# HALO®

# LPH - C18

ENHANCED STABILITY FOR LOW PH APPLICATIONS

# SPECIFICATIONS

Ligand: diisobutyloctadecylsilane
Particle Size: 2 µm, 2.7 µm
Pore Size: 90 Å

USP Designation: L1
Carbon Load: 6.5%
Surface Area:
2 µm: 120 m2/g
2.7 µm: 135 m2/g

Endcapped: No
Low pH Limit /Max T: 1/90 °C
High pH Limit/Max T: 8/40 °C

# PART NUMBERS

| 2.7 µm ANALYTICAL COLUMNS | |
|---|---|
| **Dimensions: ID x Length (in mm)** | **Part Number** |
| 1.5 x 50 | 9282X-416 |
| 1.5 x 100 | 9282X-616 |
| 1.5 x 150 | 9282X-716 |
| 2.1 x 50 | 92822-416 |
| 2.1 x 100 | 92822-616 |
| 2.1 x 150 | 92822-716 |
| 3.0 x 50 | 92823-416 |
| 3.0 x 100 | 92823-616 |
| 3.0 x 150 | 92823-716 |
| 4.6 x 50 | 92824-416 |
| 4.6 x 100 | 92824-616 |
| 4.6 x 150 | 92824-716 |

| 2.0 µm ANALYTICAL COLUMNS | |
|---|---|
| **Dimensions: ID x Length (in mm)** | **Part Number** |
| 2.1 x 50 | 91822-416 |
| 2.1 x 100 | 91822-616 |
| 2.1 x 150 | 91822-716 |
| 3.0 x 50 | 91823-416 |
| 3.0 x 100 | 91823-616 |
| 3.0 x 150 | 91823-716 |

| 2.7 µm GUARD COLUMNS | |
|---|---|
| **Guard columns, 3-pack** | |
| **Dimensions: ID x Length (in mm)** | **Part Number** |
| 2.1 x 5 | 92822-116 |
| 3.0 x 5 | 92823-116 |
| 4.6 x 5 | 92824-116 |
| Guard Column Holder | 94900-001 |

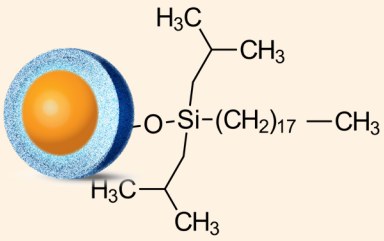
| 2.0 µm GUARD COLUMNS | |
|---|---|
| **Guard columns, 3-pack** | |
| **Dimensions: ID x Length (in mm)** | **Part Number** |
| 2.1 x 5 | 91822-116 |
| 3.0 x 5 | 91823-116 |
| Guard Column Holder | 94900-001 |

**INNOVATION YOU CAN TRUST – PERFORMANCE YOU CAN RELY ON**

# HALO® LPH - C18

## INTRODUCING HALO® LPH-C18

Introducing a low pH compatible, 90 Å, superficially porous particle C18 phase useful for any chromatographer running under low pH conditions. The sterically protected ligand reduces acidic hydrolysis which enables low pH mobile phases to be used without sacrificing column performance over time.




## FEATURES OF HALO® LPH-C18

- Improved stability with low pH mobile phases of pH 1-2
- Highly reproducible alkyl chain bonded phase coverage
- Built upon Fused-Core® Technology for fast, efficient, rugged separations

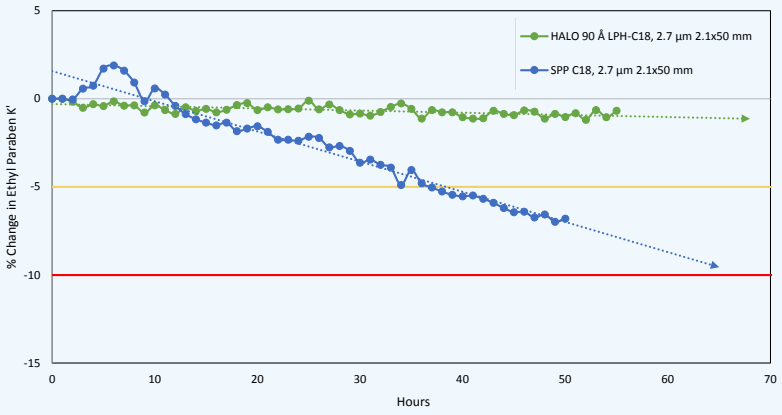
### Best Applications:

Wide range of small molecule applications including:

- polyphenols
- cannabinoids
- pesticides

## QUALITY YOU CAN COUNT ON

A separation of parabens is performed on a HALO 90 Å LPH-C18 column under low pH (pH 1) and high temperature conditions compared to a standard C18 SPP column. Due to the sterically protected ligand, the LPH-C18 column can withstand these harsh conditions over a 55 hour test.



