

HALO<sup>®</sup>  
ENVIROCLASS



## 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.



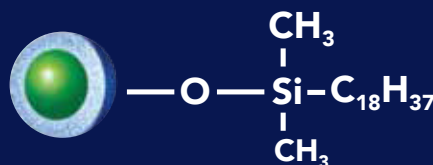
# HALO® PFAS

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.

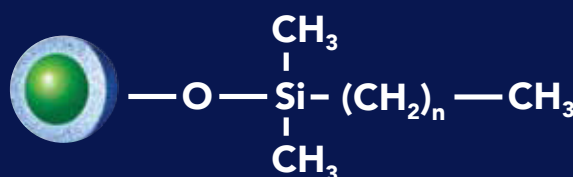
The HALO® PFAS solution is different from other C18 offerings in that it is quality assured for PFAS analysis providing confidence it will meet application demands.

- 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

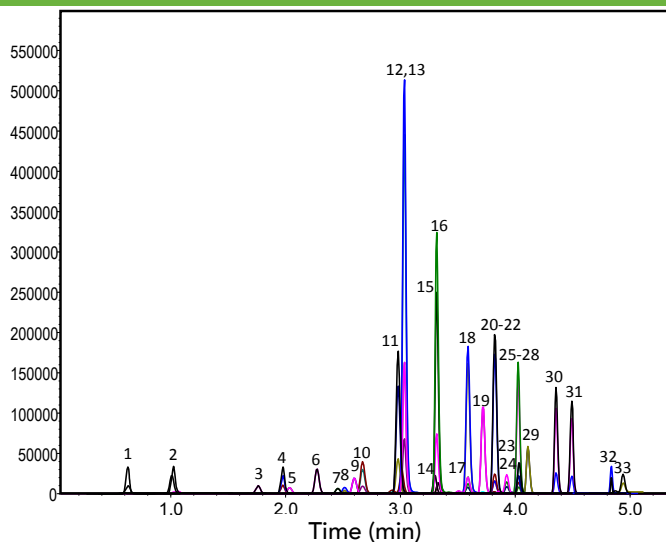


## APPLICATIONS

- 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.



### TEST CONDITIONS

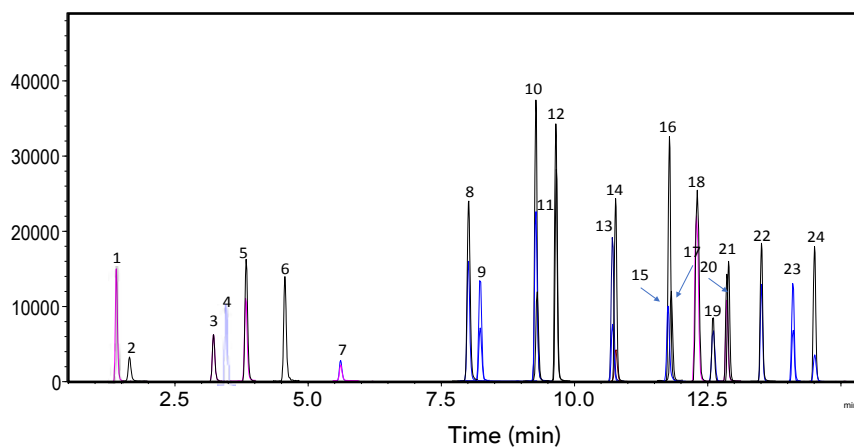
Analytical Column: HALO® PFAS, 2.7 µm, 2.1 x 100 mm  
 Delay Column: HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm  
 Mobile Phase A: 10 mM Ammonium Acetate  
 Mobile Phase B: Methanol  
 Gradient: 33-98 %B in 4.0 min; 98-100 %B in 0.1 min.;  
 hold @ 100 %B for 2 min.

