

Complete GC Solutions for Pesticides & SemiVolatiles Testing

Zebron™
GC Columns

ZB- SemiVolatiles
ZB-MultiResidue 1 & 2
ZB-CL Pesticides 1 & 2



www.phenomenex.com/PesticidesGC

 **phenomenex®**



Zebron™ ZB-SemiVolatiles

Designed For Real-World Performance

You Spoke

Your input fueled the research and development of Zebron ZB-SemiVolatiles – the column specifically designed to overcome your EPA Method 8270D obstacles.

You Tested

Several environmental labs verified real-world performance

- TestAmerica Laboratories, Inc. Buffalo
- Phoenix Environmental Laboratories, Inc.
- Other labs like yours!

You Approved

“...superior in quality and durability than any other columns we have previously used.”

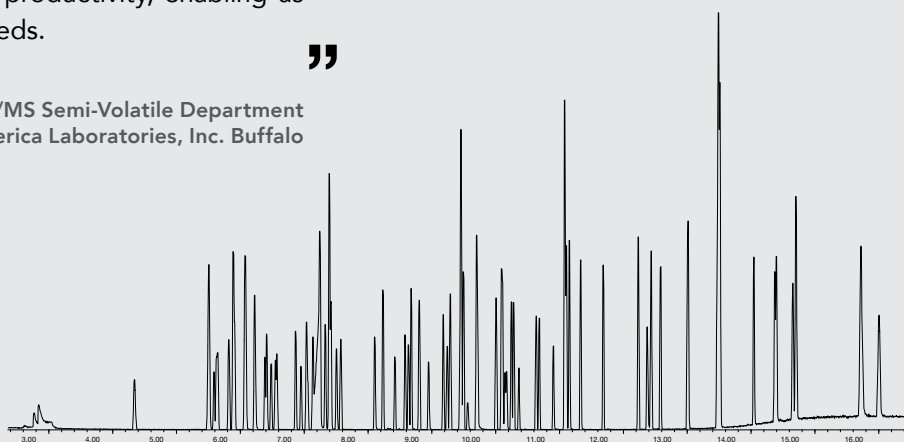
— TestAmerica Laboratories, Inc. p. 11

Real Customer Results for EPA Method 8270D on ZB-SemiVolatiles

“ Zebron ZB-SemiVolatiles is a very stable and durable semi-volatile column. This has reduced TestAmerica’s downtime and increased our productivity, enabling us to better serve our clients’ needs.

”

David Wilkes, GC/MS Semi-Volatile Department
TestAmerica Laboratories, Inc. Buffalo



Ready To Learn More?

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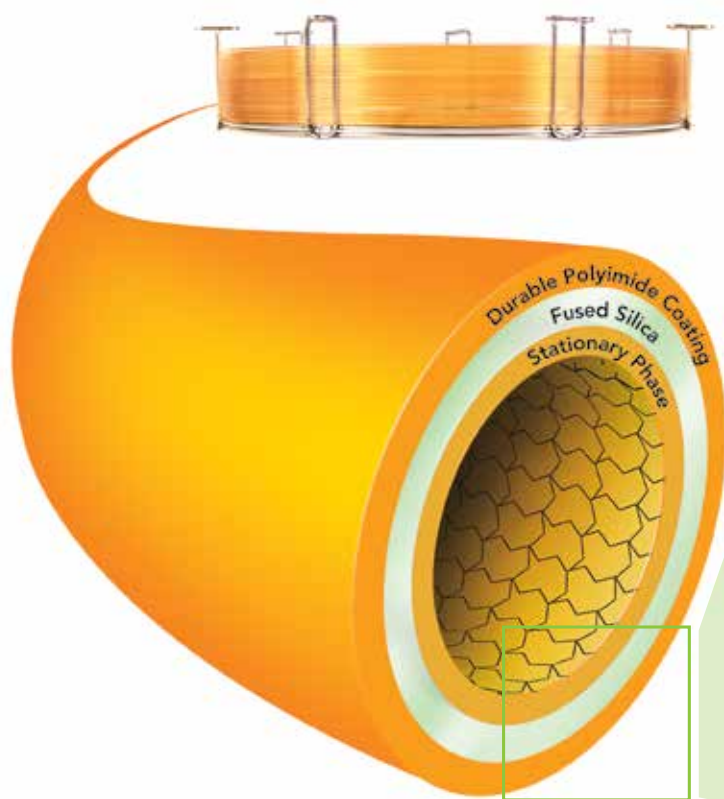
Enviro-Inert™ Technology

A New Generation In Environmental Testing

Why Is Reduced Activity Important?

Poor inertness as a result of increased column activity can lead to low acid/base sensitivity or analyte misidentification, causing incorrect data and big headaches! ZB-SemiVolatiles is designed with Enviro-Inert technology to ensure:

- Inert, rugged performance without compromising separation
- Improved resolution of key critical pairs like benzo[b]fluoranthene and benzo[k]fluoranthene
- Better peak shapes and response for acids, amines, and PAHs



Potential active sites although high purity fused silica is used

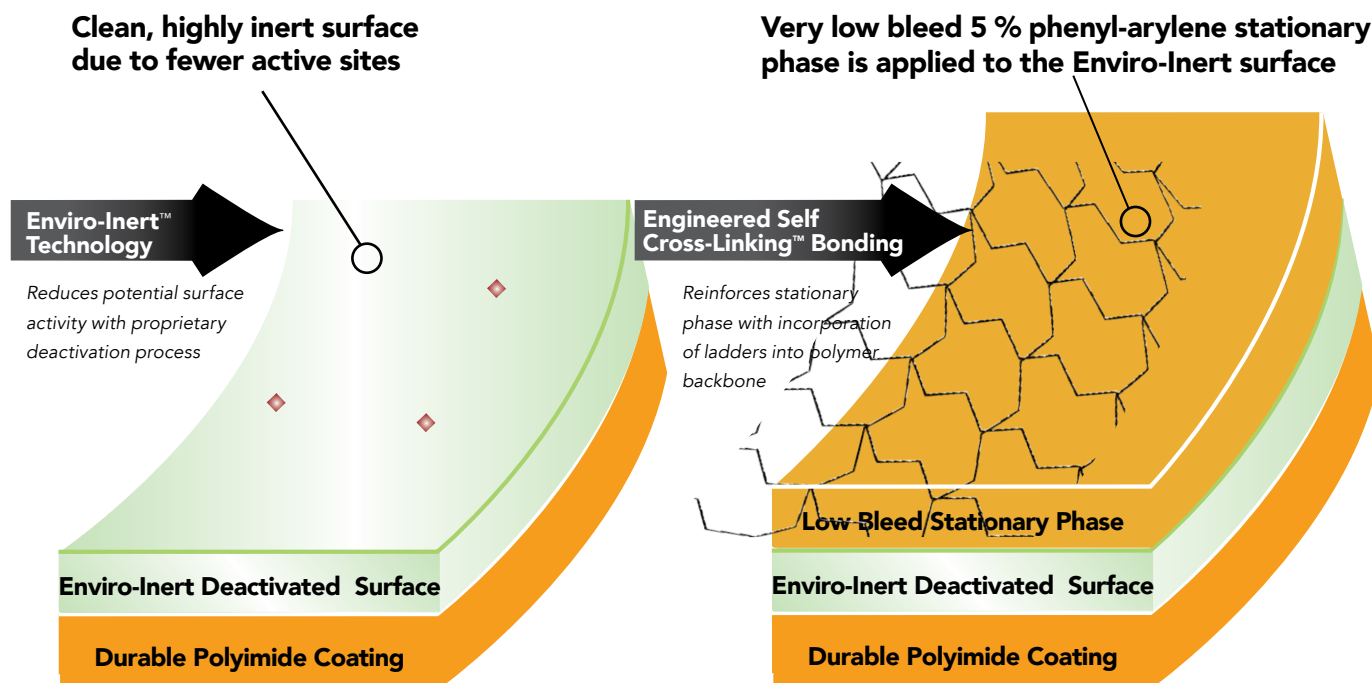
High Purity Fused Silica Surface

Durable Polyimide Coating

“ From the activation conditions and the deactivation process to the polymer coating techniques, we’ve manufactured our new proprietary bonding technology to deliver columns specifically designed to be more inert, rugged, and resilient for semivolatile methods like EPA 8270D. ”

Jim Archer, Phenomenex GC R&D Chemist
11 years J&W, 20+ years GC experience

Enviro-Inert Technology Improves Inertness Without Changing Selectivity



Guaranteed.

No retention time shifts when switching from other 5% phenyl-arylene columns.



ZB-SemiVolatiles Performance QC Test Criteria

Pyridine (PYR)

Pyridine is a very active amine, and exposes even the smallest amount of column activity. We added pyridine to our QC test to ensure that our specially deactivated column performs at the highest possible level, even for your most difficult basic compounds.

Peak Response Criteria

- EPA 8270D Requirement: Not Specified
 - Our Requirement: $\geq 0.6^*$
- 

Pentachlorophenol (PCP)

Pentachlorophenol peaks disappear and exhibit tailing on active columns, so it is important to measure their relative responses and peak skews to ensure column performance.

