SAY HELLO TO ENHANCED RETENTION, SELECTIVITY AND EFFICIENCY.
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. Pyrотetramat
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 5
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 µm 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. Oxymorphone
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 µm, 2.1 x 50 mm
- **Mobile Phase A**: water/0.1% formic acid
- **Mobile Phase B**: ACN/0.1% formic acid
- **Gradient**: 20-60% B in 6 minutes
- **Flow Rate**: 1.85 mL/min
- **Temperature**: 30 °C
- **Injection Volume**: 4 μL
- **Instrument**: Shimadzu Nexera X2 coupled to Thermo Q Exactive HF
- **Detection**: 215 nm, PDA

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 µm particle size which is amenable to both HPLC and UHPLC conditions.

**PEAK IDENTITIES**

1. Estriol
2. Hydrocortisone
3. Prednisone
4. Cortisone
5. Corticosterone 14
6. β-Estradiol
7. Cortisone Acetate
8. Testosterone
9. 17-α-Hydroxyprogesterone
10. 11-Deoxycorticosterone
11. Progesterone

**TEST CONDITIONS**

- **Column**: HALO 90 Å Biphenyl, 2.7 µm, 4.6 x 50 mm
- **Mobile Phase A**: water/0.1% formic acid
- **Mobile Phase B**: ACN/0.1% formic acid
- **Gradient**: 0-10% B in 10 min, 10-60% B in 40 min
- **Flow Rate**: 0.4 mL/min
- **Temperature**: 40 °C
- **Injection Volume**: 1 μL
- **Instrument**: Shimadzu Nexera X2
- **Detection**: MS
HIGH THROUGHPUT SULFONAMIDE SEPARATION

A mixture of sulfonamides is separated on a 2 µm 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 µm, 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 µL
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

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

HOP ACIDS ANALYSIS

This separation of alpha and beta acids of hops using a 5 µm HALO® Biphenyl column is ideal for bitterness flavor profiling used by the brewing industry.

TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 5 µm, 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 µL
Instrument: Shimadzu Nexera X2
Detection: 270 nm, PDA

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

RAPID, HIGH RESOLUTION SEPARATION OF BETA BLOCKERS

A mixture of twelve beta blockers is separated on a HALO® 2 µm Biphenyl column with excellent speed and resolution.

TEST CONDITIONS

Column: HALO 90 Å Biphenyl, 2 µm, 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 µL
Instrument: Shimadzu Nexera X2
Detection: 220 nm, PDA

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
## SPECIFICATIONS

**Ligand:** Dimethylbiphenyl  
**Particle Size:** 2, 2.7, 5 µm  
**Pore Size:** 90 Å  

**USP Designation:** L11  
**Carbon Load:** 6.7, 7.0, 5.5 %  
**Surface Area:** 120, 135, 90 m²/g

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

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### PART NUMBERS

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