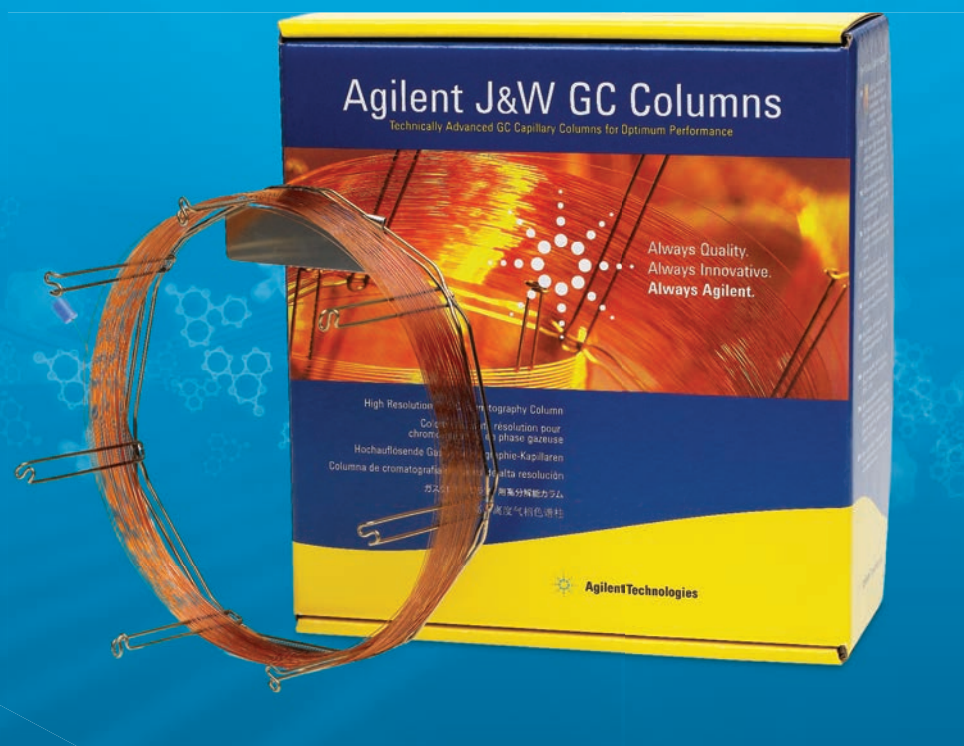


Agilent J&W GC Columns For Environmental Applications

MEASURE TRACE-LEVEL CONTAMINANTS AND MEET REGULATORY REQUIREMENTS WITH CONFIDENCE

The Measure of Confidence



 **Agilent Technologies**

Reliably and efficiently analyze increasingly small quantities of active solutes

Every day, you are on the front lines in the battle to safeguard our natural resources from potentially harmful organic and inorganic contaminants in water, soil, air, and food. To succeed, you must be able to run a high volume of samples under increasingly heavy time and cost pressures.

From testing volatile organic compounds (VOCs) in drinking water to quantifying semivolatile waterborne pollutants... you simply cannot afford interferences or reduced sensitivity caused by column bleed or activity. For starters, having to redo a run or verify suspect analytes wastes valuable resources, hinders productivity, and hurts your bottom line. Even worse, unreliable results could have catastrophic implications in terms of environmental safety.

The Agilent J&W GC column portfolio is designed and tested to help you achieve the lowest possible detection limits for difficult analytes.

Backed by 40 years of GC column innovation and applications expertise, Agilent J&W GC columns deliver low column bleed and the lowest column activity for your sensitive, trace-level applications – regardless of detector type. So you can confidently detect compounds at trace levels and comply with global regulations for continuous monitoring.

Inside: the Agilent J&W GC column portfolio covering the very latest environmental applications

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Agilent J&W Ultra Inert GC columns

Consistently analyze trace levels of pesticides, phenols, and other active compounds

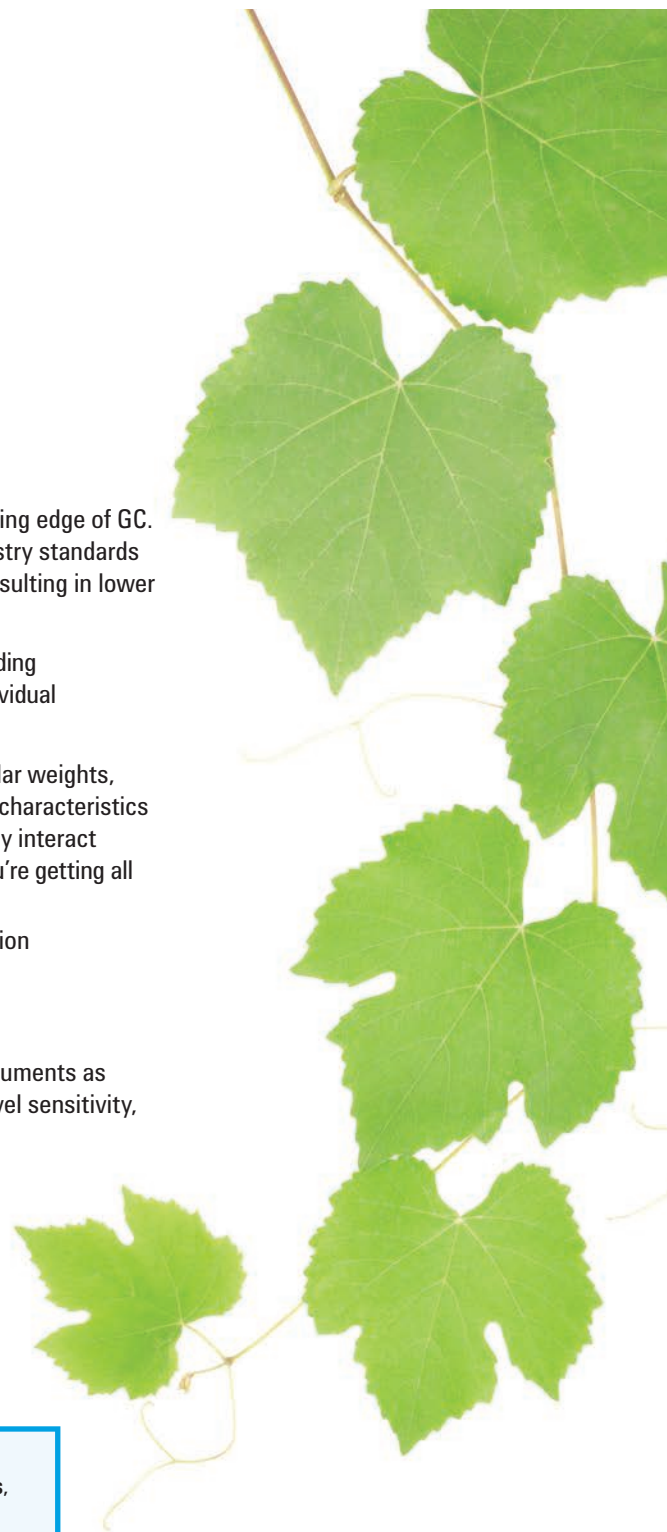
Flow path inertness isn't just vital to your analysis; it is also on the cutting edge of GC. That is why the Agilent J&W Ultra Inert GC column family pushes industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes.

Every Agilent J&W Ultra Inert GC column is tested with the most demanding Ultra Inert test probe mixture in the industry, and we prove it with an individual performance summary sheet that is shipped with each column.

Test probes in Agilent's Ultra Inert test probe mixture have low molecular weights, low boiling points, and no steric shielding of their active groups. These characteristics allow the probative portion of the test molecules to penetrate – and fully interact with – the stationary phase and column surface. So you can be sure you're getting all the benefits of column inertness, including:

- Minimal compound loss and degradation for more accurate quantitation
- Minimum peak tailing for active analytes
- Increased signal-to-noise for improved sensitivity at trace levels

To complete your Ultra Inert GC flow path, choose Agilent GC/MS instruments as well as Agilent Ultra Inert Inlet liners. These liners deliver high trace-level sensitivity, accuracy, and reproducibility *even when containing glass wool*.



Agilent Ultra Inert Inlet liners, great companion tools with the **Agilent J&W Ultra Inert GC columns,** are available in convenient 100 packs to meet the productivity demands of the environmental industry.

Application-specific Columns

TAILORED TO INDIVIDUAL METHODS AND COMPOUND CLASSES

Agilent J&W DB-UI 8270D Ultra Inert GC columns

Satisfy the rigorous demands of EPA 8270D

With **Agilent J&W DB-UI 8270D Ultra Inert GC columns**, you can count on excellent peak shape performance for active semivolatiles organic compounds targeted by EPA Method 8270D. These specialized columns support your analysis with:

- Industry leading Ultra Inert deactivation and manufacturing with no trade-offs in bleed or stationary phase selectivity.
- Unmatched testing protocol: columns are individually tested with the most probative active compounds of any GC column sold for semivolatiles.
- Convenient, economical multi-packs for high-throughput labs (available only in the U.S).

Agilent J&W Select PAH and DB-EUPAH GC columns

Conform to stringent regulatory requirements

Engineered and manufactured to the tightest QC specifications, Agilent J&W PAH columns deliver exceptional thermal stability, low column bleed at elevated temperatures, consistent column inertness, and accurate baseline resolution for critical isomer pairs.

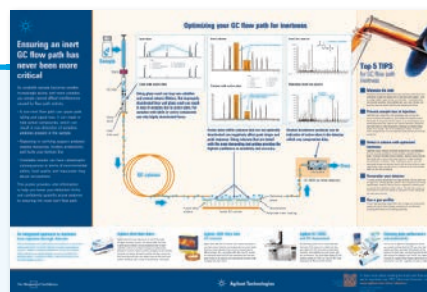
- **Agilent J&W Select PAH GC columns** accurately quantitate EPA PAHs in less than seven minutes. They also help you avoid false positives by reliably separating all PAH isomers.
- **Agilent J&W DB-EUPAH GC columns** are designed, optimized, and tested for analyzing 15+1 EU-regulated priority PAHs.

Agilent J&W DB-624UI Ultra Inert GC columns

Analyze VOCs and unknowns with confidence

Agilent J&W DB-624UI Ultra Inert GC columns are optimized for fast analysis of volatile compounds, and are ideal for environmental samples with unknown components. Their unique deactivation process enhances peak shape, improving signal-to-noise levels and increasing sensitivity for qualitative and quantitative analysis. These columns provide the following:

- Industry leading Ultra Inert deactivation and manufacturing in this mid-polarity stationary phase.
- Highest degree of column inertness for improved peak shape and linearity let you lower your detection limits and quantify active analytes with more confidence.
- All of the analytical benefits of proven inertness performance when you upgrade your existing 624 column to Agilent J&W DB-624UI.



Learn how to optimize your flow path for inertness so you can achieve the ultra low detection levels today's demanding analyses require.

Order your **FREE poster** today at
www.agilent.com/chem/uiorder

Agilent J&W DB-CLP1 and DB-CLP2 universal column pair

Perform more EPA DUAL-ECD pesticide methods

The EPA Contract Lab Program (CLP) for organochlorine pesticides mandates dual-column separation and confirmation with dual electron capture detection (ECD). A specifically designed, yet versatile, column pair can make this process easier by letting you execute more methods on the same instrument without switching columns.

Now you can simplify your operations with Agilent J&W DB-CLP1 and DB-CLP2 columns – the most flexible universal column pair for 9 EPA pesticides methods.

Together, these fast, reliable columns deliver excellent resolving power with exceptionally low bleed while eliminating the need for time-consuming column switching. You'll also gain the advantages of:

- High productivity: complete resolution and confirmation of 22 CLP pesticides can be performed in less than 7.5 minutes.
- Accurate identification and confirmation of trace-level pesticides.
- Optimal selectivity and stability: the mid-polarity arylene stationary phases provide "MS-grade" low bleed at temperatures up to 360 °C.
- Excellent column-to-column performance.
- Useful for pesticides analyses using MS and Nitrogen-Phosphorus Detectors (NPD).

