

# HALO<sup>®</sup>

## BIPHENYL

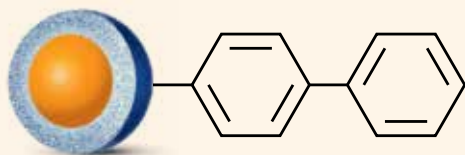
SAY HELLO TO ENHANCED  
RETENTION, SELECTIVITY AND EFFICIENCY.



# HALO® BIPHENYL

## SELECTIVITY, EFFICIENCY AND RETENTION packed into one powerful new phase

The HALO® Biphenyl offers a new perspective on retention mechanisms for polar compounds. With a combination of hydrophobic, aromatic, and polar selectivities, the HALO® Biphenyl, joined with the efficiency of robust Fused-Core® technology, unlocks powerful separation forces. Experience the difference one phase can make!

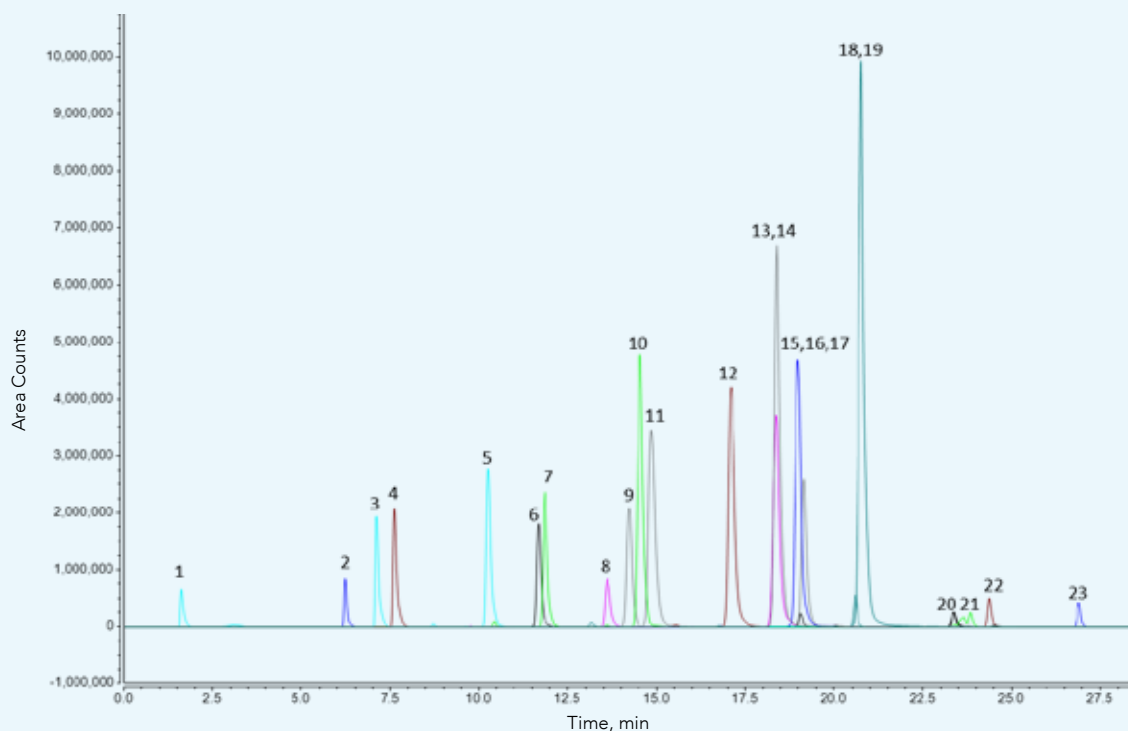


## ADVANTAGES OF THE NEW HALO® BIPHENYL

- Enhanced retention, high sensitivity, and increased efficiencies without sacrifice to robustness or reproducibility
- Increased selectivity for challenging polar compounds
- High efficiency resulting in sharp resolved peaks with excellent peak shapes

## CHALLENGING SEPARATIONS REQUESTED

The HALO® Biphenyl is ready for the challenge of complex samples. Both polar and non-polar pesticides are well resolved with this commonly required test for cannabis.