Peak Skew Criteria

- EPA 8270D Requirement: ≤ 2.0
- Our Requirement: ≤ 2.0

Peak Response Criteria

- EPA 8270D Requirement: Not Specified
 - Our Requirement: ≥ 0.3
- 

Benzidine

Benzidine is another active amine that tails when column activity is present, complicating peak quantification. We require ZB-SemiVolatiles columns to meet EPA 8270D peak skew requirements for this compound prior to shipment.

Peak Skew Criteria

- EPA Requirement: ≤ 2.0
 - Our Requirement: ≤ 2.0
- 

DDT

DDT breaks down in an active system to DDE and DDD. With our QC test, you are assured that your column will meet the EPA requirements upon installation.

Breakdown Criteria

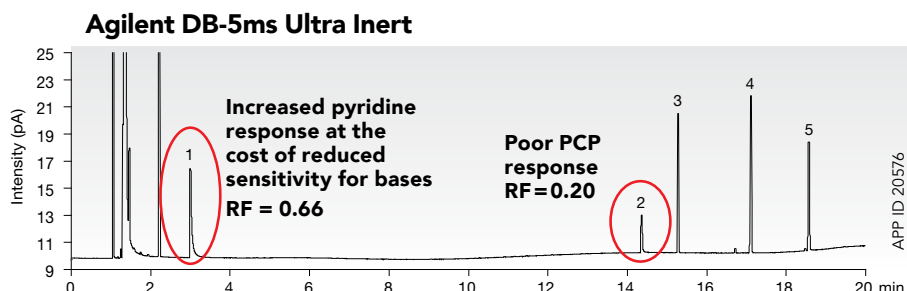
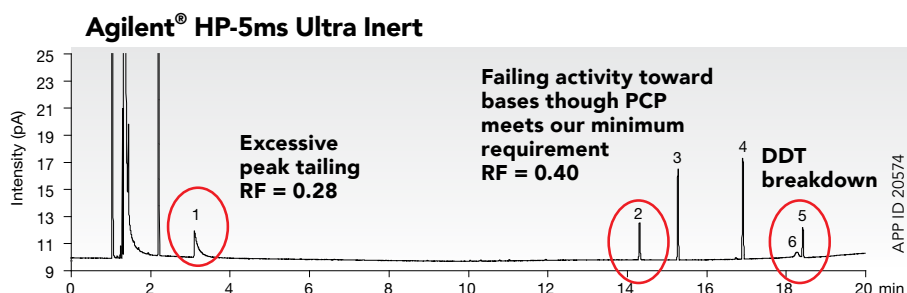
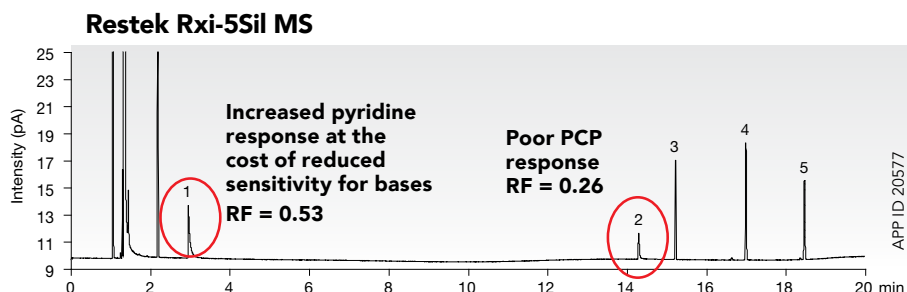
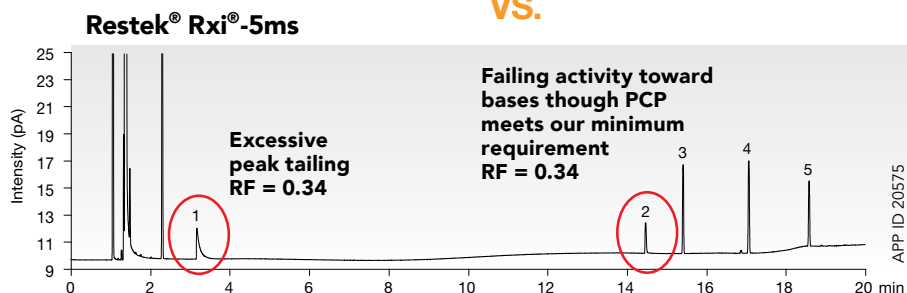
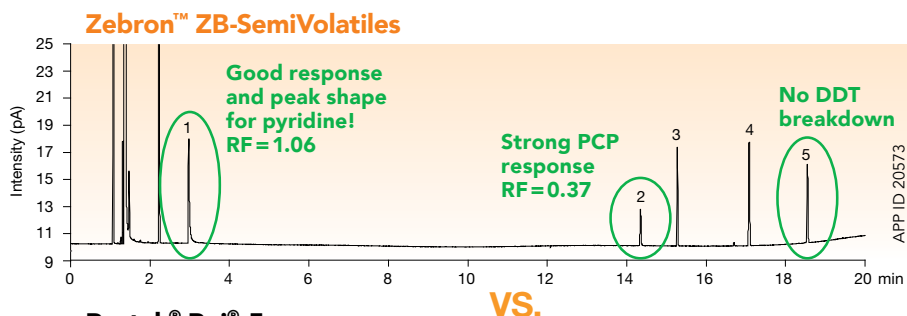
- EPA 8270D Requirement: $< 20\%$
 - Our Requirement: $< 20\%$
- 

*Requirement of 0.5 for 60m x 0.25mm x 0.25 μ m and 10_m Guardian™ dimensions

Depend on the Industry's Most Stringent QC Specifications

Leading Competitor Columns Put to ^{OUR} the Test

Our QC test exposed poor performance for key compounds on competing columns. Enviro-Inert™ technology improves inertness, so you experience increased responses, lower limits of detection (LOD), and virtually no breakdown when using a ZB-SemiVolatiles GC column.



Response Factor (RF)

	PYR	PCP
ZB-SemiVolatiles	1.06	0.37
Rxi-5ms	0.34	0.34
Rxi-5Sil MS	0.53	0.26
HP-5ms Ultra Inert	0.28	0.40
DB-5ms Ultra Inert	0.66	0.20

RF is calculated by dividing peak height of analyte by peak height of DFTPP as internal standard.

Conditions for all columns:

Dimensions: 30 meter x 0.25 mm x 0.25 µm

Injection: Split 100:1 @ 175 °C, 1 µL

Carrier Gas: Hydrogen @ 40 cm/sec (constant pressure)

Oven Program: 40 °C for 2 min to 300 °C @ 15 °C/min for 3.5 min

Detector: FID @ 325 °C

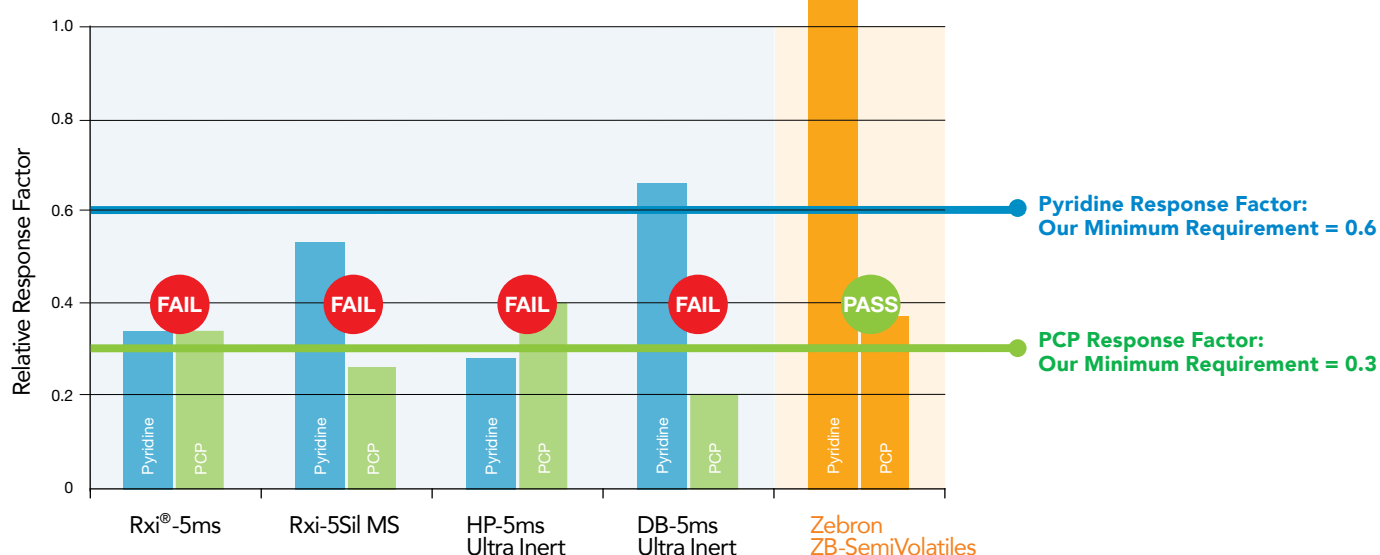
Sample: Analytes are 20ppm in Dichloromethane
1. Pyridine
2. Pentachlorophenol
3. DFTPP
4. Benzidine
5. DDT
6. DDD

Conditions were the same for all columns tested. Comparative separations are not representative of all applications.