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

PEAK #	COMPOUND	PEAK #	COMPOUND
1	PFBA	18	PFOS
2	4:2FTS	19	9Cl-PF3ONS
3	PFPeA	20	8:2FTS
4	PFBS	21	PFNS
5	PFHpS	22	PFDA
6	PFPeS	23	N-MeFOSAA
7	PFMPA	24	PFNA
8	PFHxA	25	NFDHA
9	PFEESA	26	PFUnA
10	HFPO-DA	27	N-EtFOSAA
11	PFHxS	28	6:2FTS
12	NaDONA	29	11Cl-PF3OUdS
13	ADONA	30	PFTTrDA
14	FOSA	31	PFDaA
15	PFOA	32	PFTeDA
16	PFMBA	33	PFDS
17	PFHpA		

## 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.



### TEST CONDITIONS

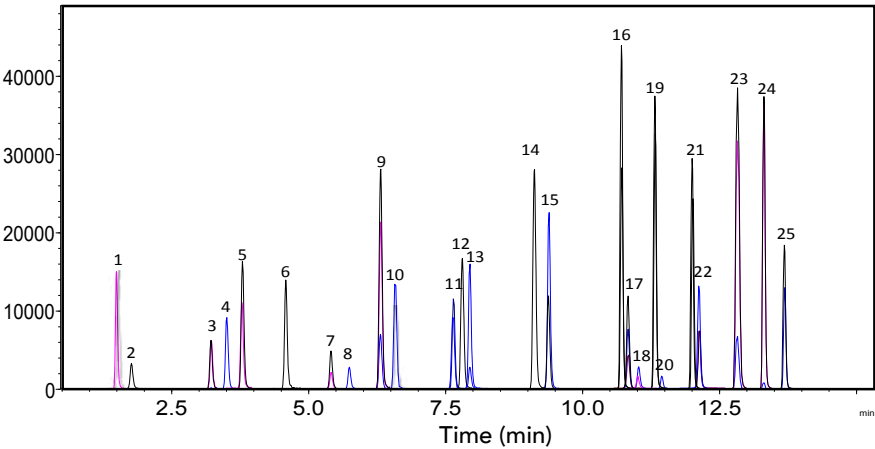
Analytical Column: HALO® PFAS, 2.7 µm, 2.1 x 100 mm  
 Delay Column: HALO® PFAS Delay, 2.7 µm, 3.0 x 50 mm  
 Mobile Phase A: 10 mM Ammonium Acetate  
 Mobile Phase B: Methanol  
 Gradient: 33-98 %B in 18 min.

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%)

PEAK #	COMPOUND	PEAK #	COMPOUND
1	PFBA	13	PFNA
2	4:2FTS	14	PFOS
3	PFPeA	15	PFNS
4	PFBS	16	PFDA
5	PFHpS	17	8:2FTS
6	PFPeS	18	N-MeFOSAA
7	PFHxA	19	6:2FTS
8	PFHpA	20	PFUnA
9	PFHxS	21	N-EtFOSAA
10	FOSA	22	PFDaA
11	PFOA	23	PFTTrDA
12	PFDS	24	PFTeDA

PFAS ANALYSIS ACCORDING TO EPA 533

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



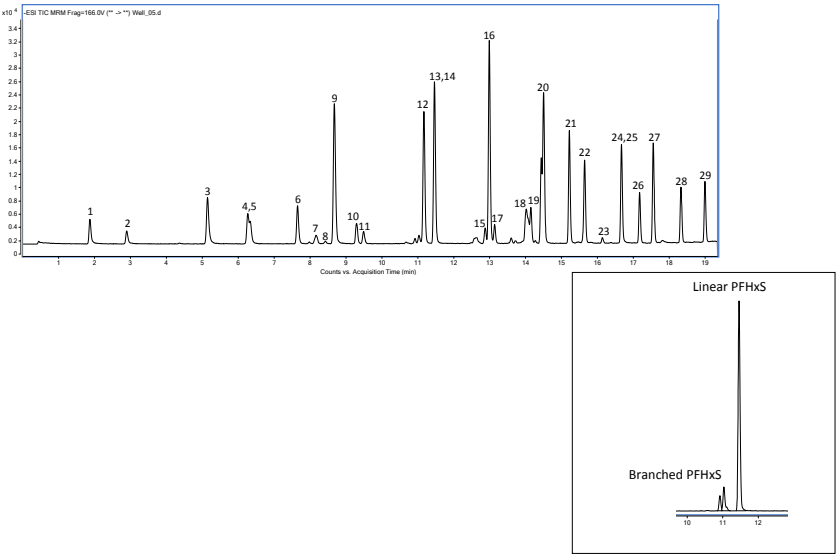
TEST CONDITIONS

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 Acetate  
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%)

PEAK #	COMPOUND	PEAK #	COMPOUND
1	PFBA	14	PFOA
2	4-2FTS	15	PFmbA
3	PFPeA	16	PFNA
4	PFBS	17	PFOS
5	PFHpS	18	9Cl-PF3ONS
6	PFPeS	19	PFDA
7	PFmpA	20	8-2FTS
8	PFHxA	21	6-2FTS
9	PFEESA	22	NFDHA
10	HFPO-DA	23	PFUnA
11	PFHpA	24	11Cl-PF3OUdS
12	PFHxS	25	PFDoA
13	ADONA		

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.



