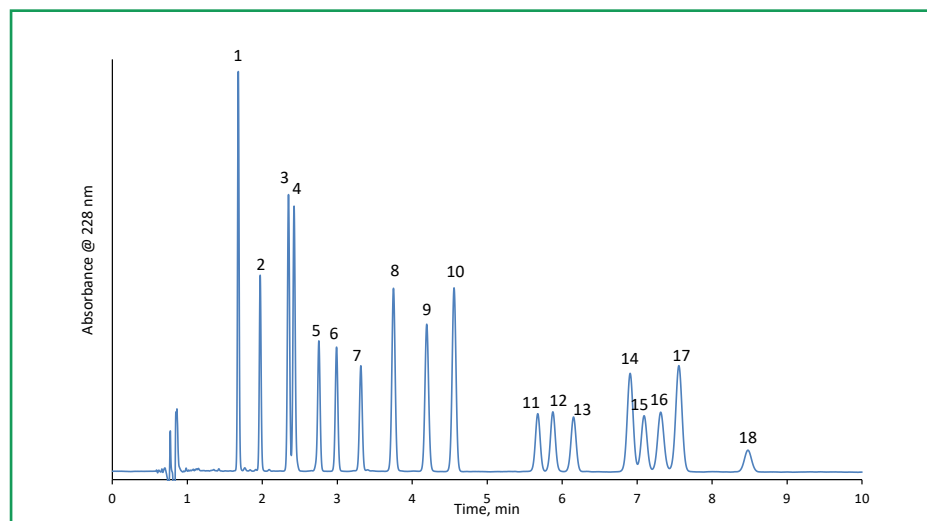




Isocratic Separation of 18 Cannabinoids

222-CN



PEAK IDENTITIES

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

TEST CONDITIONS:

Column: HALO 90 Å C18, 2.7 µm, 4.6 x 150mm

Part Number: 92814-702

Mobile Phase:

A: 20 mM Ammonium Formate, pH 2.9

B: Acetonitrile

Isocratic: 76% B

Flow Rate: 1.5 mL/min

Pressure: 231 bar

Temperature: 35 °C

Detection: UV 228 nm

Injection Volume: 4.0 µL

Sample Solvent: Methanol

Response Time: 0.025 sec

Flow Cell: 1.0 µL

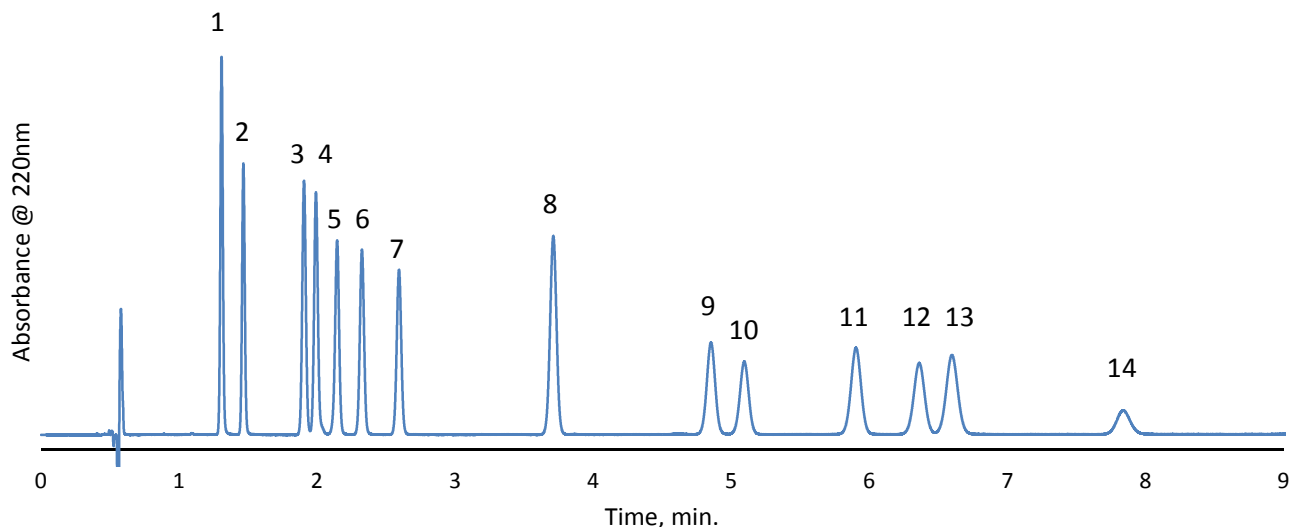
System: Shimadzu Nexera X2

A HALO® 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.



