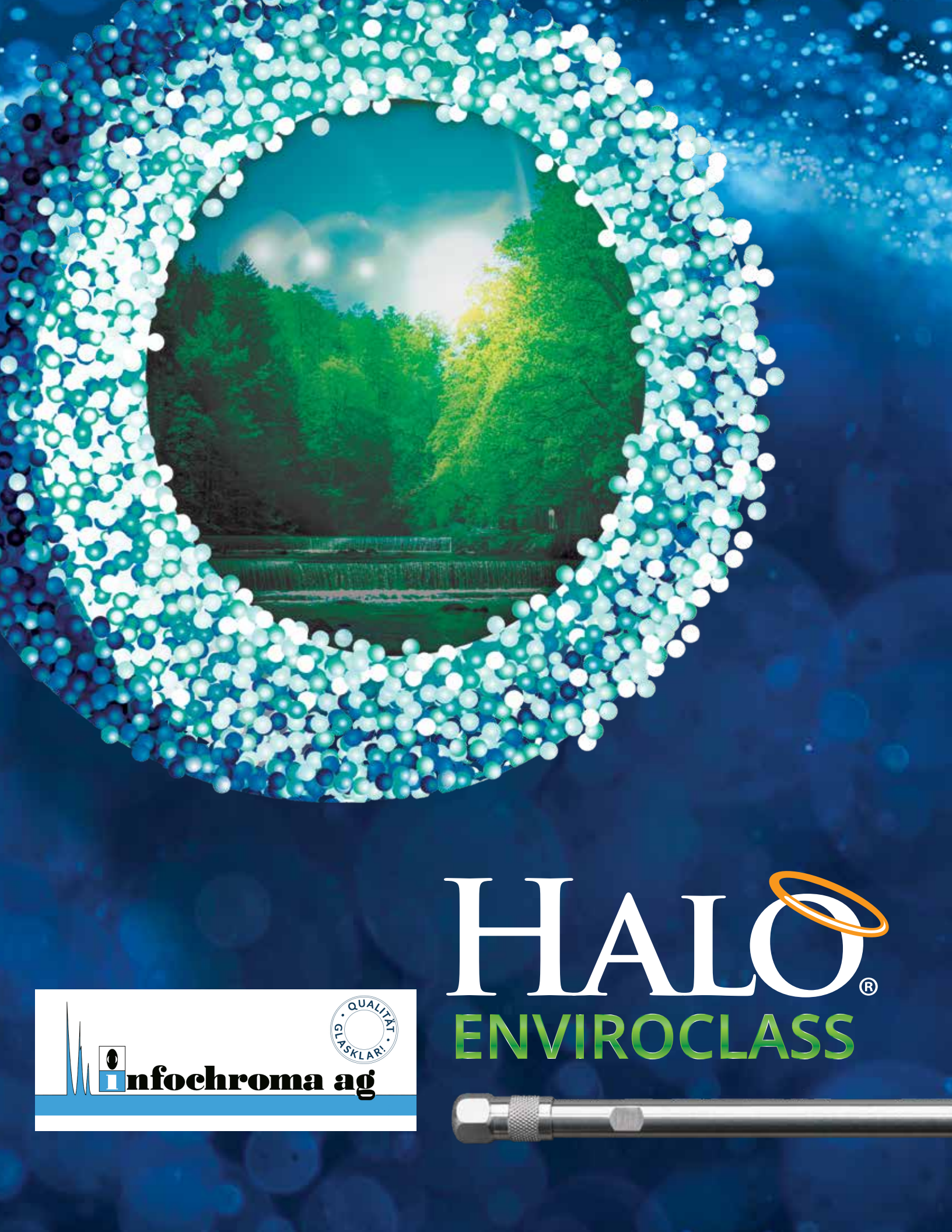

HALO®
ENVIROCLASS
QUALITÄT · GLASKLARI ·
infochroma ag

# QUALITY POLICY

AMT is committed to providing world-class innovative products that uniquely fill the growing needs of small molecule and large molecule separation scientists.

We take pride in delivering products that exceed customers' expectations on quality and delivery time and collaborate to break down any barriers that would prevent an exceptional customer experience. We continually strive to improve our organization to stay focused on safety, quality, and cost.

We embrace ISO9001 standards in our work systems and daily work. We pledge to have dynamic leadership promoting culture of excellence embedded in every employee.

# ENVIRONMENTAL SOLUTIONS

HALO® ENVIROCLASS is the newest family of products in Advanced Materials Technology's product line. Comprised of chromatography columns designed specifically to address environmental analysis, HALO® delivers results. Built upon proven Fused-Core® technology, HALO® ENVIROCLASS delivers high efficiency separations with the rugged performance required to meet challenging environmental sample matrices.

From performance designed application specific phases to separate per-and polyfluorinated alkyl substances (PFAS) and polycyclic aromatic hydrocarbons (PAH), HALO® ENVIROCLASS represents more than method assured products. It offers a suite of solutions for other persistent, high environmental-impact contamination agents such as pesticides, mycotoxins, herbicides and more all based upon HALO's 15 years of innovative and trusted technology all with the understanding of the unique needs of the environmental laboratory.

HALO® ENVIROCLASS

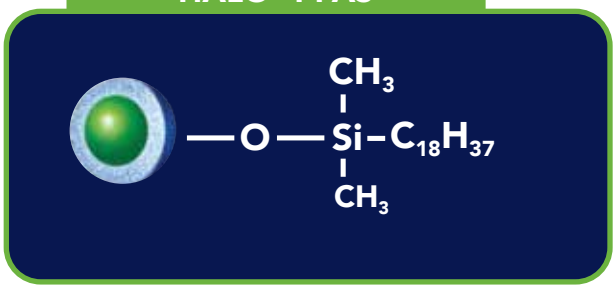
# HALO® PFAS

Designed for separation of novel and legacy short chain and long chain PFAS compounds containing branched and linear isomers, along with EPA methodology requirements in mind, HALO® PFAS offers a holistic solution. With both a PFAS specific delay column optimized to prevent background PFAS contamination from interfering with the sample results and an analytical column for PFAS sample separation and detection, the HALO® PFAS solution delivers excellent selectivity, peak shape and necessary retention to perform fast, high resolution separations in EPA methods 537.1, 533 and 8327.

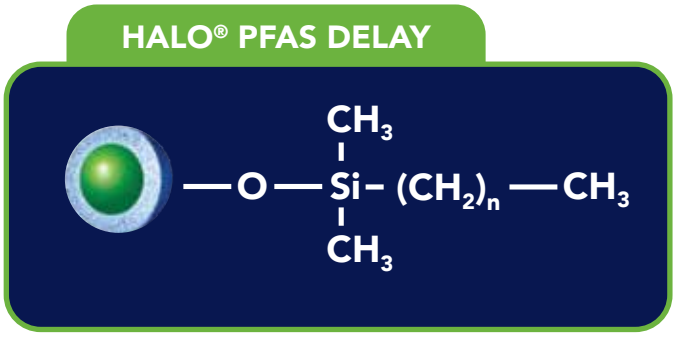
The HALO® PFAS solution is different from other C18 offerings in that it is quality assured for PFAS analysis providing confidence it will meet application demands.