### PEAK IDENTITIES

1. Daminozide
2. Flonicamid
3. Thiamethoxam
4. Imidacloprid
5. Paclobutrazol
6. Fenhexamid
7. Myclobutanil
8. Bifenazate
9. Dimethomorph Isomer 1
10. Pirotetramat
11. Dimethomorph Isomer 2
12. Spinosad A
13. Spinosad D
14. Trifloxystrobin
15. Spinetoram
16. Pyrethrin II
17. Piperonyl butoxide
18. Pyrethrin I
19. Etoxazole
20. Abamectin A
21. Cypermethrin
22. Bifenthrin
23. Acequinocyl

### TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 2.7 µm, 2.1 x 100 mm

Mobile Phase A: water/0.1% formic acid/4 mM ammonium formate

Mobile Phase B: ACN/0.1% formic acid/4 mM ammonium formate

| Gradient: | Time (min) | % B |
|-----------|------------|-----|
|           | 0.00       | 0   |
|           | 1.01       | 15  |
|           | 4.00       | 35  |
|           | 5.00       | 62  |
|           | 30.00      | 100 |
|           | 34.00      | 100 |

Flow Rate: 0.2 mL/min

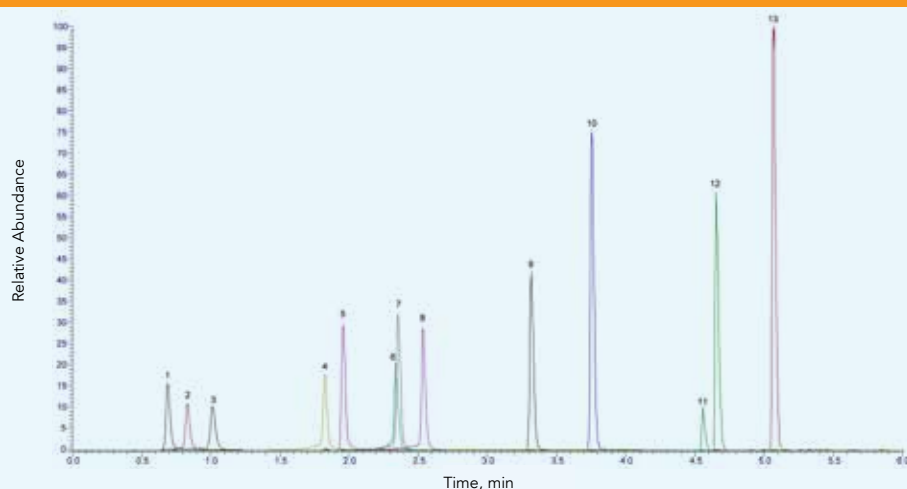
Injection Volume: 1 µL

Sample Solvent: Nevada Pesticide Mix

Detection: MS-TOF, ESI+, XIC

## FAST LC-MS SEPARATION OF OPIATES

The 2  $\mu\text{m}$  HALO® Biphenyl is well suited for high throughput analysis of drug panels. In this separation of an opiate pain panel, isobaric species are well separated. Note the resolution between peaks 1 and 3 (morphine, hydromorphone) and peaks 5 and 8 (codeine, hydrocodone).



### PEAK IDENTITIES

1. Morphine
2. Oxycodone
3. Hydromorphone
4. Naloxone
5. Codeine
6. Naltrexone
7. Oxycodone
8. Hydrocodone
9. Cis-Tramadol
10. Meperidine
11. Fentanyl
12. Buprenorphine
13. Methadone

### TEST CONDITIONS

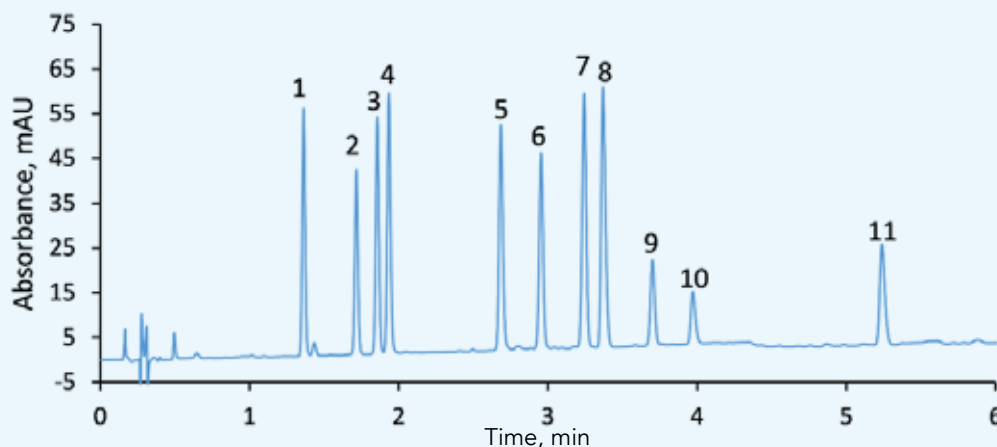
Column: HALO 90 Å Biphenyl, 2  $\mu\text{m}$ , 2.1 x 50 mm  
Mobile Phase A: water/0.1% formic acid  
Mobile Phase B: ACN/0.1% formic acid

