT: 6.31  
(+) Qualifier 216.1 > 174.0 [23.0 V],  
Quantifier 216.1 > 104.1 [39.0 V]



Prometryn RT: 6.9  
(+) Qualifier 242.2 > 200.1 [19.0 V],  
Quantifier 242.2 > 158.1 [35.0 V]

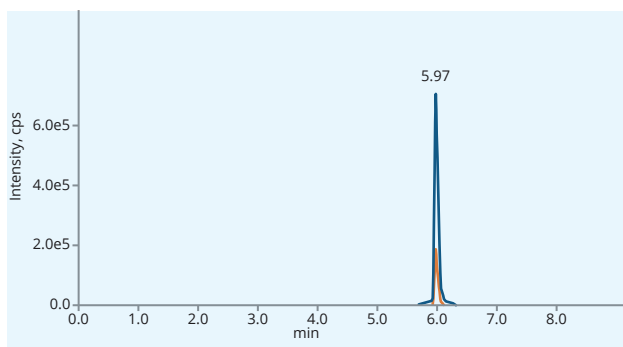


Terbutylazine RT: 6.7  
(+) Qualifier 230.1 > 174.1 [23.0 V],  
Quantifier 230.1 > 104.1 [41.0 V]

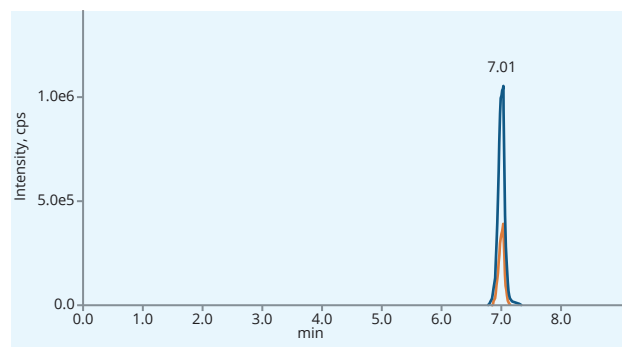


Methiocarb RT: 6.63  
(+) Qualifier 226.1 > 169.2 [13.0 V],  
Quantifier 226.1 > 121.1 [23.0 V]

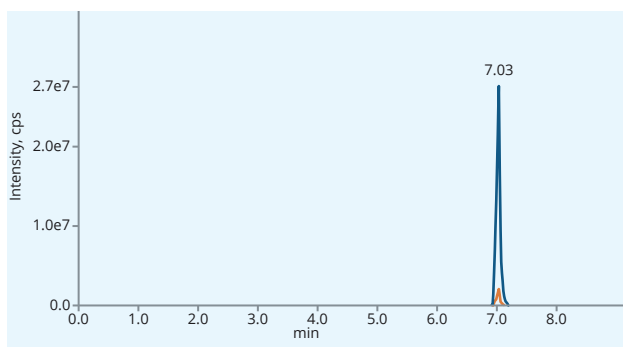
### Chemicals of emerging concern (CECs) in river water



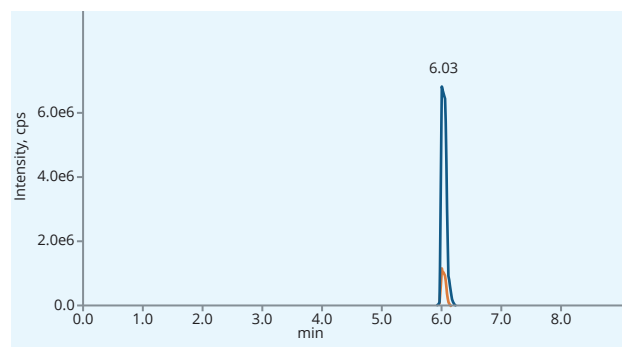
Dichlorvos RT: 5.88  
(+) Qualifier 220.9 > 109.1 [25.0 V],  
Quantifier 220.9 > 127.2 [23.0 V]



