A Full Family of Polar PEG Columns From Agilent

Product Brief

Columns and Supplies

As the frequency of polar laboratory expeditions increases and the range of exploration expands, so has our line of polyethylene glycol (PEG) capillary columns.

Added to the already powerful lineup of HP-Wax, HP-INNOWax, HP-FFAP, and HP-20M capillaries is the new family of HP-Basic Wax columns. Each of these five column types is available in a variety of diameters, lengths and film thickness including HP-INNOWax, HP-Wax, HP-Basic Wax, HP-FFAP and HP-20M.

Even though each phase is based on the polyethylene glycol polymer, strict control of the cross-linking and deactivation processes results in a variety of unique phase characteristics to meet the varying analysis needs of your laboratory.

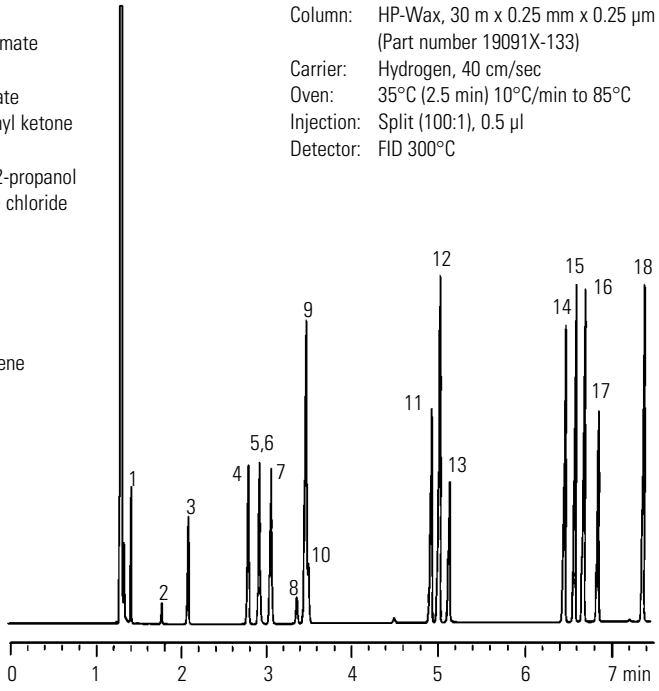
Versatile HP-INNOWax

Since its introduction, the HP-INNOWax column has become the workhorse of the PEG columns. Because of a compatibility with a wide range of analytes and solvents, long lifetime, and low-bleed characteristics, the HP-INNOWax columns are used in a wide range of applications.

Industrial Solvents

1. Pentane
2. Methyl formate
3. Acetone
4. Ethyl acetate
5. Methyl ethyl ketone
6. Methanol
7. 2-Methyl-2-propanol
8. Methylene chloride
9. Benzene
10. Ethanol
11. 2-Butanol
12. Toluene
13. n-Propanol
14. Ethyl benzene
15. p-Xylene
16. m-Xylene
17. 1-Butanol
18. o-Xylene

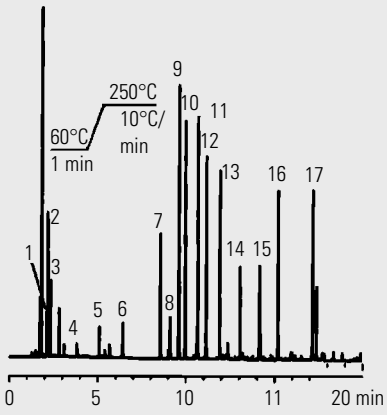
Column: HP-Wax, 30 m x 0.25 mm x 0.25 µm
(Part number 19091X-133)
Carrier: Hydrogen, 40 cm/sec
Oven: 35°C (2.5 min) 10°C/min to 85°C
Injection: Split (100:1), 0.5 µl
Detector: FID 300°C



The HP-INNOWax column has the highest upper temperature limit of any of the wax phases. With a maximum upper temperature limit for programmed operation of 270°C for standard dimensions and 250°C for 0.53 mm columns, the HP-INNOWax column is ideal for the analysis of high boiling point analytes that may be difficult or impossible to do on other "Wax" columns. For example, free fatty acids to C24 can be analyzed with this column. The versatility of the HP-INNOWax column is second to none. The superior inertness produces sharp, reproducible peaks for both basic and acidic compounds without requiring regeneration of the column with injections of acids or bases.

Aldehydes and Acids

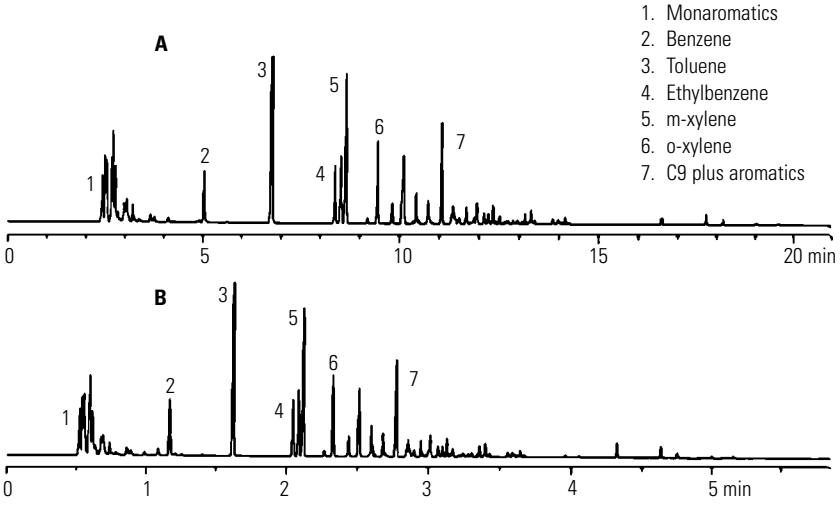
1. Butanal
2. 2-Methyl butanal
3. Pentanal
4. Hexanal
5. Heptanal
6. Octanal
7. Acetic acid
8. Decanal
9. Propanoic acid
10. iso-Butyric acid
11. Butyric acid
12. iso-Valeric acid
13. Valeric acid
14. Hexanoic acid
15. Heptanoic acid
16. Octanoic acid
17. Decanoic acid



Column:	HP-INNOWax 30 m x 0.32 mm x 0.5 µm (Part number 19091N-213)
Carrier:	Helium, 40 cm/sec, 11.7 psi (60°C), 2.5 ml/min constant flow
Oven:	60°C (1 min) to 250°C at 10°C/min
Injection:	Split (40:1), 0.5 µl, inlet at 250°C
Detector:	FID 275°C