| Gradient: | Time | % B |
|-----------|------|-----|
|           | 0    | 10  |
|           | 2.2  | 20  |
|           | 5.0  | 60  |
|           | 5.5  | 60  |

Flow Rate: 0.4 mL/min  
Temperature: 40 °C  
Injection Volume: 1  $\mu\text{L}$   
Instrument: Shimadzu Nexera X2 coupled to  
Thermo Q Exactive HF  
Detection: MS

## HIGH RESOLUTION SEPARATION OF STEROIDS

Sharp, fully resolved peaks with excellent peak shape are demonstrated in this high efficiency steroid separation using a 2.7  $\mu\text{m}$  particle size which is amenable to both HPLC and UHPLC conditions.



### PEAK IDENTITIES

1. Estriol
2. Hydrocortisone
3. Prednisone
4. Cortisone
5. Corticosterone
6.  $\beta$ -Estradiol
7. Cortisone Acetate
8. Testosterone
9. 17- $\alpha$ -Hydroxyprogesterone
10. 11-Deoxycorticosterone
11. Progesterone

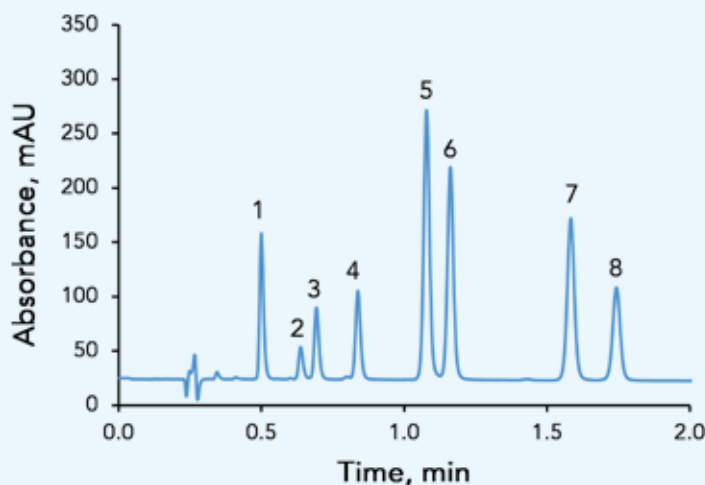
### TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 2.7  $\mu\text{m}$ , 4.6 x 50 mm  
Mobile Phase A: water  
Mobile Phase B: ACN  
Gradient: 20-60% B in 6 minutes  
Flow Rate: 1.85 mL/min

Temperature: 30 °C  
Injection Volume: 4  $\mu\text{L}$   
Instrument: Shimadzu Nexera X2  
Detection: 215 nm, PDA

## HIGH THROUGHPUT SULFONAMIDE SEPARATION

A mixture of sulfonamides is separated on a 2  $\mu\text{m}$  HALO® Biphenyl in less than 2 minutes. These synthetic drugs have several purposes, but are mainly used to treat bacterial infections. HALO® Biphenyl shows increased retention compared to alkyl phases due to the enhanced interactions between the aromatic moieties of the sulfonamides and the biphenyl structure.