- Application-assured through method qualified lot analysis
- Optimal 2.7 µm Fused-Core® particle for rugged, reliable performance delivering high efficiency, low back pressure separations
- Endcapped alkyl phases for high sensitivity (no bleed) LCMS analysis
- Pressure limit: 600 bar/9000 psi

**HALO® PFAS**




**HALO® PFAS DELAY**

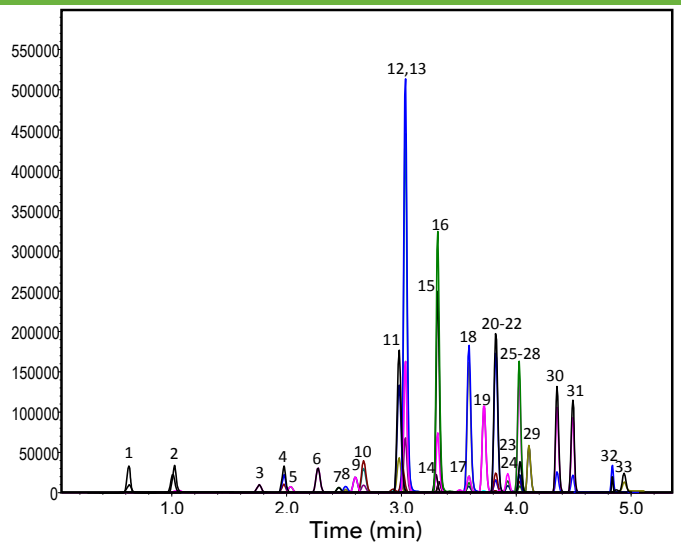



## APPLICATIONS

- EPA 533
- EPA 537.1
- EPA 8327
- Emerging PFAS

## RAPID ANALYSIS OF 33 PFAS COMPOUNDS IN UNDER 5 MINUTES

High speed separation of 33 PFAS species found in EPA 537.1, EPA 533, and EPA 8327, completed in under 5 minutes.




| PEAK # | COMPOUND |
|---|---|
| 1 | PFBA |
| 2 | 4:2FTS |
| 3 | PFPeA |
| 4 | PFBS |
| 5 | PFHpS |
| 6 | PFPeS |
| 7 | PFMPA |
| 8 | PFHxA |
| 9 | PFEESA |
| 10 | HFPO-DA |
| 11 | PFHxS |
| 12 | NaDONA |
| 13 | ADONA |
| 14 | FOSA |
| 15 | PFOA |
| 16 | PFMBA |
| 17 | PFHpA |

| PEAK # | COMPOUND |
|---|---|
| 18 | PFOS |
| 19 | 9Cl-PF3ONS |
| 20 | 8:2FTS |
| 21 | PFNS |
| 22 | PFDA |
| 23 | N-MeFOSAA |
| 24 | PFNA |
| 25 | NFDHA |
| 26 | PFUnA |
| 27 | N-EtFOSAA |
| 28 | 6:2FTS |
| 29 | 11Cl-PF3OUdS |
| 30 | PFTrDA |
| 31 | PFDoA |
| 32 | PFTeDA |
| 33 | PFDS |

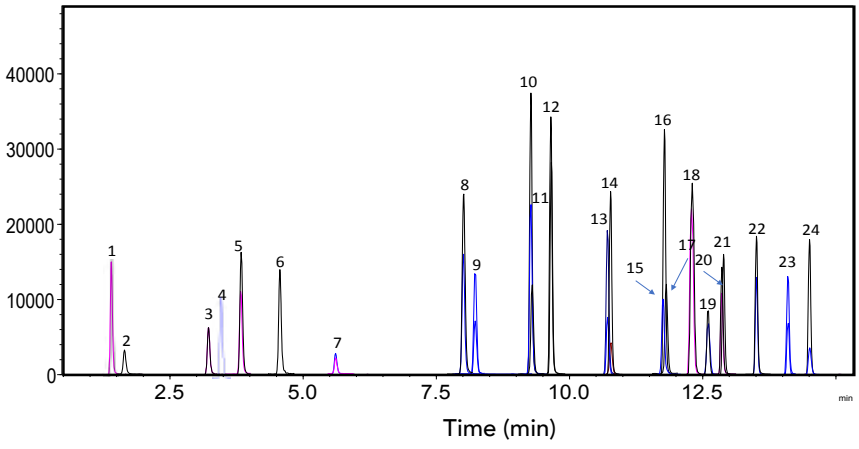
### TEST CONDITIONS

**Analytical Column:** HALO® PFAS, 2.7 µm, 2.1 x 100 mm
**Delay Column:** HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm
**Mobile Phase A:** 10 mM Ammonium Acetete
**Mobile Phase B:** Methanol
**Gradient:** 33-98 %B in 4.0 min: 98-100 %B in 0.1 min.; hold @ 100 %B for 2min.

**Flow Rate:** 0.4 mL/min
**Pressure:** 479 bar
**Temperature:** 35 °C
**Injection Volume:** 2.0 µL
**Sample Solvent:** Methanol (96%) Water (4%)

## PFAS ANALYSIS ACCORDING TO EPA 8327

HALO® PFAS provides a high resolution separation for EPA 8327 used for the analysis of non-potable water samples.




| PEAK # | COMPOUND |
|---|---|
| 1 | PFBA |
| 2 | 4:2FTS |
| 3 | PFPeA |
| 4 | PFBS |
| 5 | PFHpS |
| 6 | PFPeS |
| 7 | PFHxA |
| 8 | PFHpA |
| 9 | PFHxS |
| 10 | FOSA |
| 11 | PFOA |
| 12 | PFDS |

| PEAK # | COMPOUND |
|---|---|
| 13 | PFNA |
| 14 | PFOS |
| 15 | PFNS |
| 16 | PFDA |
| 17 | 8:2FTS |
| 18 | N-MeFOSAA |
| 19 | 6:2FTS |
| 20 | PFUnA |
| 21 | N-EtFOSAA |
| 22 | PFDoA |
| 23 | PFTrDA |
| 24 | PFTeDA |

### TEST CONDITIONS

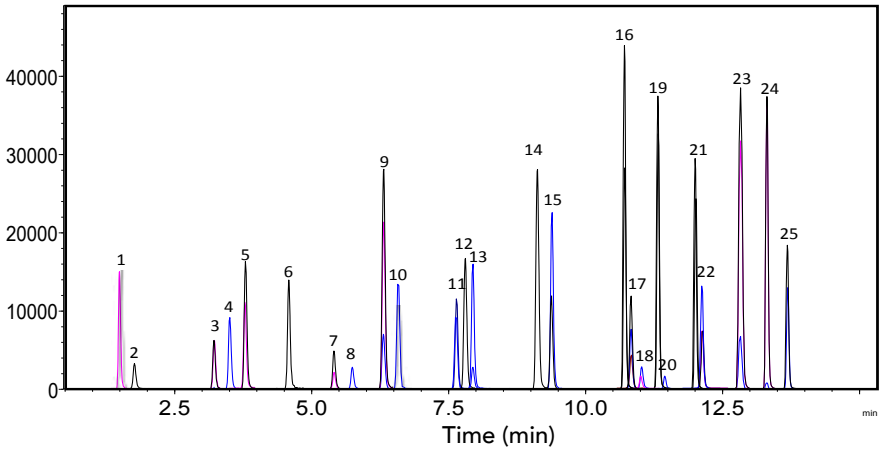
**Analytical Column:** HALO® PFAS, 2.7 µm, 2.1 x 100 mm
**Delay Column:** HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm
**Mobile Phase A:** 10 mM Ammonium Acetete
**Mobile Phase B:** Methanol
**Gradient:** 33-98 %B in 18 min.