PEG Columns for Petrochemical Applications

Reformate Gasoline Analysis



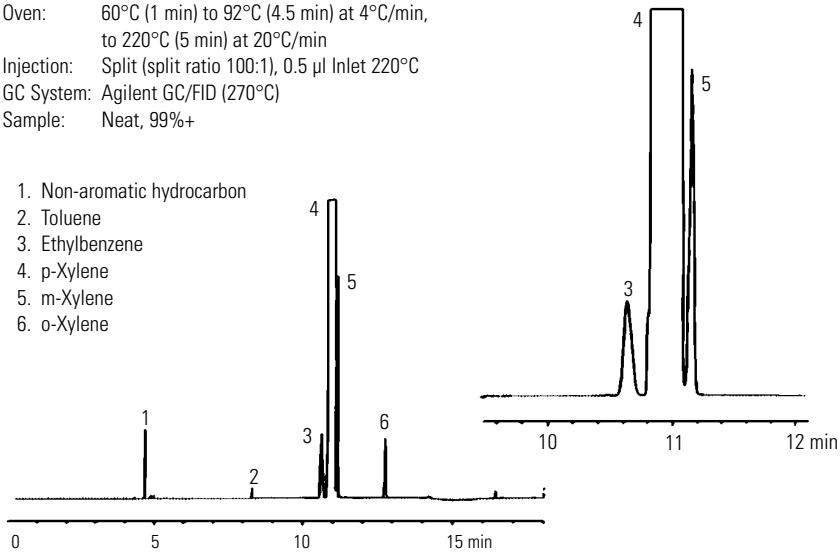
1. Monaromatics
2. Benzene
3. Toluene
4. Ethylbenzene
5. m-xylene
6. o-xylene
7. C9 plus aromatics

	A	B
Column:	HP-Wax, 30 m x 0.32 mm x 0.5 µm (Part number 19091X-213)	HP-Wax, 10 m x 0.1 mm x 0.2 µm (Part number 19091X-241)
Carrier:	Helium, 6.4 psi, constant pressure	Helium, 37.3 psi, constant pressure
Oven:	60°C (4 min) 10°C/min to 140°C (0 min) 140–200°C (4 min) at 15°C/min	60°C (1 min) 36.7°C/min to 140°C (0 min) 140–200°C (2 min) at 55.1°C/min
Injection:	250°C, 0.5 µl, Split 200/1	250°C, 0.1 µl, Split 800/1
Detector:	275°C, FID	275°C, FID

Impurities in p-Xylene: ASTM D3798

Column:	HP-INNOWax, 60 m x 0.32 mm x 0.5 µm (Part number 19091N-216)
Carrier:	He, 32 cm/sec, 19.9 psi (60°C), 2.5 ml/min constant flow
Oven:	60°C (1 min) to 92°C (4.5 min) at 4°C/min, to 220°C (5 min) at 20°C/min
Injection:	Split (split ratio 100:1), 0.5 µl Inlet 220°C
GC System:	Agilent GC/FID (270°C)
Sample:	Neat, 99%+

1. Non-aromatic hydrocarbon
2. Toluene
3. Ethylbenzene
4. p-Xylene
5. m-Xylene
6. o-Xylene



HP-INNOWax temperature range:
40°C to 260°C;
0.53 mm id columns:
40°C to 240°C

HP-INNOWax

Similar Phases

Stabilwax, Supelcowax-10, CP WAX 52 CB, DB-WAXetr

Applications

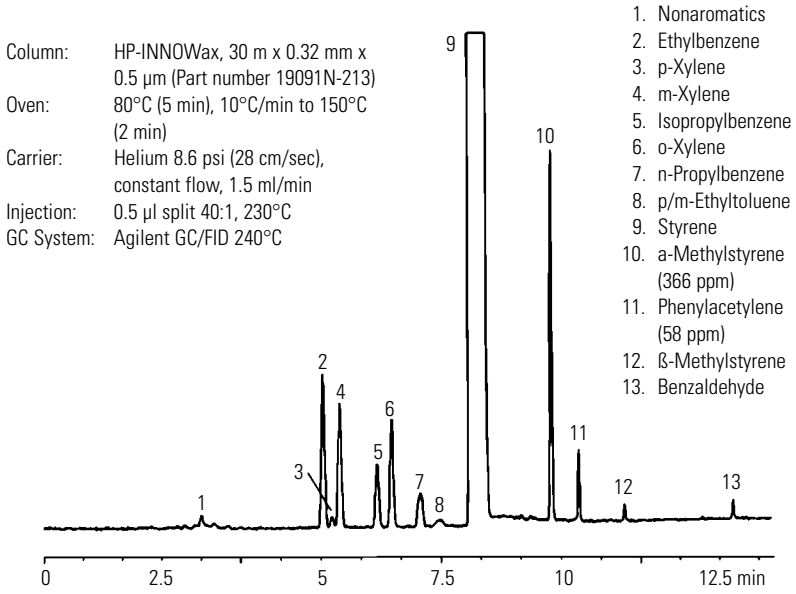
Alcohols, Free Acids, Aromatics, Essential Oils, Solvents

The HP-INNOWax columns have the lowest bleed of any of the Wax phases. This results in lower detector noise so you can detect and quantitate lower levels of compounds. This phase is also a good choice for use in mass spectrometry where column bleed can reduce the accuracy of peak identification.

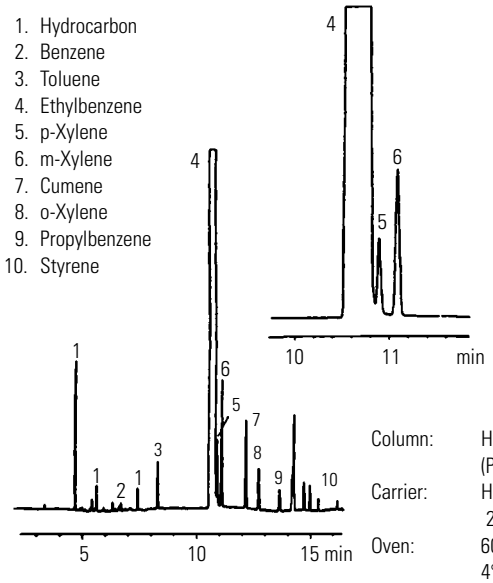
The combination of a highly deactivated glass surface with the cross-linked and surface bonding results in a column that is compatible with a wide range of polar compounds. This makes the HP-INNOWax column the ideal choice when developing new methods. The HP-INNOWax family of columns have been used successfully in a variety of different industries and applications including petrochemical, solvent analysis, food and flavors, and beverage analysis.

PEG Columns for Petrochemical Applications

Impurities in Styrene: ASTM D5135



Impurities in Ethylbenzene: ASTM D5060



Column: HP-INNOWax, 60 m x 0.32 mm x 0.5 µm (Part number 19091N-216)
Carrier: He, 32 cm/sec, 19.9 psi (60°C), 2.5 ml/min constant flow
Oven: 60°C (1 min) to 92°C (4.5 min) at 4°C/min,to 220°C (5 min) at 20°C/min
Injection: Split (split ratio 100:1), 0.5 µl Inlet 220°C
GC System: Agilent GC/FID 270°C
Sample: Neat, 99%+

Low Operating Temperature HP-WAX

The HP-Wax column has the lowest operating temperature of any of the Wax phases. The proprietary cross-linking lowers the usable temperature of the stationary phase to 20°C compared with 40°C for other Wax phases making this phase ideal for low boiling point compounds.