We also subject our Agilent J&W DB-CLP1 and DB-CLP2 GC columns to the industry's most stringent testing – which includes challenging pesticides in the test mixture – and we *prove* it with a performance summary sheet shipped with every column.

Agilent J&W DB-CLP1 and DB-CLP2 columns cover 9 EPA methods – more than any other CLP column pair

EPA Contract Lab Program Pesticides	Organochlorine pesticides
EPA Method 504.1	Halogenated pesticides
EPA Method 505	Organohalide pesticides
EPA Method 508.1	Organochlorine pesticides and herbicides
EPA Method 551	Chlorinated solvents, trihalomethanes and disinfectant by-products
EPA Method 552.3	Haloacetic acids and dalapon
EPA Method 8081B	Organochlorine pesticides
EPA Method 8082A	PCBs and arachlors
EPA Method 8151A	Chlorophenoxy acid herbicides



Here are some examples of our most popular columns for environmental applications

Analyte	Column
Semivolatiles	DB-UI 8270D HP/DB-5ms Ultra Inert DB-5.625
CLP Pesticides (dual column configuration)	DB-CLP1 (primary) / DB-CLP2 (confirmation) DB-35ms or DB-17ms (primary) / DB-XLB (confirmation)
Pesticides	DB-CLP1 (primary) / DB-CLP2 (confirmation) <i>For multiple EPA methods using ECD</i> DB-35ms Ultra Inert DB-XLB or VF-XMS DB-5ms Ultra Inert HP-5ms Ultra Inert
PAHs	Select PAH DB-EUPAH DB-UI 8720D
PCBs	DB-XLB or VF-XMS CP-Sil 5/C18 CB for PCBs
Volatile organic compounds (VOCs)	DB-624 Ultra Inert DB-VRX Select mineral oil
Dioxins and Furans	CP-Sil 88 for Dioxins DB-Dioxin
Total Petroleum Hydrocarbons	Select mineral oil DB-TPH DB-MTBE
Volatile Amines	CP-Volamine

For information on these and more environmental application columns, order your GC Column Selection Guide or visit www.agilent.com/chem/mygccolumns

Speed up your GC column selection with our one-stop resource

The Agilent J&W GC Column Selection Guide makes it easier to choose the right GC column for all your environmental applications. It guides you step-by-step through:



- Choosing a stationary phase based on factors such as selectivity, polarity, and phenyl content.
- Understanding how column diameter influences factors like efficiency, solute retention, head pressure, and carrier gas flow rates.
- Determining which column length will affect solute retention, column head pressure, column bleed – and cost.

To order your FREE *Agilent J&W GC Column Selection Guide*, visit www.agilent.com/chem/getguides



Proof that Agilent J&W GC columns deliver reliable results and low column bleed for benign and difficult sample types

Agilent J&W HP-5ms Ultra Inert GC columns outperform Restek Rxi-5ms columns in the recovery of active compounds

Column: Agilent J&W HP-5ms Ultra Inert 20 m x 0.18 mm, 0.18 μ m

Conditions

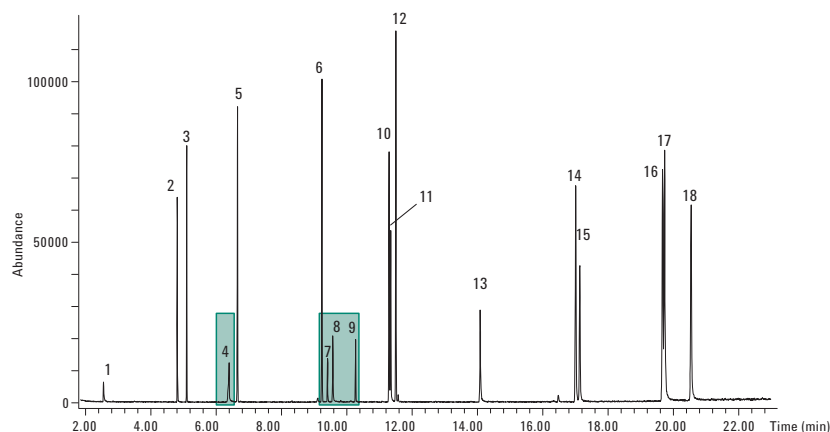
Carrier: Helium 37 cm/s, Ramped flow; 0.7 mL/min (0.1 min) to 1.3 mL/min (15 mL/min)

Oven: 35 °C (2.5 min) to 80 °C (40 °C/min), 15 °C/min to 200 °C, 8 °C/min to 275 °C (2 min)

Injection: 0.5 μ L, splitless. 280 °C purge flow 30 mL/min at 0.75 min

MSD: Transfer line 290 °C, Source 300 °C, Quad 180 °C

Sample: 0.5 ng on-column loading of Short Mix Components with ISTD



Peak identification

1. n-Nitrosodimethylamine
2. Aniline
3. 1,4-Dichlorobenzene-d4
4. Benzoic acid
5. Naphthalene-d8
6. Acenaphthene-d10
7. 2,4-Dinitrophenol
8. 4-Nitrophenol
9. 2-Me-4,6-dinitrophenol
10. 4-Aminobiphenyl
11. Pentachlorophenol
12. Phenanthrene-d10
13. Benzidine
14. Chrysene-d12
15. 3,3'-Dichlorobenzidine
16. Benzo[b]fluoranthene
17. Benzo[k]fluoranthene
18. Perylene-d12

Column: Restek Rxi-5ms 20 m x 0.18 mm, 0.18 μ m

Conditions

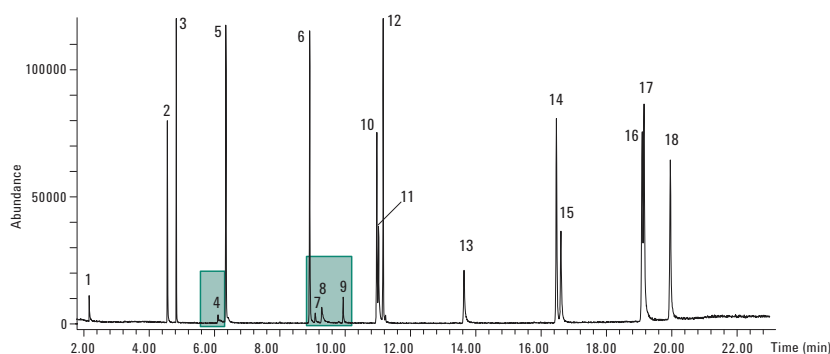
Carrier: Helium 37 cm/s, Ramped flow; 0.7 mL/min (0.1 min) to 1.3 mL/min (15 mL/min)

Oven: 35 °C (2.5 min) to 80 °C (40 °C/min), 15 °C/min to 200 °C, 8 °C/min to 275 °C (2 min)

Injection: 0.5 μ L, splitless. 280 °C purge flow 30 mL/min at 0.75 min

MSD: Transfer line 290 °C, Source 300 °C, Quad 180 °C

Sample: 0.5 ng on-column loading of Short Mix Components with ISTD

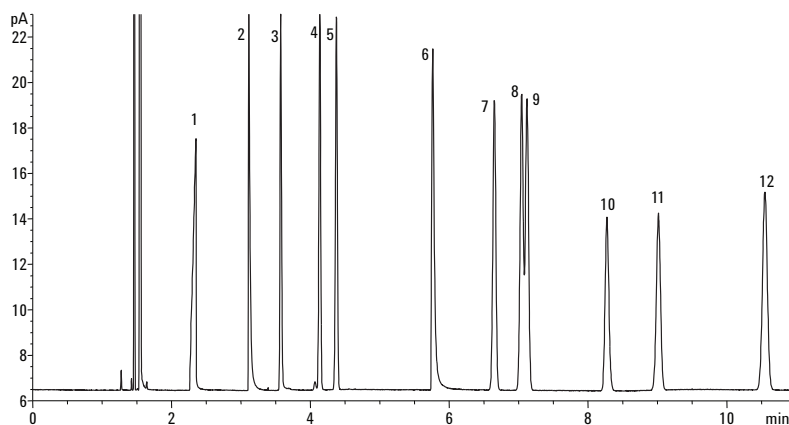


Peak identification

1. n-Nitrosodimethylamine
2. Aniline
3. 1,4-Dichlorobenzene-d4
4. Benzoic acid
5. Naphthalene-d8
6. Acenaphthene-d10
7. 2,4-Dinitrophenol
8. 4-Nitrophenol
9. 2-Me-4,6-dinitrophenol
10. 4-Aminobiphenyl
11. Pentachlorophenol
12. Phenanthrene-d10
13. Benzidine
14. Chrysene-d12
15. 3,3'-Dichlorobenzidine
16. Benzo[b]fluoranthene
17. Benzo[k]fluoranthene
18. Perylene-d12

In these examples, the **Agilent J&W HP-5ms Ultra Inert GC column** provides excellent peak shape for acids and bases, while the **Restek Rxi-5ms column** shows poor peak shape for some active compounds. (Acidic analytes are highlighted).

Agilent J&W DB-UI 8270D Example test chromatogram



Peak identification

- | | | |
|-------------------|-----------------------------|----------------------|
| 1. Propionic acid | 5. n-Octane | 9. p-Xylene |
| 2. Pyridine | 6. 1,2-Butanediol | 10. 2-Heptanone |
| 3. 1-Pentanol | 7. 1-Chloro-2-fluorobenzene | 11. n-Nonane |
| 4. 1-Octene | 8. m-Xylene | 12. Isopropylbenzene |

Test chromatogram of semivolatiles run on an **Agilent J&W DB-UI 8270D** column. Results from individual test chromatograms provide proof of inertness performance with every column shipped.

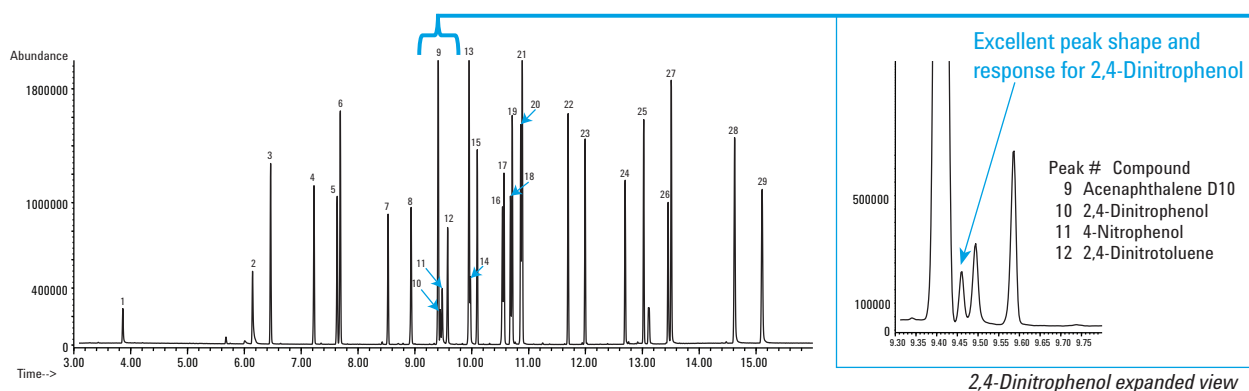
High-volume lab?
Try our convenient
column multi-packs

Agilent J&W DB-UI 8270D Ultra Inert GC columns are available in economical multi-packs that give you six columns for the price of five (US only).