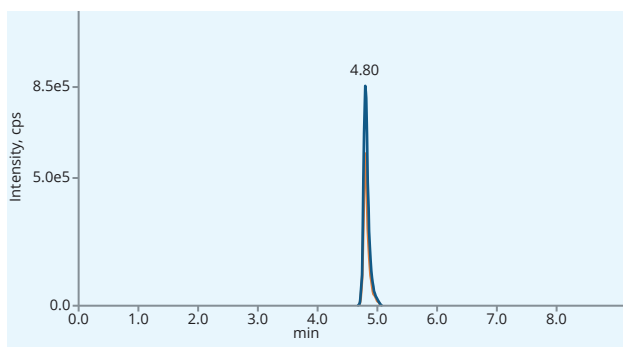
Alachlor RT: 7.0  
(+) Qualifier 270.1 > 238.2 [17.0 V],  
Quantifier 270.1 > 162.2 [28.0 V]



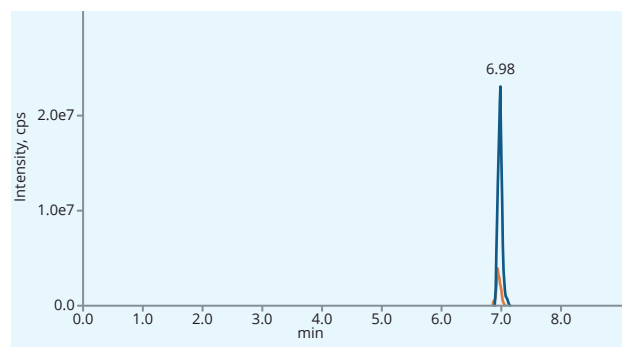
Cybutryne RT: 6.98  
(+) Qualifier 254.2 > 198.2 [23.0 V],  
Quantifier 254.2 > 83.2 [39.0 V]



Hexazinon RT: 5.94  
(+) Qualifier 253.2 > 171.2 [27.0 V],  
Quantifier 253.2 > 85.1 [44.0 V]

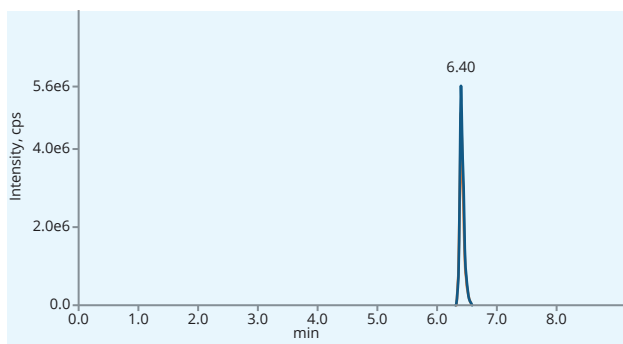


Clothianidin RT: 4.7  
(+) Qualifier 250.0 > 169.1 [17.0 V],  
Quantifier 250.0 > 132.0 [21.0 V]

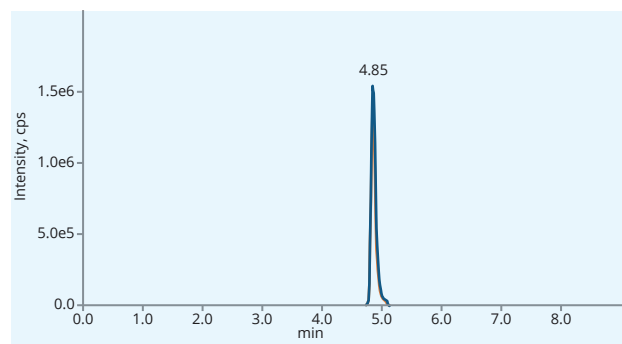


Terbutryn RT: 6.91  
(+) Qualifier 242.2 > 186.1 [23.0 V],  
Quantifier 242.2 > 68.1 [57.0 V]