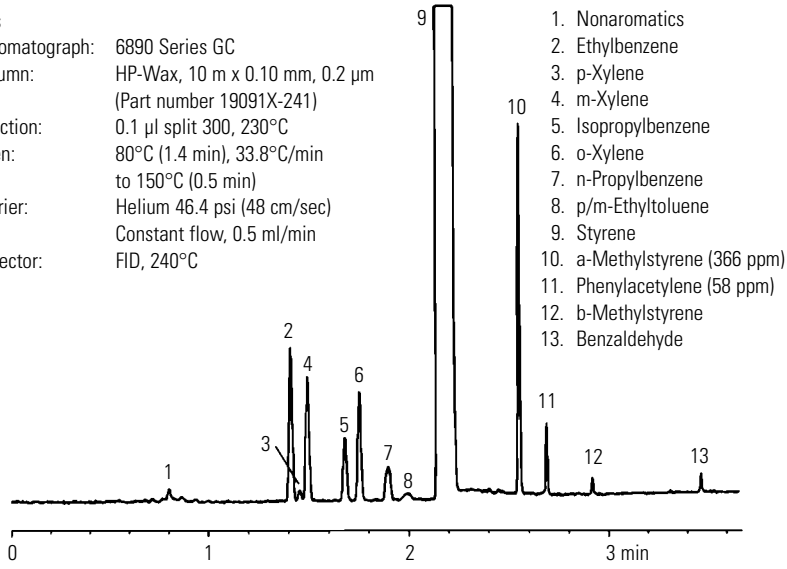
If your application is purge and trap or headspace, the HP-Wax column can be used with cryogenic cooling for cold trapping analytes. The HP-Wax column is designed to match the polarity of competitive Wax columns making substitution easy. The HP-Wax phase is the closest in polarity to the HP-20M so you can transfer your methods to a cross-linked phase without lengthy method development.

PEG Columns for Petrochemical/Chemical Applications

Impurities in Styrene

Gas Chromatograph: 6890 Series GC
Column: HP-Wax, 10 m x 0.10 mm, 0.2 µm (Part number 19091X-241)
Injection: 0.1 µl split 300, 230°C
Oven: 80°C (1.4 min), 33.8°C/min to 150°C (0.5 min)
Carrier: Helium 46.4 psi (48 cm/sec) Constant flow, 0.5 ml/min
Detector: FID, 240°C

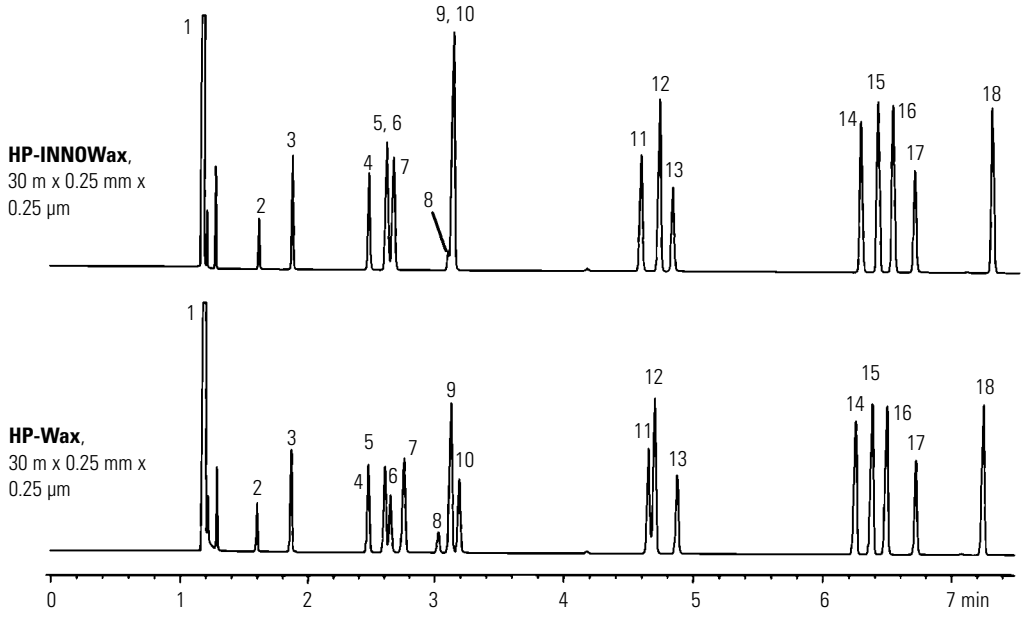
1. Nonaromatics
2. Ethylbenzene
3. p-Xylene
4. m-Xylene
5. Isopropylbenzene
6. o-Xylene
7. n-Propylbenzene
8. p/m-Ethyltoluene
9. Styrene
10. a-Methylstyrene (366 ppm)
11. Phenylacetylene (58 ppm)
12. b-Methylstyrene
13. Benzaldehyde



Solvent Analysis
HP-INNOWax, HP-Wax Comparison

1. Pentane
2. Methyl formate
3. Acetone
4. Ethyl acetate
5. Methyl ethyl ketone
6. Methanol
7. 2-Methyl-2-propanol
8. Methylene chloride
9. Benzene
10. Ethanol
11. 2-Butanol
12. Toluene
13. n-Propanol
14. Ethyl benzene
15. p-Xylene
16. m-Xylene
17. 1-Butanol
18. o-Xylene

Carrier: Hydrogen, 40 cm/sec, constant pressure
Oven: 35°C (2.5 min), 10°C/min to 85°C
Injection: 250°C, Split (100:1), 0.5 µl
GC System: Agilent GC/FID, 300°C

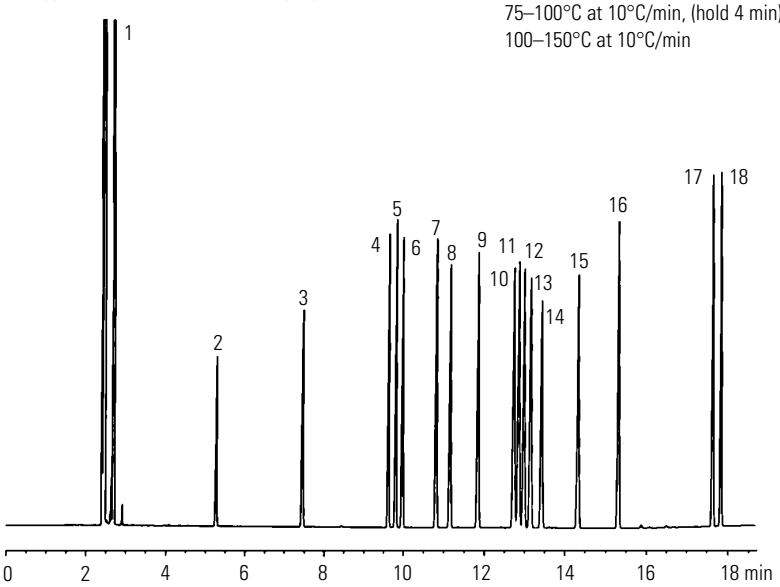


PEG Columns for Petrochemical/Chemical Applications

Substituted Aromatics HP-Wax Column

1. Hexane
2. Benzene
3. Toluene
4. Ethylbenzene
5. 1,4-Xylene
6. 1,3-Xylene
7. Cumene
8. 1,2-Xylene
9. Propylbenzene
10. tert-Butylbenzene
11. Isobutylbenzene
12. Mesitylene
13. sec-Butylbenzene
14. Styrene
15. 1,2,4-Trimethylbenzene
16. Butylbenzene
17. 1,4-Diisopropylbenzene
18. trans-ß-Methylstyrene