Learn more at
www.agilent.com/chem/UI8270D



10 ng/ μ L Semivolatile Checkout Standard on an 20 m x 0.18 mm, 0.36 μ m Agilent J&W DB-UI 8270D Capillary GC Column using an Ultra Inert Liner with Wool



Peak identification

- | | | | | |
|--------------------------------|------------------------------|---------------------------------|------------------------|----------------------------|
| 1. N-Nitrosodimethylamine | 7. Hexachlorocyclopentadiene | 13. Flourene | 19. Terbufos | 25. 4,4'-DDT |
| 2. Aniline | 8. Mevinphos | 14. 4,6-Dinitro-2-methyl phenol | 20. Chlorothalonil | 26. 3,3'-Dichlorobenzidine |
| 3. 1,4-Dichlorobenzene-d4 | 9. Acenaphthene-d10 | 15. Trifluralin | 21. Phenanthrene-d10 | 27. Chrysene d-12 |
| 4. Isophorone | 10. 2,4-Dinitrophenol | 16. Simazine | 22. Aldrin | 28. Benzo[b]flouranthene |
| 5. 1,3-Dimethyl-2-nitrobenzene | 11. 4-Nitrophenol | 17. Atrazine | 23. Heptachlor epoxide | 29. Perylene-d12 |
| 6. Naphthalene | 12. 2,4-Dinitrotoluene | 18. Pentachlorophenol | 24. Endrin | |

29-component mix run on an **Agilent J&W DB-UI 8270D** 20 m x 0.18 mm, 0.36 μ m capillary GC column. Note the excellent peak shapes – achieved in less than 16 minutes.

Analyzing fire retardant PBDEs

Polybrominated Diphenyl Ethers PBDEs

Column: Agilent J&W DB-5ms Ultra Inert, Agilent Part No. 122-5512UI, 15 m x 0.25 mm, 0.25 µm

Conditions

Instrument: Agilent 6890N/5973B MSD

Sampler: Agilent 7683B, 5.0 µL syringe, (Agilent Part No. 5188-5246),
1.0 µL splitless injection, 5 ng each component on-column

Carrier: Helium 72 cm/s, constant flow

Inlet: Pulsed splitless; 325 °C, 20 psi until 1.5 min,
purge flow 50 mL/min at 2.0 min

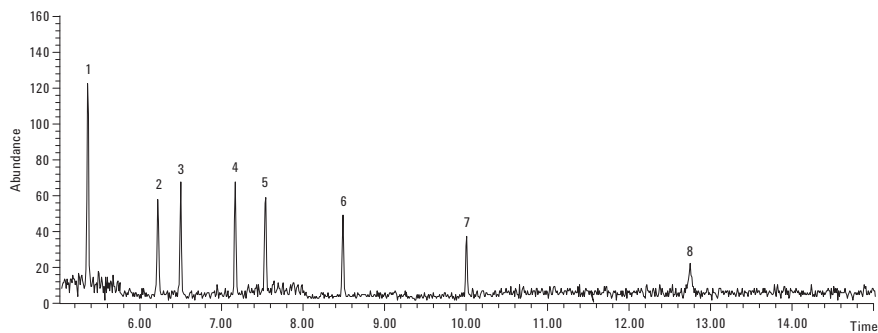
Oven: 150 to 325 °C (17 °C/min), hold 5 min

Detector: MSD source at 300 °C, quadropole at 150 °C,
transfer line at 300 °C, scan range 200-1000 amu

Supplies

Liner: Direct connect, dual taper, deactivated,
4 mm id, G1544-80700

Syringe: Autosampler syringe, 0.5 µL, 23g, cone, 5188-5246



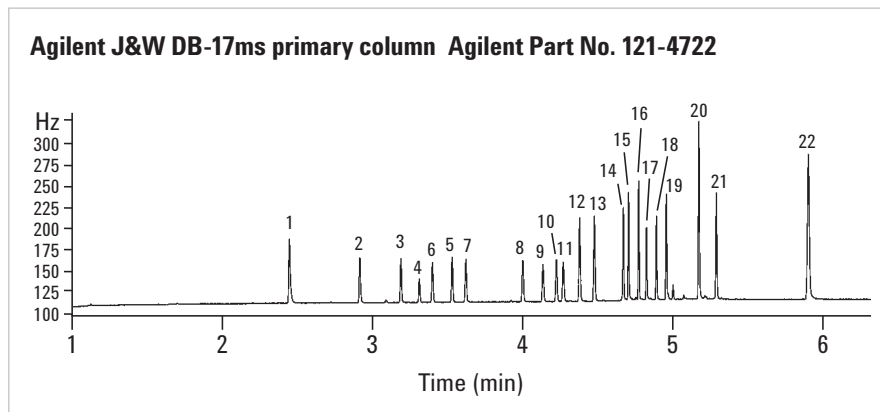
Peak identification

1. BDE-47
2. BDE-100
3. BDE-99
4. BDE-154
5. BDE-153
6. BDE-183
7. BDE-205
8. BDE-209

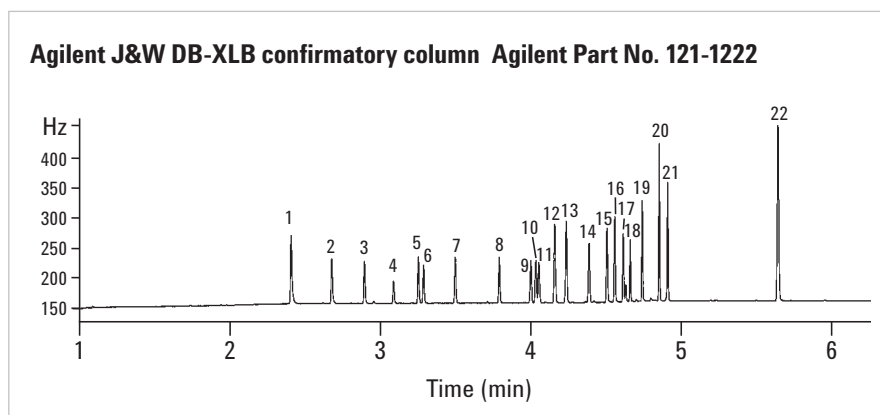
Pesticides

When it comes to speed and resolution, Agilent J&W High Efficiency GC columns outperform a leading competitor – and we can *prove* it

Rapid CLP (Contract Laboratory Program) Pesticide Analysis: A side-by-side column comparison



Here, the **Agilent J&W DB-17ms primary analysis column** resolved all 22 peaks of interest in less than 6 minutes with sharp symmetry and minimal baseline drift. Conversely, Restek's primary analysis column resolved only 20 of 22 peaks – and displayed evidence of peak tailing. See Restek's results on page 11.



Agilent J&W DB-XLB confirmatory analysis column resolved 20 peaks of interest in less than 6 minutes (the remaining peaks were close to being baseline resolved and were sufficient for peak confirmation.)

Peak identification

- | | | |
|-------------------------|------------------------|------------------------|
| 1. Tetrachloro-m-xylene | 9. γ Chlordane | 17. 4,4' DDT |
| 2. α BHC | 10. α Chlordane | 18. Endrin Aldehyde |
| 3. γ BHC | 11. Endosulfan I | 19. Endosulfan Sulfate |
| 4. β BHC | 12. 4,4' DDE | 20. Methoxychlor |
| 5. δ BHC | 13. Dieldrin | 21. Endrin Ketone |
| 6. Heptachlor | 14. Endrin | 22. Decachlorobiphenyl |
| 7. Aldrin | 15. 4,4' DDD | |
| 8. Heptachlor Epoxide | 16. Endosulfan II | |

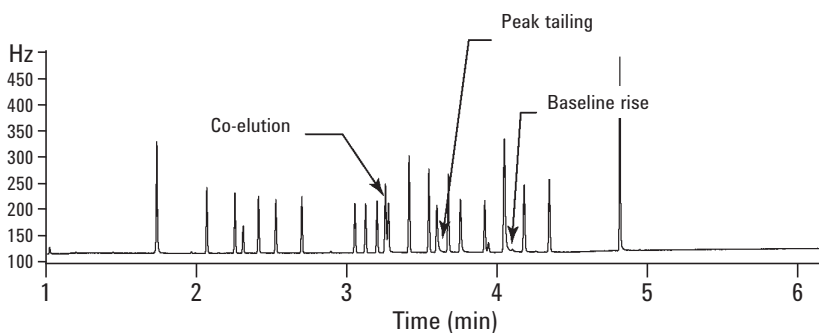
Conditions

Carrier Hydrogen (69 cm/sec at 120 °C, ramped at 99 mL/min to 106 cm/sec at 4.4 minutes)
Oven 120 °C (0.32 min); 120 °C/min to 160 °C; 30 °C/min to 258 °C (0.18 min); 38.81°C/min to 300 °C (1.5 min)
Injection Split/splitless; 220 °C, pulsed splitless (35 psi for 0.5 min, purge flow of 40 mL/min at 1 minute, gas saver flow 20 mL/min on 3 minutes)
Detector μ ECD 320 °C; nitrogen makeup; constant column + makeup flow 60 mL/min

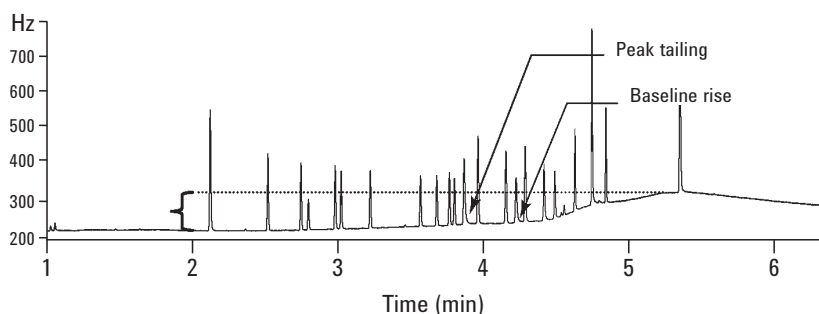
Peak identification

1. Tetrachloro-m-xylene	12. 4,4' DDE
2. α BHC	13. Dieldrin
3. γ BHC	14. Endrin
4. β BHC	15. 4,4' DDD
5. δ BHC	16. Endosulfan II
6. Heptachlor	17. 4,4' DDT
7. Aldrin	18. Endrin Aldehyde
8. Heptachlor Epoxide	19. Endosulfan Sulfate
9. γ Chlordane	20. Methoxychlor
10. α Chlordane	21. Endrin Ketone
11. Endosulfan I	22. Decachlorobiphenyl

Restek primary column



Restek confirmatory column



Although Restek's confirmatory column resolved all 22 peaks of interest, there is evidence of peak tailing – as well as an unacceptable level of temperature-dependent baseline drift. Compare that to Agilent's results, which show sharp, symmetrical peaks and minimal temperature-dependent baseline drift.

Agilent J&W High Efficiency Capillary GC columns

*Decrease your run times
by 50% or more, without
compromising resolution*

Agilent's high efficiency GC column family has expanded to include both 0.15 mm id and 0.18 mm id columns.

Agilent J&W High Efficiency Capillary GC columns can reduce your sample run time by 50% or more (compared to conventional GC), so you can get the reliable results you need using the resources you *have*. They are ideal for applications that require faster run times, and offer:

- **The flexibility to choose between helium and hydrogen carrier gases.** You can stay with a helium carrier if you wish to simplify method development, or switch to a hydrogen carrier if faster analysis is desired.
- **The ability to separate samples using less carrier gas,** which can lead to longer intervals between cylinder changes, increased uptime, and a lower cost per sample.

As an added benefit, Agilent J&W High Efficiency Capillary GC columns are compatible with all standard-pressure capillary GC and GC/MS instruments without expensive high-pressure modifications.