Isocratic Separation of 14 Cannabinoids on HALO C18

G0157



TEST CONDITIONS:

Column: HALO 90Å, C18, 2.7 µm, 3.0 x 150mm

Part Number: 92813-702

Mobile Phase:

A= Water/ 0.1% formic acid

B= Acetonitrile/ 0.085% formic acid

Isocratic: 75%B

Flow Rate: 1.0 mL/min.

Initial Pressure: 350 bar

Temperature: 30°C

Detection: UV 220 nm, PDA

Injection Volume: 0.6 µL

Dwell Volume: 0.471 mL

Sample Solvent: 75/25 methanol/ water

Response Time: 0.025 sec.

Data Rate: 100 Hz

LC System: Shimadzu Nexera X2

Flow Cell: 1 µL

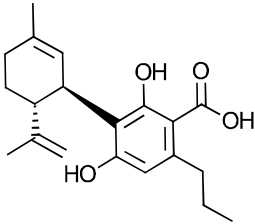
PEAK IDENTITIES:

1. Cannabidivarinic acid (CBDVA)
2. Cannabidvarin (CBDV)
3. Cannabidiolic acid (CBDA)
4. Cannabigerolic acid (CBGA)
5. Cannabigerol (CBG)
6. Cannabidiol (CBD)
7. Tetrahydrocannabivarin (THCV)
8. Cannabinol (CBN)
9. delta-9- Tetrahydrocannabinol (Δ9-THC)
10. delta-8-Tetrahydrocannabinol (Δ8-THC)
11. Cannabicyclol (CBL)
12. Cannabichromene (CBC)
13. delta-9-Tetrahydrocannabinolic acid A (THCA)
14. Cannabichromenic acid (CBCA)

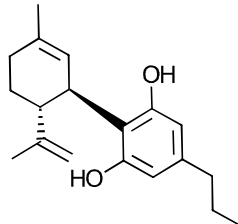
A HALO C18 column is used to separate a mixture of fourteen cannabinoids, showing fast results and high resolution within critical pairs. Cannabinoids are a class of chemical compounds primarily found in the marijuana plant. Many of these compounds have been found to provide medicinal benefits such as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