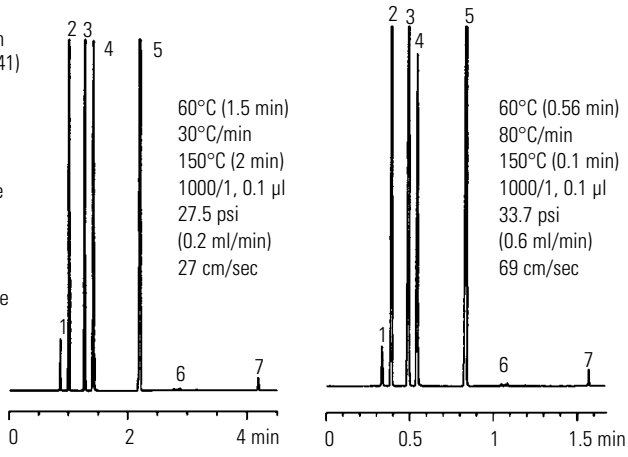
Column: HP-Wax, 60 m x 0.32 mm x 0.5 µm (Part number 19091X-216)
GC System: Agilent GC/FID, 300°C
Injection: Split, 250:1, 0.5 µl injection, 250°C
Concentration of analytes: 500 µg/ml in hexane
Carrier: Hydrogen at 40 cm/sec constant pressure
Oven: 50°C for 1 min; 50–75 at 4°C/min, 75–100°C at 10°C/min, (hold 4 min) 100–150°C at 10°C/min



Solvents in Paint Thinner

HP-Wax,
10 m x 100 µm x 0.2 µm
(Part number 19091X-241)

1. Propylene oxide
2. Acetone
3. Methanol
4. Methylene chloride
5. Toluene
6. C8 aromatics
7. 4-hydroxy-4 methyl-2-pentanone



Temperature range:
20°C to 250°C;
Series 530-µm and thick-film columns: 20°C to 230°C

HP-Wax

Similar Phases

DB-Wax, Rtx-wax, Carbowax 20M

Applications

Alcohols, Aromatics, Essential Oils, Solvents

The HP-Wax columns are available in 100 µm diameters for fast analysis. The 100 µm columns have the same phase chemistry as the standard dimension HP-Wax columns so translating methods to the smaller dimensions is simple. If you are using the HP-INNOWax columns, you can still translate your methods to the 100 µm HP-Wax columns. Most methods translate directly without the need for time consuming method development. Faster analysis means more productivity for your lab.

The HP-Wax columns are cross-linked and bonded to ensure long lifetime. The columns can be solvent rinsed to extend the column lifetime and reduce costs. Although the HP-Wax columns are used for the same application areas as the HP-INNOWax columns, the HP-Wax has slightly different selectivity for some compounds like alcohols (see comparative chromatogram on page 4). If some analytes are difficult to separate on the HP-INNOWax columns and you need the polarity of a Wax column, try the HP-Wax column.

HP-FFAP Columns for Free Fatty Acid Analyses

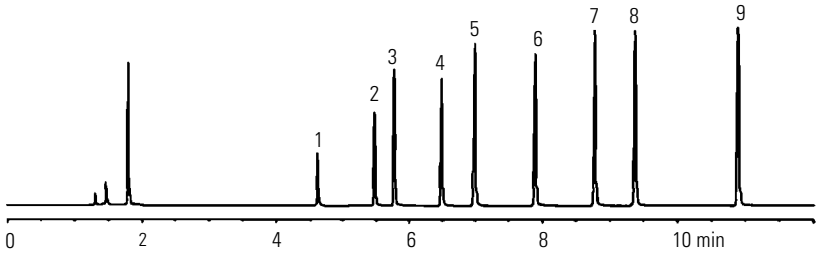
The HP-FFAP columns are designed primarily for the analysis of organic acids, free fatty acids or samples that require quantitation of acidic impurities. The stationary phase is modified with acid to provide a very inert column that can accommodate the demanding analysis of acids dissolved in water. Free fatty acids up to C24 can be analyzed without costly and time consuming derivatization. If you want to analyze the derivatized free acids, the FFAP column is a good choice to resolve the derivatized saturated and unsaturated acids to C24.

The HP-FFAP is cross-linked and bonded to resist the damage that can occur when injecting water based samples and can be used at operating temperatures of 60°C to 240°C. These columns do not require several injections of acids (priming) before accurate quantitation is possible so accurate results are obtained quickly. The columns are also solvent rinsable for long column lifetimes.

HP PEG Columns for Foods and Flavors Applications

Free fatty acids (C2–C7)

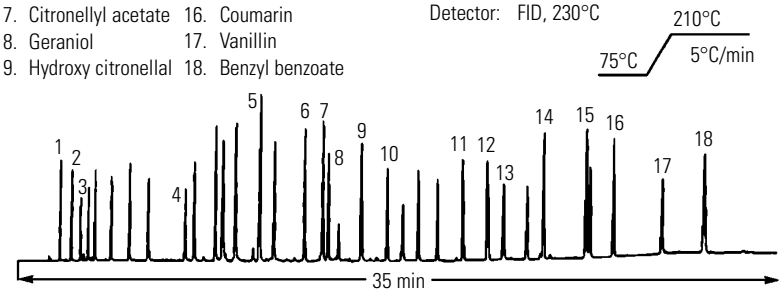
Injection: 0.5 µl, split 20/1, 260°C
Column: HP-FFAP, 25 m 0.32 mm 0.5 µm (Part number 19091F-112)
Carrier: Helium @ 10.8 psi (42 cm/sec)
Oven: 80°C (1 min), to 120°C (20°C/min), then to 205°C (6.13°C/min), 205°C (2 min)
GC System: Agilent GC/FID, 260°C



Perfume Calibration Mix

1. α-Pinene
2. β-Pinene
3. δ-Limonene
4. Citronellal
5. Menthol
6. Benzyl acetate
7. Citronellyl acetate
8. Geraniol
9. Hydroxy citronellal
10. Anisaldehyde
11. Methyl cinnamate
12. Ethyl cinnamate
13. Eugenol
14. Jasmonal
15. Diethyl phthalate
16. Coumarin
17. Vanillin
18. Benzyl benzoate

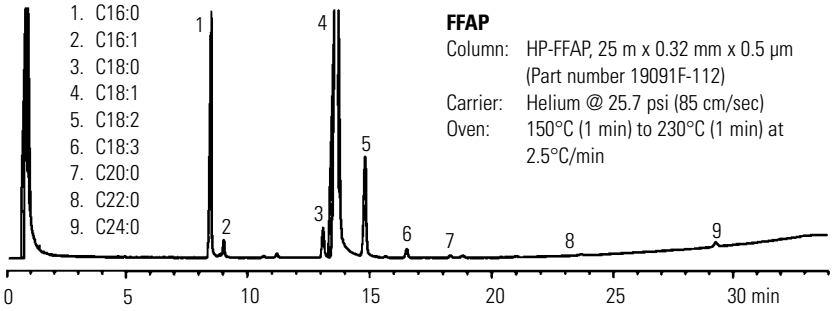
Column: HP-20M (Carbowax 20 M)
50 m x 0.32 mm x 0.3 µm
(Part number 19091W-015)
Carrier: Hydrogen, 64 cm/sec
Oven: Temperature program listed
Injection: Split, 210°C
Detector: FID, 230°C