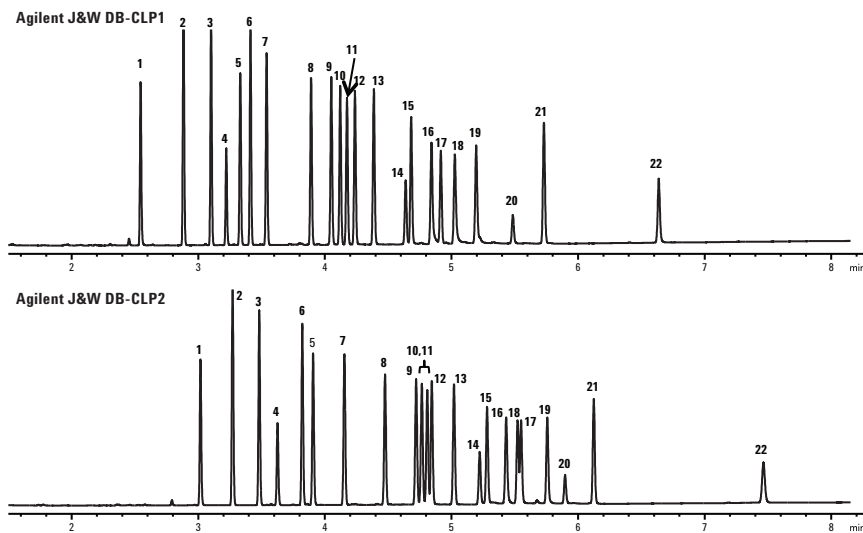
Fast CLP Pesticides – Chlorinated Pesticides

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

Conditions

Carrier: Helium, constant flow, 3.5 mL/min
Injection temperature: 250 °C
Injection: 1 µL, splitless
Oven: 150 °C, hold 0.2 min, 45 °C/min to 250 °C,
18 °C/min to 300 °C, 30 °C/min to 330 °C, hold 2.5 min
Detector: µECD, 340 °C



Peak identification

1. Tetrachloro-m-xylene (surrogate standard)
2. a-BHC
3. g-BHC
4. b-BHC
5. Heptachlor
6. d-BHC
7. Aldrin
8. Heptachlor epoxide
9. g-Chlordane
10. a-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulphate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (surrogate standard)

In 7.5 minutes, the **Agilent J&W CLP1/CLP2** column pair analyzed chlorinated pesticides according to the CLP Pesticides method.



Achieve fast, high-resolution analysis
of CLP pesticides

To learn more about the Agilent J&W DB-CLP1 & CLP2 Universal Column Pair,
visit www.agilent.com/chem/CLP

EPA Method 8081B (extended) – Organochlorine Pesticides

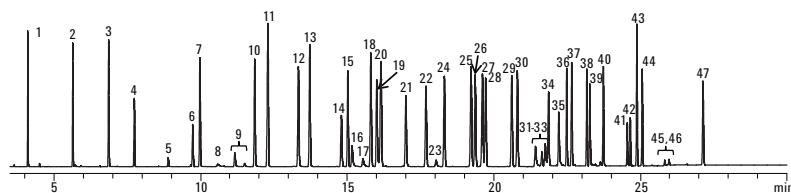
Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

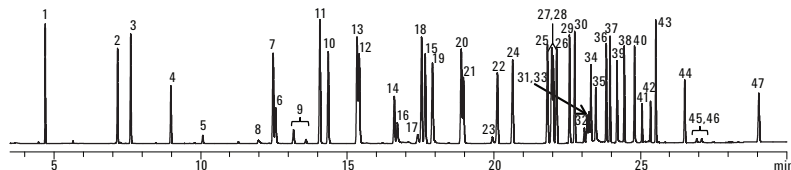
Conditions

Carrier: Helium, constant flow, 43.5 cm/s
 Injection temperature: 250 °C
 Injection: 2 µL, splitless
 Oven: 80 °C, hold 0.5 min, 20 °C/min to 150 °C, 5 °C/min to 235 °C, 15 °C/min to 300 °C, hold 5 min
 Detector: µECD, 325 °C

Agilent J&W DB-CLP1



Agilent J&W DB-CLP2



Peak identification

- | | |
|---|---|
| 1. 1,2-Dibromo-3-chloropropane | 25. g-Chlordane |
| 2. Hexachlorocyclopentadiene | 26. trans-Nonachlor |
| 3. 1-Bromo-2-nitrobenzene | 27. a-Chlordane |
| 4. Etriazazole | 28. Endosulfan I |
| 5. Chloroneb | 29. 4,4'-DDE |
| 6. Trifluralin | 30. Dieldrin |
| 7. Terachloro-m-xylene (surrogate standard) | 31. Chlorobenzilate (250 ng/mL) |
| 8. Propachlor | 32. Perthane (250 ng/mL) |
| 9. Diallate isomers (250 ng/mL) | 33. Chloropropylate (250 ng/mL) |
| 10. Hexachlorobenzene | 34. Endrin |
| 11. a-BHC | 35. Nitrofen |
| 12. Pentachloronitrobenzene | 36. 4,4'-DDD |
| 13. g-BHC | 37. Endosulfan II |
| 14. b-BHC | 38. 4,4'-DDT |
| 15. Heptachlor | 39. Endrin aldehyde |
| 16. Dichlone | 40. Endosulfan sulphate |
| 17. Alachlor | 41. Captafol |
| 18. d-BHC | 42. Methoxychlor |
| 19. Chlorothalonil | 43. Endrin ketone |
| 20. Aldrin | 44. Mirex |
| 21. DCPA | 45. cis-Permethrin |
| 22. Isodrin | 46. trans-Permethrin |
| 23. Kelthane | 47. Decachlorobiphenyl (surrogate standard) |
| 24. Heptachlor epoxide | |

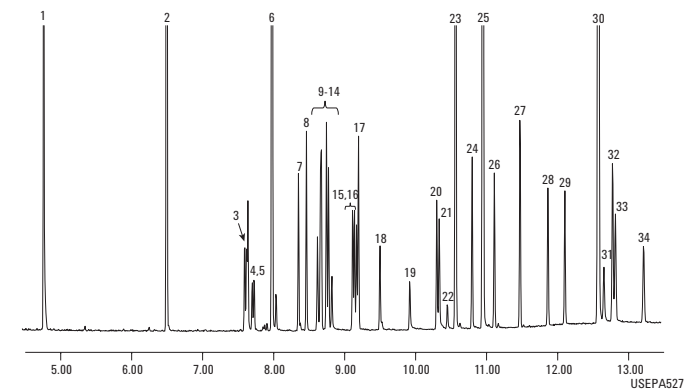
In this example, the **Agilent J&W CLP1 and CLP2** column pair separated 47 organochlorine pesticides in less than 30 minutes, according to EPA method 8081B (extended).

Pesticides and Fire Retardants (US EPA 527)

Column: Agilent J&W DB-5ms Ultra Inert, Agilent Part No. 122-5532UI, 30 m x 0.25 mm, 0.25 µm

Conditions

Carrier: Helium, 52 cm/sec, constant flow
 Oven: 60 °C (1 min) to 210 °C (25 °/min), 20 °C/min to 310 °C (3 min)
 Injection: Splitless, 250 °C, purge flow 50 mL/min @ 1 in, gas saver 80 mL/min @ 3 min
 Detector: Transfer line 290 °C, source 300 °C, quad 180 °C
 Sample: Pesticide/PBDE standards, 1 ng with 5 ng IS/SS on-column



Peak identification

- | | |
|--------------------------------|-------------------------|
| 1. 1,2-Dimethyl-2-nitrobenzene | 18. Fenamiphos |
| 2. Acenaphthalene-D10 | 19. Nitrophen |
| 3. Dimethoate | 20. Norflurazone |
| 4. Atrazine | 21. Kepone |
| 5. Propazine | 22. Hexazinone |
| 6. Anthracene-D10 | 23. Triphenyl phosphate |
| 7. Vinclozoline | 24. Bifenthrin |
| 8. Prometryne | 25. Chrysene-D12 |
| 9. Bromacil | 26. BDE-47 |
| 10. Malathion | 27. Mirex |
| 11. Thiazopyr | 28. BDE-100 |
| 12. Dursban | 29. BDE-99 |
| 13. Benthicarb | 30. Perylene-D12 |
| 14. Parathion | 31. Fenvalerate |
| 15. Terbus sulfone | 32. Esfenvalerate |
| 16. Bioallethrin | 33. Hexabromobiphenyl |
| 17. Oxychlordane | 34. BDE-153 |

Despite the challenging mass range of this analysis, the **Agilent J&W DB-5ms Ultra Inert GC** column met the method's recovery criteria.

EPA Method 508.1 Analytical Results

EPA Method 508.1 – Chlorinated Pesticides and Herbicides

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

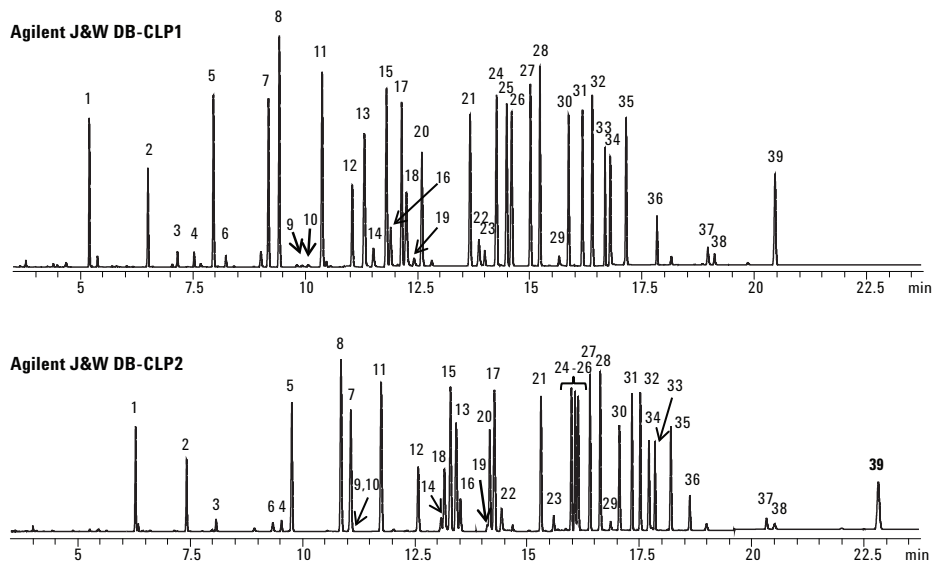
Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

Conditions

Carrier: Helium, constant flow, 35 cm/s
 Injection temperature: 250 °C
 Injection: 2 µL, splitless
 Oven: 80 °C, hold 0.5 min, 26 °C/min to 175 °C,
 6.5 °C/min to 235 °C, 15 °C/min to 300 °C, hold 6 min
 Detector: µECD, 340 °C
 Sample: 100 ng/mL EPA 508.1 analytes, 100 ng/mL pesticide surrogate mix

Peak identification

1. Hexachlorocyclopentadiene
2. Etriazole
3. Chloroneb
4. Trifluralin
5. Tetrachloro-m-xylene (surrogate standard)
6. Propachlor
7. Hexachlorobenzene
8. α-BHC
9. Atrazine
10. Simazine
11. γ-BHC
12. β-BHC
13. Heptachlor
14. Alachlor
15. δ-BHC
16. Chlorothalonil
17. Aldrin
18. Metribuzin
19. Metolachlor
20. DCPA
21. Heptachlor epoxide
22. Cyanazine
23. Butachlor
24. γ-Chlordane
25. α-Chlordane
26. Endosulfan I
27. 4,4'-DDE
28. Dieldrin
29. Chlorobenzilate
30. Endrin
31. 4,4'-DDD
32. Endosulfan II
33. 4,4'-DDT
34. Endrin aldehyde
35. Endosulfan sulfate
36. Methoxychlor
37. cis-Permethrin
38. trans-Permethrin
39. Decachlorobiphenyl (surrogate standard)



The **Agilent J&W CLP1** column separates all chlorinated pesticide and herbicide analytes according to EPA Method 505.