**Flow Rate:** 0.4 mL/min
**Initial Back Pressure:** 485 bar
**Temperature:** 35 °C
**Injection Volume:** 2.0 µL
**Sample Solvent:** Methanol (96%) / Water (4%)

*For complete method information see Technical Library at fused-core.com*

## PFAS ANALYSIS ACCORDING TO EPA 533

EPA Method 533 is for drinking water analysis and targets both short and long chain PFAS compounds.




| PEAK # | COMPOUND |
|---|---|
| 1 | PFBA |
| 2 | 4-2FTS |
| 3 | PFPeA |
| 4 | PFBS |
| 5 | PFHpS |
| 6 | PFPeS |
| 7 | PFmpA |
| 8 | PFHxA |
| 9 | PFEESA |
| 10 | HFPO-DA |
| 11 | PFHpA |
| 12 | PFHxS |
| 13 | ADONA |

| PEAK # | COMPOUND |
|---|---|
| 14 | PFOA |
| 15 | PFmbA |
| 16 | PFNA |
| 17 | PFOS |
| 18 | 9Cl-PF3ONS |
| 19 | PFDA |
| 20 | 8-2FTS |
| 21 | 6-2FTS |
| 22 | NFDHA |
| 23 | PFUnA |
| 24 | 11Cl-PF3OUdS |
| 25 | PFDoA |

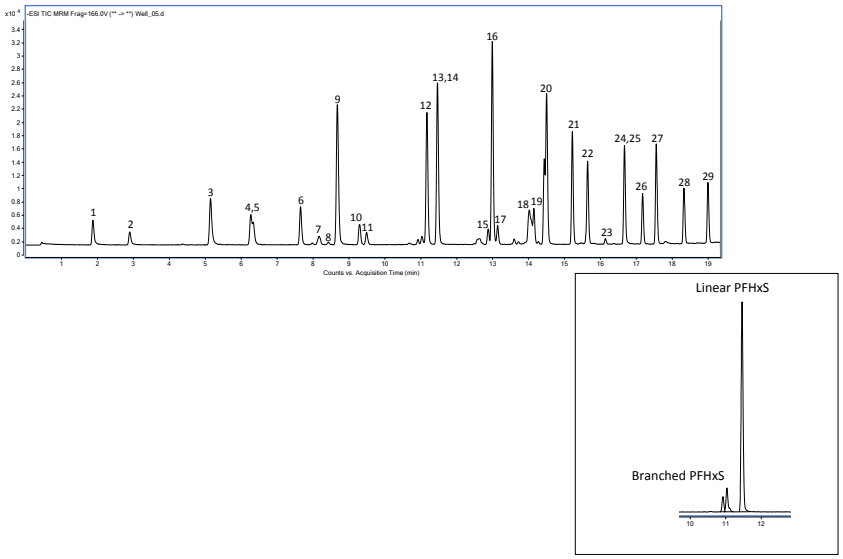
### TEST CONDITIONS

**Analytical Column:** HALO® PFAS, 2.7 µm, 2.1 x 100 mm
**Delay Column:** HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm
**Mobile Phase A:** 10 mM Ammonium Acetete
**Mobile Phase B:** Methanol
**Gradient:** 33-98 %B in 18 min.

**Flow Rate:** 0.4 mL/min
**Initial Back Pressure:** 485 bar
**Temperature:** 35 °C
**Injection Volume:** 2.0 µL
**Sample Solvent:** Methanol (96%) / Water (4%)

## ANALYSIS OF PFAS IN WELL WATER

Method 533 complements EPA Method 537.1 and can be used to test for 11 additional PFAS species.Here we show a clear separation of the branched and linear isomers of PFAS species PFHxS, found in a spiked well water sample.




| PEAK # | COMPOUND |
|---|---|
| 1 | PFBA |
| 2 | PFMPA |
| 3 | PFPeA |
| 4 | PFBS |
| 5 | PFMBA |
| 6 | PFEESA |
| 7 | NFDHA |
| 8 | 4-2FTS |
| 9 | PFHxA |
| 10 | PFPeS |
| 11 | HFPO-DA |
| 12 | PFHpA |
| 13 | PFHxS |
| 14 | ADONA |
| 15 | 6-2FTS |

| PEAK # | COMPOUND |
|---|---|
| 16 | PFOA |
| 17 | PFHpS |
| 18 | PFNA |
| 19 | PFOS |
| 20 | 9Cl-PF3ONS |
| 21 | 8-2FTS |
| 22 | PFDA |
| 23 | NMeFOSAA |
| 24 | NEtFOSAA |
| 25 | PFUnA |
| 26 | 11Cl-PF3OUdS |
| 27 | PFDoA |
| 28 | PFTrA |
| 29 | PFTA |

### TEST CONDITIONS

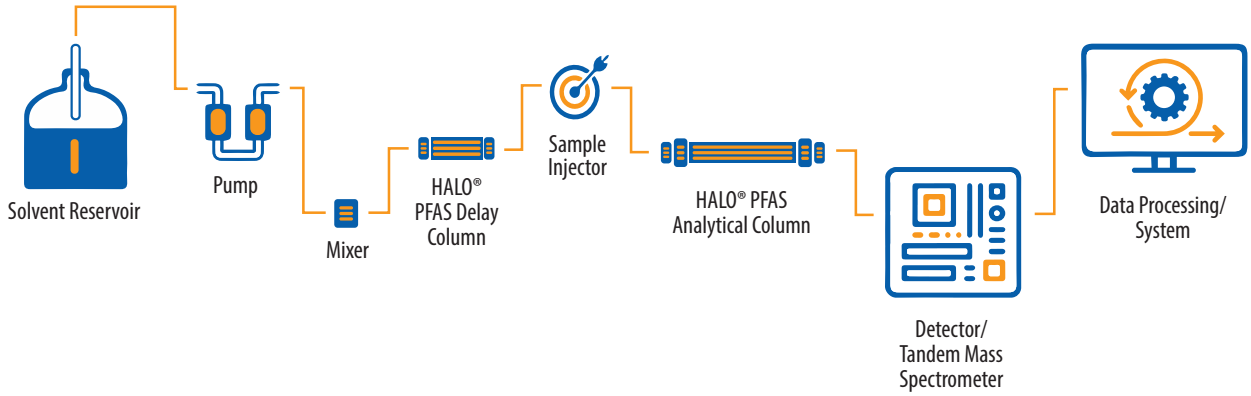
**Analytical Column:** HALO® PFAS, 2.7 µm, 2.1 x 100 mm
**Delay Column:** HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm
**Mobile Phase A:** 20 mM Ammonium Acetete
**Mobile Phase B:** Methanol
**Gradient:** 20-90 %B in 15 min.; hold @ 90 %B for 5 min.
**Flow Rate:** 0.4 mL/min
**Pressure:** 505 bar