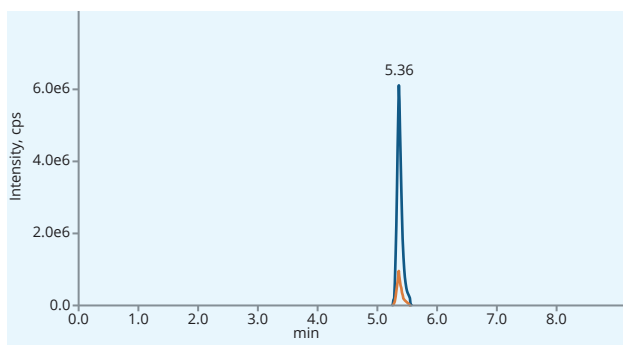
### Chemicals of emerging concern (CECs) in river water



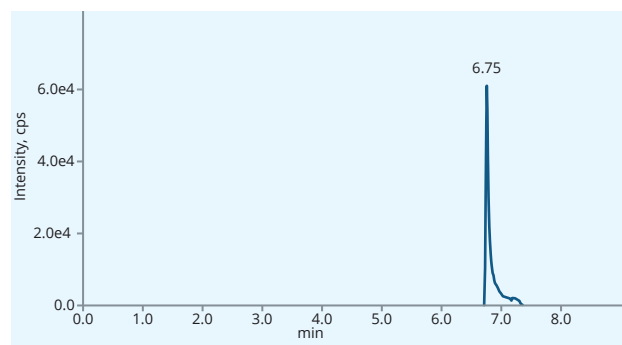
Metazachlor RT: 6.35  
(+) Qualifier 278.2 > 134.2 [27.0 V],  
Quantifier 278.2 > 210.2 [17.0 V]



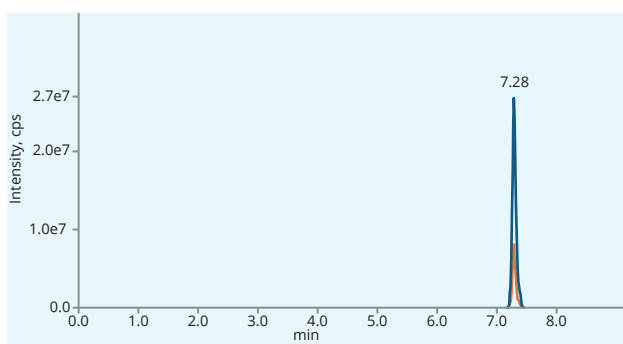
Imidacloprid RT: 4.62  
(+) Qualifier 256.2 > 209.0 [23.0 V],  
Quantifier 256.2 > 175.2 [23.0 V]



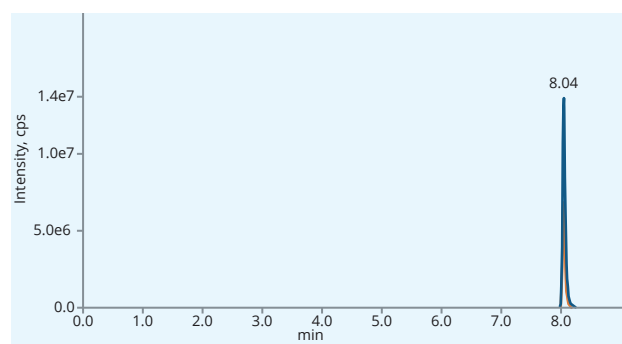
Thiachloprid RT: 5.22  
(+) Qualifier 253.1 > 126.1 [29.0 V],  
Quantifier 253.1 > 99.1 [57.0 V]



Linuron RT: 6.6  
(+) Qualifier 249.1 > 160.0 [23.0 V],  
Quantifier 249.1 > 182.1 [21.0 V]