Competing Columns Fail Our Stringent QC Requirements

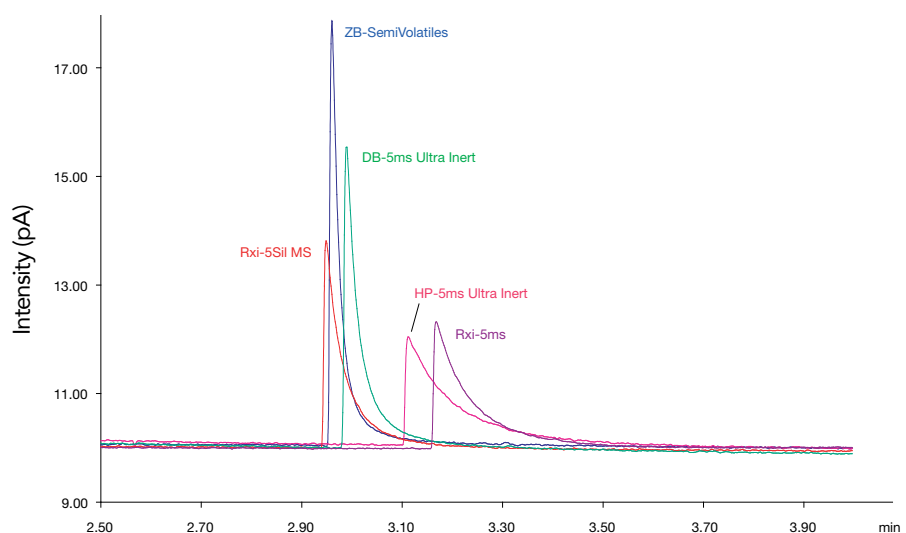
As part of our QC requirements, columns must meet minimum Pyridine and Pentachlorophenol responses. Each of the four competitor columns would have been failed by our QC department and would not have shipped to our customers.

QC Test Mix Results: Pyridine and PCP Response Levels



Why Is Pyridine Response Important?

Pyridine is a very active amine and a good indicator for both column lifetime and sensitivity. Columns with higher initial peak responses can be expected to maintain performance over time. Additionally, higher responses allow you to run at lower levels of detection, improving the sensitivity of your analysis.



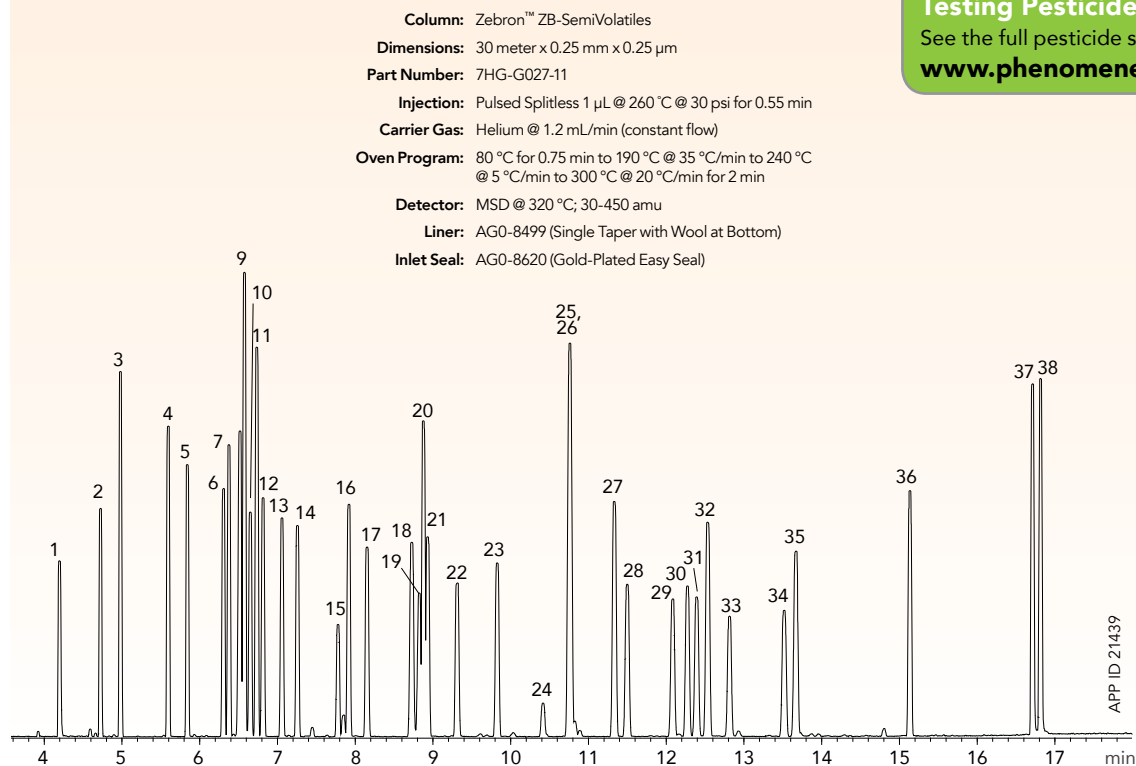
Conditions were the same for all columns tested. Comparative separations are not representative of all applications.

Organochlorine Pesticides by GC/MS

Testing Pesticides or Herbicides?

See the full pesticide solution guide at

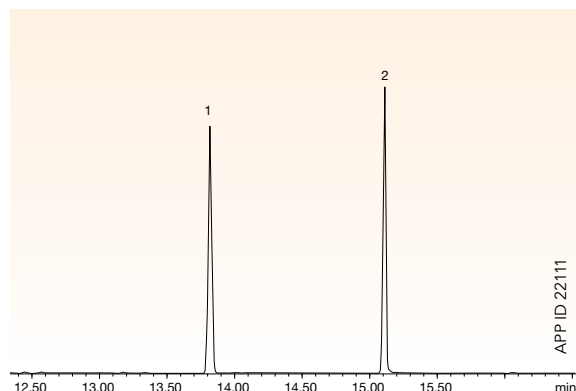
www.phenomenex.com/PesticidesGC



Sample:

- | | | | |
|------------------------------|-----------------------------|------------------------|----------------------------|
| 1. Hexachlorocyclopentadiene | 11. Pentachloronitrobenzene | 21. Aldrin | 31. Endosulfan II |
| 2. Etridiazole | 12. beta-BHC | 22. 4,4-Dibromophenol | 32. DDD |
| 3. Chloroneb | 13. Chlorothalonil | 23. Heptachlor epoxide | 33. Endrin aldehyde |
| 4. Propachlor | 14. delta-BHC | 24. gamma-Chlordane | 34. Endosulfan sulfate |
| 5. Trifluralin | 15. Metribuzin | 25. alpha-Chlordane | 35. DDT (Chlorophenothane) |
| 6. alpha-BHC | 16. Alachlor | 26. Endosulfan II | 36. Methoxychlor |
| 7. Hexachlorobenzene | 17. Heptachlor | 27. DDE | 37. cis-Permethrin |
| 8. Simazine | 18. Metolachlor | 28. Dieldrin | 38. trans-Permethrin |
| 9. Atrazine | 19. Cyanazine | 29. Endrin | |
| 10. gamma-BHC | 20. Dacthal (DCPA) | 30. Chlorobenzilate | |

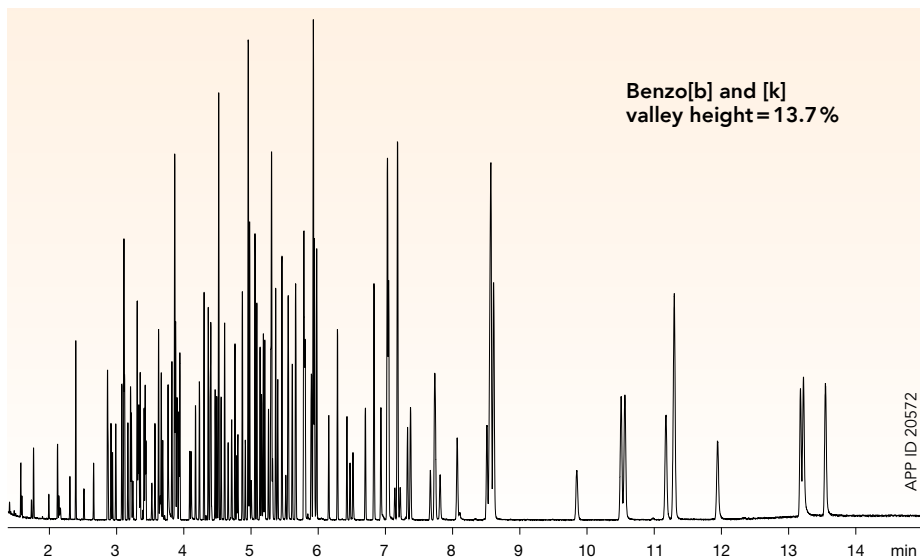
Endothall Testing by EPA 548.1



Column: Zebron ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G027-11
Injection: Pulsed 2 µL @ 200 °C
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 80 °C for 5 min to 260 °C @ 10 °C/min for 10 min
Detector: MSD @ 320 °C, 45-450 amu
Note: Pulsed splitless injection @ 30 psi for 0.55 min
Sample: 1. Acenaphthene-d10
 2. Endothall (derivatized)