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 Acetate  
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

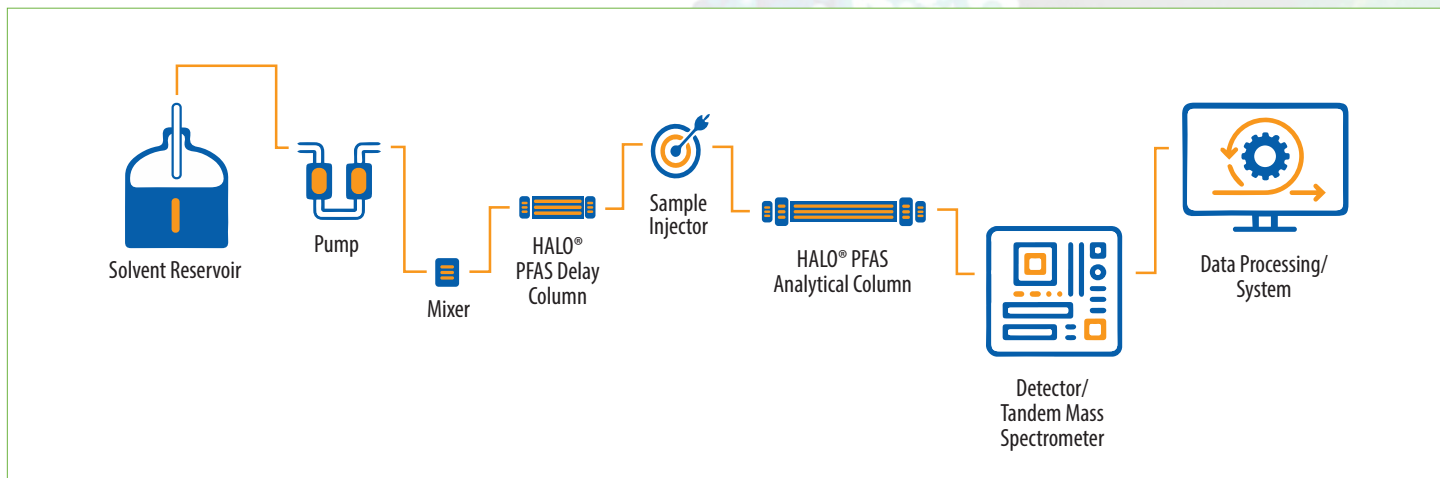
PEAK #	COMPOUND	PEAK #	COMPOUND
1	PFBA	16	PFOA
2	PFMPA	17	PFHpS
3	PFPeA	18	PFNA
4	PFBS	19	PFOS
5	PFMBA	20	9Cl-PF3ONS
6	PFEESA	21	8-2FTS
7	NFDHA	22	PFDA
8	4-2FTS	23	NMeFOSAA
9	PFHxA	24	NEtFOSAA
10	PFPeS	25	PFUnA
11	HFPO-DA	26	11Cl-PF3OUdS
12	PFHpA	27	PFDoA
13	PFHxS	28	PFTtA
14	ADONA	29	PFTA
15	6-2FTS		

Data courtesy of STRIDE Center for PFAS Solutions



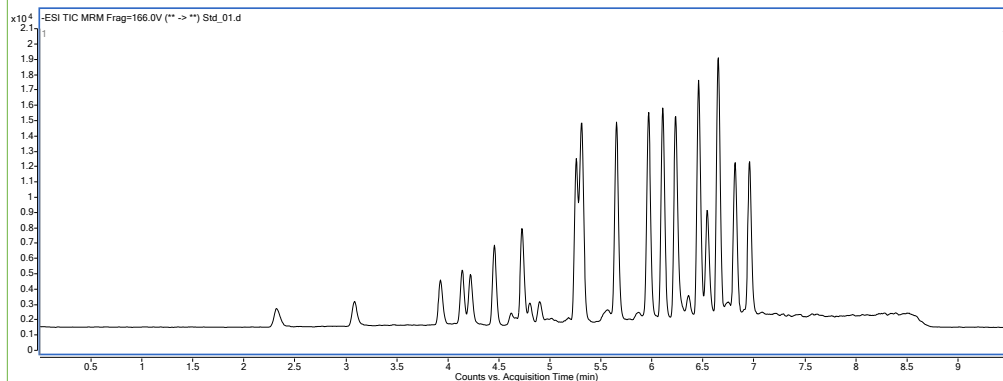
# HALO® PFAS DELAY COLUMN

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.