STRUCTURES ON PAGE 2

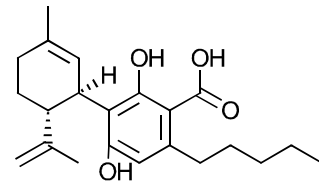
Cannabinoid Structures



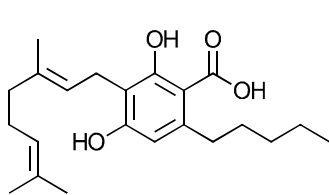
CBDVA



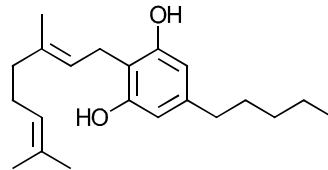
CBDV



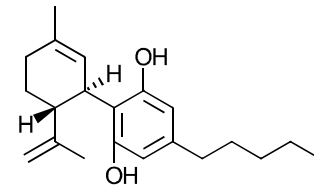
CBDA



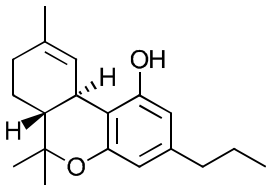
CBGA



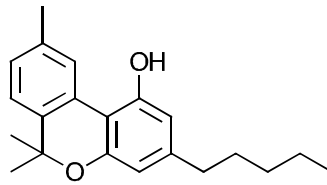
CBG



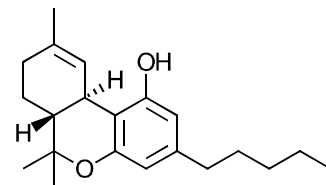
CBD



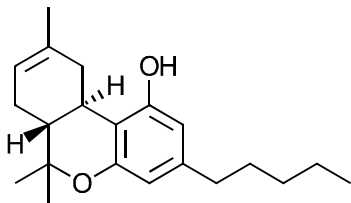
THCV



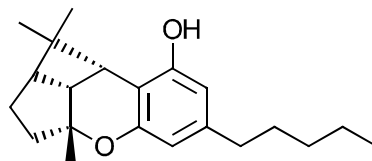
CBN



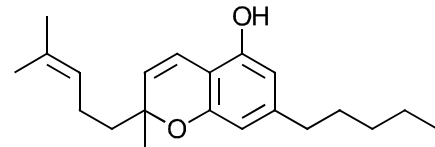
Δ9-THC



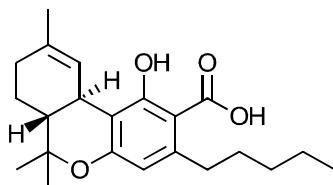
Δ8-THC



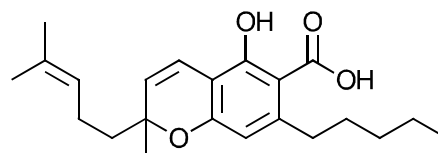
CBL



CBC

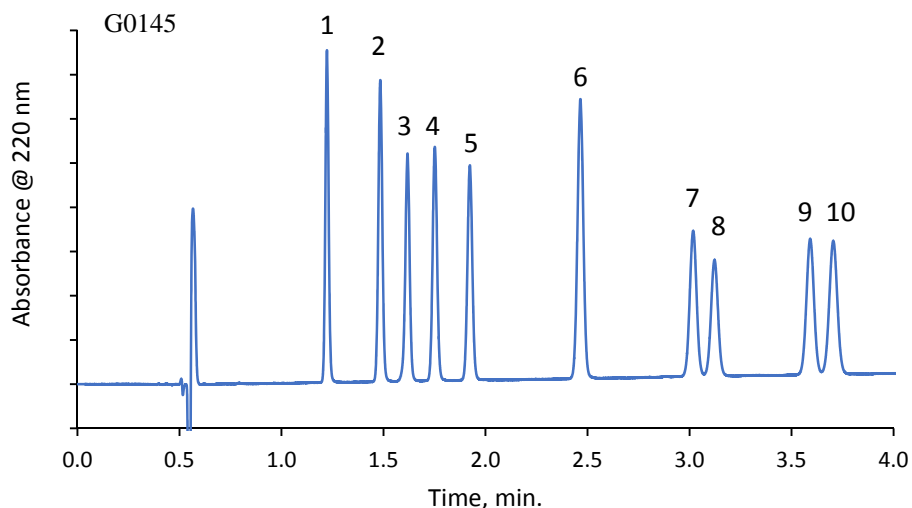


THCA



CBCA

Fast Separation of Ten Cannabinoids on HALO C18



PEAK IDENTITIES:

1. Cannabidivarin (CBDV)
2. Cannabidiolic acid (CBDA)
3. Cannabigerol (CBG)
4. Cannabidiol (CBD)
5. Tetrahydrocannabivarin (THCV)
6. Cannabinol (CBN)
7. delta-9- Tetrahydrocannabinol (Δ 9-THC)
8. delta-8-Tetrahydrocannabinol (Δ 8-THC)
9. Cannabichromene (CBC)
10. delta-9-Tetrahydrocannabinolic acid A (THCA)

TEST CONDITIONS:

Column: HALO 90Å, C18, 2.7 μ m, 4.6 x 100mm
Part Number: 92814-602

Mobile Phase:

A= Water/ 0.1% formic acid

B= Acetonitrile/ 0.085% formic acid

Gradient: 77-85%B in 4 min.

Flow Rate: 1.5 mL/min.