Additional Applications

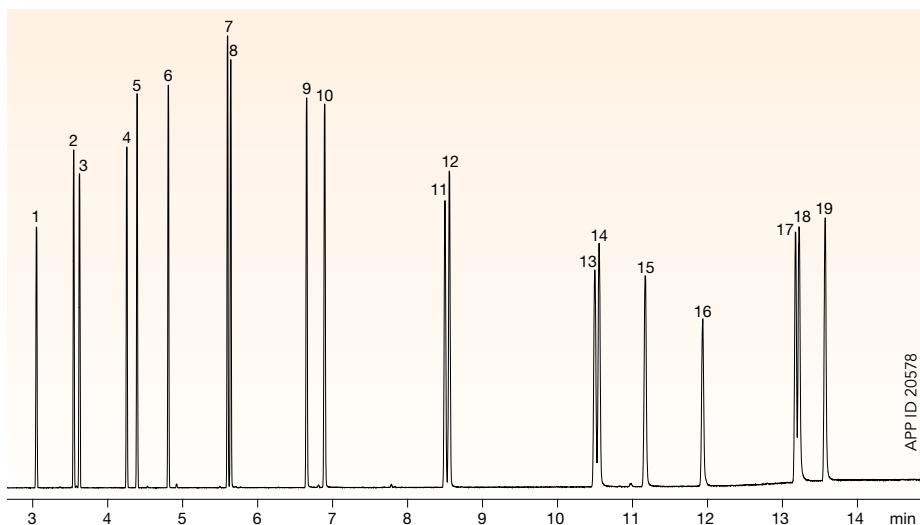
135 SVOCs in Under 14 Minutes



Column: Zebron™ ZB-SemiVolatiles
Dimensions: 20 meter x 0.18 mm x 0.36 µm
Part Number: 7FD-G027-53
Injection: Split 10:1 @ 300 °C, 1 µL
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 260 °C @ 40 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min
Detector: MSD @ 340 °C; 45 – 450 amu
Sample: Analytes are 25ppm in Dichloromethane
Liner: AG0-8499 (Single Taper with Wool)
Septum: AG0-4697 (PhenoRed™ - 400)
Inlet Seal: AG0-8620 (Easy Seals™ Inlet Base Seal)

See the full compound list at www.phenomenex.com/GC

Polycyclic Aromatic Hydrocarbons (PAHs)



Column: Zebron ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part Number: 7HG-G027-11
Injection: Split 10:1 @ 280 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 260 °C @ 30 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min
Detector: MSD @ 340 °C; 45 – 450 amu
Sample: Analytes are 25ppm in Dichloromethane
 1. Naphthalene
 2. 2-Methylnaphthalene
 3. 1-Methylnaphthalene
 4. Acenaphthylene
 5. Acenaphthene
 6. Fluorene
 7. Phenanthrene
 8. Anthracene
 9. Fluoranthene
 10. Pyrene
 11. Benz[a]anthracene
 12. Chrysene
 13. Benzo[b]fluoranthene
 14. Benzo[k]fluoranthene
 15. Benzo[a]pyrene
 16. 3-Methylcholanthrene
 17. Indeno[1,2,3-cd]pyrene
 18. Dibenzo[a,h]anthracene
 19. Benzo[g,h,i]perylene

Need Resolution of Benzo[b], [j], and [k]?

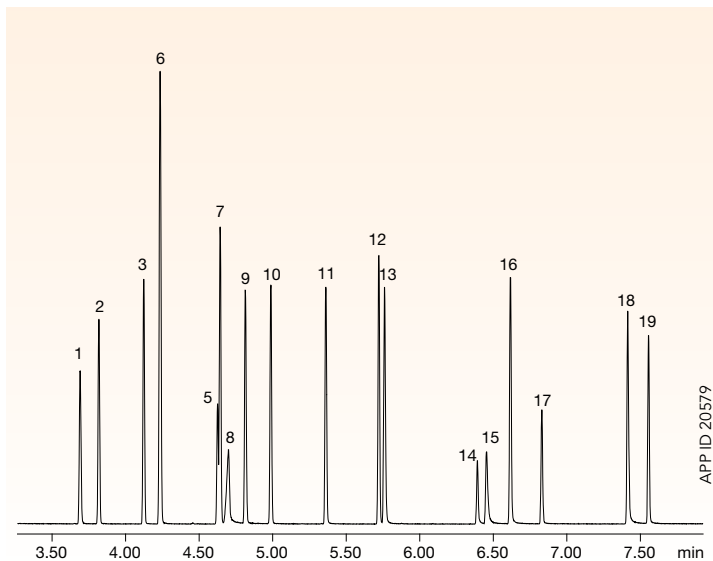
You can get separation of all three compounds on a Zebron ZB-35!

Download the full application note at www.phenomenex.com/GC

Want Even More Applications?

Free technical tips, guides, and hundreds of applications are at www.phenomenex.com/GC

Phenols



Column: Zebron™ ZB-SemiVolatiles

Dimensions: 30 meter x 0.25 mm x 0.25 μ m

Part Number: 7HG-G027-11

Injection: Split 10:1 @ 280 °C, 1 μ L

Carrier Gas: Helium @ 1.4 mL/min (constant flow)

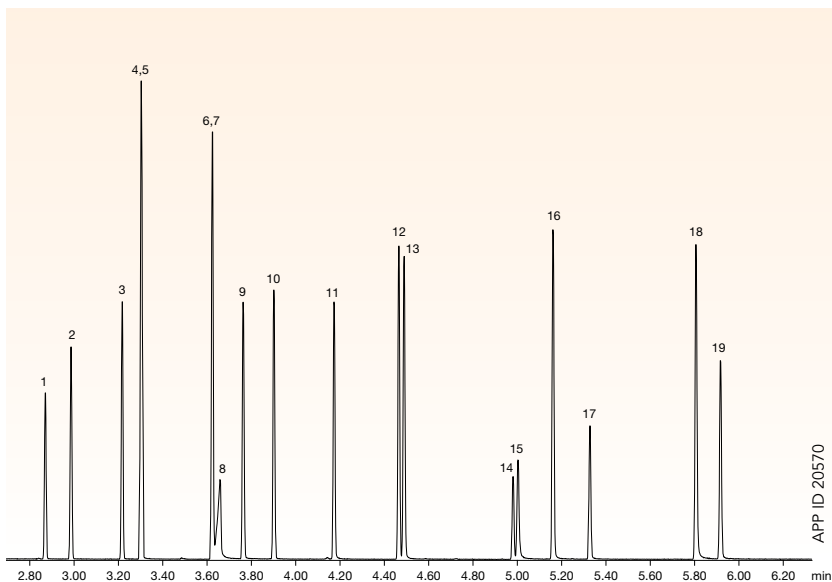
Oven Program: 40 °C for 0.5 min to 260 °C @ 30 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min

Detector: MSD @ 340 °C; 45 – 450 amu

Samples: Analytes are 25ppm in Dichloromethane

1. Phenol
2. 2-Chlorophenol
3. 2-Methylphenol
4. 4-Methylphenol
5. 3-Methylphenol
6. 2-Nitrophenol
7. 2,4-Dimethylphenol
8. Benzoic Acid
9. 2,4-Dichlorophenol
10. 2,6-Dichlorophenol
11. 4-Chloro-3-methylphenol
12. 2,4,6-Trichlorophenol
13. 2,4,5-Trichlorophenol
14. 2,4-Dinitrophenol
15. 4-Nitrophenol
16. 2,3,4,6-Tetrachlorophenol
17. 2-Methyl-4,6-dinitrophenol
18. Pentachlorophenol
19. Dinoseb

Fast Phenols



Column: Zebron ZB-SemiVolatiles

Dimensions: 20 meter x 0.18 mm x 0.36 μ m

Part Number: 7FD-G027-53

Injection: Pulsed Split 10:1 @ 300 °C, 30 psi, 1 μ L

Carrier Gas: Helium @ 1.5 mL/min (constant flow)

Oven Program: 40 °C for 0.5 min to 260 °C @ 40 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min