### TEST CONDITIONS

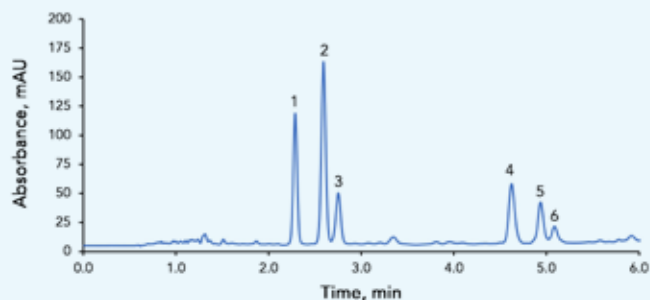
Column: HALO 90 Å Biphenyl, 2  $\mu\text{m}$ , 2.1 x 50 mm  
 Mobile Phase A: water/0.1% formic acid  
 Mobile Phase B: ACN/0.1% formic acid  
 Gradient: 15-20% B in 2 min  
 Flow Rate: 0.5 mL/min  
 Temperature: 40 °C  
 Injection Volume: 1  $\mu\text{L}$   
 Instrument: Shimadzu Nexera X2  
 Detection: 254 nm, PDA

### PEAK IDENTITIES

1. Sulfacetamide
2. Sulfadiazine
3. Sulfapyridine
4. Sulfamerazine
5. Sulfamethoxazole
6. Sulfamethazine
7. Sulfamethoxypyridazine
8. Sulfachloropyridazine

## HOP ACIDS ANALYSIS

This separation of alpha and beta acids of hops using a 5  $\mu\text{m}$  HALO® Biphenyl column is ideal for bitterness flavor profiling used by the brewing industry.



### PEAK IDENTITIES

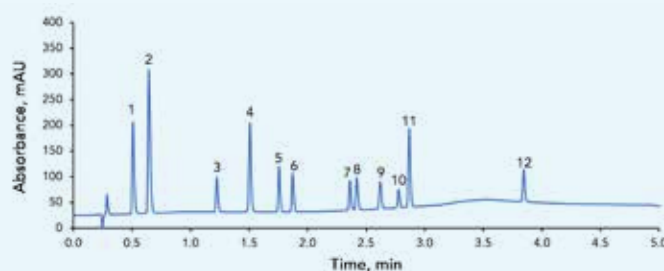
1. Cohumulone
2. Humulone
3. Adhumulone
4. Colupulone
5. Lupulone
6. Adlupulone

### TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 5  $\mu\text{m}$ , 4.6 x 150 mm  
 Mobile Phase A: water/0.1% formic acid  
 Mobile Phase B: ACN/0.1% formic acid  
 Gradient: Hold at 60% B until 3 min; 60-80% B from 3-6 min  
 Flow Rate: 2.0 mL/min  
 Temperature: 30 °C  
 Injection Volume: 5  $\mu\text{L}$   
 Instrument: Shimadzu Nexera X2  
 Detection: 270 nm, PDA

## RAPID, HIGH RESOLUTION SEPARATION OF BETA BLOCKERS

A mixture of twelve beta blockers is separated on a HALO® 2  $\mu\text{m}$  Biphenyl column with excellent speed and resolution.



### PEAK IDENTITIES

1. Atenolol
2. Sotalol
3. Nadolol
4. Pindolol
5. Acebutolol
6. Metoprolol
7. Bisoprolol
8. Oxprenolol
9. Labetalol
10. Alprenolol
11. Propranolol
12. Carvedilol

### TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 2  $\mu\text{m}$ , 2.1 x 50 mm  
 Mobile Phase A: water/0.1% formic acid  
 Mobile Phase B: ACN/0.1% formic acid  
 Gradient: 10-50% B in 5 min  
 Flow Rate: 0.5 mL/min  
 Temperature: 35 °C  
 Injection Volume: 1  $\mu\text{L}$   
 Instrument: Shimadzu Nexera X2  
 Detection: 220 nm, PDA