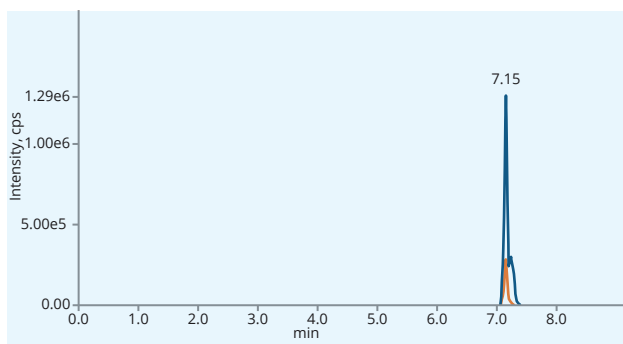


Spiroxamine RT: 7.1  
(+) Qualifier 298.4 > 144.2 [27.0 V],  
Quantifier 298.4 > 100.2 [43.0 V]

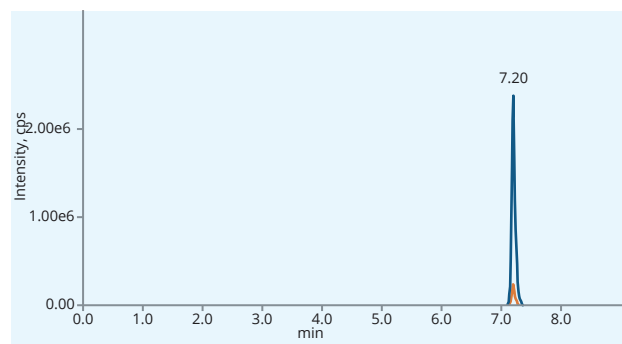


Fenpropimorph RT: 7.97  
(+) Qualifier 304.0 > 147.0 [39.0 V],  
Quantifier 304.0 > 117.0 [71.0 V]

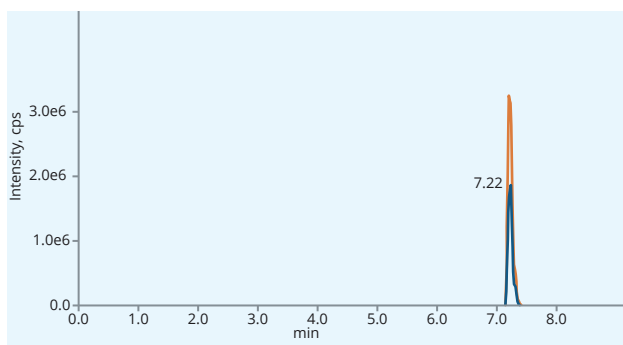
### Chemicals of emerging concern (CECs) in river water



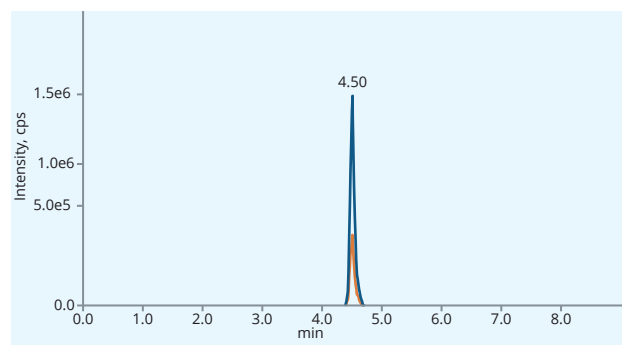
Tebuconazole RT: 7.1  
(+) Qualifier 308.0 > 70.0 [39.0 V],  
Quantifier 308.0 > 125.0 [47.0 V]



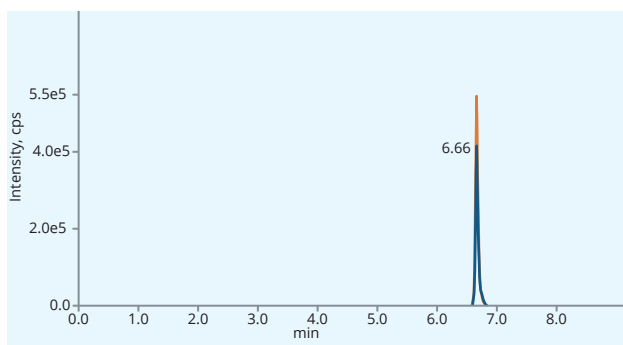
Propiconazole RT: 7.15  
(+) Qualifier 342.1 > 159.1 [43.0 V],  
Quantifier 342.1 > 69.1 [33.0 V]