Initial Pressure: 197 bar

Temperature: 38°C

Detection: UV 220 nm, PDA

Injection Volume: 1.3 μ L

Dwell Volume; 0.471 mL

Sample Solvent: 75/25 methanol/ water

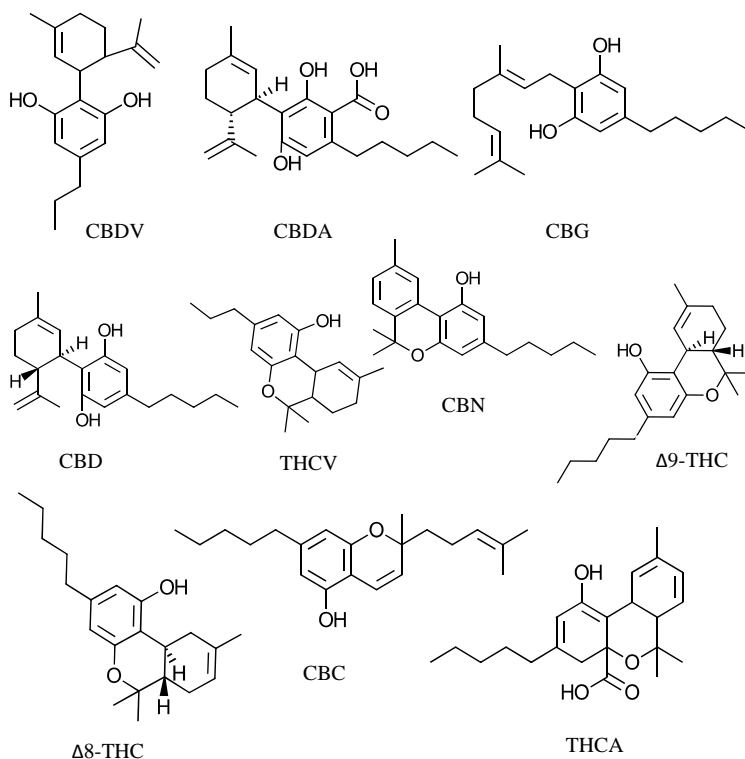
Response Time: 0.025 sec.

Data Rate: 100 Hz

LC System: Shimadzu Nexera X2

Flow Cell: 1 μ L

STRUCTURES:

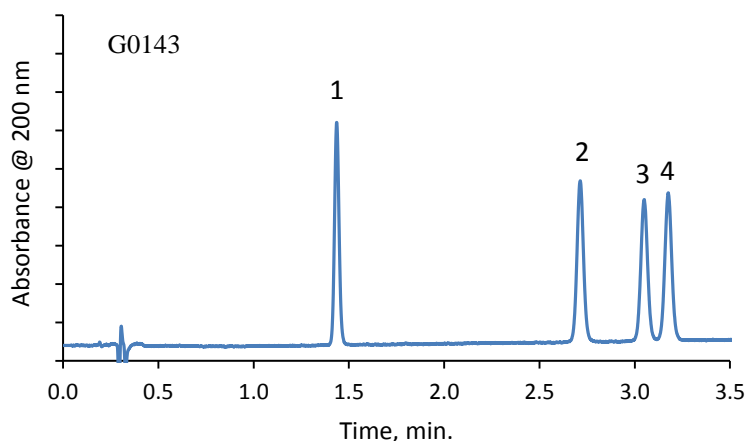


A HALO C18 column is used to separate a mixture of ten cannabinoids, showing fast results and high resolution within critical pairs. Cannabinoids are a class of chemical compounds primarily found in the marijuana plant. Many of these compounds have been found to provide medicinal benefits such as reduction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

HALO | Fused-Core® Particle Technology

Application Note: 153-SC

Isocratic Separation of Synthetic Cannabinoids on HALO C18



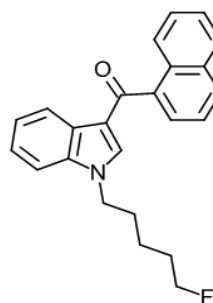
PEAK IDENTITIES:

1. AM2201 (359.44 g/mol)
2. JWH-081 (371.47 g/mol)
3. JWH-122 (355.47 g/mol)
4. JWH-019 (355.47 g/mol)

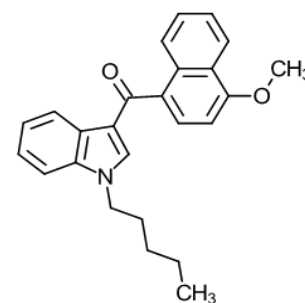
TEST CONDITIONS:

Column: HALO C18, 2.7 μ m, 2.1 x 100 mm
 Part Number: 92812-602
 Mobile Phase: Isocratic: 25/75 A/B
 A= 5 mM ammonium formate
 B= 95/5 acetonitrile/ water with 5 mM ammonium formate
 Flow Rate: 0.6 mL/min.
 Pressure: 279 bar
 Temperature: 30 °C
 Injection Volume: 0.5 μ L
 Sample Solvent: 50/50 water/acetonitrile
 Detection: UV 200 nm, VWD
 Data Rate: 100 Hz
 Flow Cell: 1 μ L
 LC System: Shimadzu Nexera X2