**Temperature:** 44 °C
**Detection:** -ESI MRM
**Injection Volume:** 2.0 µL
**Sample Solvent:** Methanol (96%) / Water (4%)
**LC System:** Agilent Triple Quadrupole LC/MS 6400

*Data courtesy of STRIDE Center for PFAS Solutions*

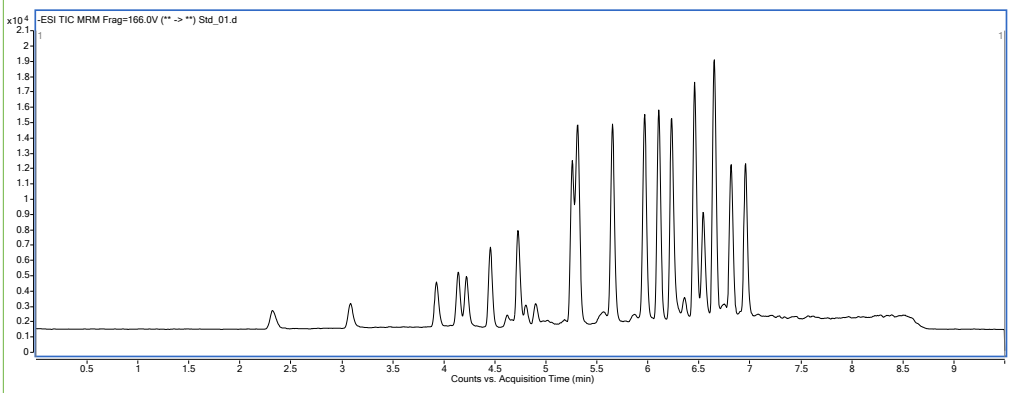
# HALO® PFAS DELAY COLUMN

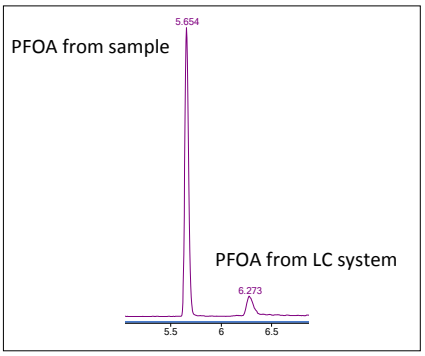
HALO® PFAS Delay is an application assured column solution. The delay column is used to prevent background PFAS contamination from interfering with the PFAS of interest that are separated with the analytical column. The delay column bonded phase is a highly retentive endcapped silane chosen for its ability to demonstrate delay of background instrument PFAS contamination across multiple mobile phase conditions. For this reason, the HALO® PFAS Delay column is placed upstream of the sample injector.




## DEMONSTRATION OF THE HALO® PFAS DELAY COLUMN

Demonstration of the delay column utility for PFOA extracted ion. The prevalence of PFOA is commonly observed as an instrument materials contaminant- therefore is important to be separated from sample containing PFOA for accurate quantitation.




### TEST CONDITIONS

**Analytical Column:** HALO® PFAS, 2.7 µm, 2.1 x 100 mm
**Delay Column:** HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm
**Mobile Phase A:** 20 mM Ammonium Acetete
**Mobile Phase B:** Methanol
**Gradient:** 20-90 %B in 6 min.; hold @ 90 %B for 2 min.
**Flow Rate:** 0.4 mL/min

**Pressure:** 505 bar
**Temperature:** 44 °C
**Detection:** -ESI MRM
**Injection Volume:** 2.0 µL
**Sample Solvent:** Methanol (96%) / Water (4%)
**LC System:** Agilent Triple Quadrupole LC/MS 6400

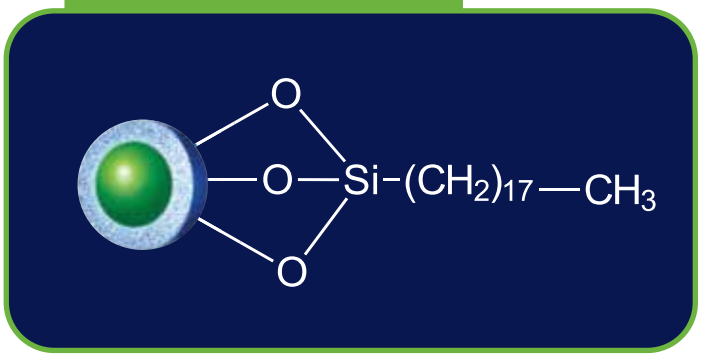
*Data courtesy of STRIDE Center for PFAS Solutions*

# HALO® PAH

The HALO® PAH is an un-endcapped trifunctional C18 bonded phase with proprietary manufacturing process designed on proven Fused-Core® technology to provide a fast, efficient separation of PAH compounds.

The HALO® PAH delivers a method-specific, robust, high efficiency separation of 16 standard PAH compounds with a resolution value of at least 1.5 in under 5 minutes for EPA 8310 and EPA 610.

**HALO® PAH**

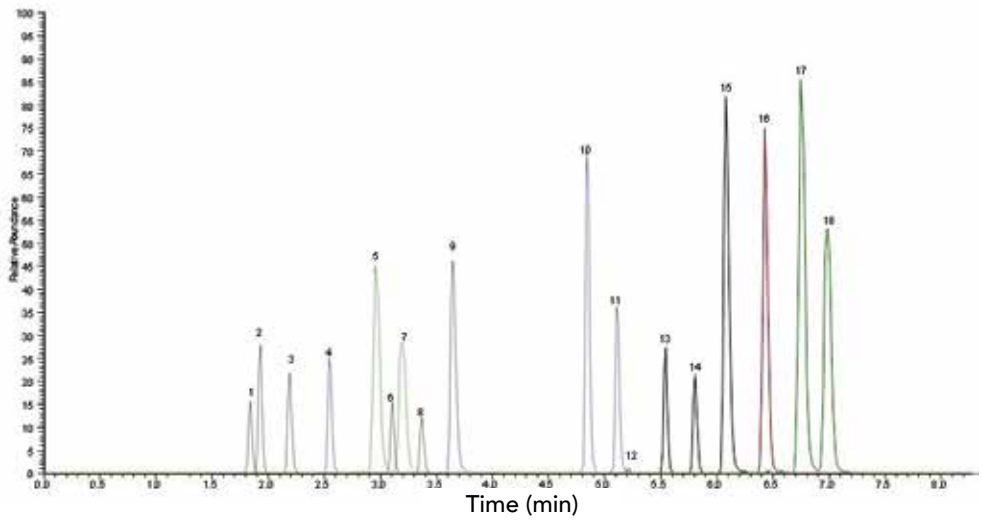



- Application-assured through method qualified lot analysis
- Optimal 2.7 µm Fused-Core® particle for rugged, reliable performance delivering high efficiency, low back pressure separations
- Well suited for UV, Fluorescence and MS detection
- Pressure limit: 600 bar/9000 psi