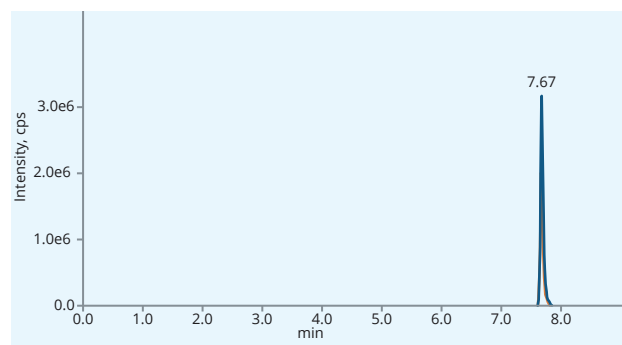
Chlorfenvinphos RT: 7.18  
(+) Qualifier 358.9 > 99.0 [39.0 V],  
Quantifier 358.9 > 155.1 [17.0 V]



Thiamethoxam RT: 4.34  
(+) Qualifier 292.0 > 211.0 [17.0 V],  
Quantifier 292.0 > 181.0 [31.0 V]

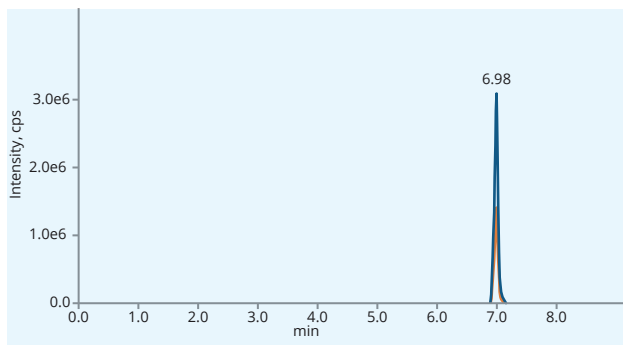


Ethofumesate RT: 6.62  
(+) Qualifier 304.0 > 121.0 [27.0 V],  
Quantifier 304.0 > 161.0 [31.0 V]

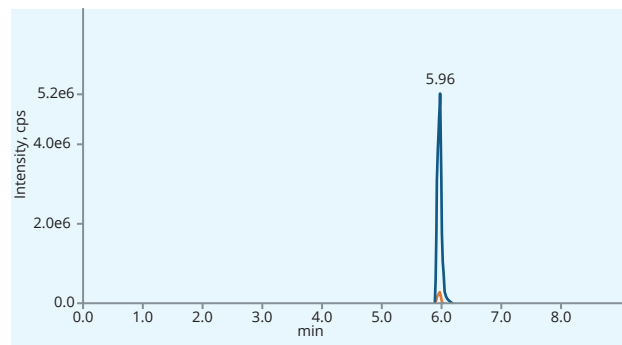


Quinoxifen RT: 7.61  
(+) Qualifier 308.0 > 197.0 [43.0 V],  
Quantifier 308.0 > 162.0 [57.0 V]

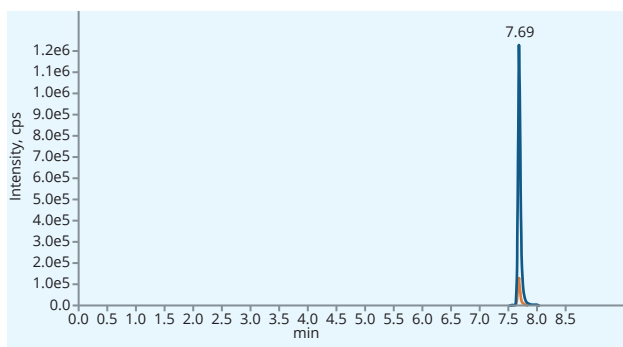
### Chemicals of emerging concern (CECs) in river water