# SPECIFICATIONS

**Ligand:** Dimethylbiphenyl  
**Particle Size:** 2, 2.7, 5  $\mu\text{m}$   
**Pore Size:** 90 Å

**USP Designation:** L11  
**Carbon Load:** 6.7, 7.0, 5.5 %  
**Surface Area:** 120, 135, 90  $\text{m}^2/\text{g}$

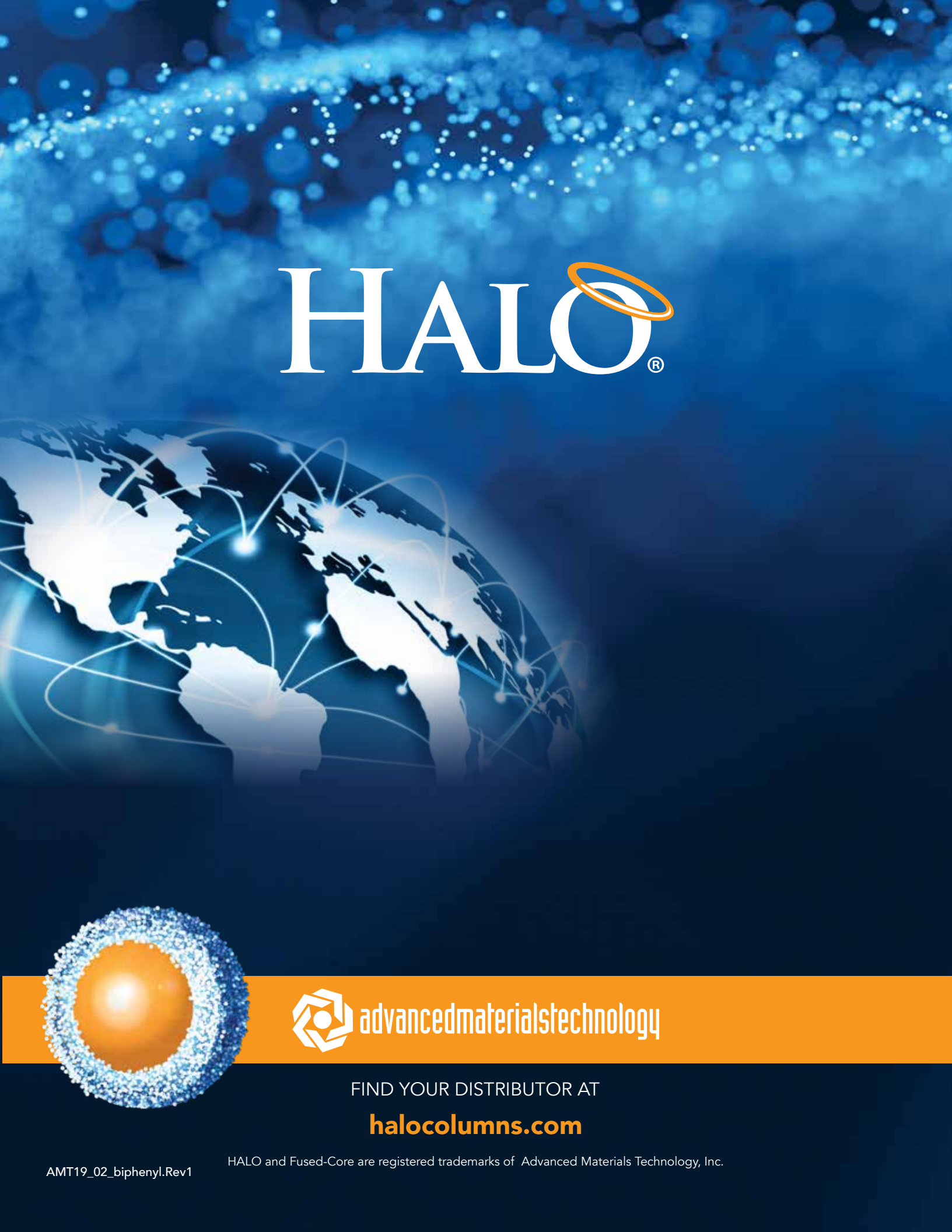
**Endcapped:** Yes  
**Low pH Limit /Max T:** 2/60°C  
**High pH Limit/Max T:** 9/40°C