## APPLICATIONS

- EPA 610
- EPA 8310 +2
- EU 15+1
- Emerging PAHs

## Rapid LCMS analysis of PAH compounds using HALO® PAH




| PEAK # | COMPOUND |
|---|---|
| 1 | Naphthalene |
| 2 | Acenaphthylene |
| 3 | 1-Methylnaphthalene |
| 4 | 2-Methylnaphthalene |
| 5 | Acenaphthene |
| 6 | Fluorene |
| 7 | Phenanthrene |
| 8 | Anthracene |
| 9 | Fluoranthene |
| 10 | Pyrene |
| 11 | Benzo[a]anthracene |
| 12 | Chrysene |
| 13 | Benzo[b]fluoranthene |
| 14 | Benzo[k]fluoranthene |
| 15 | Benzo[a]pyrene |
| 16 | Dibenzo[a,h]anthracene |
| 17 | Benzo[ghi]perylene |
| 18 | Indeno[1,2,3-cd]pyrene |

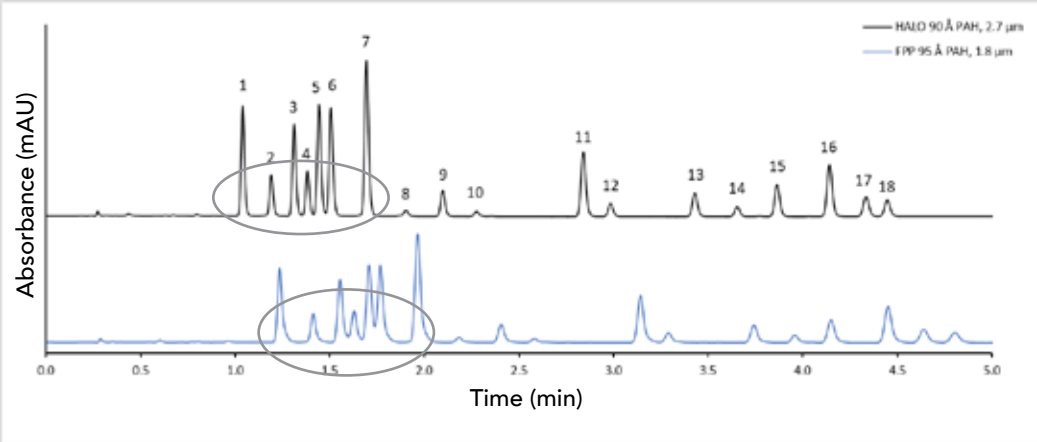
**TEST CONDITIONS**

**Column:** HALO 90 Å PAH, 2.7 µm, 2.1 x 100 mm
**Flow Rate:** 0.4 mL/min
**Pressure:** 289 bar
**Column Temperature:** 30 °C
**Injection Volume:** 1 µL

**Sample Solvent:** Methanol
**LC System:** Shimadzu Nexera
**Mobile Phase A:** Water/0.1% formic acid
**Mobile Phase B:** Acetonitrile/0.1% formic acid
**Gradient:** 40-100 %B in 5.0 min; hold @ 100 %B for 3 min

## HALO® PAH COMPETITIVE ADVANTAGE

HALO® PAH outperforms a fully porous particle (FPP) 1.8 µm, 95 Å column for a fast 5 min separation of method EPA 8310 + 2 demonstrating improved speed and resolution.




| PEAK # | COMPOUND |
|---|---|
| 1 | Naphthalene |
| 2 | Acenaphthylene |
| 3 | 1-Methylnaphthalene |
| 4 | 2-Methylnaphthalene |
| 5 | Acenaphthene |
| 6 | Fluorene |
| 7 | Phenanthrene |
| 8 | Anthracene |
| 9 | Fluoranthene |
| 10 | Pyrene |
| 11 | Benzo[a]anthracene |
| 12 | Chrysene |
| 13 | Benzo[b]fluoranthene |
| 14 | Benzo[k]fluoranthene |
| 15 | Benzo[a]pyrene |
| 16 | Dibenzo[a,h]anthracene |
| 17 | Benzo[ghi]perylene |
| 18 | Indeno[1,2,3-cd]pyrene |

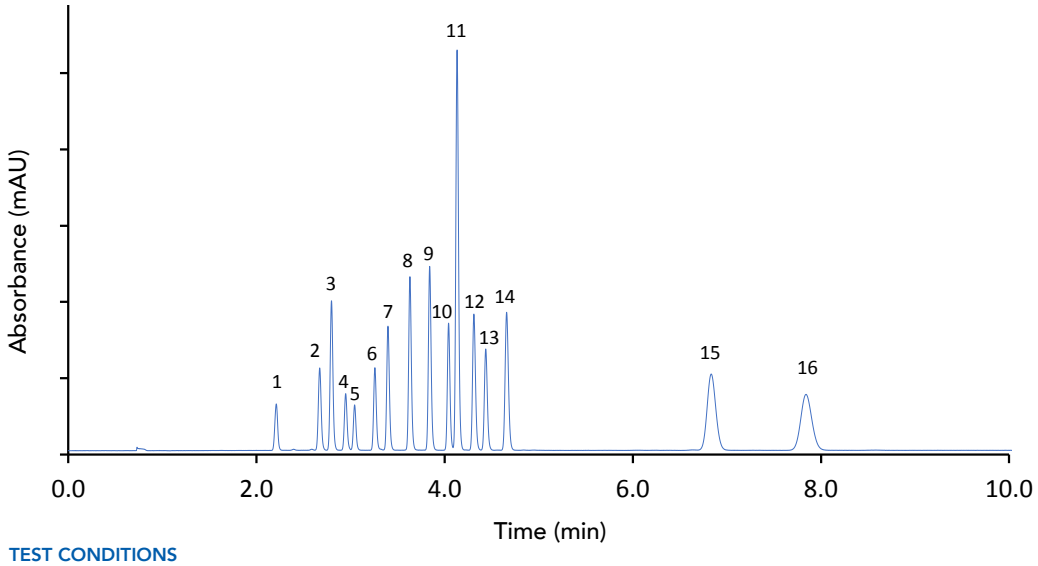
### TEST CONDITIONS

**Column:** HALO 90 Å PAH, 2.7 µm, 4.6 x 50 mm
**Competitor Column:** FPP 95 Å PAH, 1.8 µm, 4.6 x 50 mm
**Mobile Phase A:** Water
**Mobile Phase B:** Acetonitrile
**Gradient:** 50-100 %B in 4 min; hold @ 100 %B for 1 min.
**Flow Rate:** 1.8 mL/min

**HALO® Back Pressure:** 256 bar
**Competitor Back Pressure:** 344 bar
**Temperature:** 30 °C
**Detection:** 280 nm
**Injection Volume:** 2 µL

## SEPARATION OF EU 15 + 1 USING HALO® PAH

The separation is completed on a 4.6 x 50 mm HALO® PAH column in less than 8 minutes with excellent resolution between the critical pairs 4 and 5 which only differ by the presence of a methyl group in this EU 15 + 1 separation.




| PEAK # | COMPOUND |
|---|---|
| 1 | Benzo[c]fluorene |
| 2 | Cyclopenta[cd]pyrene |
| 3 | Benzo[a]anthracene |
| 4 | Chrysene |
| 5 | 5-Methylchrysene |
| 6 | Benzo[j]fluoranthene |
| 7 | Benzo[b]fluoranthene |
| 8 | Benzo[k]fluoranthene |
| 9 | Benzo[a]pyrene |
| 10 | Dibenzo[a,l]pyrene |
| 11 | Dibenz[a,h]anthracene |
| 12 | Benzo[ghi]perylene |
| 13 | Indeno[1,2,3-cd]pyrene |
| 14 | Dibenzo[a,e]pyrene |
| 15 | Dibenzo[a,i]pyrene |
| 16 | Dibenzo[a,h]pyrene |

### TEST CONDITIONS

**Column:** HALO 90 Å PAH, 2.7 µm, 4.6 x 50 mm
**Mobile Phase A:** Water
**Mobile Phase B:** Acetonitrile
**Gradient:** 50-100% B in 4 min.; hold @ 100% for 6 min
**Flow Rate:** 1.8 mL/min

**Temperature:** 30 °C
**Detection:** 292 nm
**Injection Volume:** 10 µL
**Data Rate:** 100 Hz
**LC System:** Shimadzu Nexera X2

# ENVIROCLASS SOLUTIONS

For the protection of human and environmental health, increased research and regulations of chemicals continue to drive more challenging separation and detection demands. HALO® provides a portfolio of selectivities and particle sizes designed for analysis of small molecules of interest to environmental scientists. Whether your research is driven by HPLC, UHPLC, or LCMS, HALO® offers a tailored solution for your demands.