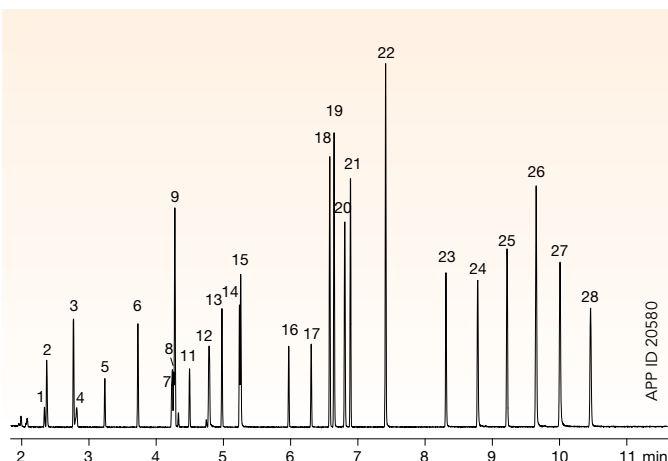
Detector: MSD @ 340 °C; 45-450 amu

Samples: Analytes are 25ppm in Dichloromethane

1. Phenol
2. 2-Chlorophenol
3. 2-Methylphenol
4. 4-Methylphenol
5. 3-Methylphenol
6. 2-Nitrophenol
7. 2,4-Dimethylphenol
8. Benzoic Acid
9. 2,4-Dichlorophenol
10. 2,6-Dichlorophenol
11. 4-Chloro-3-methylphenol
12. 2,4,6-Trichlorophenol
13. 2,4,5-Trichlorophenol
14. 2,4-Dinitrophenol
15. 4-Nitrophenol
16. 2,3,4,6-Tetrachlorophenol
17. 2-Methyl-4,6-dinitrophenol
18. Pentachlorophenol
19. Dinoseb

Additional Applications

Amines



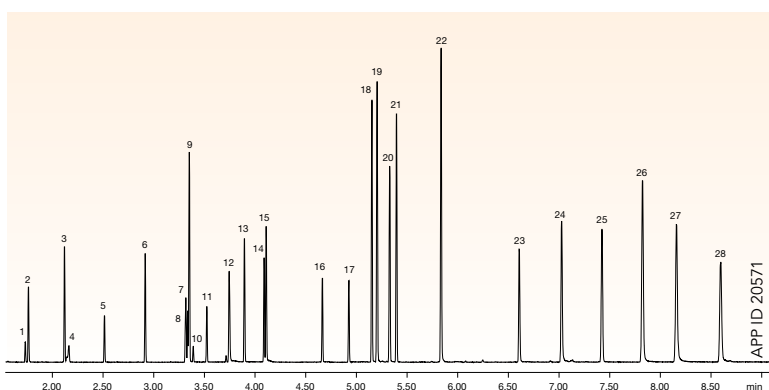
Speed It Up With Fast GC!

Increase throughput and maintain resolution using the 20 meter ZB-SemiVolatiles GC column. Find fast applications for PAHs, phenols, and amines online at

www.phenomenex.com/GC

Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part Number: 7HG-G027-11
Injection: Split 10:1 @ 280 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 260 °C @ 40 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min
Detector: MSD @ 340 °C; 45 – 450 amu
Samples: Analytes are 25ppm in Dichloromethane
 1. N-Nitrosodimethylamine
 2. Pyridine
 3. 2-Picoline
 4. N-Nitrosomethylethylamine
 5. N-Nitrosodiethylamine
 6. Aniline
 7. N-Nitrosopyrrolidine
 8. N-Nitrosodi-n-propylamine
 9. N-Nitrosomorpholine
 10. o-Toluidine
 11. N-Nitrosopiperidine
 12. α,α-Dimethylphenethylamine
 13. 4-Chloroaniline
 14. N-Nitrosodi-n-butylamine
 15. p-Phenylenediamine
 16. 2-Nitroaniline
 17. 3-Nitroaniline
 18. 1-Naphthylamine
 19. 2-Naphthylamine
 20. 4-Nitroaniline
 21. Diphenylamine
 22. 4-Aminobiphenyl
 23. Methapyrilene
 24. Benzidine
 25. o-Tolidine
 26. p-Dimethylaminoazobenzene
 27. 2-Acetylaminofluorene
 28. 3,3'-Dichlorobenzene

Fast Amines



Column: Zebron ZB-SemiVolatiles
Dimensions: 20 meter x 0.18 mm x 0.36 µm
Part Number: 7FD-G027-53
Injection: Pulsed Split 10:1 @ 300 °C, 30 psi, 1 µL
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 260 °C @ 40 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min
Detector: MSD @ 340 °C; 45-450 amu
Sample:

1. N-Nitrosodimethylamine	15. p-Phenylenediamine
2. Pyridine	16. 2-Nitroaniline
3. 2-Picoline	17. 3-Nitroaniline
4. N-Nitrosomethylethylamine	18. 1-Naphthylamine
5. N-Nitrosodiethylamine	19. 2-Naphthylamine
6. Aniline	20. 4-Nitroaniline
7. N-Nitrosopyrrolidine	21. Diphenylamine
8. N-Nitrosodi-n-propylamine	22. 4-Aminobiphenyl
9. N-Nitrosomorpholine	23. Methapyrilene
10. o-Toluidine	24. Benzidine
11. N-Nitrosopiperidine	25. o-Tolidine
12. α,α-Dimethylphenethylamine (Phentermine)	26. p-Dimethylaminoazobenzene
13. 4-Chloroaniline	27. 2-Acetylaminofluorene
14. N-Nitrosodi-n-butylamine	28. 3,3'-Dichlorobenzene

ZB-SemiVolatiles

We QC Test For the Compounds You Analyze

We take the guesswork out of meeting method requirements by aggressively testing ZB-SemiVolatiles with two different test mixes. We incorporated troublesome analytes from your samples and compounds in the EPA 8270D tuning standard into our QC test, so you can be sure your column is ready to meet suitability requirements for the method.

Meet Requirements Out-of-the-Box

Test Probe	Criteria	EPA Requirement	Our Requirement
Pyridine Very active amine that exposes even the smallest amount of column activity. This ensures that our Enviro-Inert™ deactivated column performs at the highest possible level for difficult basic compounds.	Peak Response	Not Specified	≥ 0.6
Pentachlorophenol Disappears and tails on active columns; it is important to measure relative response and peak skew criteria.	Peak Skew Peak Response	≤ 2.0 Not Specified	≤ 2.0 ≥ 0.3
Benzidine Active amine that tails when column activity is present, complicating peak quantification.	Peak Skew	≤ 2.0	≤ 2.0
DDT Breaks down in an active system to DDE and DDD. With our QC test, you are assured that your column will meet the EPA requirements upon installation.	Breakdown	< 20 %	< 20 %
Injection To ensure trace-level sensitivity, QC is performed with a 20 ppm mix using a 100:1 split injection – effectively 250 times less than the EPA maximum allowed.	Sensitivity	50 ng or less on column	0.2 ng on column

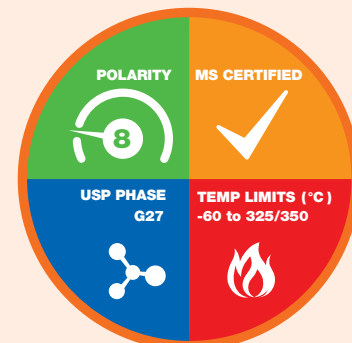
Stands Up to Tough Samples for Increased Lifetime

“ I have found the Phenomenex ZB-SemiVolatiles columns to be superior in quality and durability than any other columns we have previously used. The columns not only last longer, but the reproducibility of column is extraordinary. The column holds calibrations particularly well, even after multiple injections of samples with far less than desirable matrices. All of this equates to less downtime and maintenance and more productivity for TestAmerica. ”

Ryan McKernan, GC-MS Semi-Volatile Analyst
TestAmerica Laboratories, Inc. Buffalo

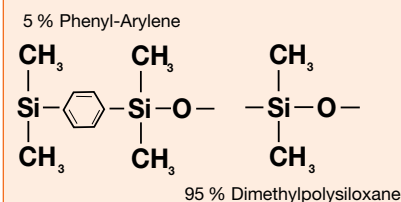
 The opinions stated herein are solely those of the speaker and not necessarily those of any company or organization.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



Recommended Applications

- Semivolatiles (SVOCs)
- EPA Methods (525, 610, 625, 8100, 8270D)
- PAHs
- PBDEs



Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Ordering Information

Zebron ZB-SemiVolatiles GC Columns			
ID (mm)	df (µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	-60 to 325/350	7EG-G027-11
0.25	0.50	-60 to 325/350	7EG-G027-17
20-Meter			
0.18	0.18	-60 to 325/350	7FD-G027-08
0.18	0.36	-60 to 325/350	7FD-G027-53
30-Meter			
0.25	0.25	-60 to 325/350	7HG-G027-11
0.25	0.50	-60 to 325/350	7HG-G027-17
0.32	0.25	-60 to 325/350	7HM-G027-11
30-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.25	-60 to 325/350	7HG-G027-11-GGA
0.25	0.50	-60 to 325/350	7HG-G027-17-GGA
30-Meter with 10-Meter Guardian Integrated Guard			
0.25	0.25	-60 to 325/350	7HG-G027-11-GGC
0.25	0.50	-60 to 325/350	7HG-G027-17-GGC
60-Meter			
0.25	0.25	-60 to 325/350	7KG-G027-11

Note: If you need a 5 in. cage, contact Technical support via Phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

ZB-MultiResidue 1 & 2




Zebtron

Multi-Pesticide Residue Testing by GC/MS

Zebron™ MultiResidue™

- Optimized Selectivity
- Two Complementary Phase Chemistries
- MS Certified Bleed Levels
- High Temperature Limits (320/340 °C)
- Very Low Column Activity



Zebron™
GC Columns

Multi-Pesticide Residue Testing by GC/MS

Pesticides are widely used by farmers to control pests, weeds and molds that would otherwise decrease crop production. While this has significantly increased worldwide food productions, these same pesticides pose significant health and environmental risks.