## PART NUMBERS

| ANALYTICAL COLUMNS |        |                 |                   |                 |
|--------------------|--------|-----------------|-------------------|-----------------|
| ID                 | Length | 2 $\mu\text{m}$ | 2.7 $\mu\text{m}$ | 5 $\mu\text{m}$ |
| 2.1 mm             | 20 mm  | 91812-211       | 92812-211         | 95812-211       |
| 2.1 mm             | 30 mm  | 91812-311       | 92812-311         | 95812-311       |
| 2.1 mm             | 50 mm  | 91812-411       | 92812-411         | 95812-411       |
| 2.1 mm             | 75 mm  | 91812-511       | 92812-511         | 95812-511       |
| 2.1 mm             | 100 mm | 91812-611       | 92812-611         | 95812-611       |
| 2.1 mm             | 150 mm | 91812-711       | 92812-711         | 95812-711       |
| 2.1 mm             | 250 mm | 91812-911       | 92812-911         | 95812-911       |
| 3.0 mm             | 20 mm  | 91813-211       | 92813-211         | 95813-211       |
| 3.0 mm             | 30 mm  | 91813-311       | 92813-311         | 95813-311       |
| 3.0 mm             | 50 mm  | 91813-411       | 92813-411         | 95813-411       |
| 3.0 mm             | 75 mm  | 91813-511       | 92813-511         | 95813-511       |
| 3.0 mm             | 100 mm | 91813-611       | 92813-611         | 95813-611       |
| 3.0 mm             | 150 mm | 91813-711       | 92813-711         | 95813-711       |
| 3.0 mm             | 250 mm | 91813-911       | 92813-911         | 95813-911       |
| 4.6 mm             | 20 mm  |                 | 92814-211         | 95814-211       |
| 4.6 mm             | 30 mm  |                 | 92814-311         | 95814-311       |
| 4.6 mm             | 50 mm  |                 | 92814-411         | 95814-411       |
| 4.6 mm             | 75 mm  |                 | 92814-511         | 95814-511       |
| 4.6 mm             | 100 mm |                 | 92814-611         | 95814-611       |
| 4.6 mm             | 150 mm |                 | 92814-711         | 95814-711       |
| 4.6 mm             | 250 mm |                 | 92814-911         | 95814-911       |
| 10.0 mm            | 50 mm  |                 | 92810-411         | 95810-411       |
| 10.0 mm            | 75 mm  |                 | 92810-511         | 95810-511       |
| 10.0 mm            | 100 mm |                 | 92810-611         | 95810-611       |
| 10.0 mm            | 150 mm |                 | 92810-711         | 95810-711       |

| CAPILLARY COLUMNS                     |                 |                   |                 |
|---------------------------------------|-----------------|-------------------|-----------------|
| ID                                    | Length          | 2.7 $\mu\text{m}$ | 5 $\mu\text{m}$ |
| 0.075 mm                              | 50 mm           | 98219-411         | 98519-411       |
| 0.075 mm                              | 100 mm          | 98219-611         | 98519-611       |
| 0.075 mm                              | 150 mm          | 98219-711         | 98519-711       |
| 0.1 mm                                | 50 mm           | 98218-411         | 98518-411       |
| 0.1 mm                                | 100 mm          | 98218-611         | 98518-611       |
| 0.1 mm                                | 150 mm          | 98218-711         | 98518-711       |
| 0.2 mm                                | 50 mm           | 98217-411         | 98517-411       |
| 0.2 mm                                | 100 mm          | 98217-611         | 98517-611       |
| 0.2 mm                                | 150 mm          | 98217-711         | 98517-711       |
| 0.3 mm                                | 50 mm           | 98216-411         | 98516-411       |
| 0.3 mm                                | 100 mm          | 98216-611         | 98516-611       |
| 0.3 mm                                | 150 mm          | 98216-711         | 98516-711       |
| 0.5 mm                                | 50 mm           | 98215-411         | 98515-411       |
| 0.5 mm                                | 100 mm          | 98215-611         | 98515-611       |
| 0.5 mm                                | 150 mm          | 98215-711         | 98515-711       |
| 1.0 mm                                | 30 mm           | 92811-311         | 95811-311       |
| 1.0 mm                                | 50 mm           | 92811-411         | 95811-411       |
| 1.0 mm                                | 75 mm           | 92811-511         | 95811-511       |
| 1.0 mm                                | 100 mm          | 92811-611         | 95811-611       |
| 1.0 mm                                | 150 mm          | 92811-711         | 95811-711       |
| GUARD COLUMNS (3 PK)                  |                 |                   |                 |
| Dimensions:<br>ID x Length<br>(in mm) | 2 $\mu\text{m}$ | 2.7 $\mu\text{m}$ | 5 $\mu\text{m}$ |
| 2.1 x 5                               | 91812-111       | 92812-111         | 95812-111       |
| 3.0 x 5                               | 91813-111       | 92813-111         | 95813-111       |
| 4.6 x 5                               |                 | 92814-111         | 95814-111       |
| Guard Column<br>Holder                |                 | 94900-001         |                 |

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# HALO®



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