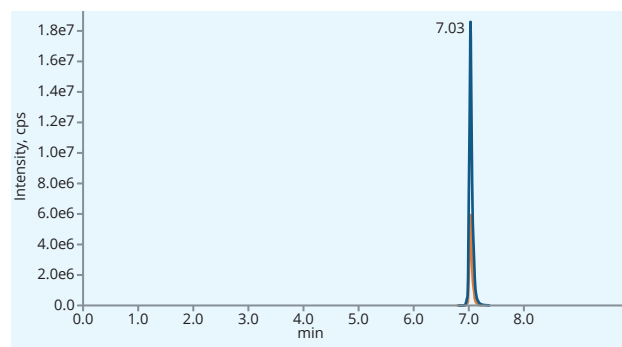
Epoxiconazole RT: 6.9  
(+) Qualifier 330.0 > 121.0 [27.0 V],  
Quantifier 330.0 > 101.0 [63.0 V]



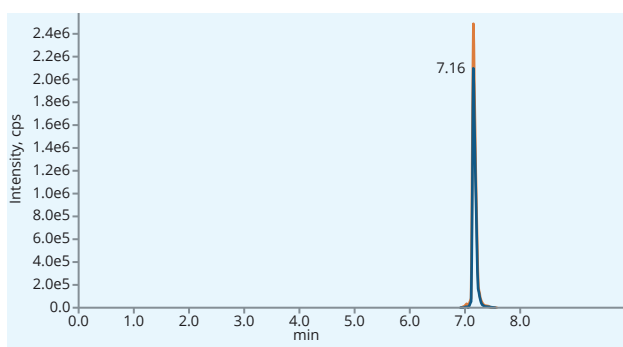
Thiophanate-methyl RT: 5.84  
(+) Qualifier 343.0 > 151.0 [25.0 V],  
Quantifier 343.0 > 192.0 [21.0 V]



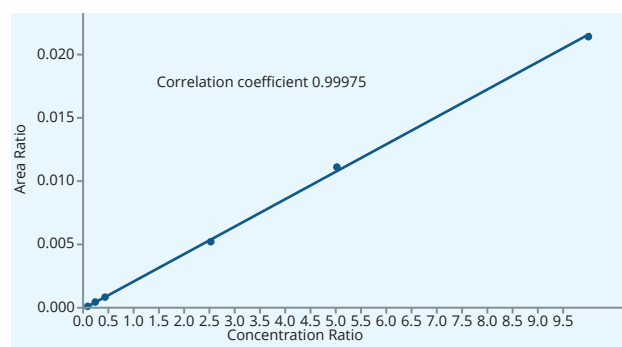
Pendimethalin RT: 7.65  
(+) Qualifier 282.2 > 212.1 [15.0 V],  
Quantifier 282.2 > 194.2 [21.0 V]



Metolachlor RT: 7.0  
(+) Qualifier 284.2 > 252.2 [21.0 V],  
Quantifier 284.2 > 176.2 [33.0 V]



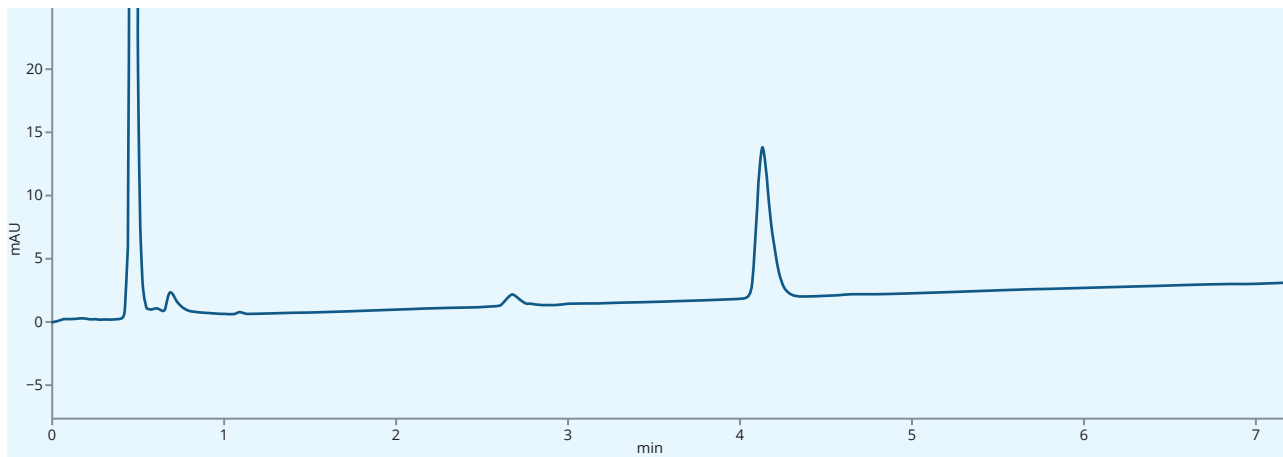
Fenthion RT: 7.1  
(+) Qualifier 278.9 > 169.0 [25.0 V],  
Quantifier 278.9 > 246.9 [19.0 V]