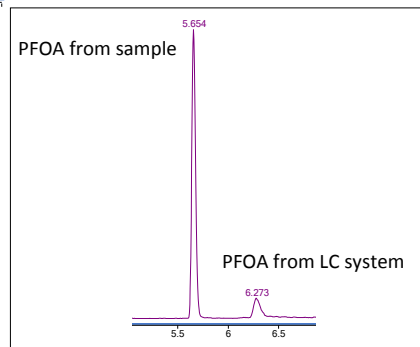


### TEST CONDITIONS

Analytical Column: HALO® PFAS, 2.7  $\mu$ m, 2.1 x 100 mm  
Delay Column: HALO® PFAS Delay, 2.7  $\mu$ m, 3.0 x 50 mm  
Mobile Phase A: 20 mM Ammonium Acetate  
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  $\mu$ L  
Sample Solvent: Methanol (96%) / Water (4%)  
LC System: Agilent Triple Quadrupole LC/MS 6400

Data courtesy of STRIDE Center for PFAS Solutions



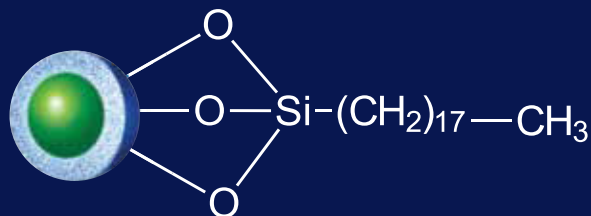
# HALO® PAH

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.