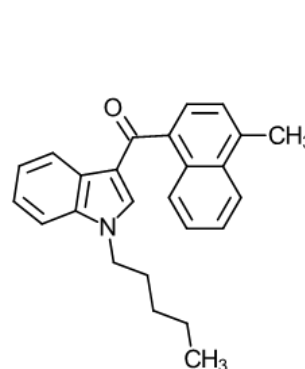
STRUCTURES:



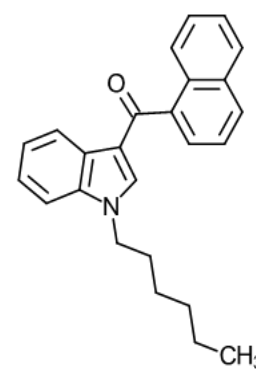
AM2201



JWH-081



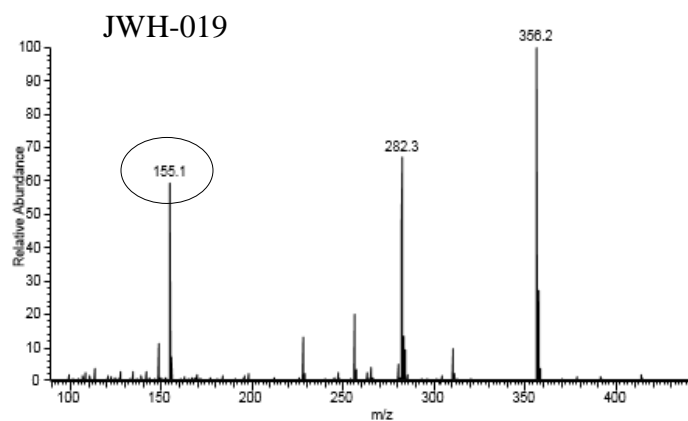
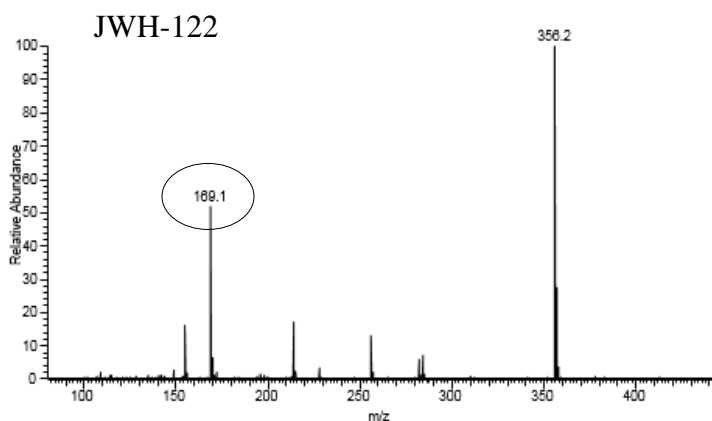
JWH-122



JWH-019

Synthetic cannabinoids are man-made compounds that act like the chemicals found in the marijuana plant. The four compounds in this mixture represent only a small number of the variations that exist. Just as one compound is made illegal, another variation will be synthesized to take its place. This represents a growing challenge for law enforcement agencies. Using a HALO C18 column gives a fast, efficient separation of these cannabinoids with ample resolution for the next generation of illegal species.

Determination of Synthetic Cannabinoid Homologues on HALO C18



MS TESTING CONDITIONS:

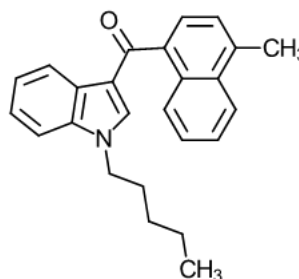
MS System: Thermo Fisher Orbitrap VelosPro ETD

Scan Time: 6 μ scans/250 ms max inject time

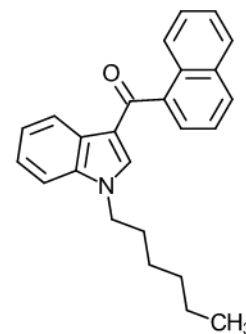
Scan range: 50-2000 m/z

MS parameters: Positive ion mode, ESI at +4.0 kV, 225°C capillary

STRUCTURES:



JWH-122 (m/z= 356.47)

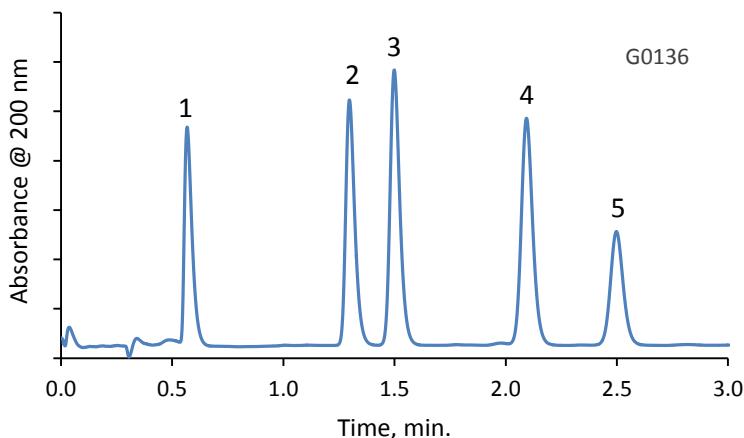


JWH-019 (m/z= 356.47)

Synthetic cannabinoids can be very similar in their chemical structure. In fact, many of these cannabinoids are analogs or isomers of each other and can be difficult to distinguish. Two homologues in this particular sample were fraction collected and then identified using an orbital ion trap MS system. The Orbitrap allows us to see signature fragmentations of a particular compound, allowing positive identification of each isomer.

Application Note: 147-SC

Isocratic Separation of Synthetic Cannabinoids on HALO C18



PEAK IDENTITIES:

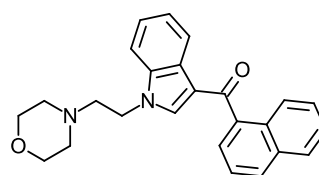
1. JWH-200
2. (±)-CP 47, 497
3. (±)-CP 47, 497 C8 Homologue
4. JWH-250
5. HU-211

TEST CONDITIONS:

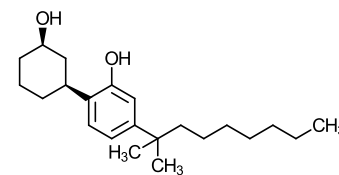
Column: HALO C18, 2.1 x 100 mm, 2.7 μm
 Part Number: 92812-602
 Mobile Phase: Isocratic: 25/75 A/B
 A= 5 mM ammonium formate, pH unadjusted
 B= 95/5 acetonitrile/ water with 5 mM ammonium formate
 Flow Rate: 0.6 mL/min.
 Pressure: 247 bar
 Temperature: 30 °C
 Injection Volume: 0.5 μL
 Sample Solvent: 50/50 water/acetonitrile
 Detection: UV 200 nm, VWD
 Data Rate: 50 Hz
 Flow Cell: 2.5 μL semi-micro
 LC System: Shimadzu Prominence UFLC XR

Synthetic cannabinoids are man-made compounds that act like the chemicals found in the marijuana plant. The five compounds in this mixture are illegal and represent only a small number of the variations that exist. Just as one compound is made illegal, another variation will be made to take its place. This represents a growing challenge for law enforcement agencies. Using a HALO C18 column gives a fast, efficient separation of these illegal drugs with ample resolution for the next generation of illegal species.

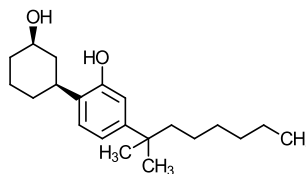
STRUCTURES:



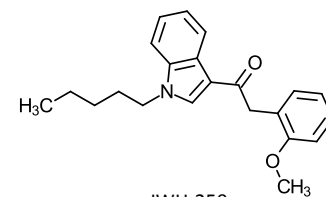
JWH-200



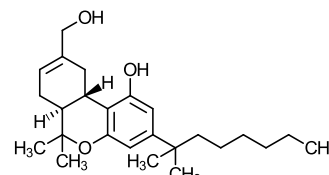
(±)-CP 47, 497 C8 Homologue



(±)-CP 47, 497



JWH-250



HU-211