PEG Column	Features	Advantages	Benefits
HP-INNOWax	Highest Upper Temperature Limit	Analyze High-Boiling Point Compounds	Wide Usage
	Chemical Compatibility	General Purpose Column	Wide Usage
	Low Bleed	Low Detector Noise	Best Choice for MS Use
	Bonded and Cross-linked	Solvent Rinsable	Low Lifetime
	Highly Inert	General Purpose Column	Broad Analyte Compatibility
HP-Wax Columns	Lowest Operating Temperature Limit	Analyze Low-Boiling Point Analytes	Wide Usage
	Similar in Polarity to HP-20M	Transfer Older Methods to Cross-linked Phase	Easier Method Transfer
	Available in 100 µm id	Fast Analysis	Higher Sample Throughput
	Bonded and Cross-linked	Solvent Rinsable	Long Lifetime
	Highly Inert	Excellent for Slightly Basic Compounds	Accurate Quantitation
HP-FFAP Columns	Designed for Acids	Can Inject Acids Directly	No Need for Derivatization
	Bonded and Cross-linked	Solvent Rinsable	Long Column Lifetime
HP-Basic Wax Columns	Selective for Amines	Sharp Peaks	No Need to Precondition
	Upper Temperature Limit to 260°C	Analyze High-Boiling Point Compounds	Expanded Range of Analytes
	Bonded and Cross-linked	Solvent Reinsable	Long Column Lifetime

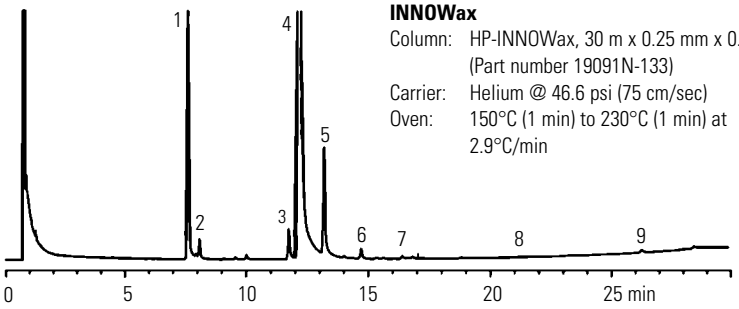
PEG Columns for Foods and Flavors Applications

Derivatized Olive Oil (FAMEs) on Two Different Columns



FFAP

Column: HP-FFAP, 25 m x 0.32 mm x 0.5 µm (Part number 19091F-112)
Carrier: Helium @ 25.7 psi (85 cm/sec)
Oven: 150°C (1 min) to 230°C (1 min) at 2.5°C/min



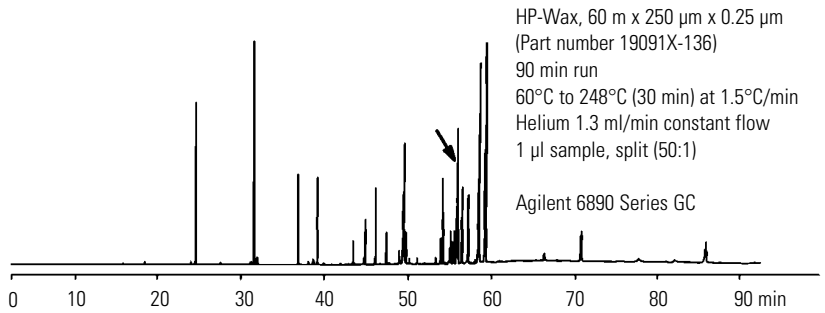
INNOWax

Column: HP-INNOWax, 30 m x 0.25 mm x 0.25 µm (Part number 19091N-133)
Carrier: Helium @ 46.6 psi (75 cm/sec)
Oven: 150°C (1 min) to 230°C (1 min) at 2.9°C/min

Common Parameters

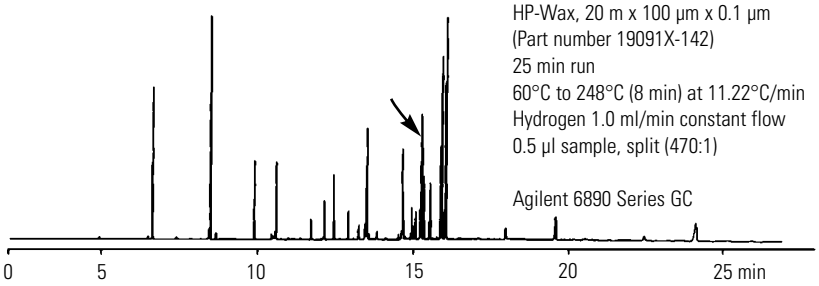
GC:	6890	Liner:	Deactivated with glass wool plug
Sample:	Greek Olive Oil (Derivatized) in Methylene Chloride	Detector Temp.:	260°C
Split Ratio:	20/1	Hydrogen Flow:	40 ml/min
Injector Temp.:	260°C	Air Flow:	450 ml/min
Injection Size:	1.5 µl	Makeup Flow:	45 ml/min (Nitrogen)
			Constant Flow Mode

Jasmine Extract



HP-Wax, 60 m x 250 µm x 0.25 µm
(Part number 19091X-136)
90 min run
60°C to 248°C (30 min) at 1.5°C/min
Helium 1.3 ml/min constant flow
1 µl sample, split (50:1)

Agilent 6890 Series GC



HP-Wax, 20 m x 100 µm x 0.1 µm
(Part number 19091X-142)
25 min run
60°C to 248°C (8 min) at 11.22°C/min
Hydrogen 1.0 ml/min constant flow
0.5 µl sample, split (470:1)

Agilent 6890 Series GC

HP-FFAP

Similar Phases

DB-FFAP, Stabilwax-DA, OV-351, CP WAX 58CB, Nukol

Applications

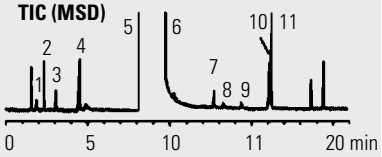
Acids, Alcohols, Aldehydes, Acrylates, Ketones, Nitriles

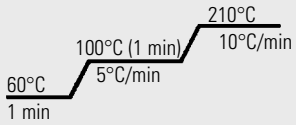
Temperature Range

60°C to 240°C

Ethoxyethanol HP-FFAP Column

1. Ethylene oxide
2. Ethyl formate
3. Ethyl alcohol
4. Water
5. 2-Ethoxyethanol
6. 2-Ethoxyethyl acetate
7. Hydroxy acetate
8. Acetic acid
9. Formic acid
10. Ethylene glycol/ monoformate
11. Ethylene glycol/ monoacetate





Column: HP-FFAP, (Cross-linked polyethylene glycol) 30 m x 0.53 mm x 1.0 µm (Part no. 19095F-123)
Carrier: Helium at 10 ml/min
Oven: Temperature program listed below
Injection: Split (10:1), 220°C
Detector: MSD (280°C)

HP-Basic Wax

Similar Phases

CAM, Carbowax Amine, Stabilwax-DB, CP-51 WAX for amines, CP-WAX for amines and diamines

Applications

Amines and other basic compounds

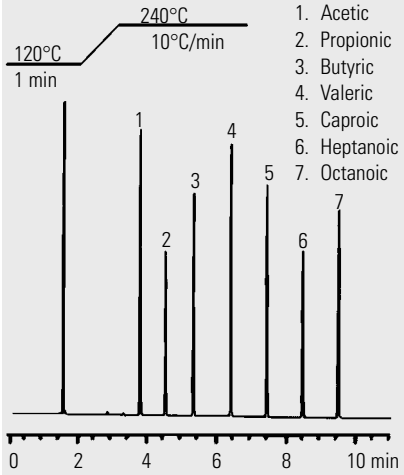
Temperature Range isothermal/ temperature programmed

40°C to 240/260°C
40°C to 220/240°C for 0.53 mm id

HP-Basic Wax for Amines and Other Basic Compounds

The most recent addition to the Agilent line of PEG capillary columns is the HP-Basic Wax column. This phase has been specifically developed for the analysis of amines and other basic compounds. Peak shapes for amines show excellent symmetry from the very first injection so there is no need to "prime" the column with sample before quantitative results can be obtained.