- 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

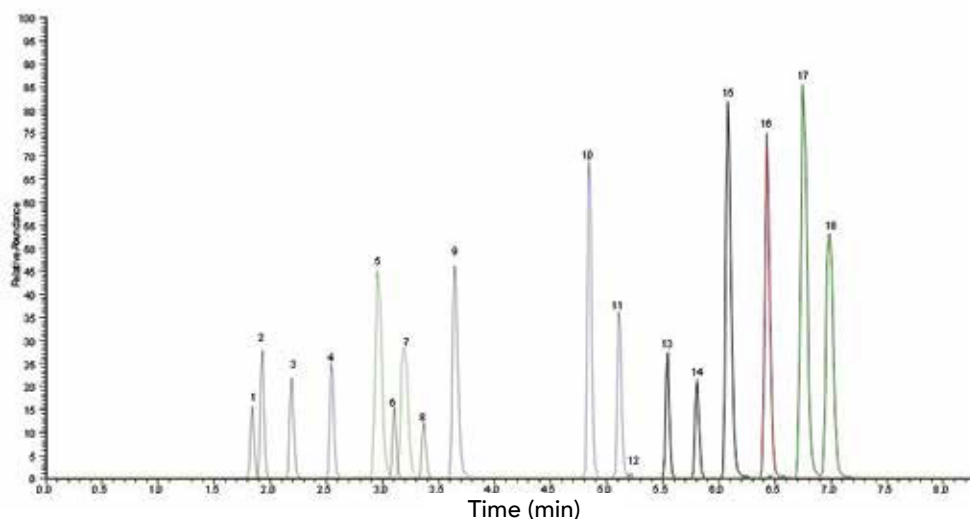
## HALO® PAH



## APPLICATIONS

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

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



### 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

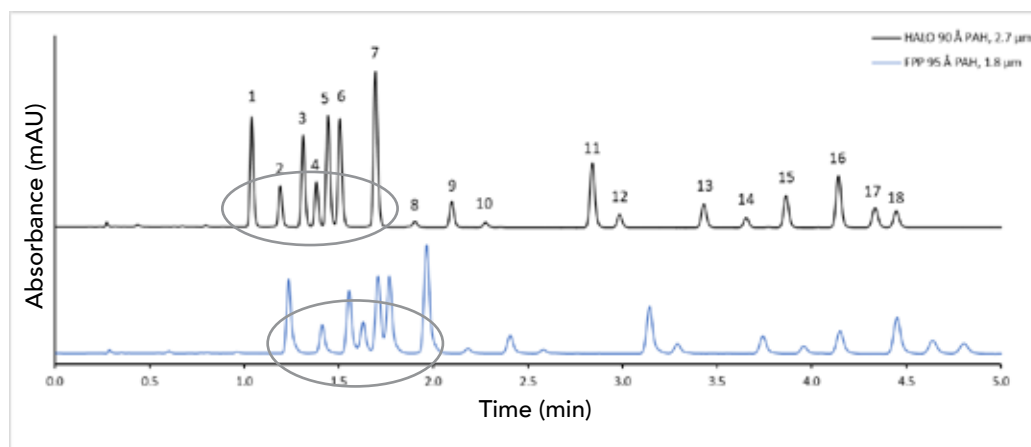
Sample Solvent: Methanol  
LC System: Shimadzu Nexera  
Mobile Phase A: Water/0.1% formic acid  
Mobile Phase B: Acetonitrile/0.1% formic acid  
Gradient: 40-100 %B in 5.0 min; hold @ 100 %B for 3 min

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



## 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

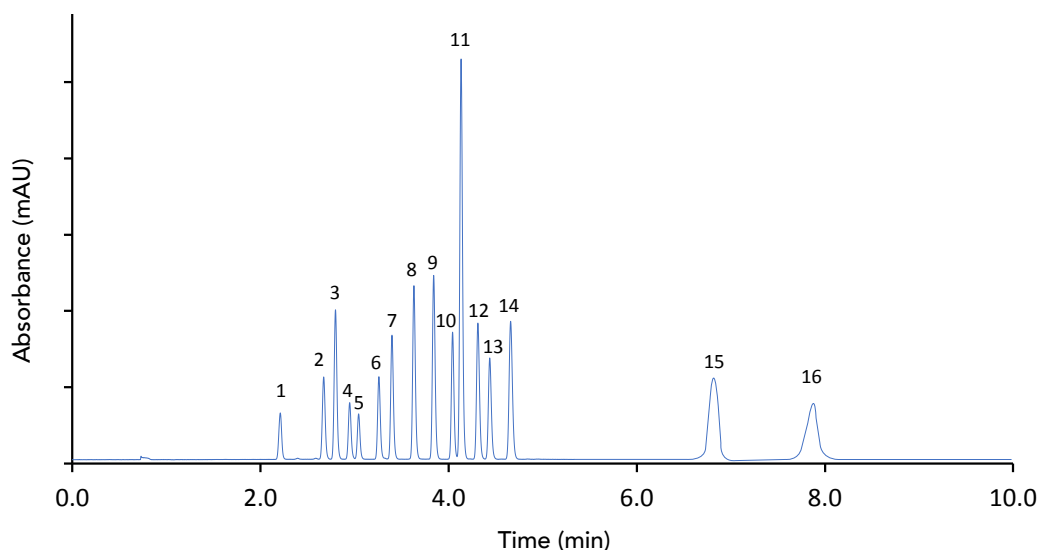
### TEST CONDITIONS

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,j]pyrene

### TEST CONDITIONS

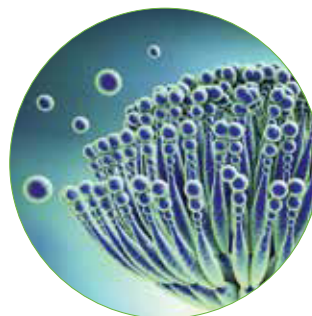
Column: HALO 90 Å PAH, 2.7 µm, 4.6 x 50 mm  
 Mobile Phase A: Water  
 Mobile Phase B: Acetonitrile  
 Gradient: 50-100% B in 4 min.; hold @ 100% for 6 min  
 Flow Rate: 1.8 mL/min

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.

