

HALO[®]

LPH - C18

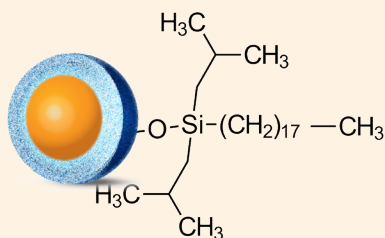
ENHANCED STABILITY FOR LOW PH APPLICATIONS



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

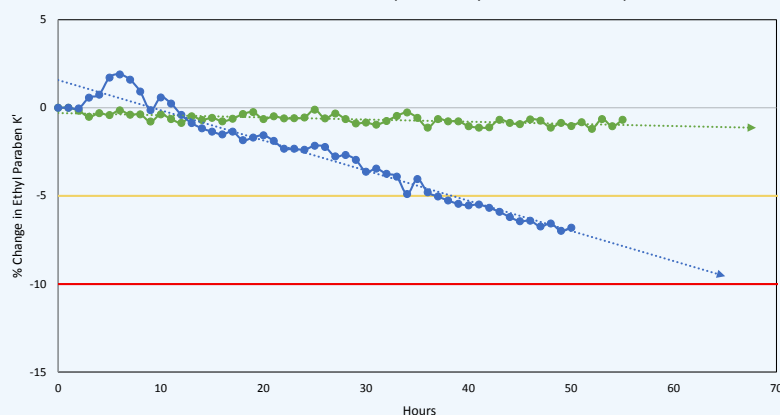
Best Applications:

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

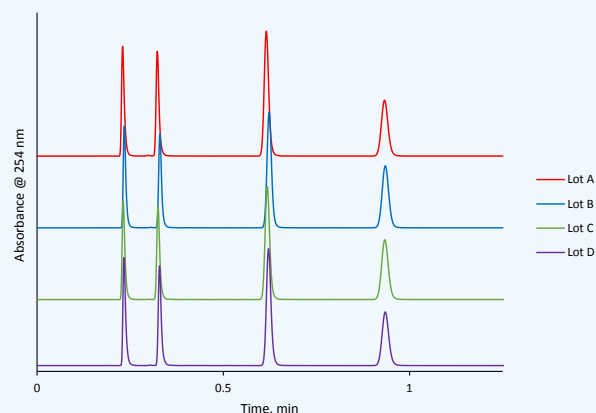
Data Rate: 100 Hz

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

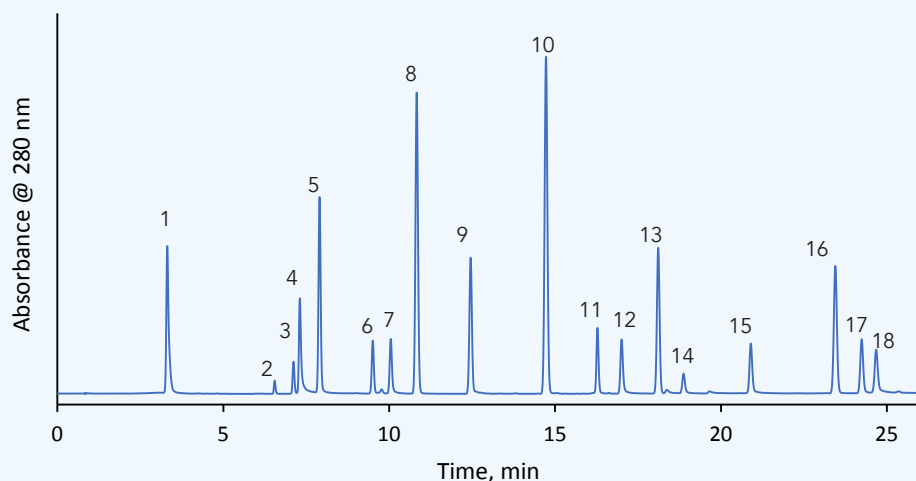
Flow Cell: 1.8 mL/min.

Column: HALO 90 Å LPH-C18 2.7 μm 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.



TEST CONDITIONS

Column: HALO 90 Å LPH-C18, 2.7 μ m 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 μ L

Sample Solvent: Water

Data Rate: 100 Hz

Response Time: 0.025 sec.

Flow Cell: 1 μ L

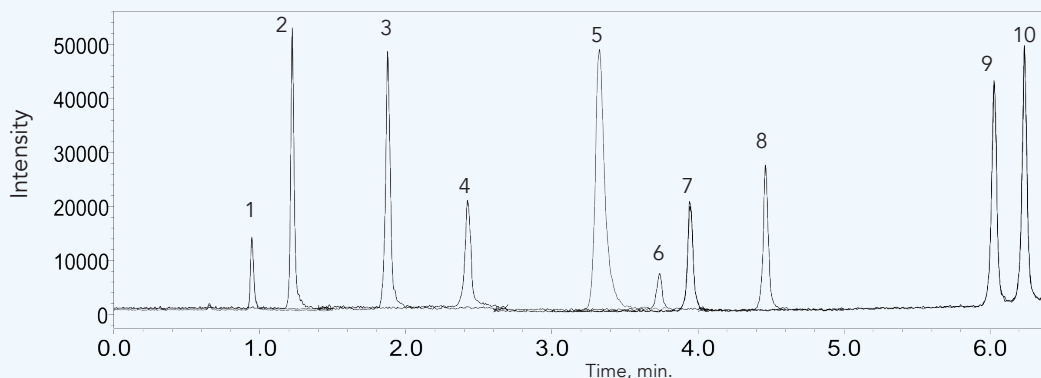
LC System: Shimadzu Nexera X2

PEAK IDENTITIES

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

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 μ m HALO® LPH-C18 column showing excellent resolution.