Example of calibration curve for  
4-(4-Chloro-2-methylphenoxy)butanoic acid (MCPB)

### Tween 80

Tween 80 is used to stabilize aqueous solutions with drugs and also as an emulgator in the pharma industry. It is also used as an additive in vaccine production. Currently it is added to Covid19 vaccines.



Analysis of hydrolyzed PS-80 on CHROMSHELL® C18-XB

<b>Column</b>	CHROMSHELL® C18-XB, 2.6 µm
<b>Dimensions</b>	100 mm × 4.6 mm
<b>Part number</b>	CSH-5749-GI46
<b>Mobile phase</b>	Proprietary
<b>Temperature</b>	Proprietary
<b>Injection volume</b>	2.5 µL
<b>Detection</b>	UV @195 nm
<b>Analytes</b>	<b>1. Tween 80</b>

## Column protection

CHROMSHELL® UHPLC columns can be protected by means of a guard system or by using an appropriate guard column filter (in-line filter).

The ARION® Guard System (AGS) is ideal for the protection of CHROMSHELL® UHPLC columns. We recommend it as an easy and less expensive solution in comparison with high pressure guard systems. The AGS can be used with pressures up to **900 bar**. More details about this guard system are on page 50.

Protection can be perfectly ensured by installing a pre-column filter holder with a 0.2µm or 0.5µm frit. This in-line filter can withstand pressures of up to 1375 bar and is easy to use. The filter holder consists of a two-piece body and replaceable filter – a metal frit.

Main features and benefits:

- Minimized dead-volume.
- Easy installation and use.
- Pressure rating up to **1375 bar**.
- Works with 1/16inch column connections from all manufacturers.
- Spare frits with various porosities.



FGS in-line filter

## In-line filter selection guide

The FGS in-line filter made from 316 stainless steel is designed to reduce the number of connections compared with standard pre-column filters.

The in-line filter guarantees a very small dead volume thanks to the small bore size (0.15 mm in the body and nut). The total length is 46.5 mm.



Replacement frits

### FGS in-line filter holder

Description	Amount	Internal volume	Part number
FGS in-line filter holder for 0.2µm frit (including encased type frit)	1 pc	0.59 µL	FGS-5782-OR0
FGS in-line filter holder for 0.5µm frit (including encased type frit)	1 pc	0.61 µL	FGS-5782-OS0

### Replacement frits

Description	Amount	Frit volume	Frit OD	Part number
FGS stainless steel frit for in-line filter 0.2 µm, ID 1.96 mm	5 pcs	0.11 µL	1.96 mm	FGS-5782-SRB
FGS stainless steel frit for in-line filter 0.5 µm, ID 1.96 mm	5 pcs	0.13 µL	1.96 mm	FGS-5782-SSB

*Note: The frit consists of stainless steel frit and PEEK ring. The ring has 2.92 mm OD. The frit porosity values are only nominal. They do not reflect maximum pore size of the frit.*



Exploded view