MYCOTOXINS: toxins produced by molds (fungi) and can accumulate in crops, where they pose health hazards to humans and animals.

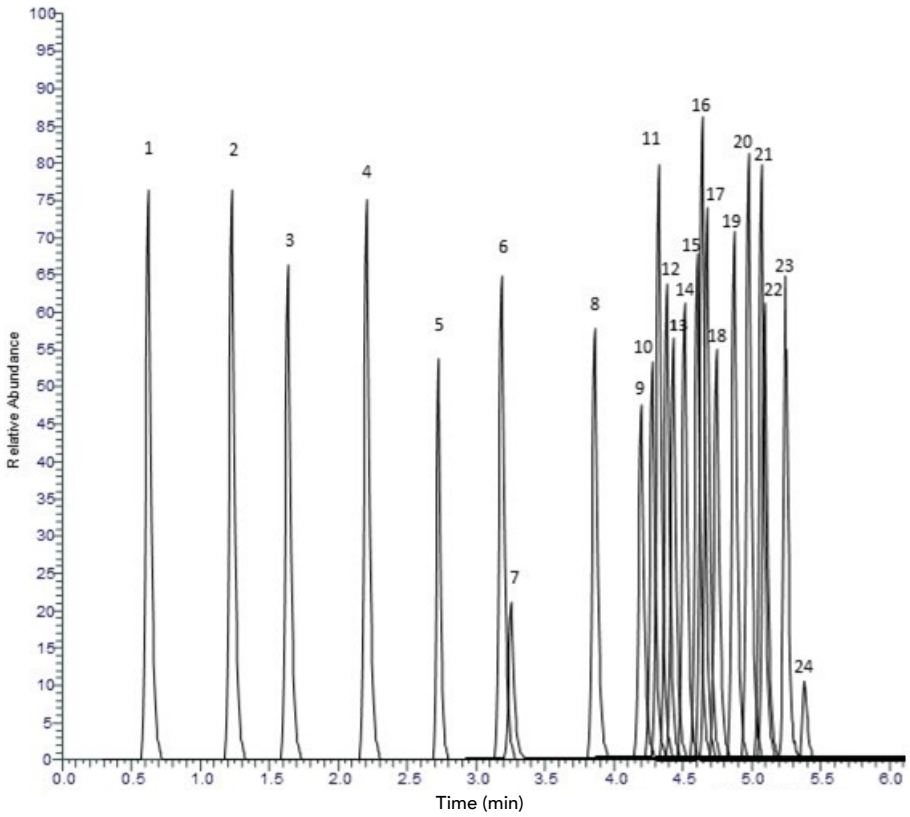
PESTICIDES: any substance used to kill, repel, or control certain forms of plant or animal life that are considered to be pests.

HERBICIDES: a broad class of pesticides that are used to remove nuisance plants.

CARBONYL COMPOUNDS: significant source of organic carbon balance in both aquatic and atmospheric oxidation processes of hydrocarbons often from vehicle emissions and industrial plants.

# MYCOTOXINS

The 2 µm HALO® PFP is an ideal choice for high throughput LCMS analysis of mycotoxins, in which multiple isobaric species separation is needed. Here 24 compounds are separated in 5.5 minutes.




| PEAK # | COMPOUND |
|---|---|
| 1 | Nivalenol |
| 2 | Deoxynivalenol |
| 3 | Deoxynivalenol-3-glu-coside |
| 4 | Fusarenon X |
| 5 | Neosolaniol |
| 6 | 15-Acetyldeoxyniva-lenol |
| 7 | 3-Acetyldeoxynivalenol |
| 8 | Gliotoxin |
| 9 | Aflatoxin G2 |
| 10 | Aflatoxin M1 |
| 11 | Aflatoxin G1 |
| 12 | Aflatoxin B2 |
| 13 | HT-2 + Na |
| 14 | Diacetoxyscirpenol |
| 15 | Aflatoxin B1 |
| 16 | Ochratoxin A |
| 17 | T-2 +Na |
| 18 | Ochratoxin B |
| 19 | Citrinin |
| 20 | Zearalenone |
| 21 | Patulin +MEOH |
| 22 | Fumonisin B1 |
| 23 | Fumonisin B3 |
| 24 | Fumonisin B2 |

## TEST CONDITIONS

**Column:** HALO 90 Å PFP, 2 µm, 2 x 50 mm
**Mobile Phase A:** Water/2mM ammonium formate/0.1% Formic acid
**Mobile Phase B:** Methanol/2mM ammonium formate/0.1% Formic acid

**Gradient:**

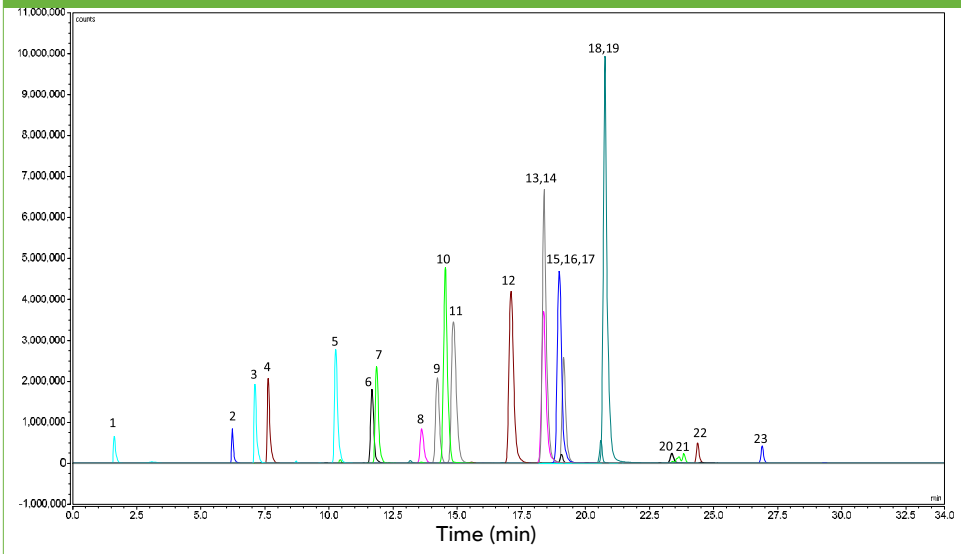
| TIME | % B |
|---|---|
| 0.01 | 15 |
| 1.0 | 25 |
| 2.0 | 40 |
| 2.50 | 41 |
| 4.50 | 100 |
| 5.50 | 100 |
| 5.51 | 15 |
| 6.50 | Finished |