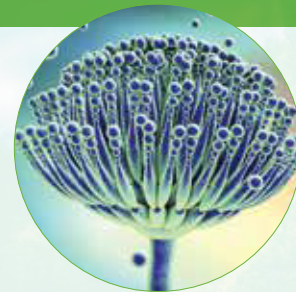


**HERBICIDES:** a broad class of pesticides that are used to remove nuisance plants.

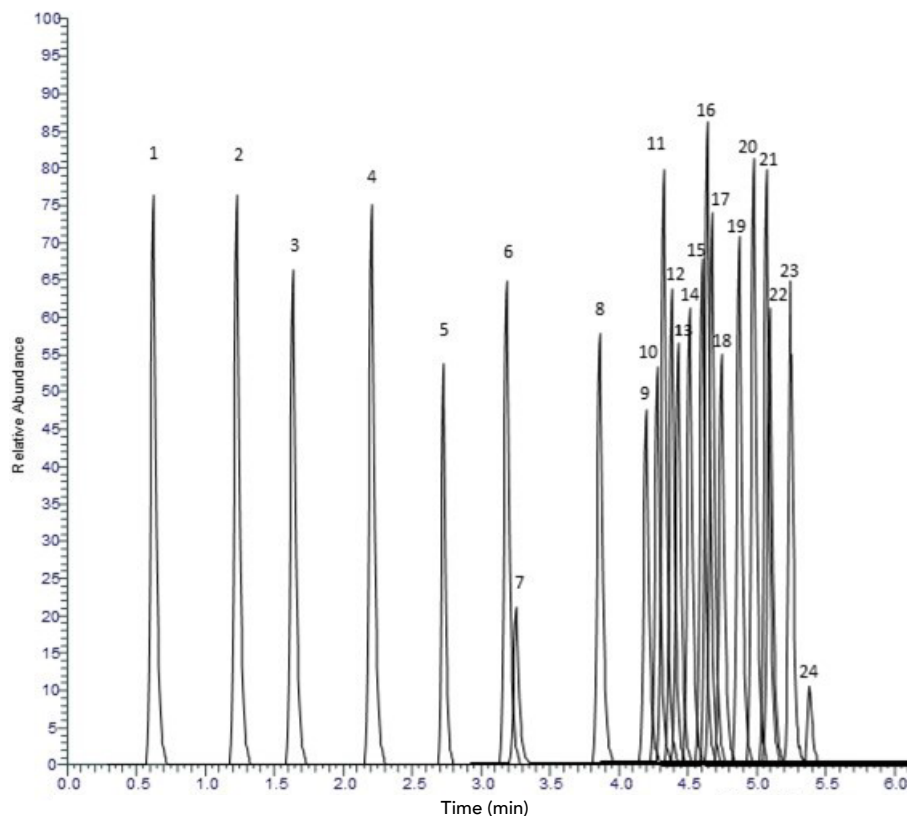


**CARBONYL COMPOUNDS:** significant source of organic carbon balance in both aquatic and atmospheric oxidation processes of hydrocarbons often from vehicle emissions and industrial plants.





The 2  $\mu$ m 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-glucoside
4	Fusarenon X
5	Neosolaniol
6	15-Acetyldeoxynivalenol
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  $\mu$ m, 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  $\mu$ L

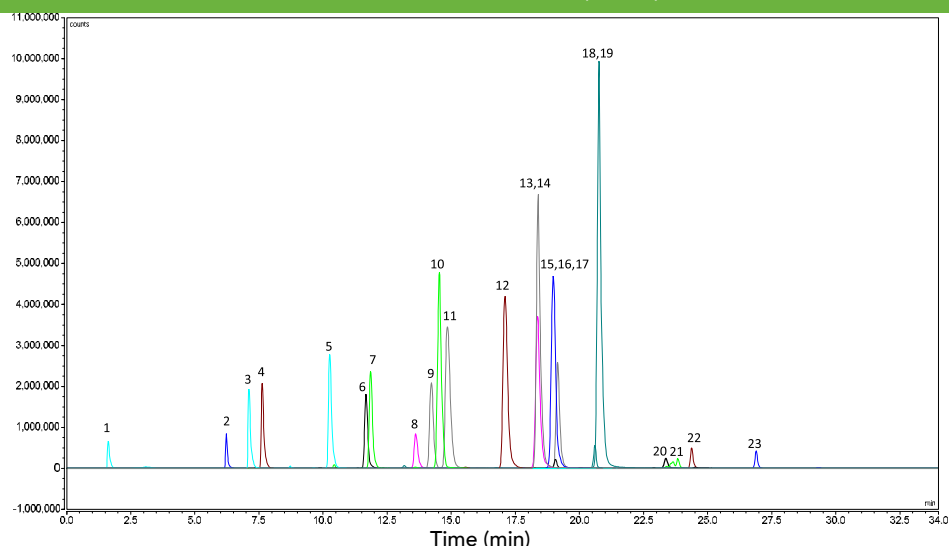
Sample Solvent: 95/5 water/methanol

LC System: Shimadzu Nexera X2

Detection: +ESI MS/MS



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



## TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 2.7  $\mu$ m, 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