The restrictions for specific pesticides differ from one country to the next. As world trade increases, the potential threat to other countries' populations increases. This is especially true in the European Union, where produce can be transported from one country to another quite easily.

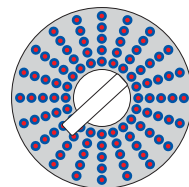
For this reason, pesticides are the subject of increasing regulation. Since many different types of pesticides can be used on the same food product, multiple residue screening approaches are used to test for more than 300 compounds. Gas Chromatography (GC) is still the most common test method for the majority of pesticide classes. While ECD or NPD may be used for screening, MS detection must be employed to provide positive confirmation.

Zebtron™ MultiResidue™ columns are well suited for use on all types of detectors. They provide very low bleed levels even at elevated temperatures required to remove matrix contamination during high temperature bake outs. When used in conjunction with a screening method that uses an analyte specific detector such as ECD, Zebtron MR-1 and MR-2 columns can be a powerful tool in identifying positive samples.

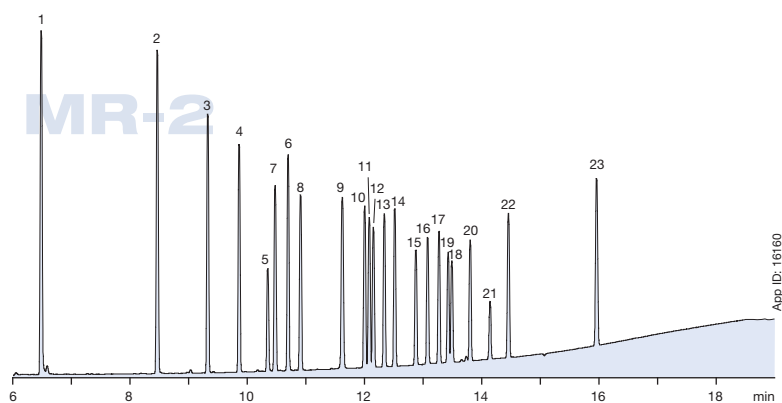
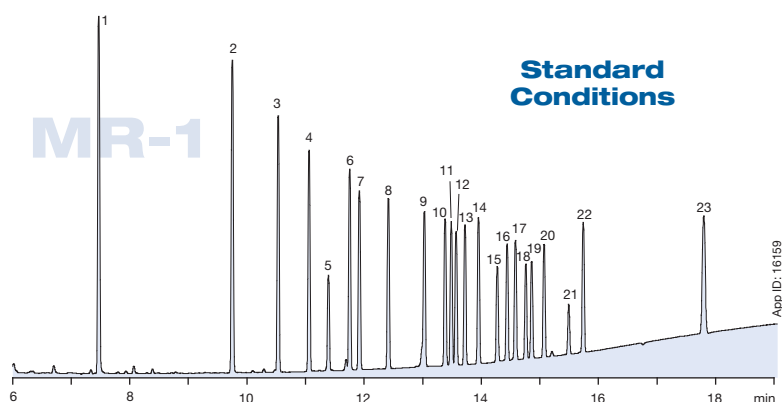
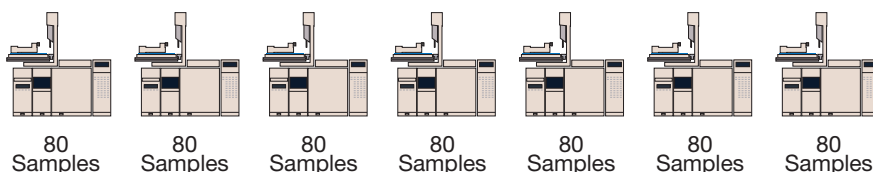


Increase Your Lab's Productivity

Zebtron™ MultiResidue™ columns were designed to provide optimized resolution of all classes of pesticides. This unique selectivity allows your lab to maintain separation of critical compounds even when analysis times are shortened by more than 40 %. The increase in lab productivity makes sure you get results to your customers on time, even for rush samples.



7 Instruments Required to Run 500 Samples Per Day



Column: Zebtron MultiResidue-1
Zebtron MultiResidue-2
Dimensions: 30 meter x 0.53 mm x 0.50 µm
30 meter x 0.53 mm x 0.50 µm
Part No.: 7HK-G016-17; 7HK-G017-17
Injection: Splitless @ 250 °C, 1 µL

Carrier Gas: Helium @ 5.2 mL/min (constant flow)
Oven Program: 90 °C for 0.5 min to 320 °C @ 15 °C/min for 5 min
Detector: ECD @ 350 °C

Same Columns + Optimized Conditions = Increased Productivity

3.5 Instruments Required to Run 500 Samples Per Day



144
Samples



144
Samples



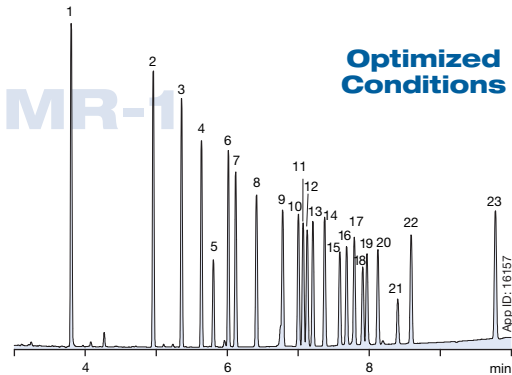
144
Samples



68 Samples
with time to
spare!

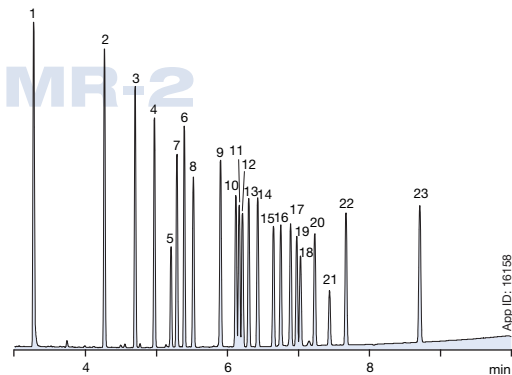


**These instruments available
for other analysis**



44 % Shorter Analysis

Almost no change in resolution!



Sample for all columns on p. 8-9:

1. Tetrachloro-m-xylene (TCMX) (surr)
2. 1-Bromo-2-nitrobenzene (IS)
3. α -BHC
4. γ -BHC (Lindane)
5. β -BHC
6. δ -BHC
7. Heptachlor
8. Aldrin
9. Heptachlor epoxide
10. *trans*-Chlordane (gamma)
11. *cis*-Chlordane (alpha)
12. Endosulfan I
13. 4,4'-DDE
14. Dieldrin
15. Endrin
16. DDD
17. Endosulfan II
18. Endrin aldehyde
19. DDT
20. Endosulfan sulfate
21. Methoxychlor
22. Endrin ketone
23. Decachlorobiphenyl (DCB) (surr)

Tech Tip:

High flow rates reduce a compound's residence time in the inlet. This can significantly reduce injection port breakdown for sensitive compounds such as Endrin & DDT.

Column: Zebron MultiResidue-1
Zebron MultiResidue-2

Dimensions: 30 meter x 0.53 mm x 0.50 μ m
30 meter x 0.53 mm x 0.50 μ m

Part No.: 7HK-G016-17; 7HK-G017-17

Injection: Splitless @ 250 $^{\circ}$ C, 1 μ L

Carrier Gas: Helium @ 8 mL/min (constant flow)

Oven Program: 110 $^{\circ}$ C for 0.5 min to 250 $^{\circ}$ C @ 30 $^{\circ}$ C/min
to 340 $^{\circ}$ C @ 20 $^{\circ}$ C/min for 2 min

Detector: ECD @ 350 $^{\circ}$ C

A New Generation of Columns for Pesticide Analysis

Optimized Selectivity

Many pesticide compounds have very similar structures or have isomers that are present in the product. Zebron™ MultiResidue™ phases were developed to provide optimum selectivity for a variety of pesticide compounds. Every analysis is unique, but we can help you determine the best phase to use in order to resolve your pesticide sample.