**Flow Rate:** 0.4 mL/min
**Initial Pressure:** 485 bar
**Temperature:** 40 °C
**Injection Volume:** 1 µL
**Sample Solvent:** 95/5 water/methanol
**LC System:** Shimadzu Nexera X2
**Detection:** +ESI MS/MS

HALO® ENVIROCLASS

# PESTICIDES

## High resolution LCMS separation of pesticides using HALO® Biphenyl, which offers 100% aqueous compatibility, ideal to enhance retention of the early eluting polar pesticides.




| PEAK # | COMPOUND |
|---|---|
| 1 | Daminozide |
| 2 | Flonicamid |
| 3 | Thiamethoxam |
| 4 | Imidacloprid |
| 5 | Paclobutrazol |
| 6 | Fenhexamid |
| 7 | Myclobutanil |
| 8 | Bifenazate |
| 9 | Dimethomorph Isomer 1 |
| 10 | Spirotetramat |
| 11 | Dimethomorph Isomer 2 |
| 12 | Spinosad A |
| 13 | Spinosad D |
| 14 | Trifloxystrobin |
| 15 | Spinetoram |
| 16 | Pyrethrin II |

| PEAK # | COMPOUND |
|---|---|
| 17 | Piperonyl butoxide |
| 18 | Pyrethrin I |
| 19 | Etoxazole |
| 20 | Abamectin A |
| 21 | Cypermethrin |
| 22 | Bifenthrin |
| 23 | Acequinocyl |

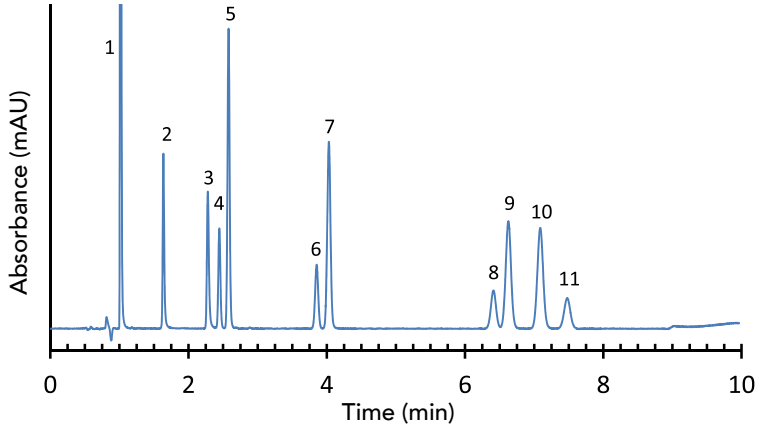
Fludioxonil (observed in negative ion mode)

### TEST CONDITIONS

**Column:** HALO 90 Å Biphenyl, 2.7 µm, 2.1 x 100 mm
**A=**Water/0.1% formic acid/4 mM ammonium formate
**B=**Acetonitrile/0.1% formic acid/4 mM ammonium formate
**Gradient:** 0-15% B in 1.01 min; 15-35% B in 3.99 min; 35-62% B in 1 min; 62-100% B in 25 min; hold at 100% B for 4 min

**Flow Rate:** 0.2 mL/min
**Pressure:** 89 bar (initial)
**Temperature:** 40 °C
**Injection Volume:** 1 µL
**Sample Solvent:** acetonitrile
**Detection:** +ESI

## 11 triazine pesticides are separated in less than 8 minutes using a HALO® AQ-C18 column for its symmetrical peak shape and high resolution.




| PEAK # | COMPOUND |
|---|---|
| 1 | Acetone (solvent) |
| 2 | Atraton |
| 3 | Prometon |
| 4 | Simazine |
| 5 | Simetryn |
| 6 | Atrazine |
| 7 | Ametryn |
| 8 | Propazine |
| 9 | Prometryn |
| 10 | Terbutryn |
| 11 | Terbuthylazine |

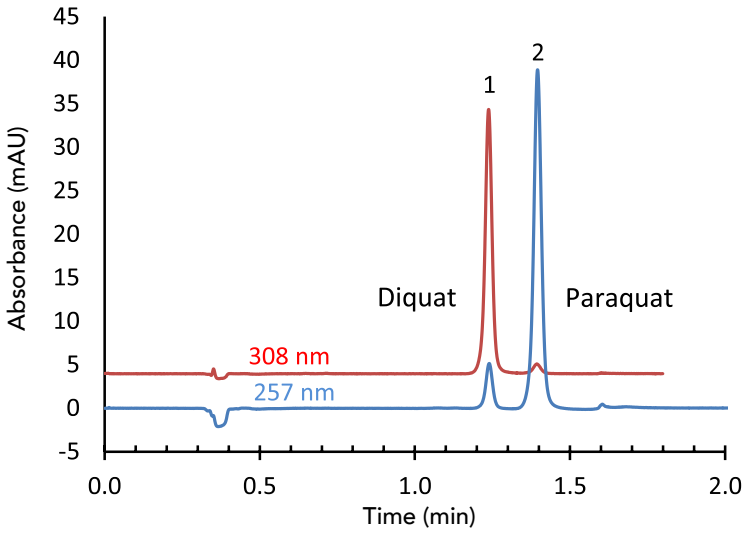
### TEST CONDITIONS

**Column:** HALO AQ-C18, 2.7 µm, 4.6 x 150 mm
**Mobile Phase A:** 0.02 M sodium phosphate buffer, pH=3.0
**Mobile Phase B:** Acetonitrile
**Gradient:** hold at 40% B for 8 min; 40-75% B in 2 min
**Flow Rate:** 1.6 mL/min.

**Pressure:** 310 bar at start
**Temperature:** 35°C
**Detection:** UV 254 nm, VWD
**Injection Volume:** 2.0 µL
**Sample Solvent:** 25/75: acetone/acetonitrile

# HERBICIDES

EPA Method 549.2 specifies the use of two different wavelengths to limit potential matrix interferences. The separation of diquat and paraquat is complete in less than 1.5 minutes on a HALO® Phenyl-Hexyl column using an ion-pair containing mobile phase.