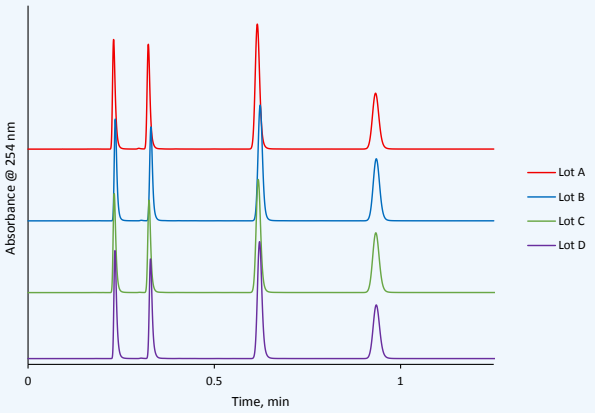

### TEST CONDITIONS

**Column:** HALO 90 Å LPH-C18, 2.7 µm 2.1x50 mm
**Part Number:** 92822-416
**Mobile Phase A:** Water, 1% TFA (pH: 1)
**Mobile Phase B:** Acetonitrile
**Gradient:**

| Time | %B |
|---|---|
| 0.0 | 20 |
| 7.50 | 20 |
| 7.51 | 5 |
| 45.00 | 5 |
| 47.00 | 100 |
| 51.00 | 100 |
| 51.01 | 20 |
| 60.00 | 20 |

**Flow Rate:** 0.5 mL/min
**Pressure:** 108 bar
**Temperature:** 60 °C
**Detection:** UV 254 nm, PDA
**Injection Volume:** 0.4 µL (methyl and ethyl paraben)
**Sample Solvent:** 25/75 ACN/ Water
**Data Rate:** 100 Hz
**Response Time:** 0.025 sec.
**Flow Cell:** 1 µl
**LC System:** Shimadzu Nexera X2

Excellent lot-to-lot reproducibility is observed with a mixture of neutral compounds.



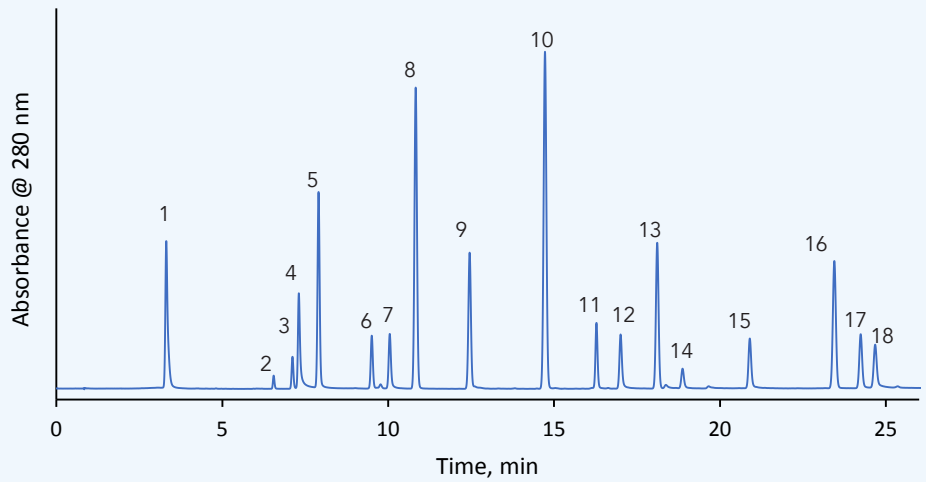

### TEST CONDITIONS

**Mobile Phase A:** Water
**Mobile Phase B:** Acetonitrile
**Isocratic:** 60/40 Acetonitrile/Water
**Wavelength:** 254 nm
**Injection:** 2.0 µL (uracil, phenol, 1-Cl-4-nitrobenzene, naphthalene)
**Temperature:** 30 °C
**Flow Cell:** 1.8 mL/min.
**Column:** HALO 90 Å LPH-C18 2.7µm 4.6 x 50mm

# APPLICATIONS

## COMMON POLYPHENOLS FOUND IN WINE

Common polyphenols found in wine are separated using a HALO 90 Å LPH-C18 column using analytical standards. This stationary phase contains a sterically protected ligand which is ideal for high stability under low pH conditions.