Lower your detection limits – regardless of analysis

To learn more about Agilent J&W DB-624UI GC columns, visit
www.agilent.com/chem/624UI

Confidently identify organochlorine pesticides in soil

Organochlorine Pesticides I EPA Method 8081A (GC/MS)

Column: Agilent J&W DB-35ms, Agilent Part No. 122-3832,
30 m x 0.25 mm, 0.25 µm

Conditions

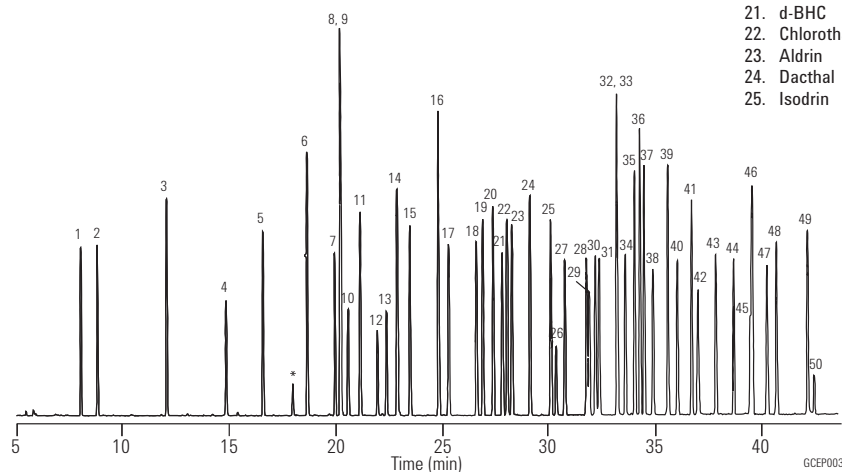
Carrier: Helium at 35 cm/sec, measured at 50 °C
Oven: 50 °C for 1 min, 50-100 °C at 25 °C/min
 100-300 °C at 5 °C/min, 300 °C for 5 min
Injection: Splitless, 250 °C, 30 sec purge activation time
Detector: MSD, 300 °C transfer line, Full scan at m/z 50-500
Sample: 1 µL of 35 µg/mL composite 8081A, standards, AccuStandard Inc.

Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Peak identification

- | | |
|--|----------------------------|
| 1. 1,2-Dibromo-3-chloropropane | 26. Kelthane |
| 2. 4-Chloro-3-nitrobenzotrifluoride (SS) | 27. Heptachlor epoxide |
| 3. Hexachloropentadiene | 28. g-Chlordane |
| 4. 1-Bromo-2-nitrobenzene (IS) | 29. trans-Nonachlor |
| 5. Terrazole | 30. a-Chlordane |
| 6. Chloroneb | 31. Endosulfan I |
| 7. Trifluralin | 32. Captan |
| 8. 2-Bromobiphenyl (SS) | 33. p,p'-DDE |
| 9. Tetrachloro m-xylene (SS) | 34. Dieldrin |
| 10. a, a-Dibromo-m-xylene | 35. Chlorobenzilate |
| 11. Propachlor | 36. Perthane |
| 12. Di-allate A | 37. Chloropropylate |
| 13. Di-allate B | 38. Endrin |
| 14. Hexachlorobenzene | 39. p,p'-DDD |
| 15. a-BHC | 40. Endosulfan II |
| 16. Pentachloronitrobenzene (IS) | 41. p,p'-DDT |
| 17. g-BHC | 42. Endrin aldehyde |
| 18. b-BHC | 43. Endosulfan sulfate |
| 19. Heptachlor | 44. Dibutylchloredate (SS) |
| 20. Alachlor | 45. Captafol |
| 21. d-BHC | 46. Methoxychlor |
| 22. Chlorthalonil | 47. Endrin ketone |
| 23. Aldrin | 48. Mirex |
| 24. Dacthal | 49. cis-Permethrin |
| 25. Isodrin | 50. trans-Permethrin |
- * Breakdown Products
 SS - Surrogate Standard
 IS - Internal Standard



Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

Soil analysis: Identifying organochlorine pesticides

Organochlorine Pesticides II EPA Method 8081A (GC/MS)

Column: Agilent J&W DB-5ms, Agilent Part No. 122-5532, 30 m x 0.25 mm, 0.25 µm

Conditions

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min, 50-100 °C at 25 °C/min
100-300 °C at 5 °/min, 300 °C for 5 min

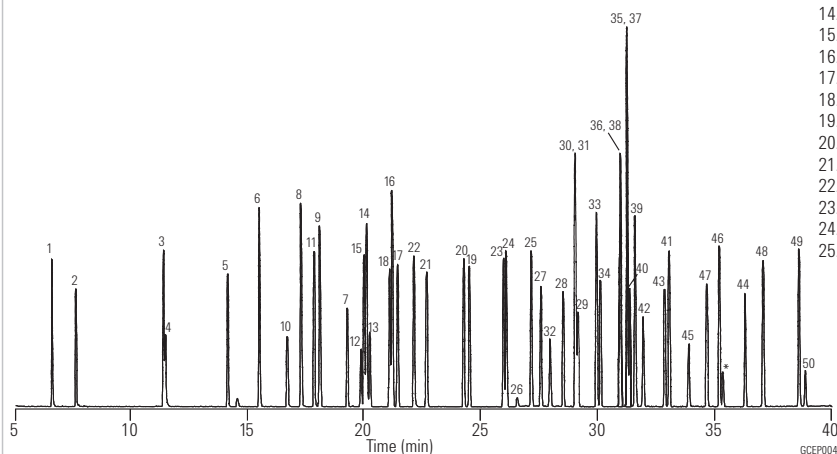
Injection: Splitless, 250 °C, 30 sec purge activation time

Detector: MSD, 300 °C transfer line, Full scan at m/z 50-500

Sample: 1 µL of 35 µg/mL composite 8081A, standards, AccuStandard Inc.

Peak identification

- | | |
|--|----------------------------|
| 1. 1,2-Dibromo-3-chloropropane | 26. Kelthane |
| 2. 4-Chloro-3-nitrobenzotrifluoride (SS) | 27. Heptachlor epoxide |
| 3. Hexachloropentadiene | 28. g-Chlordane |
| 4. 1-Bromo-2-nitrobenzene (IS) | 29. trans-Nonachlor |
| 5. Terrazole | 30. a-Chlordane |
| 6. Chloroneb | 31. Endosulfan I |
| 7. Trifluralin | 32. Captan |
| 8. 2-Bromobiphenyl (SS) | 33. p,p'-DDE |
| 9. Tetrachloro m-xylene (SS) | 34. Dieldrin |
| 10. a, a-Dibromo-m-xylene | 35. Chlorobenzilate |
| 11. Propachlor | 36. Perthane |
| 12. Di-allate A | 37. Chloropropylate |
| 13. Di-allate B | 38. Endrin |
| 14. Hexachlorobenzene | 39. p,p'-DDD |
| 15. a-BHC | 40. Endosulfan II |
| 16. Pentachloronitrobenzene (IS) | 41. p,p'-DDT |
| 17. g-BHC | 42. Endrin aldehyde |
| 18. b-BHC | 43. Endosulfan sulfate |
| 19. Heptachlor | 44. Dibutylchloredate (SS) |
| 20. Alachlor | 45. Captafol |
| 21. d-BHC | 46. Methoxychlor |
| 22. Chlorothalonil | 47. Endrin ketone |
| 23. Aldrin | 48. Mirex |
| 24. Dacthal | 49. cis-Permethrin |
| 25. Isodrin | 50. trans-Permethrin |
- * Breakdown Products
SS - Surrogate Standard
IS - Internal Standard



Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.



Get superior performance, reliability and productivity with industry-leading 5975C Series GC/MSD. Learn more at www.agilent.com/chem/5975C

Analyzing carcinogenic PAHs: Agilent J&W Select PAH GC columns provide excellent separation and resolution for PAH isomers

Column: Agilent J&W Select PAH, 15 m x 0.15 mm, 0.10 μ m (Agilent Part No. CP7461)

Conditions

Instrument: 450-GC/320-MS

Injection: 1 μ L

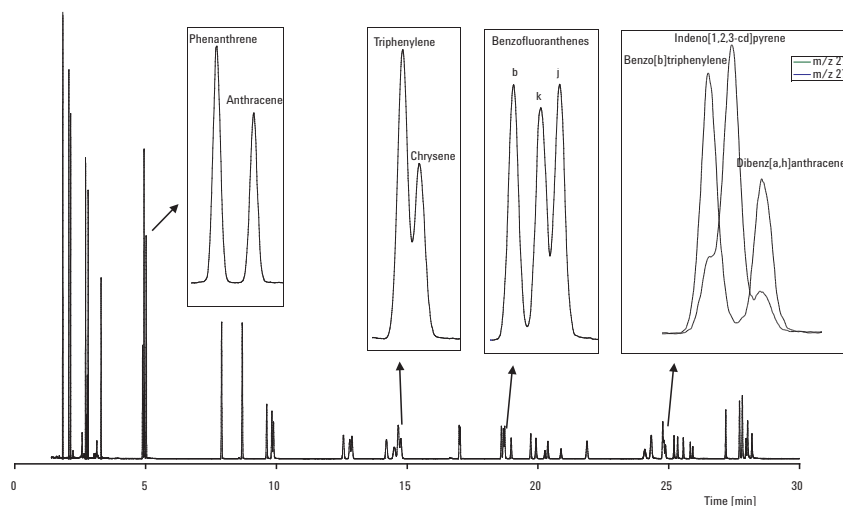
Temp: 70 °C (0.4 min), 70 °C/min, 180 °C, 7 °C/min, 230 °C (7 min), 50 °C/min, 280 °C (7 min), 30 °C/min, 350 °C (4 min)

Carrier Gas: Helium, constant flow 1.2 mL/min

Injector: 300 °C, Splitless mode, 0.5 min @ 100 mL/min

Detector: Triple Quad 320-MS, EI in SIM mode, ion source 275 °C, transfer line 300 °C

Sample: Approx. 0.1-0.3 μ g/mL



Peak identification

1. Naphthalene-d8
2. Naphthalene
3. 2-Methylnaphthalene
4. 1-Methylnaphthalene
5. Acenaphthylene
6. Acenaphthene-d10
7. Acenaphthene
8. Fluorene
9. Phenanthrene-d10
10. Phenanthrene
11. Anthracene
12. Fluoranthene
13. Pyrene
14. Benzo[a]fluorene
15. Benzo[b]fluorene
16. 7H-Benzo[c]fluorene
17. Benzo[b]naphtho[2,1-d]thiophene
18. Benzo[g,h,i]fluoranthene
19. Benzo[c]phenanthrene
20. Benzo[a]anthracene

- | | | | |
|---------------------------|-----------------------------|--------------------------------|------------------------------|
| 21. Cyclopenta[c,d]pyrene | 30. Benzo[a]fluoranthene | 39. Dibenzo[a,j]anthracene | 48. 7H-Dibenzo[c,g]carbazole |
| 22. Chrysene-d10 | 31. Benzo[e]pyrene | 40. Dibenzo[a,h]anthracene D14 | 49. Dibenzo[a,l]pyrene |
| 23. Triphenylene | 32. Benzo[a]pyrene | 41. Benzo[b]triphenylene | 50. Dibenzo[a,e]pyrene |
| 24. Chrysene | 33. Perylene-d12 | 42. Indeno[1,2,3-cd]pyrene | 51. Coronene |
| 25. 6-Methylchrysene | 34. Perylene | 43. Dibenzo[a,h]anthracene | 52. Benzo[b]perylene |
| 26. 5-Methylchrysene | 35. 3-Methylcholanthrene | 44. Benzo[b]chrysene | 53. Dibenzo[a,i]pyrene |
| 27. Benzo[b]fluoranthene | 36. 9,10-diphenylanthracene | 45. Picene | 54. Dibenzo[a,h]pyrene |
| 28. Benzo[k]fluoranthene | 37. Dibenzo[a,h]acridine | 46. Benzo[g,h,i]perylene | |
| 29. Benzo[j]fluoranthene | 38. Dibenzo[a,j]acridine | 47. Dibenzo[def,mno]chrysene | |

Fast Separation of 16 US EPA 610 Regulated PAHs

Column: Agilent J&W Select PAH, 30 m x 0.25 mm, 0.15 μ m (Agilent Part No. CP7462)