Free Fatty Acids



Column: HP-FFAP 30 m x 0.53 mm x 1.0 µm (Part number 19095F-123)
Carrier: Helium, 49 cm/sec, 6 ml/min constant flow
Oven: 120°C (1 min) to 240°C at 10°C/min
Injection: Split (15:1), 1 µl, inlet = 240°C
Detector: FID (265°C)
Sample: 1 to 2% acids in acetone

The HP-Basic Wax column can be used from 60°C to 260°C; one of the highest in the industry so you can extend the range of compounds you can analyze. Best of all, accurate quantitation is possible from the first injection and the performance of the column does not deteriorate even after many injections. The column can be solvent rinsed (water and methane are not recommended) to extend the lifetime of the column.

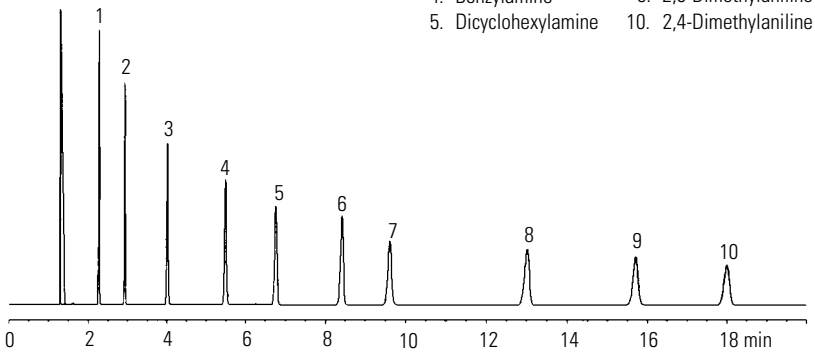
PEG Columns for Foods and Flavors Applications

Analysis of Amines

Column: HP-Basic Wax, 30 m x 0.32 mm x 0.25 µm (Part number 19091N-613)
Carrier: Hydrogen, 6.0 psi
Oven: 120°C
Injector: 250°C, Split ratio: 100:1
Detector: 250°C, FID

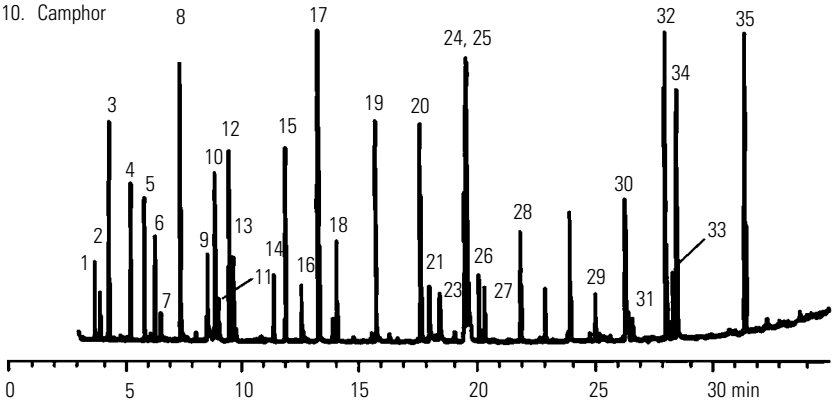
Test Mixture
(0.5 mg/ml in Hexane)

1. n-Octylamine
2. n-Nonylamine
3. n-Decylamine
4. Benzylamine
5. Dicyclohexylamine
6. n-Heptadecane
7. Trihexylamine
8. n-octyldecane
9. 2,6-Dimethylaniline
10. 2,4-Dimethylaniline



Flavors/Fragrance Standard Mix

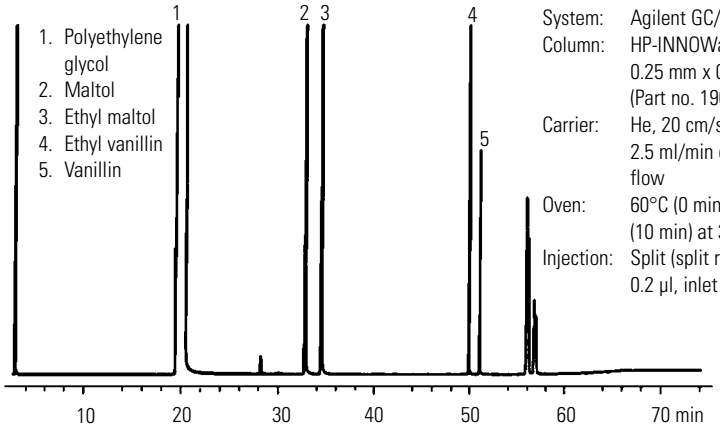
1. 1-Limonene
2. cis-3-Hexenal
3. Prenyl acetate
4. cis-3-Hexenyl acetate
5. Rose oxide
6. Hexenol
7. Nonanal
8. p-Methyl cresol
9. Decanal
10. Camphor
11. Benzyl aldehyde
12. Linalool
13. Octanol
14. Menthol
15. Citronellyl acetate
16. alpha-Terpineol
17. Benzyl acetate
18. Citronellol
19. Geraniol
20. Phenyl propyl acetate
21. Maltol
22. Cyclamen aldehyde
23. Cinnamic aldehyde
24. Isopropyl myristate
25. Unknown
26. Dimethyl anthranilate
27. p-Cresol
28. Eugenol
29. Heliotropine
30. Helional
31. Idole
32. Methyl naphthyl ketone
33. Musk xylol
34. Vanillin
35. Ethylene brassylate (Musk T)



Column: HP-INNOWax, 30 m x 0.25 mm x 0.25 µm (Part number 19091N-133)
Carrier: Helium, 30 cm/sec, 0.9 ml/min, Constant Flow
Oven: 80°C (1 min), 5°C/min to 250°C (2 min)
Injection: 0.2 µl, On-column
Detector: MSD, 280°C
Sample: 500 ppm in ethanol

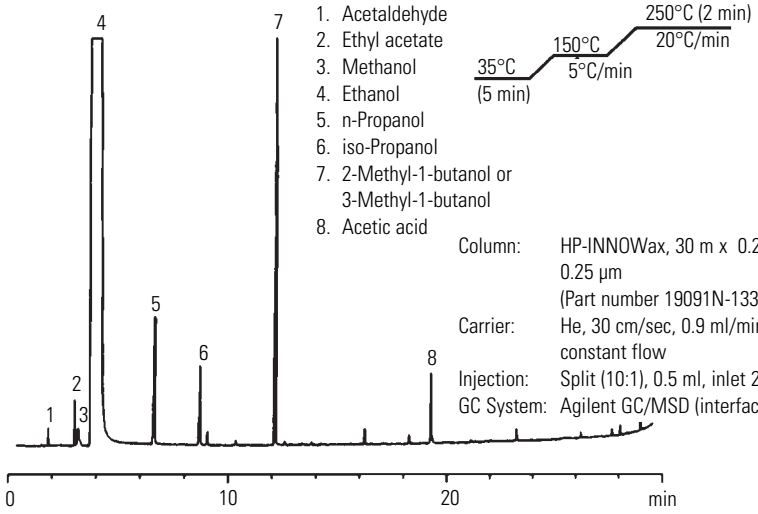
PEG Columns for Foods and Flavors Applications