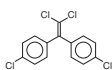
Figure 1: Selectivity of DDT, DDD, and DDE isomers at 25 ng on column using MS

Sample:

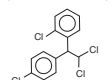
1. *o,p*-DDE



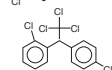
2. *p,p*-DDE



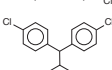
3. *o,p*-DDD



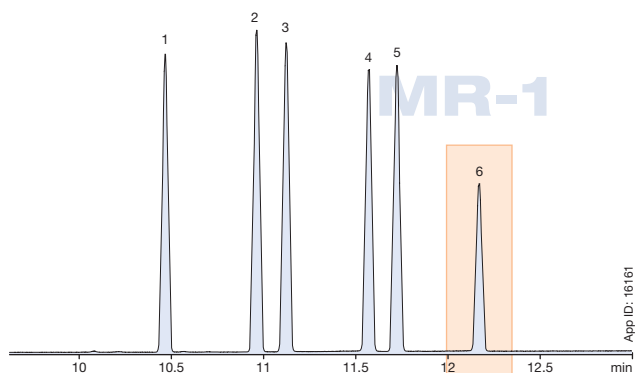
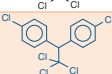
4. *o,p*-DDT



5. *p,p*-DDD



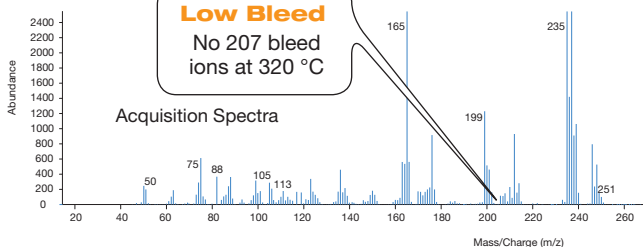
6. *p,p*-DDT



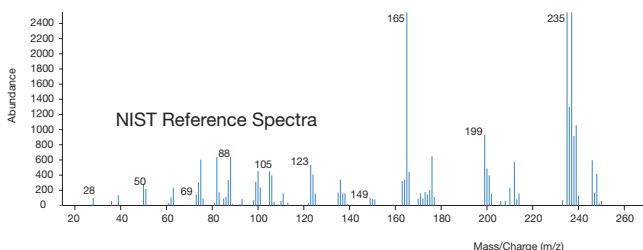
Low Bleed

No 207 bleed ions at 320 °C

Acquisition Spectra



NIST Reference Spectra



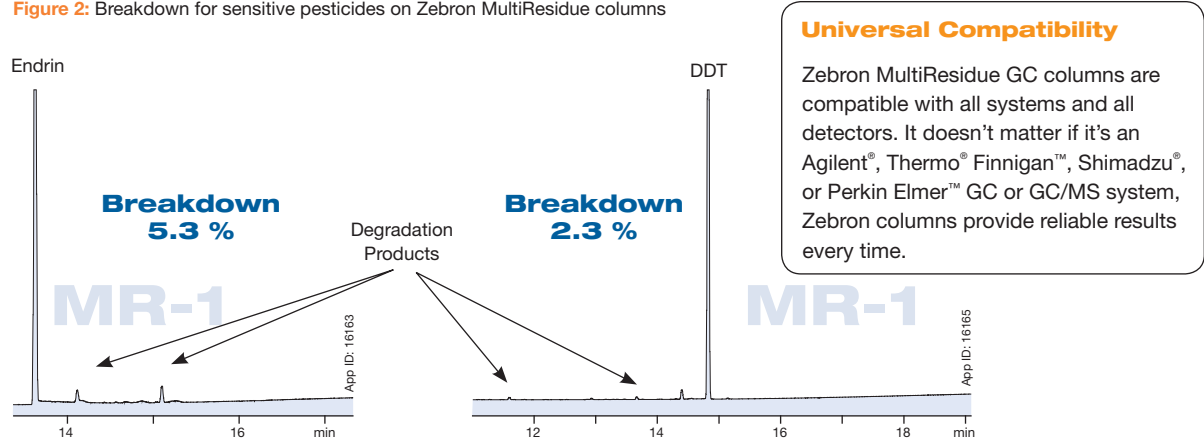
Low Bleed

Zebron columns have developed a reputation for low column bleed and high temperature limits and Zebron MultiResidue columns are no different. The columns are made using an extremely stable siloxane-based polymer that contains absolutely no cyano functionality. Our Engineered Self Crosslinking™ (ESC) bonding process makes both columns MS certified, allowing for unmatched spectral integrity even for low-level samples.

Low Column Activity

Many pesticides are sensitive to system activity and readily breakdown. This can be a significant problem when working with low level samples and sensitive detectors such as ECD. Zebron™ MultiResidue™ columns have been completely deactivated and provide excellent peak shape for even the most active compounds.

Figure 2: Breakdown for sensitive pesticides on Zebron MultiResidue columns



Tunable Selectivity

Zebron MultiResidue GC columns were developed specifically for pesticide analysis. Their unique selectivity improves the separation of all classes of pesticides, herbicides, and insecticides. Since the columns are MS Certified, samples can be prescreened using analyte specific detectors, and then confirmed using MS.

Sensitive and Stable

Figure 3: Repeatability at 5 pg on-column concentration of various pesticides using Zebron MR-1 and MR-2 columns

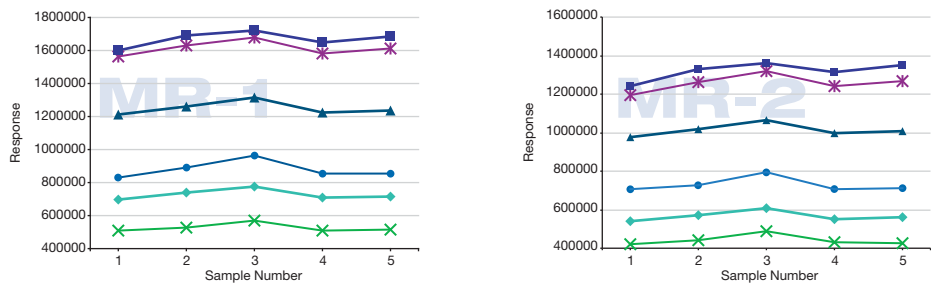


Table 1: Relative standard deviation (RSD) for five replicate injections of pesticide at 5 pg on-column concentration

Analyte	MR-1 % RSD	MR-2 % RSD
Lindane (γ-BHC)	2.78	3.53
Heptachlor	2.83	3.60
Dieldrin	3.38	3.28
Endrin	4.34	4.54
DDT	5.92	5.14
Methoxychlor	5.21	5.96

Performance That Exceeds US EPA Method 8081A Specifications

The EPA outlines strict performance guidelines that must be met for compound linearity, percent relative standard deviation (% RSD), and breakdown of DDT and endrin. Column resolution and performance are critical in meeting these requirements. The data below was calculated using EPA Method 8081A guidelines.

Table 1: Five-point calibration curve at 5, 10, 25,100, and 250 ppb

Analyte	Zebtron™ MR-1 % RSD*	Zebtron™ MR-2 % RSD*	US EPA Specifications
α-BHC	6.75	7.91	< 20
γ-BHC (Lindane)	5.52	5.70	< 20
β-BHC	3.57	9.21	< 20
δ-BHC	5.90	7.58	< 20
Heptachlor	4.21	5.37	< 20
Aldrin	4.34	5.25	< 20
Heptachlor epoxide	3.70	4.48	< 20
γ-Chlordane	3.68	3.61	< 20
α-Chlordane	2.91	3.39	< 20
Endosulfan I	2.93	3.91	< 20
DDE	4.56	6.77	< 20
Dieldrin	3.85	4.75	< 20
Endrin	4.17	3.84	< 20
DDD	4.79	7.36	< 20
Endosulfan II	2.63	3.53	< 20
Endrin aldehyde	4.11	4.72	< 20
DDT	3.70	5.42	< 20
Endosulfan sulfate	3.31	3.20	< 20
Methoxychlor	7.39	4.21	< 20
Endrin ketone	3.48	3.95	< 20
Average	4.28	5.21	< 20

*Calculated using response factors as per EPA guidelines

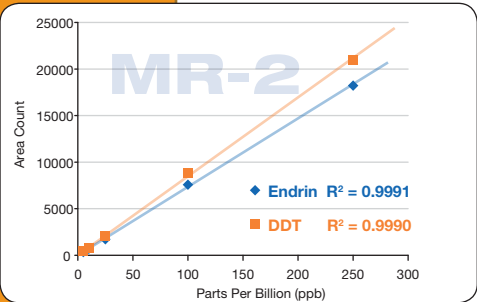
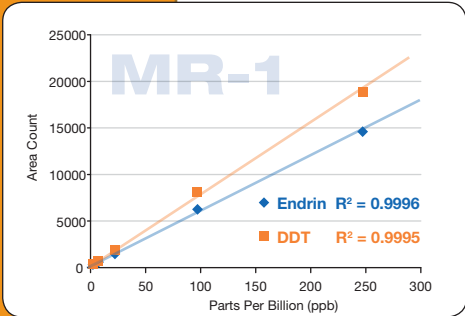