Conditions

Instrument: 450-GC/320-MS

Injection: 1 μ L

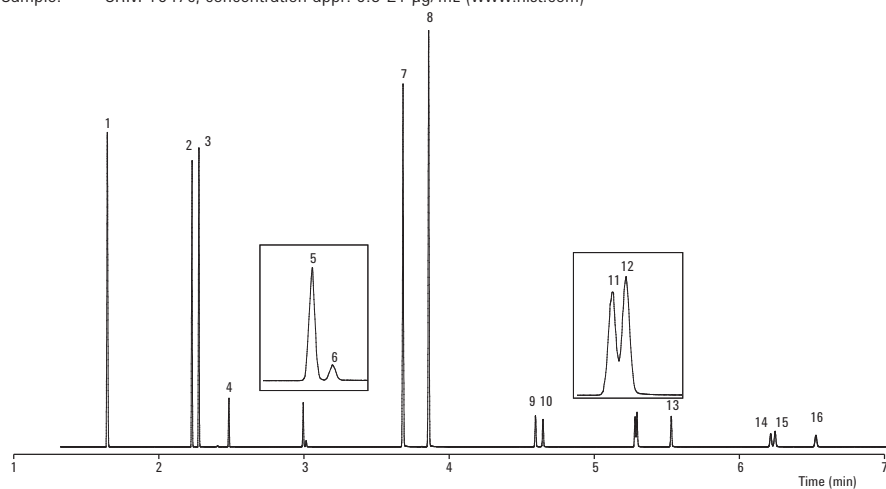
Temperature: 70 $^{\circ}$ C (0.80 min), 60 $^{\circ}$ C/min, 180 $^{\circ}$ C, 20 $^{\circ}$ C/min 350 $^{\circ}$ C (5 min)

Carrier Gas: Helium, constant flow 2.0 mL/min

Injector: 300 $^{\circ}$ C, Splitless mode, 0.75 min @ 50 mL/min

Detector: Triple Quad 320-MS, EI in SIM mode, ion source 275 $^{\circ}$ C, transfer line 300 $^{\circ}$ C

Sample: SRM 1647c, concentration appr. 0.8-21 μ g/mL (www.nist.com)



Peak identification

- | | |
|-------------------|----------------------------|
| 1. Naphthalene | 9. Benz[a]anthracene |
| 2. Acenaphthylene | 10. Chrysene |
| 3. Acenaphthene | 11. Benzo[b]fluoranthene |
| 4. Fluorene | 12. Benzo[k]fluoranthene |
| 5. Phenanthrene | 13. Benzo[a]pyrene |
| 6. Anthracene | 14. Indeno[1,2,3-cd]pyrene |
| 7. Fluoranthene | 15. Dibenzo[a,h]anthracene |
| 8. Pyrene | 16. Benzo[ghi]perylene |

Many polycyclic aromatic hydrocarbons (PAHs) have the same mass, making GC/MS separation difficult. The enhanced resolution of **Agilent J&W Select PAH columns** prevent co-elution of interfering PAHs that can cause false positives and inaccurate results.



Check out Agilent's complete line of sample preparation products for any type of GC and GC/MS analysis at www.agilent.com/chem/sampleprep

Agilent J&W DB-EUPAH GC columns clearly surpass the competition in detecting dangerous PAHs

Performance Comparison for 15+1 EU-Regulated Priority PAHs

Column: 1 Agilent J&W DB-EUPAH 20 m x 0.18 mm, 0.14 μm , (Agilent Part No. 121-9627)

Column: 2 Restek Rxi-17 20 m x 0.18 mm, 0.18 μm (results on page 20)

Conditions

Instrument: Agilent 6890N/5975B MSD

Sampler: Agilent 7683B, 5.0 μL syringe (Agilent Part No. 5181-1273) 0.5 μL splitless injection, injection speed 75 $\mu\text{L}/\text{min}$

Carrier: Helium, ramped flow 1.0 mL/min (0.2 min), 5 mL/min 2 to 1.7 mL/min

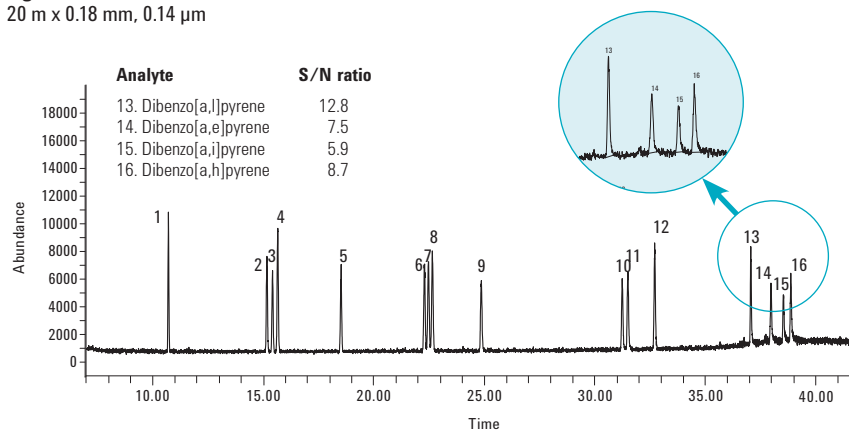
Inlet: 325 $^{\circ}\text{C}$ splitless, purge flow 60 mL/min at 0.8 min

Oven: 45 $^{\circ}\text{C}$ (0.8 min) to 200 $^{\circ}\text{C}$ (45 $^{\circ}\text{C}/\text{min}$), 2.5 $^{\circ}\text{C}/\text{min}$ to 225 $^{\circ}\text{C}$, 3 $^{\circ}\text{C}/\text{min}$ to 266 $^{\circ}\text{C}$, 5 $^{\circ}\text{C}/\text{min}$ to 300 $^{\circ}\text{C}$, 10 $^{\circ}\text{C}/\text{min}$ to 320 $^{\circ}\text{C}$ (4.5 min)

Detector: MSD source at 300 $^{\circ}\text{C}$, quadrupole at 180 $^{\circ}\text{C}$, transfer line at 330 $^{\circ}\text{C}$, Scan range 50-550 AMU

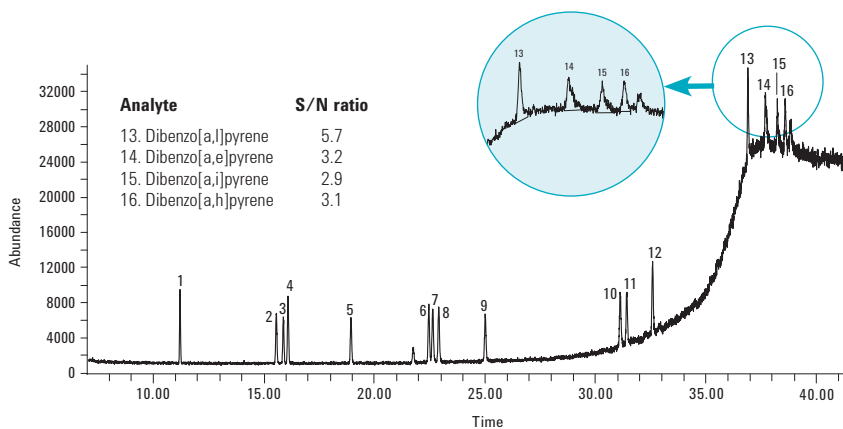
Agilent J&W DB-EUPAH

20 m x 0.18 mm, 0.14 μm



In the chromatogram above, all 15+1 EU-regulated priority PAHs are well resolved with the **Agilent J&W DB-EUPAH column**. Challenging Benzo[b,k,j]fluoranthene isomers are baseline resolved, allowing accurate quantitation of each isomer. Baseline resolution is also achieved for three critical pairs: benzo[a]anthracene and cyclopenta[c,d]pyrene, cyclopenta[c,d]pyrene and chrysene, and indeno[1,2,3-cd]pyrene and dibenzo[a,h]anthracene.

Restek Rxi-17
20 m x 0.18 mm, 0.18 μ m



Peak identification

1. Benzo[c]fluorene
2. Benz[a]anthracene
3. Cyclopenta[c,d]pyrene
4. Chrysene
5. 5-Methylchrysene
6. Benzo[b]fluoranthene
7. Benzo[k]fluoranthene
8. Benzo[j]fluoranthene
9. Benz[a]pyrene
10. Indeno[1,2,3-cd]pyrene
11. Dibenzo[a,h]anthracene
12. Benzo[g,h,i]perylene
13. Dibenzo[a,l]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo[a,i]pyrene
16. Dibenzo[a,h]pyrene

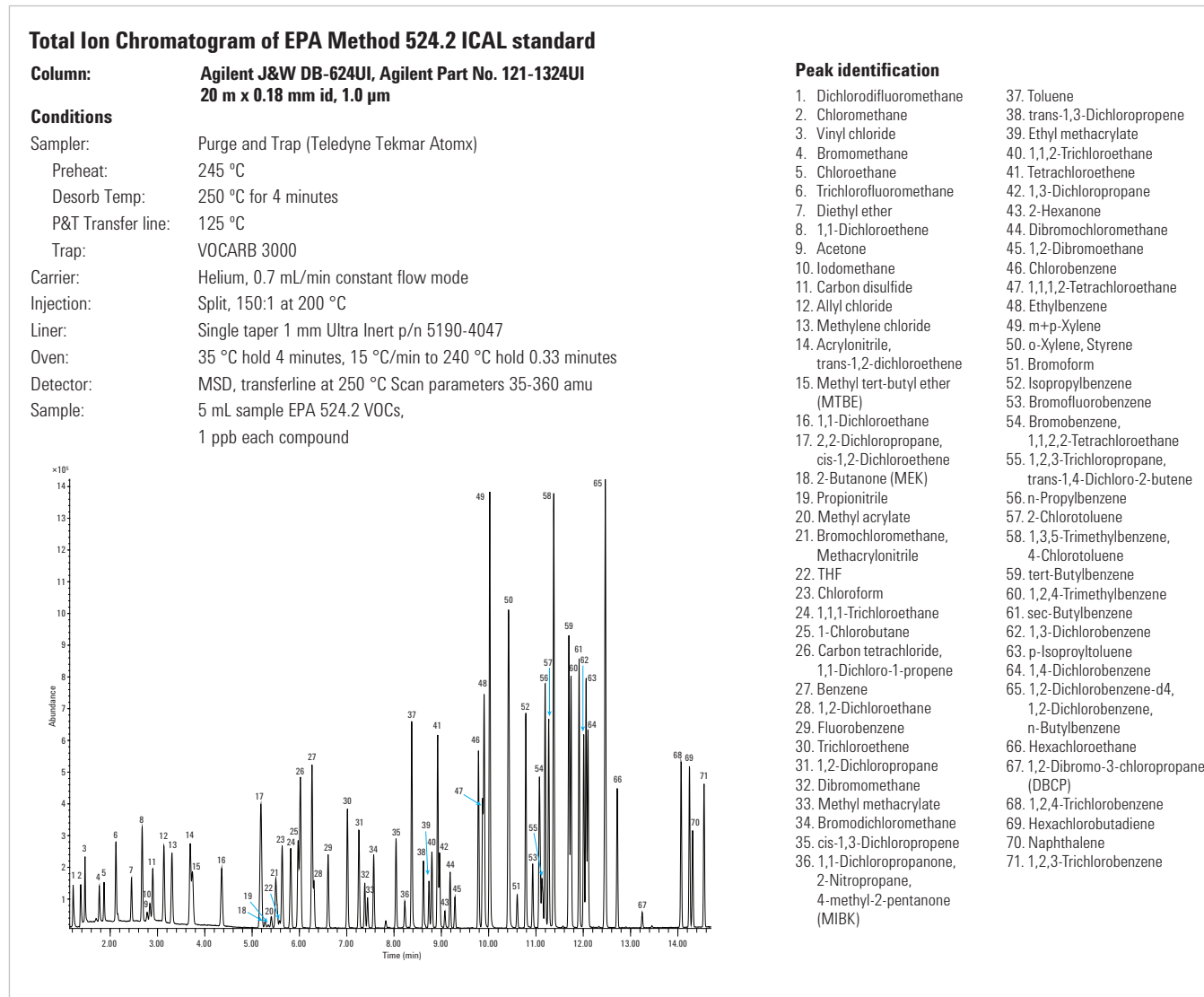
Here, the Restek Rxi-17 column shows significantly higher bleed than the DB-EUPAH column, even at 320°C. As a result, the signal-to-noise ratios are less than half of those achieved by the DB-EUPAH columns. The Rxi-17 column's excess bleed at higher temperatures makes trace-level detection difficult and unreliable for the four late-eluting dibenzopyrene isomers.