Vanillin Mix



System: Agilent GC/FID, 300°C
Column: HP-INNOWax, 30 m x 0.25 mm x 0.25 µm (Part no. 19091N-133)
Carrier: He, 20 cm/sec (100°C), 2.5 ml/min constant flow
Oven: 60°C (0 min) to 258°C (10 min) at 3°C/min
Injection: Split (split ratio 100:1), 0.2 µl, inlet 270°C

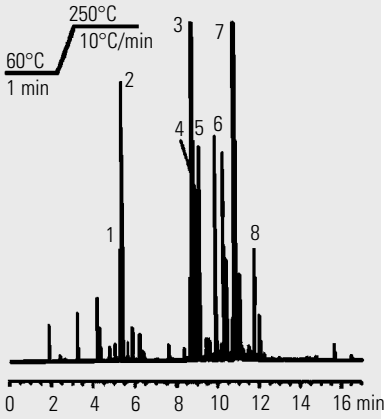
Brandy
HP 5890 Series II with EPC and FID



Column: HP-INNOWax, 30 m x 0.25 mm x 0.25 µm (Part number 19091N-133)
Carrier: He, 30 cm/sec, 0.9 ml/min constant flow
Injection: Split (10:1), 0.5 ml, inlet 250°C
GC System: Agilent GC/MSD (interface 280°C)

Peppermint Oil

1. Limonene
2. Cineole
3. Menthone
4. Menthofuran
5. d-sio-Menthone
6. Menthyl acetate
7. Menthol
8. Germacrene

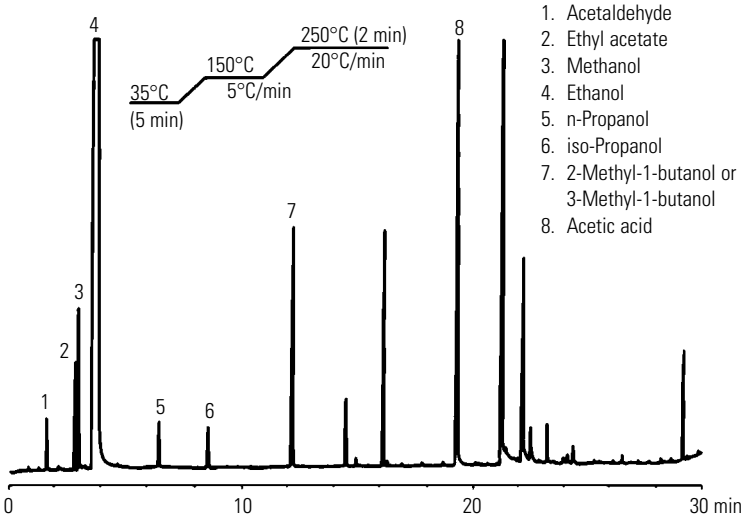


Column: HP-INNOWax (cross-linked PEG) 30 m x 0.32 mm x 0.5 µm (Part number 19091N-213)
Carrier: Helium, 40 cm/sec, 11.7 psi (60°C), 2.5 ml/min constant flow
Oven: 60°C (1 min) to 250°C at 10°C/min
Injection: Split (60:1), 0.5 µl, inlet at 220°C
Detector: FID (275°C)
Sample: Neat

Wine, Cabernet
HP 5890 Series II with EPC and FID

GC System: Agilent GC/FID
Automated Sampler: 7673 Automated Sampler
Column: HP-INNOWax, 30 m x 0.25 mm x 0.25 µm (Part number 19091N-133)

Column: HP-INNOWax, 30 m x 0.25 mm x 0.25 µm (Part number 19091N-133)
Carrier: He, 33 cm/sec, 15.5 psi (35°C), 1.5 ml/min constant flow
Oven: 35°C (5 min) to 150°C at 5°C/min, to 250°C (2 min) at 20°C/min
Injection: Split (split ratio 25:1), 1 µl, inlet temp at 220°C
Detector: FID (280°C)
Sample: Neat



1. Acetaldehyde
2. Ethyl acetate
3. Methanol
4. Ethanol
5. n-Propanol
6. iso-Propanol
7. 2-Methyl-1-butanol or 3-Methyl-1-butanol
8. Acetic acid

HP-20M

Similar Phases

Carbowax 20M, 007-CW, BP-20

Applications

Alcohols, Free Acids, Ethers, Glycols

Nonbonded HP-20M Columns

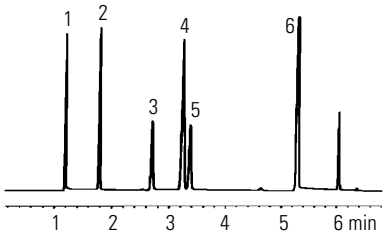
The HP-20M is the nonbonded wax phase that was designed to support established methods that require the polarity be identical to Carbowax 20M. The columns have a temperature range of 60°C to 220°C.

PEG Columns for Paramaceuticals Applications

Alcohols, Adehydes, and Ketones

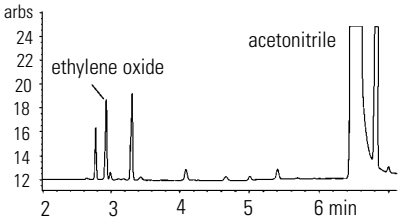
Calibration standards

1. Acetaldehyde
2. Acetone
3. Methanol
4. Isopropanol
5. Ethanol
6. n-Propanol IS



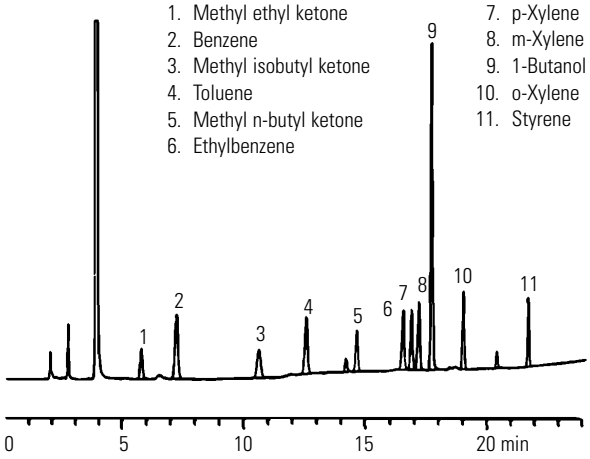
Column:	HP-INNOWax, 15 m x 0.25 mm x 0.5 µm (Part number 19091N-231)
Detector:	FID, 275°C
Carrier:	Helium, 1.2 ml/min, Constant Flow
Oven:	40°C (4 min), 10°C/min to 60°C; 25°C/min to 110°C
Injection:	0.5 µl, 250°C, Split 250:1

Analysis of Ethylene Oxide in a Pharmaceutical Formulation



Inlet:	Split/10:1, 1 µl, 250°C
Column:	HP-WAX, 60 m x 0.53 mm i.d. x 1 µm (Part number 19095X-126)
Carrier Gas:	Hydrogen
Head Pressure:	25 kPa at 50°C–constant flow mode
Flow:	5.2 ml/min
Oven Temperature:	50°C, 5°C/min to 75°C, 25°C/min to 200°C
GC System:	Agilent GC/FID, 250°C