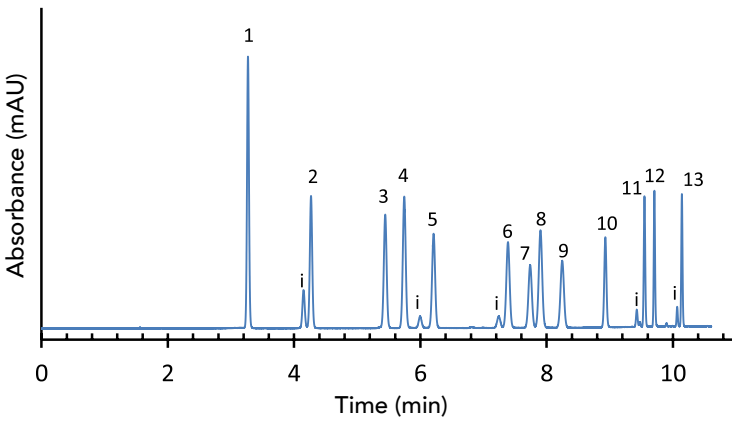

| PEAK # | COMPOUND |
|---|---|
| 1 | Diquat dibromide |
| 2 | Paraquat dichloride |

### TEST CONDITIONS

**Column:** HALO 90 Å Phenyl-Hexyl, 5 µm 3.0 x 100 mm
**Mobile Phase:** 13.5 mL orthophosphoric acid, 10.3 mL diethylamine and 3.0 g of hexane-sulfonic acid, sodium salt in 1 L of water
**Flow Rate:** 1.0 mL/min
**Pressure:** 156 bar
**Temperature:** 30 °C
**Detection:** UV 257, 308 nm, VWD
**Injection Volume:** 40 µL
**Sample Solvent:** Water

# CARBONYL COMPOUNDS

By using a HALO® C18 column with a ACN/THF-containing mobile phase, the DNPH-derivatized carbonyl compounds are fully resolved from their isomers with high resolution.




### TEST CONDITIONS

**Column:** HALO 90 Å C18, 2.7 µm, 4.6 x 150 mm
**Mobile Phase:** 55/45 - A/B
A: Water
B: Acetonitrile/THF (80/20)
**Gradient:** 45-58% B in 7.5 min; 58-80% B in 1.5 min; hold at 80% B for 3 min

**Flow Rate:** 1.5 mL/min
**Pressure:** 355 bar
**Temperature:** 30 °C
**Detection:** UV 360 nm, VWD
**Injection Volume:** 0.3 µL
**Sample Solvent:** Acetonitrile

| PEAK # | COMPOUND |
|---|---|
| 1 | Formaldehyde-2,4-DNPH |
| 2 | Acetaldehyde-2,4-DNPH |
| 3 | Acetone-2,4-DNPH |
| 4 | Acrolein-2,4-DNPH |
| 5 | Propionaldehyde-2,4-DNPH |
| 6 | Crotonaldehyde-2,4-DNPH |
| 7 | 2-Butanone-2,4-DNPH |
| 8 | Methacrolein-2,4-DNPH |
| 9 | Butyraldehyde-2,4-DNPH |
| 10 | Benzaldehyde-2,4-DNPH |
| 11 | Valeraldehyde-2,4-DNPH |
| 12 | m-Tolualdehyde-2,4-DNPH |
| 13 | Hexaldehyde-2,4-DNPH<br>2,4-DNPH = 2,4-Dinitro-phenylhydrazone<br>i = anti, syn, isomers of the respective DPNH derivatives |

# HALO® ENVIROCLASS SPECIFICATIONS TABLES

## SPECIFICATIONS

| BONDED PHASE | PARTICLE SIZE (µm) | SURFACE AREA ($m^2/g$) | LOW pH/T LIMIT | HIGH pH/T LIMIT | ENDCAPPED |
|---|---|---|---|---|---|
| PFAS Analytical | 2.7 | 135 | 2/60 °C | 9/40 °C | Yes |
| PFAS Delay | 2.7 | 90 | 2/60 °C | 9/40 °C | Yes |
| PAH | 2.7 | 135 | 2/60 °C | 9/40°C | No |

# ORDERING INFORMATION

## PFAS

### ANALYTICAL COLUMNS

| Dimensions: ID x Length (in mm) | PN |
|---|---|
| 2.1 x 50 | 92812-413 |
| 2.1 x 100 | 92812-613 |
| 2.1 x 150 | 92812-713 |
| 2.1 x 250 | 92812-913 |
| 3.0 x 50 | 92813-413 |
| 3.0 x 100 | 92813-613 |
| 3.0 x 150 | 92813-713 |
| 3.0 x 250 | 92813-913 |

### DELAY COLUMNS

| Dimensions: ID x Length (in mm) | PN |
|---|---|
| 3.0 x 50 | 92113-415 |
| 4.6 x 50 | 92114-415 |

## PAH

### ANALYTICAL COLUMNS

| Dimensions: ID x Length (in mm) | PN |
|---|---|
| 2.1 x 50 | 92842-412 |
| 2.1 x 100 | 92842-612 |
| 2.1 x 150 | 92842-712 |
| 3.0 x 50 | 92843-412 |
| 3.0 x 100 | 92843-612 |
| 3.0 x 150 | 92843-712 |
| 4.6 x 50 | 92844-412 |
| 4.6 x 100 | 92844-612 |
| 4.6 x 150 | 92844-712 |

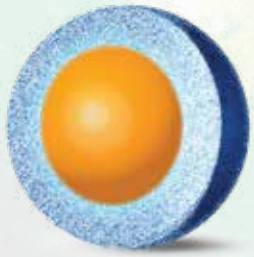
### GUARD COLUMNS

**2.7 µm Guard Columns 3-pk**

| Dimensions: ID x Length (in mm) | PN |
|---|---|
| 2.1 x 5 | 92842-112 |
| 3.0 x 5 | 92843-112 |
| 4.6 x 5 | 92844-112 |
| Guard Column Holder | 94900-001 |

# OTHER SMALL MOLECULE HALO® OFFERINGS FOR ENVIRONMENTAL APPLICATIONS

Below is a list of other phases that accomplish complex separations for environmental needs as well as many other applications of interest for small molecule separations.



## SMALL MOLECULE

| BONDED PHASE | FEATURES AND BENEFITS |
|---|---|
| AQ-C18 | • Ideal for mixtures of polar and non-polar solutes<br>• High retentivity of C18 with alternate selectivity<br>• 100% aqueous compatible |
| C18 | • Universal phase for acids, bases and neutral solutes<br>• Excellent stability at low to mid mobile phase pH<br>• Wide range of published literature applications |
| HILIC | • Ideal for polar analytes<br>• Alternate mode to reversed-phase modes<br>• Can be used in HILIC and normal-phase modes |
| C8 | • Ideal for broad range of analytes<br>• Less hydrophobic (less retentive) than C18<br>• Better ion-pair applications than C18 |
| ES-CN | • Ideal for polar analytes<br>• Alternate selectivity to alkyl phases<br>• 100% aqueous compatible |
| PHENYL-HEXYL | • Ideal for separating aromatic compounds using pi-pi interactions<br>• Alternate selectivity to alkyl phases<br>• Also available with 160 Å pores for peptide mapping |
| BIPHENYL | • Ideal for aromatic (pi-pi) compounds<br>• Alternate selectivity to alkyl phases<br>• 100% aqueous compatible |
| PFP | • Ideal for aromatics and electron-rich compounds<br>• Alternate selectivity to alkyl phases<br>• Useful in RPLC and HILIC modes |
| RP-AMIDE | • Ideal for basic compounds (alcohols, acids, phenols, catechins)<br>• Alternate selectivity to alkyl phases<br>• 100% aqueous compatible |
| PENTA-HILIC | • Ideal for polar compounds poorly retained in RPLC<br>• Alternate selectivity for HILIC mode<br>• Excellent peak shape for basic compounds in HILIC mode |
| C30 | • Ideal for hydrophobic, long chain, structurally related isomers<br>• Alternate alkyl phase with high shape selectivity<br>• 100% aqueous compatible |

# HALO®

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