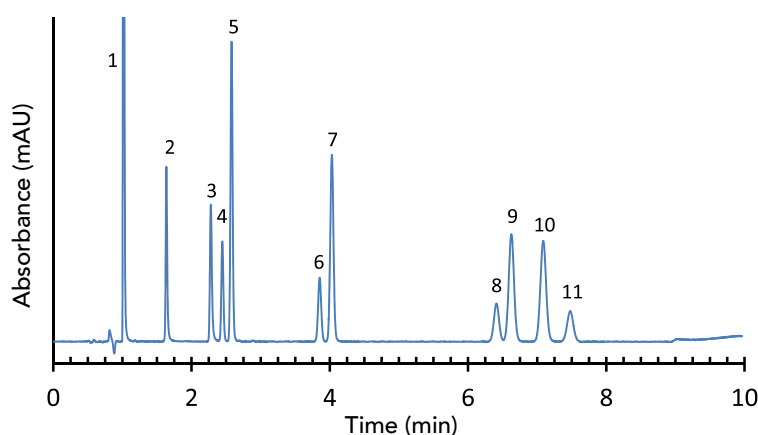
Flow Rate: 0.2 mL/min  
 Pressure: 89 bar (initial)  
 Temperature: 40 °C  
 Injection Volume: 1  $\mu$ L  
 Sample Solvent: acetonitrile  
 Detection: +ESI

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)

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



## TEST CONDITIONS

Column: HALO AQ-C18, 2.7  $\mu$ m, 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  $\mu$ L  
 Sample Solvent: 25/75: acetone/acetonitrile

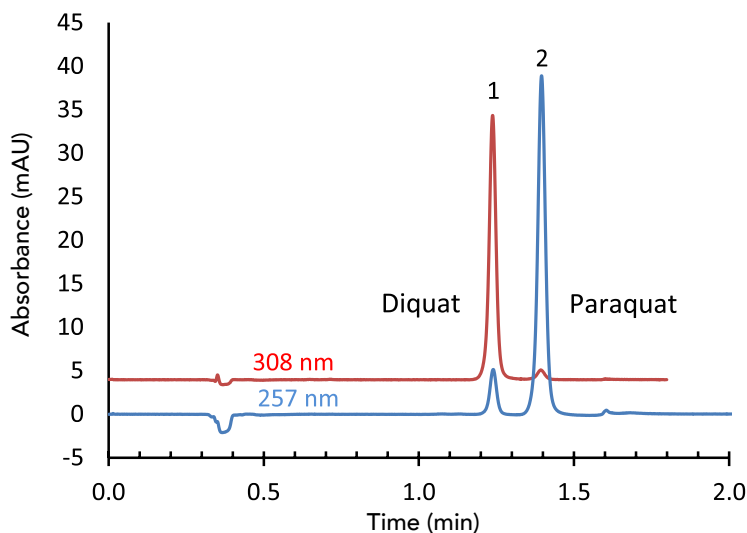
PEAK #	COMPOUND
1	Acetone (solvent)
2	Atraton
3	Prometon
4	Simazine
5	Simetryn
6	Atrazine
7	Ametryn
8	Propazine
9	Prometryn
10	Terbutryn
11	Terbutylazine



# 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

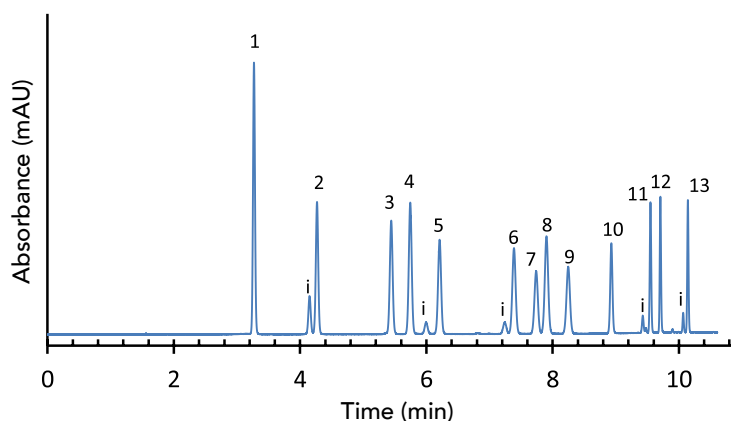
## TEST CONDITIONS

Column: HALO 90 Å Phenyl-Hexyl, 5  $\mu$ m  
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  $\mu$ L  
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.