### PEAK IDENTITIES

1. Gallic Acid
2. Epigallocatechin
3. Chlorogenic Acid
4. Catechin
5. Caffeic Acid
6. Epicatechin
7. Epigallocatechin Gallate
8. p-Coumaric Acid
9. Ferulic Acid
10. o-Coumaric Acid
11. Quercitrin
12. Myricetin
13. Resveratrol
14. Morin
15. Quercetin
16. Naringenin
17. Apigenin
18. Kaempferol

### TEST CONDITIONS

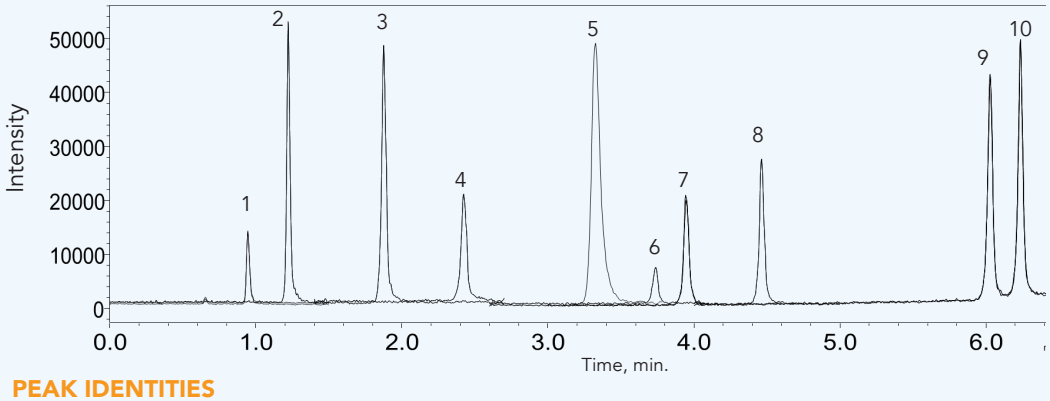
**Column:** HALO 90 Å LPH-C18, 2.7 µm 2.1x100 mm
**Mobile Phase A:** Water/ 0.1% Formic Acid
**Mobile Phase B:** Acetonitrile/ 0.1% Formic Acid
**Gradient:**

| Time (min) | %B |
|---|---|
| 0.0 | 0 |
| 3.5 | 8 |
| 7.1 | 10 |
| 25.0 | 30 |
| 26.0 | 40 |
| 27.0 | 100 |
| 29.0 | 100 |
| 30.0 | 0 |
| 35.0 | 0 |

**Flow Rate:** 0.3 mL/min
**Pressure:** 159 bar
**Temperature:** 30 °C
**Detection:** UV 280 nm, PDA
**Injection Volume:** 0.7 µL
**Sample Solvent:** Water
**Data Rate:** 100 Hz
**Response Time:** 0.025 sec.
**Flow Cell:** 1 µL
**LC System:** Shimadzu Nexera X2

## CATECHINS AND CAFFEINE IN TEA

Catechins belong to the subgroup of polyphenols called flavonoids. These compounds contain antioxidant properties and exist in food and medicinal plants, including tea. An LC-MS separation of catechins and caffeine is demonstrated on a 2 µm HALO® LPH-C18 column showing excellent resolution.




### PEAK IDENTITIES

1. Gallic Acid
2. Gallocatechin
3. Epigallocatechin
4. Catechin
5. Caffeine
6. Epicatechin
7. Epigallocatechin Gallate
8. Gallocatechin Gallate
9. Epicatechin Gallate
10. Catechin Gallate

### TEST CONDITIONS

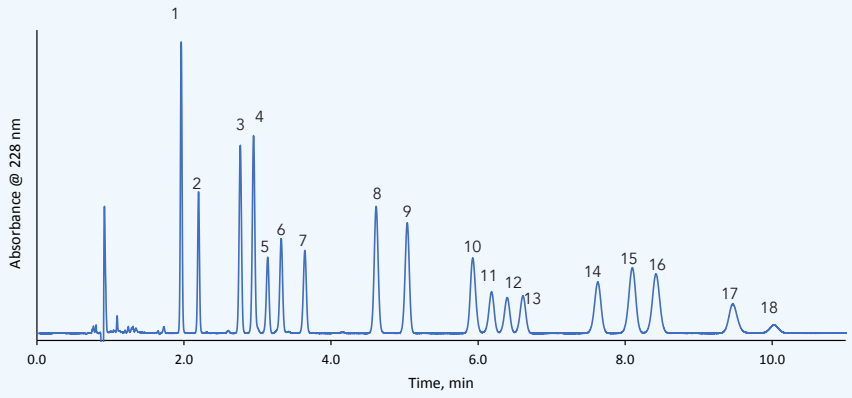
**Column:** HALO 90 Å LPH-C18 2 µm, 2.1x100 mm
**Mobile Phase A:** Water, 0.2% Formic Acid (pH 2.45)
**Mobile Phase B:** Acetonitrile, 0.2% Formic Acid
**Gradient:**

| Time | %B |
|---|---|
| 0.0 | 10 |
| 1.0 | 10 |
| 6.0 | 21 |
| 7.0 | 21 |

**Flow Rate:** 0.3 mL/min
**Pressure:** 438 bar
**Temperature:** 40 °C
**Detection:** +/- ESI MS/MS
**Injection Volume:** 2 µL
**Sample Solvent:** Water
**MS System:** Shimadzu 8040
**LC System:** Shimadzu Nexera X2

## SEPARATION OF 18 CANNABINOIDS USING HALO® LPH-C18

A HALO® LPH-C18 column is used to separate a mixture of eighteen cannabinoids, showing fast results and high resolution within critical pairs. Cannabinoids are a class of chemical compounds primarily found in the marijuana plant. Many of these compounds have been found to provide medicinal benefits such as reduction in pain and inflammation.