With its higher upper temperature limit, superior thermal stability and greater column inertness, the **Agilent J&W DB-EUPAH column** improves peak shape and sensitivity. This translates to consistently lower detection limits – a **must** for analyzing EU-priority PAHs.



Ensure the highest quality gas while keeping gas lines clean and leak-free with Agilent's high-capacity gas filter. Learn more at www.agilent.com/chem/gasclean

Lower detection limits (PPT/PPQ levels)



The Agilent J&W DB-624UI GC column provided excellent stability, robustness, and peak shape – lowering detection limits to PPT or PPQ levels.

For more details on optimizing your GC/MS volatiles analyses,
visit www.agilent.com/chem/library and search for
Agilent Application Note 5995-0029EN

EPA Method 504.1 Analytical Results

EPA Method 504.1 - 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3-trichloropropane (123TCP)

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

Conditions

Carrier: Helium, constant flow, 3.75 mL/min

Injection temperature: 200 °C

Injection: 2 µL, splitless

Oven: 50 °C, hold 1.5 min, 20 °C/min to 95 °C,

40 °C/min to 175 °C, hold 1.25 min

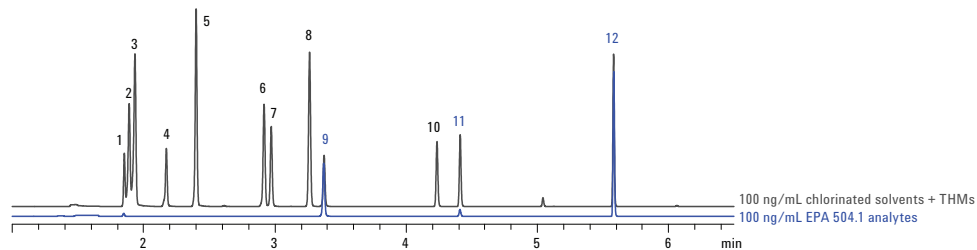
Detector: µECD, 300 °C

Sample: 100 ng/mL EPA 504.1 analytes, 100 ng/mL chlorinated solvents + trihalomethanes

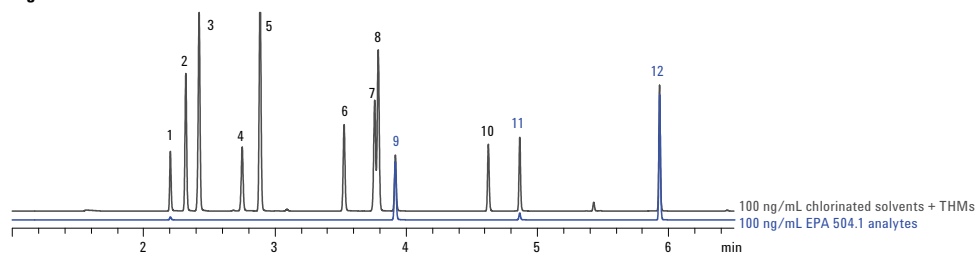
Peak identification

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroethene
5. Bromodichloromethane
6. Tetrachloroethene
7. 1,1,2-Trichloroethane
8. Dibromochloromethane
9. 1,2-Dibromoethane (EDB)
10. Bromoform
11. 1,2,3-Trichloropropane (123TCP)
12. 1,2-Dibromo-3-chloropropane (DBCP)

Agilent J&W DB-CLP1



Agilent J&W DB-CLP2



Agilent J&W CLP1/CLP2 columns analyze 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3-trichloropropane (123TCP) according to EPA Method 504.1, with cooler analysis temperatures allowing a faster GC cycle time.

Confirmed speed and accuracy for VOCs

High Speed VOC, EPA Method 8260

Column: Agilent J&W DB-VRX Agilent Part No. 121-1524, 20 m x 0.18 mm, 1.00 µm

Conditions

Carrier: Helium at 55 cm/sec (1.5 mL/min)

Oven: 45 °C for 3.0 minutes
 45-190 °C at 36 °C/min
 190-225 °C at 20 °C/min
 225 °C for 0.5 min

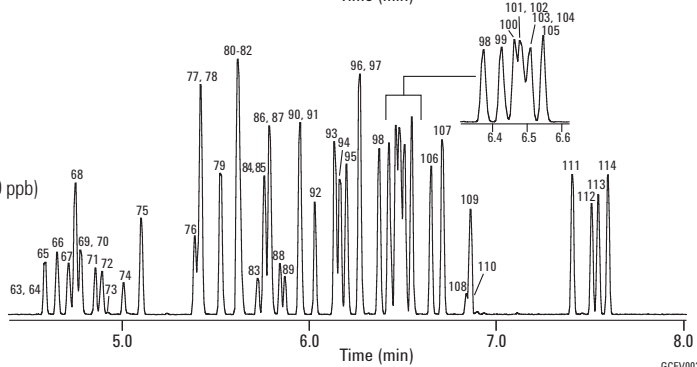
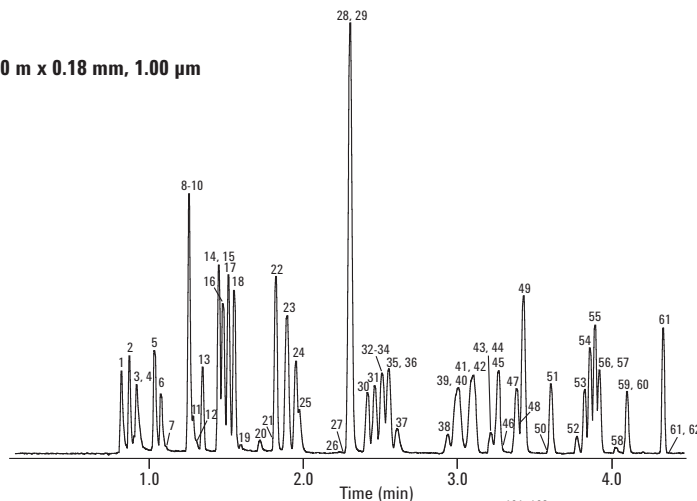
Sampler: Purge and Trap (Tekmar 3100)
 Purge: 11 min
 Trap: Vocab 3000
 Preheat: 245 °C

Injection: Desorb: 250 °C for 1 min
 Bake: 260 °C for 10 min
 Line & valve: 100 °C

Split, 150 °C
 Split ratio 60:1

Detector: Agilent 5973 MSD,
 Scan range: 35-260 amu
 Scan rate: 3.25 scans/sec
 Quad temperature: 150 °C
 Source temperature: 200 °C
 Transfer line temp: 200 °C

Sample: 5 mL
 • Halogenated and aromatic analytes at 40 ppb
 • Internal standards at 20 ppb
 • Polar analytes (i.e., ethers, alcohols and ketones at 100-800 ppb)



Suggested Supplies:

Septum: 11 mm Advanced Green septa, 5183-4759
 Liner: Direct, 1.5 mm id, 18740-80200
 Seal: Gold plated seal, 18740-20885

Peak identification

1. Dichlorodifluoromethane	20. 1-Propanol	39. Pentafluorobenzene	58. 1,4-Dioxane	77. 1-Chlorohexane	96. 1,3,5-Trimethylbenzene
2. Chloromethane	21. Propargyl alcohol	40. 1,2-Dichloroethane	59. Epichlorohydrin	78. Chlorobenzene	97. Pentachloroethane
3. Hydroxypropionitrile	22. trans-1,2-Dichloroethane	41. 1,1,1-Trichloroethane	60. Methyl methacrylate	79. Ethylbenzene	98. tert-Butylbenzene
4. Vinyl chloride	23. MTBE	42. 1-Chlorobutane	61. cis-1,3-Dichloropropene	80. Bromoform	99. 1,2,4-Trimethylbenzene
5. Bromomethane	24. 1,1-Dichloroethane	43. Crotonaldehyde	62. Propiolactone	81. m-Xylene	100. sec-Butylbenzene
6. Chloroethane	25. Propionitrile	44. 2-Chloroethanol	63. Bromoacetone	82. p-Xylene	101. 1,3-Dichlorobenzene
7. Ethanol	26. 2-Butanone	45. 1,1-Dichloropropene	64. Pyridine	83. trans-Dichlorobutene	102. Benzylchloride
8. Acetonitrile	27. Diisopropyl ether	46. 1-Butanol	65. trans-1,3-Dichloropropene	84. 1,3-Dichloro-2-propanol	103. 1,4-Dichlorobenzene-d4 (IS)
9. Acrolein	28. cis-1,2-Dichloroethane	47. Carbon tetrachloride	66. 1,1,2-Trichloroethane	85. Styrene	104. 1,4-Dichlorobenzene
10. Trichlorofluoromethane	29. Methacrylonitrile	48. Chloroacetonitrile	67. Toluene-d8 (IS)	86. 1,1,2,2-Tetrachloroethane	105. Isopropyltoluene
11. Isopropyl alcohol	30. Bromochloromethane	49. Benzene	68. Toluene	87. o-Xylene	106. 1,2-Dichlorobenzene
12. Acetone	31. Chloroform	50. tert-Amylmethyl ether	69. 1,3-Dichloropropane	88. 1,2,3-Trichloropropane	107. Butylbenzene
13. Ethyl ether	32. 2,2-Dichloropropane	51. Fluorobenzene (IS)	70. Paraldehyde	89. cis-Dichlorobutene	108. 1,2-Dibromo-3-chloropropane
14. 1,1-Dichloroethane	33. Ethyl acetate	52. 2-Pentanone	71. Ethyl methacrylate	90. 4-Bromofluorobenzene (IS)	109. Hexachloroethane
15. tert-Butyl alcohol	34. Ethyl-tert-butyl ether	53. Dibromomethane	72. Dibromochloromethane	91. Isopropylbenzene	110. Nitrobenzene
16. Acrylonitrile	35. Methyl acrylate	54. 1,2-Dichloropropane	73. 3-Chloropropionitrile	92. Bromobenzene	111. 1,2,4-Trichlorobenzene
17. Methylene chloride	36. Dibromofluoromethane (IS)	55. Trichloroethene	74. 1,2-Dibromoethane	93. Propylbenzene	112. Naphthalene
18. Allyl chloride	37. Isobutanol	56. Bromodichloromethane	75. Tetrachloroethene	94. 2-Chlorotoluene	113. Hexachlorobutadiene
19. Allyl alcohol	38. Dichloroethane-d4 (IS)	57. 2-Nitropropane	76. 1,1,1,2-Tetrachloroethane	95. 4-Chlorotoluene	114. 1,2,3-Trichlorobenzene
					IS – Internal Standard

114 VOCs resolved in under 8 minutes EPA Method 8260 with P&T sample introduction is one of the most widely used water analysis methods. As the chromatogram above demonstrates, Agilent J&W DB-VRX columns ensure the fewest chromatographic coelutions and the highest degree of mass spectral integrity for VOC analysis.