TEST CONDITIONS

Column: HALO 90 Å LPH-C18 2 μ m, 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 μ L

Sample Solvent: Water

MS System: Shimadzu 8040

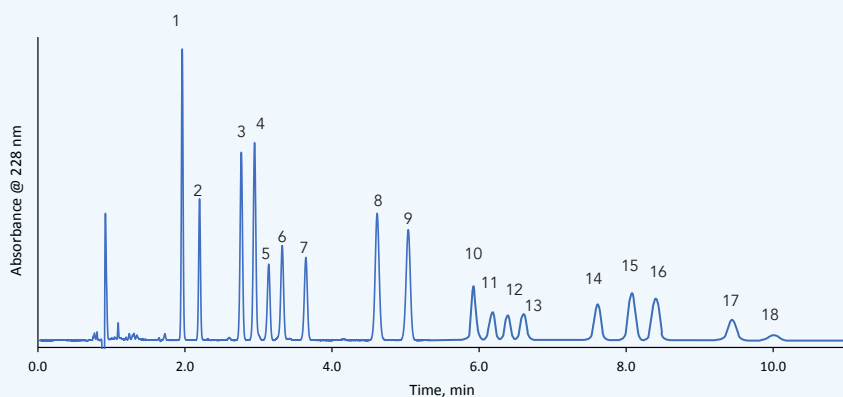
LC System: Shimadzu Nexera X2

PEAK IDENTITIES

- | | | |
|---------------------|-----------------------------|---------------------------|
| 1. Gallic Acid | 5. Caffeine | 8. Gallo catechin Gallate |
| 2. Gallo catechin | 6. Epicatechin | 9. Epicatechin Gallate |
| 3. Epigallocatechin | 7. Epigallocatechin Gallate | 10. Catechin Gallate |
| 4. Catechin | | |

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

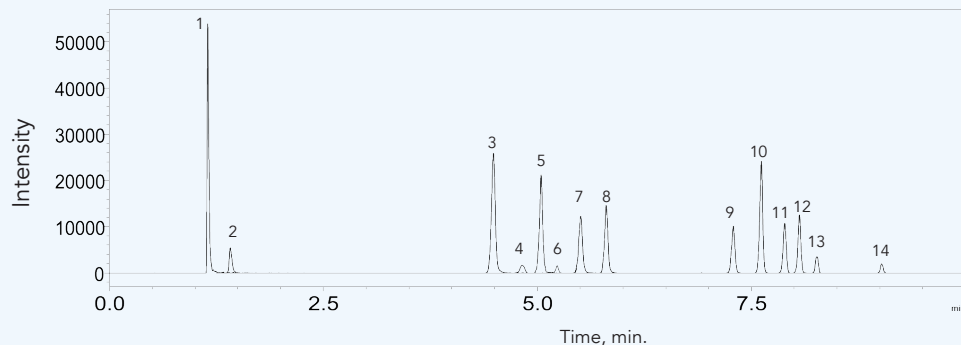
Column: HALO 90 Å LPH-C18, 2.7 μ m, 4.6 x 150mm
 Mobile Phase A: 5 mM Ammonium Formate, 0.1% Formic Acid
 Mobile Phase B: Acetonitrile, 0.1% Formic Acid
 Isocratic: 75% B
 Flow Rate: 1.5 mL/min
 Pressure: 232 bar
 Temperature: 30°C
 Detection: PDA, UV: 228 nm
 Injection Volume: 3 μ L
 Sample Solvent: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

PEAK IDENTITIES

- | | | |
|----------------------------------|--|--|
| 1. Cannabidivarinic acid (CBDVA) | 7. Tetrahydrocannabivarin (THCV) | 13. delta 8- Tetrahydrocannabinol (D8-THC) |
| 2. Cannabidivarin (CBDV) | 8. Tetrahydrocannabivarinic acid (THCVA) | 14. Cannabicycol (CBL) |
| 3. Cannabidiolic acid (CBDA) | 9. Cannabinol (CBN) | 15. Cannabichromene (CBC) |
| 4. Cannabigerolic acid (CBGA) | 10. Cannabinolic acid (CBNA) | 16. Tetrahydrocannabinolic acid A (THCA-A) |
| 5. Cannabigerol (CBG) | 11. Exo-tetrahydrocannabinol (EXO-THC) | 17. Cannabichromenic acid (CBCA) |
| 6. Cannabidiol (CBD) | 12. delta 9- Tetrahydrocannabinol (D9-THC) | 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 μ m HALO 90 Å LPH-C18 where both speed and resolution are demonstrated.



PEAK IDENTITIES

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

TEST CONDITIONS

Column: HALO 90 Å LPH-C18 2 μ m, 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 μ L
 Sample Solvent: Methanol
 MS System: Shimadzu 8040

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

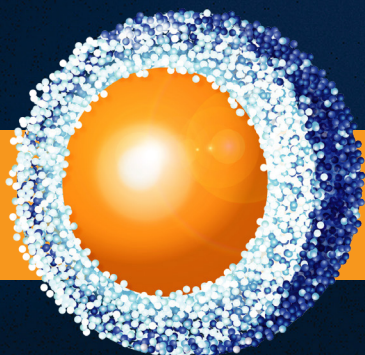
2.7 μm GUARD COLUMNS

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

HALO®



advancedmaterialstechnology

MAC-MOD Analytical is an authorized distributor of HALO columns

HALO and Fused-Core are registered trademarks of Advanced Materials Technology, Inc.