### TEST CONDITIONS

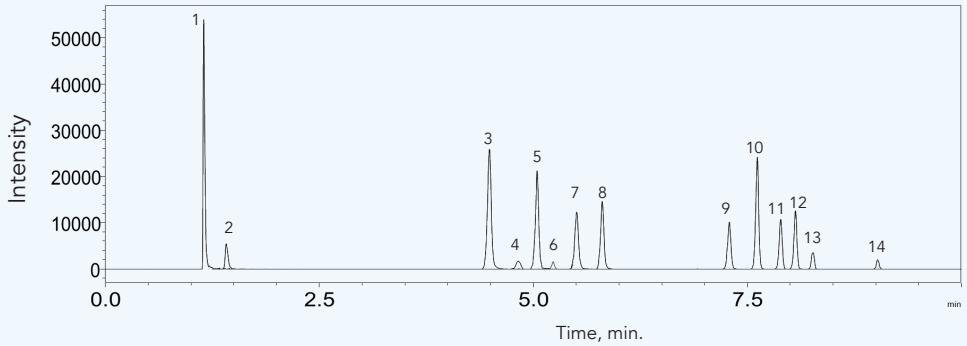
**Column:** HALO 90 Å LPH-C18, 2.7 µm, 4.6 x 150mm
**Mobile Phase A:** 5 mM Ammonium Formate, 0.1% Formic Acid
**Mobile Phase B:** Acetonitrile, 0.1% Formic Acid
Isocratic: 75% B
**Flow Rate:** 1.5 mL/min
**Pressure:** 232 bar
**Temperature:** 30°C
**Detection: PDA, UV:** 228 nm
**Injection Volume:** 3 µL
**Sample Solvent:** 75/25 MeOH/ Water
**Data Rate:** 100 Hz
**Response Time:** 0.025 sec.
**Flow Cell:** 1 µl
**LC System:** Shimadzu Nexera X2

### PEAK IDENTITIES

1. Cannabidivarinic acid (CBDVA)
2. Cannabidivarin (CBDV)
3. Cannabidiolic acid (CBDA)
4. Cannabigerolic acid (CBGA)
5. Cannabigerol (CBG)
6. Cannabidiol (CBD)
7. Tetrahydrocannabivarin (THCV)
8. Tetrahydrocannabivarinic acid (THCVA)
9. Cannabinol (CBN)
10. Cannabinolic acid (CBNA)
11. Exo-tetrahydrocannabinol (EXO-THC)
12. delta 9- Tetrahydrocannabinol (D9-THC)
13. delta 8- Tetrahydrocannabinol (D8-THC)
14. Cannabicycol (CBL)
15. Cannabichromene (CBC)
16. Tetrahydrocannabinolic acid A (THCA-A)
17. Cannabichromenic acid (CBCA)
18. Cannabicyclolic acid (CBLA)

## PESTICIDE SCREENING OF BARLEY

Pesticides screening of crops, in this example barley being the crop of concern, is performed using LCMS with the 2 µm HALO 90 Å LPH-C18 where both speed and resolution are demonstrated.




### TEST CONDITIONS

**Column:** HALO 90 Å LPH-C18 2 µm, 2.1x100 mm
**Mobile Phase A:** Water, 0.1% Formic Acid
**Mobile Phase B:** Acetonitrile, 0.1% Formic Acid
**Gradient:**

| Time | %B |
|---|---|
| 0.0 | 30 |
| 1.0 | 30 |
| 12.0 | 100 |
| 16.0 | 100 |

**Flow Rate:** 0.2 mL/min
**Pressure:** 235 bar
**Temperature:** 30 °C
**Detection:** +ESI MS/MS
**Injection Volume:** 2 µL
**Sample Solvent:** Methanol
MS System: Shimadzu 8040

### PEAK IDENTITIES

1. Carbendazim
2. Dicrotophos
3. Azamethiphos
4. Pyrimethani
5. Carbofuran
6. Dodemorph
7. Atrazine
8. Diuron
9. Iprovalicarb
10. Azoxystrobin
11. Fluopram
12. Methoxyfenozide
13. Flutolanil
14. Picoxystrobin