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 2,4-DNPH = 2,4-Dinitro- phenylhydrazones i = anti, syn, isomers of the respective DNPH derivatives

## TEST CONDITIONS

Column: HALO 90 Å C18, 2.7  $\mu$ m, 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  $\mu$ L  
Sample Solvent: Acetonitrile

# HALO® ENVIROCLASS SPECIFICATIONS TABLES

## SPECIFICATIONS

BONDED PHASE	PARTICLE SIZE (µm)	SURFACE AREA (m²/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

### ANALYTICAL COLUMNS

### DELAY COLUMNS

PFAS

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

Dimensions: ID x Length (in mm)

PN

3.0 x 50	92113-415
4.6 x 50	92114-415

### ANALYTICAL COLUMNS

### GUARD COLUMNS

PAH

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

#### 2.7 µm Guard Columns 3-pk

Dimensions: ID x Length (in mm)

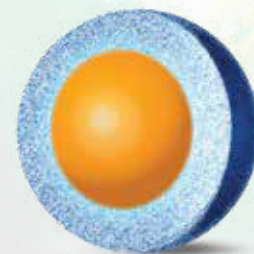
PN

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.



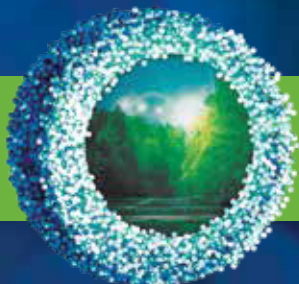
## SMALL MOLECULE

BONDED PHASE	FEATURES AND BENEFITS
<b>AQ-C18</b>	<ul style="list-style-type: none"> <li>• Ideal for mixtures of polar and non-polar solutes</li> <li>• High retentivity of C18 with alternate selectivity</li> <li>• 100% aqueous compatible</li> </ul>
<b>C18</b>	<ul style="list-style-type: none"> <li>• Universal phase for acids, bases and neutral solutes</li> <li>• Excellent stability at low to mid mobile phase pH</li> <li>• Wide range of published literature applications</li> </ul>
<b>HILIC</b>	<ul style="list-style-type: none"> <li>• Ideal for polar analytes</li> <li>• Alternate mode to reversed-phase modes</li> <li>• Can be used in HILIC and normal-phase modes</li> </ul>
<b>C8</b>	<ul style="list-style-type: none"> <li>• Ideal for broad range of analytes</li> <li>• Less hydrophobic (less retentive) than C18</li> <li>• Better ion-pair applications than C18</li> </ul>
<b>ES-CN</b>	<ul style="list-style-type: none"> <li>• Ideal for polar analytes</li> <li>• Alternate selectivity to alkyl phases</li> <li>• 100% aqueous compatible</li> </ul>
<b>PHENYL-HEXYL</b>	<ul style="list-style-type: none"> <li>• Ideal for separating aromatic compounds using pi-pi interactions</li> <li>• Alternate selectivity to alkyl phases</li> <li>• Also available with 160 Å pores for peptide mapping</li> </ul>
<b>BIPHENYL</b>	<ul style="list-style-type: none"> <li>• Ideal for aromatic (pi-pi) compounds</li> <li>• Alternate selectivity to alkyl phases</li> <li>• 100% aqueous compatible</li> </ul>
<b>PFP</b>	<ul style="list-style-type: none"> <li>• Ideal for aromatics and electron-rich compounds</li> <li>• Alternate selectivity to alkyl phases</li> <li>• Useful in RPLC and HILIC modes</li> </ul>
<b>RP-AMIDE</b>	<ul style="list-style-type: none"> <li>• Ideal for basic compounds (alcohols, acids, phenols, catechins)</li> <li>• Alternate selectivity to alkyl phases</li> <li>• 100% aqueous compatible</li> </ul>
<b>PENTA-HILIC</b>	<ul style="list-style-type: none"> <li>• Ideal for polar compounds poorly retained in RPLC</li> <li>• Alternate selectivity for HILIC mode</li> <li>• Excellent peak shape for basic compounds in HILIC mode</li> </ul>
<b>C30</b>	<ul style="list-style-type: none"> <li>• Ideal for hydrophobic, long chain, structurally related isomers</li> <li>• Alternate alkyl phase with high shape selectivity</li> <li>• 100% aqueous compatible</li> </ul>

# HALO®



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MAC-MOD Analytical is an authorized distributor of HALO columns