EPA Volatiles by GC/MS (Split Injector)

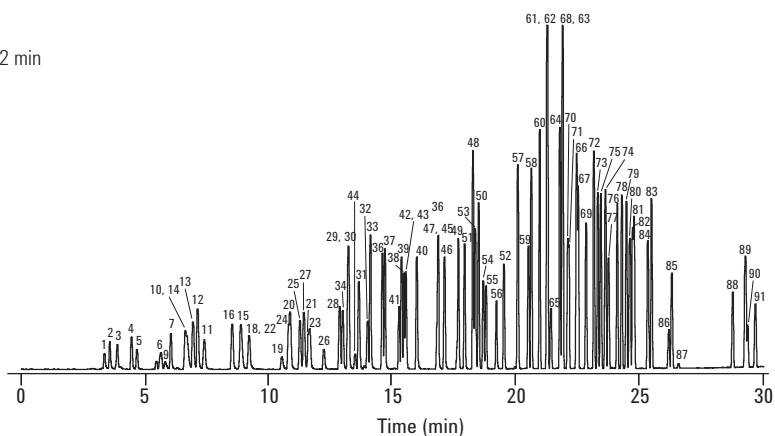
Column: Agilent J&W DB-VRX, Agilent Part No. 122-1564, 60 m x 0.25 mm, 1.40 µm

Conditions

Carrier: Helium at 30 cm/sec, measured at 45 °C
Oven: 45 °C for 10 min, 45-190 °C at 12 °/min, 190 °C for 2 min
 190-225 °C at 6 °C/min, 225 °C for 1 min
Sampler: Purge and trap (O.I.A. 4560)
 Purge: Helium for 11 min at 40 mL/min
 Trap: Tenax/Silica Gel/Carbosieve
 Preheat: 175 °C
 Desorb: 220 °C for 0.6 min
Injection: Split, 110 °C, Split flow 30 mL/min
Detector: MSD, 235 °C transfer line scan 35-260 amu
 (m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367



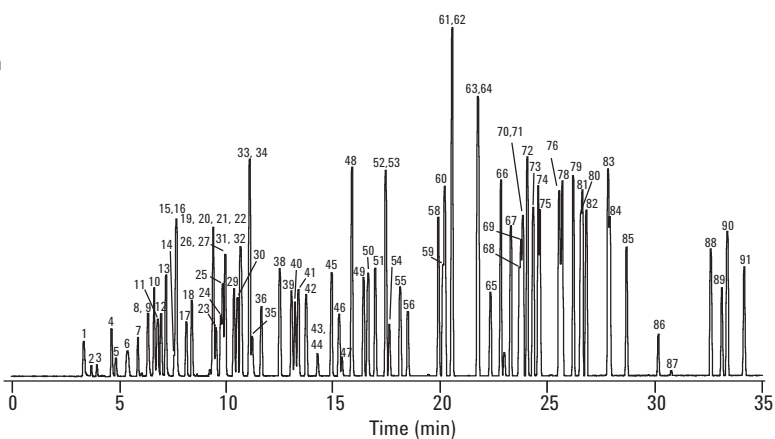
Column: Agilent J&W DB-624, Agilent Part No. 122-1364, 60 m x 0.25 mm, 1.40 µm

Conditions

Carrier: Helium at 31 cm/sec, measured at 40 °C
Oven: 45 °C for 3 min, 45-90 °C at 8 °/min, 90 °C for 4 min
 90-200 °C at 6 °C/min, 200 °C for 5 min
Sampler: Purge and trap (O.I.A. 4560)
 Purge: Helium for 11 min at 40 mL/min
 Trap: Tenax/Silica Gel/Carbosieve
 Preheat: 175 °C
 Desorb: 220 °C for 0.6 min
Injection: Split, 110 °C, Split flow 30 mL/min
Detector: MSD, 235 °C transfer line, Full scan 35-260 amu
 (m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367



Peak identification

1. Dichlorodifluoromethane	17. Hexane	33. Benzene	49. trans-1,3-Dichloropropene	85. Hexachloroethane
2. Chloromethane	18. 1,1-Dichloroethane	34. 1,2-Dichloroethane	50. Ethyl methacrylate	86. 1,2-Dibromo-3-chloropropane
3. Vinyl chloride	19. 2-Butanone	35. 2,2-Dimethylhexane	51. 1,1,2-Trichloroethane	87. Nitrobenzene
4. Bromomethane	20. cis-1,2-Dichloroethene	36. Fluorobenzene (IS)	52. Tetrachloroethene	88. 1,2,4-Trichlorobenzene
5. Chloroethane	21. 2,2-Dichloropropane	37. 1,4-Difluorobenzene (IS)	53. 1,3-Dichloropropane	89. Hexachlorobutadiene
6. Trichlorofluoromethane	22. Propionitrile	38. Trichloroethene	54. 2-Hexanone	90. Naphthalene
7. Diethyl ether	23. Methyl acrylate	39. 1,2-Dichloropropane	55. Dibromochloromethane	91. 1,2,3-Trichlorobenzene
8. 1,1-Dichloroethane	24. Methacrylonitrile	40. Methyl methacrylate	56. 1,2-Dibromoethane	
9. Acetone	25. Bromochloromethane	41. Dibromomethane	57. 1-Chloro-3-fluorobenzene (IS)	IS - Internal Standard
10. Iodomethane	26. Tetrahydrofuran	42. Bromodichloromethane	58. Chlorobenzene	SS - Surrogate Standard
11. Carbon disulfide	27. Chloroform	43. 2-Nitropropane	59. 1,1,1,2-Tetrachloroethane	
12. Allyl chloride	28. Pentafluorobenzene (IS)	44. Chloroacetonitrile	60. Ethylbenzene	Note: Some compounds not present in both chromatograms
13. Methylene chloride	29. 1,1,1-Trichloroethane	45. cis-1,3-Dichloropropene	81. p-Isopropyltoluene	
14. Acrylonitrile	30. 1-Chlorobutane	46. 4-Methyl-2-pentanone	82. 1,4-Dichlorobenzene	
15. Methyl-tert-butyl ether	31. 1,1-Dichloropropene	47. 1,1-Dichloro-2-propanone	83. n-Butylbenzene	
16. trans-1,2-Dichloroethene	32. Carbon tetrachloride	48. Toluene	84. 1,2-Dichlorobenzene	

Agilent J&W DB-VRX and DB-624GC columns are optimized for fast analysis of volatile compounds, and are ideal for environmental and chemical samples with unknown components.

C₁ and C₂ Halocarbons (Freons)

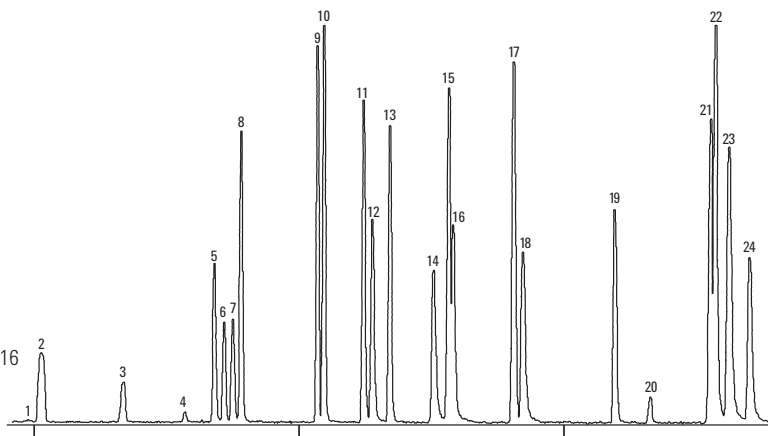
Column: Agilent J&W GS-GasPro, Agilent Part No. 113-4362, 60 m x 0.32 mm, 1.40 μm

Conditions

Carrier: Helium at 35 cm/sec, constant velocity
Oven: 40 °C for 2 min, 40-120 °C at 10 °C/min
120 °C for 3 min, 120-200 °C at 10 °C/min
Injection: Splitless, 250 °C
0.20 min purge activation time
Detector: MSD, 280 °C,
full scan 45-180 amu
Sample: 1.0 μL of 100 ppm mixture of AccuStandard
M-REF & M-REF-X in methanol

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 μL tapered, FN 23-26s/42/HP, 5181-1267



Peak identification

	Freon #		
1. Chlorotrifluoromethane*	13	14. 1,2-Dichloro-1,1,2,2-tetrafluoroethane	114
2. Trifluoromethane	23	15. 2-Chloro-1,1,1,2-tetrafluoroethane	124
3. Bromotrifluoromethane	13B1	16. 1-Chloro-1,1-difluoroethane	142b
4. Chloropentafluoroethane	115	17. Dichlorofluoromethane	21
5. Pentafluoroethane	125	18. Trichlorofluoromethane	11
6. 1,1,1-Trifluoroethane	143a	19. Chloroethane	160
7. Dichlorodifluoromethane	12	20. Dichloromethane	30
8. Chlorodifluoromethane	22	21. 1,1-Dichloro-1-fluoroethane	141b
9. 1,1,1,2-Tetrafluoroethane	134a	22. 2,2-Dichloro-1,1,1-trifluoroethane	123
10. Chloromethane	40	23. 1,1,2-Trichloro-1,2,2-trifluoroethane	113
11. 1,1,2,2-Tetrafluoroethane	134	24. 1,2-Dibromo-1,1,2,2-tetrafluoroethane	114B2
12. Bromochlorodifluoromethane	12B1		
13. 1,1-Difluoroethane	152a		

*Peak not shown



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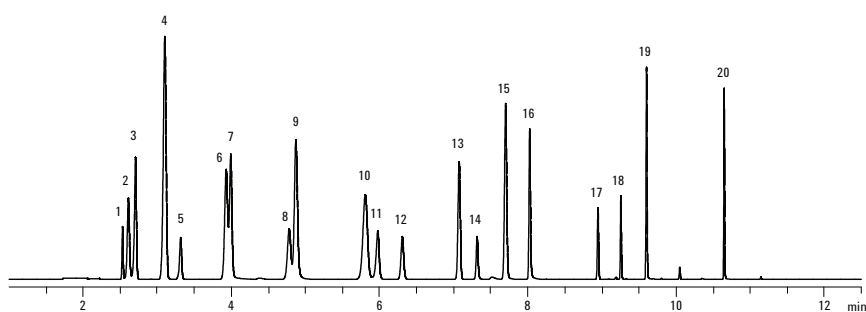
Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

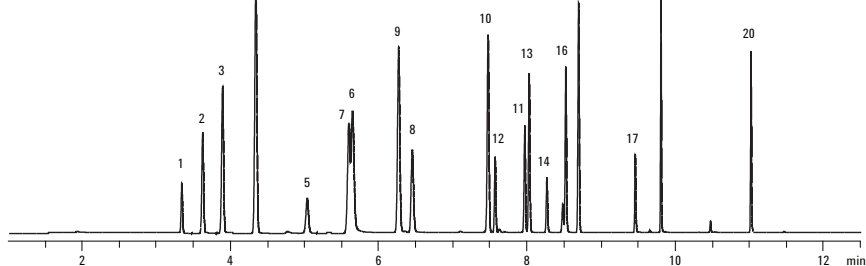
Conditions

Carrier: Helium, constant flow, 45 cm/s
Injection temperature: 200 °C
Injection: 2 µL, splitless
Oven: 35 °C, hold 5.75 min, 20 °C/min to 95 °C,
40 °C/min to 200 °C, hold 1.25 min
Detector: µECD, 300 °C

Agilent J&W DB-CLP1



Agilent J&W DB-CLP2



Peak identification

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroacetonitrile
5. Trichloroethene
6. Chloral hydrate
7. Bromodichloromethane
8. 1,1-Dichloro-2-propanone
9. Dichloroacetonitrile
10. Chloropicrin
11. Tetrachloroethene
12. 1,1,2-Trichloroethane
13. Dibromochloromethane
14. 1,2-Dibromoethane
15. 1,1,1-Trichloro-2-propanone
16. Bromochloroacetonitrile
17. Bromoform
18. 1,2,3-Trichloropropane
19. Dibromoacetonitrile
20. 1,2-Dibromo-3-chloropropane

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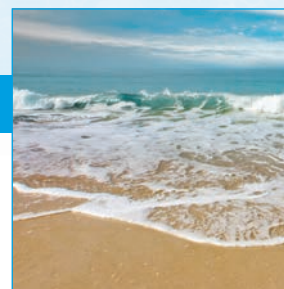
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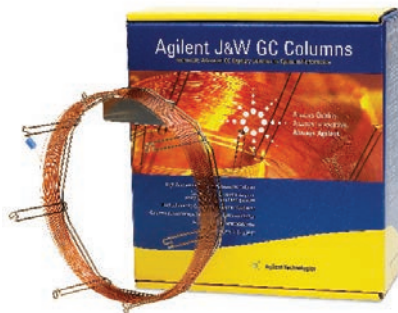




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