Volatile Hydrocarbons and Ketones in Blood



Headspace sampler:	Agilent 7694
Column:	HP-INNOWax, 30 m x 0.53 mm x 1.0 µm (Part number 19095N-123)
Inlet:	Split/2:1 (180°C)
GC System:	Agilent GC/FID 220°C

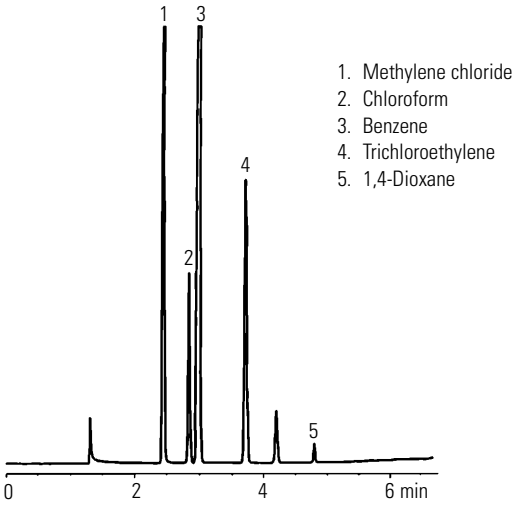
GC Conditions

Oven temperature:	40°C (10 min), 5°C/min to 110°C
Carrier gas flow rate:	3.4 ml/min (25 cm/sec), constant flow

Headspace Conditions

Oven temperature:	90°C
Valve and loop temp.:	92°C
Transfer line temp.:	110°C
Incubation time:	30 min
Shaking:	High
Injection timing:	0.5 min pres; 0.02 min vent; 1.0 min inject
Vial pressure:	10.8 psi
Loop size:	1 ml
Sample:	1.0 ml blood and 100 µl internal standard (0.01% n-butanol in deionized water) to each 22 ml headspace vial.

Organic Volatile Impurities in Pharmaceuticals



Equipment

Column:	HP-INNOWax, 30 m x 0.53 mm x 1.0 µm (Part number 19095N-123)
Detector:	FID, 300°C
Sample introduction:	Agilent 7694 Headspace Sampler

Experimental

Carrier gas:	He, 40 cm/sec, constant flow
Oven:	50°C (hold 3.5 min) to 60°C at 10°C/min, to 160°C at 40°C/min
Injection:	Splitless, 1 µl sample volume, 175°C
Sample:	100 mg pharmaceutical with 50 ppm $CHCl_3$; 100 ppm remaining components

Headspace Sampler Conditions

Setpoint:
Oven–80°C Transfer line–110°C Loop–90°C
Time events (min):
Vent time–0.50 Loop equilibrium time–0.05
Loop fill time–0.15
GC cycle time–10 Pressurize time–0.20
Vial equilibrium time–10 to 60 min with vigorous agitation

Agilent PEG Ordering Information

HP-Wax, HP-INNOWax, and HP-Basic Wax Columns

Description*	HP-Wax Part No.	HP-INNOWax Part No.**	HP-Basic Wax Part No.
10 m x 0.1 mm x 0.1 µm	19091X-141		
10 m x 0.1 mm x 0.2 µm	19091X-241		
20 m x 0.1 mm x 0.1 µm	19091X-142		
20 m x 0.1 mm x 0.2 µm	19091X-242		
40 m x 0.1 mm x 0.2 µm	19091X-244		
25 m x 0.2 mm x 0.2 µm	19091X-102	19091N-102	
25 m x 0.2 mm x 0.4 µm	19091X-202	19091N-202	
50 m x 0.2 mm x 0.2 µm	19091X-105	19091N-105	
50 m x 0.2 mm x 0.4 µm	19091X-205	19091N-205	
15 m x 0.25 mm x 0.15 µm	19091X-031	19091N-031	
15 m x 0.25 mm x 0.25 µm	19091X-131	19091N-131	19091N-631
15 m x 0.25 mm x 0.5 µm	19091X-231	19091N-231	19091N-731
30 m x 0.25 mm x 0.15 µm	19091X-033	19091N-033	
30 m x 0.25 mm x 0.25 µm	19091X-133	19091N-133	19091N-633
30 m x 0.25 mm x 0.5 µm	19091X-233	19091N-233	19091N-733
60 m x 0.25 mm x 0.15 µm	19091X-036	19091N-036	
60 m x 0.25 mm x 0.25 µm	19091X-136	19091N-136	
60 m x 0.25 mm x 0.5 µm	19091X-236	19091N-236	
15 m x 0.32 mm x 0.15 µm	19091X-011	19091N-011	
15 m x 0.32 mm x 0.25 µm	19091X-111	19091N-111	19091N-611
15 m x 0.32 mm x 0.5 µm	19091X-211	19091N-211	19091N-711
30 m x 0.32 mm x 0.15 µm	19091X-013	19091N-013	
30 m x 0.32 mm x 0.25 µm	19091X-113	19091N-133	19091N-613
30 m x 0.32 mm x 0.5 µm	19091X-213	19091N-213	19091N-713
60 m x 0.32 mm x 0.15 µm	19091X-016	19091N-016	
60 m x 0.32 mm x 0.25 µm	19091X-116	19091N-116	
60 m x 0.32 mm x 0.5 µm	19091X-216	19091N-216	
15 m x 0.53 mm x 1.0 µm	19095X-121	19095N-121	19095N-621
30 m x 0.53 mm x 1.0 µm	19095X-123	19095N-123	19095N-623
60 m x 0.53 mm x 1.0 µm	19095X-126	19095N-126	

** Length x Internal Diameter x Film Thickness*

*** INNOphase ™ bondable*

HP-FFAP Columns

Description*	HP-FFAP Part No.
25 m x 0.2 mm x 0.3 µm	19091F-102
50 m x 0.2 mm x 0.3 µm	19091F-105
15 m x 0.25 mm x 0.25 µm	19091F-431
30 m x 0.25 mm x 0.25 µm	19091F-433
15 m x 0.32 mm x 0.25 µm	19091F-411
25 m x 0.32 mm x 0.50 µm	19091F-112
30 m x 0.32 mm x 0.25 µm	19091F-413
50 m x 0.32 mm x 0.50 µm	19091F-115
10 m x 0.53 mm x 1.0 µm	19095F-121
15 m x 0.53 mm x 1.0 µm	19095F-120
30 m x 0.53 mm x 1.0 µm	19095F-123

** Length x Internal Diameter x Film Thickness*

HP-101 and HP-20M Capillary Columns

Description*	HP-101 Part No.	HP-20M Part No.
25 m x 0.2 mm x 0.1 µm		19091W-102
50 m x 0.2 mm x 0.1 µm		19091W-105
25 m x 0.32 mm x 0.3 µm	19091Y-012	19091W-012
50 m x 0.32 mm x 0.3 µm	19091Y-015	19091W-015
10 m x 0.53 mm x 1.33 µm		19095W-121
30 m x 0.53 mm x 1.33 µm		19095W-123

** Length x Internal Diameter x Film Thickness*

So when you search the polar horizon, squinting to distinquish where the snow line begins and the sky ends, be sure you have Agilent PEG columns to help you find the answers you need quickly and reliably.

Column polarity, ruggedness, and lifetime second to none sets Agilent PEG columns apart from the competition.

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