Table 2: Percent breakdown of endrin & DDT as per EPA guidelines

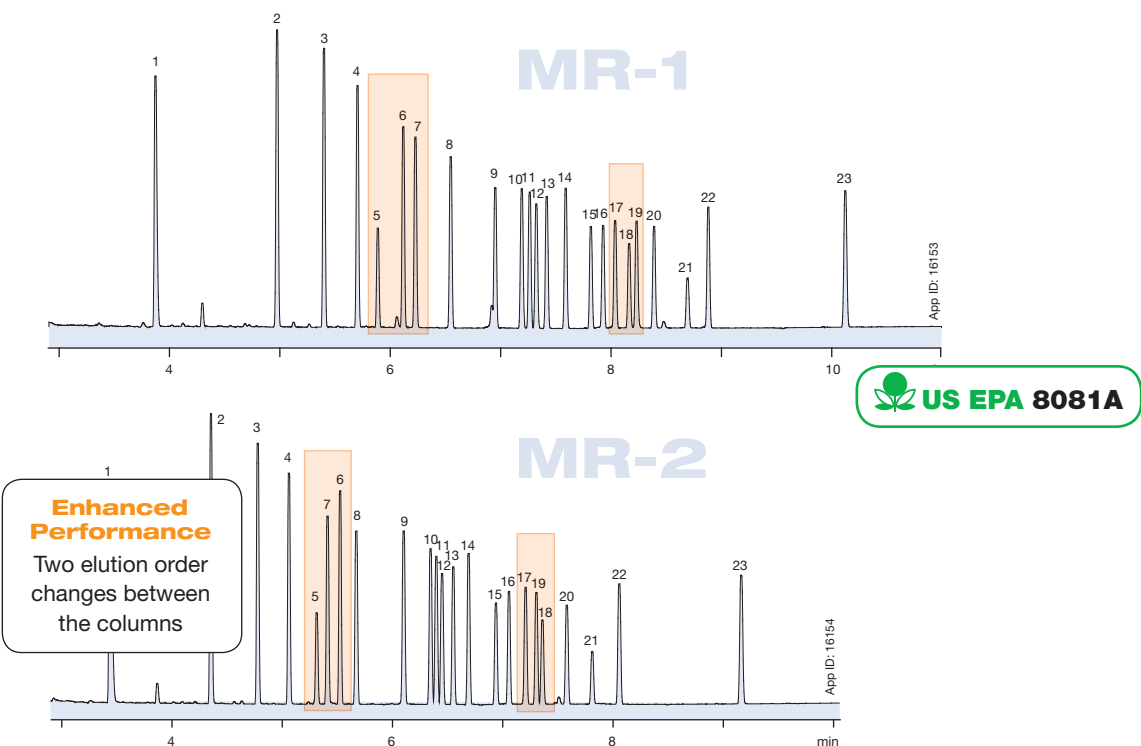
Analyte	Zebtron MR-1 % Breakdown	Zebtron MR-2 % Breakdown	US EPA Requirements
Endrin	5.3	7.0	< 15
DDT	2.3	2.9	< 15



Baseline Resolution of all 20 EPA 8081A's Chlorinated Pesticides!

The US EPA regulates the testing of 20 specific chlorinated pesticides under the official Method 8081A. The method specifies an Electron Capture Detector (ECD), which is extremely sensitive for chlorinated compounds. However, it does not provide any confirmatory information about the peak.

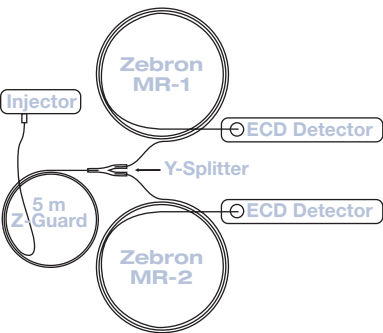
To reduce the occurrence of misidentifications, the method requires the use of two GC columns of dissimilar selectivity in a parallel configuration. The EPA considers an analyte's presence confirmed if it has a peak at the pre-determined retention time on both columns. The unique selectivity of Zebron™ MultiResidue™ columns allows for baseline resolution ($R_s > 1.5$) of all compounds with two elution order changes between the columns!



Column: Zebron MultiResidue-1
Zebron MultiResidue-2
Dimensions: 30 meter x 0.32 mm x 0.50 μ m
30 meter x 0.32 mm x 0.25 μ m
Part No.: 7HM-G016-17; 7HM-G017-11
Injection: Splitless @ 250 $^{\circ}$ C, 1 μ L
Carrier Gas: Helium @ 3.4 mL/min (constant flow)
Oven Program: 100 $^{\circ}$ C for 0.5 min to 220 $^{\circ}$ C @
35 $^{\circ}$ C/min to 340 $^{\circ}$ C at 20 $^{\circ}$ C/min for
2 min
Detector: ECD @ 350 $^{\circ}$ C

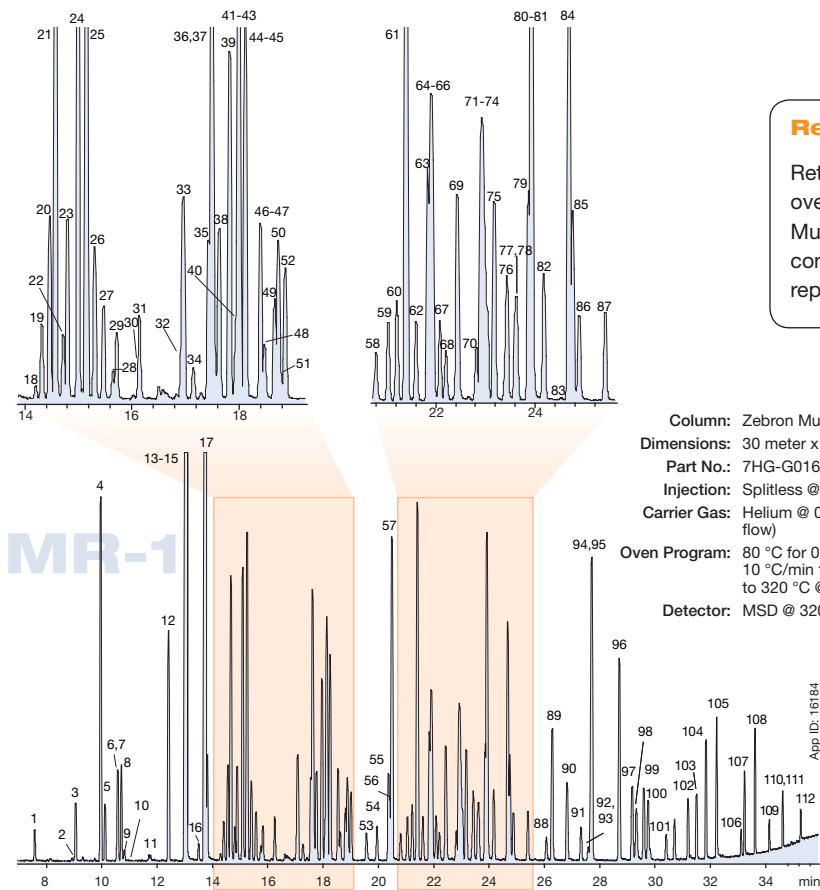
Notes: Columns connected using a 5 m Z-Guard and a Y-splitter

- Sample:
1. Tetrachloro-m-xylene (TCMX) (surr)
 2. 1-Bromo-2-nitrobenzene
 3. α -BHC
 4. γ -BHC (Lindane)
 5. β -BHC
 6. δ -BHC
 7. Heptachlor
 8. Aldrin
 9. Heptachlor epoxide
 10. γ -Chlordane (*trans*)
 11. α -Chlordane (*cis*)
 12. Endosulfan I
 13. 4,4'-DDE
 14. Dieldrin
 15. Endrin
 16. 4,4'-DDD
 17. Endosulfan II
 18. Endrin aldehyde
 19. 4,4'-DDT
 20. Endosulfan sulfate
 21. Methoxychlor
 22. Endrin ketone
 23. Decachlorobiphenyl (DCB) (surr)



Confirmation of Multi-Pesticide Mixture by GC/MS

The low bleed performance of both Zebron™ MultiResidue™ MR-1 and MR-2 columns allow them to be used on GC/MS.



Retention Time Data

Retention time data is available for over 300 pesticides on a Zebron MultiResidue-1 column. Please contact your local Phenomenex representative for more details.

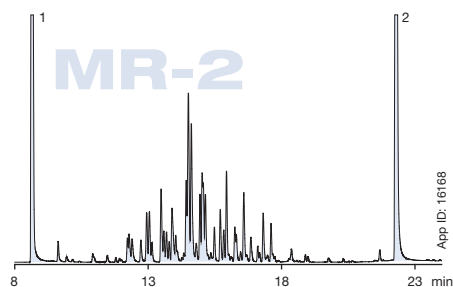
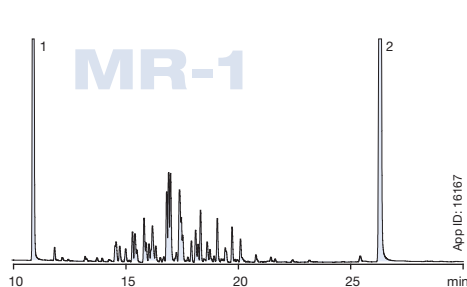
Column: Zebron MultiResidue-1
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G016-11
Injection: Splitless @ 260 °C, 1 µL
Carrier Gas: Helium @ 0.90 mL/min (constant flow)
Oven Program: 80 °C for 0.5 min to 150 °C @ 10 °C/min to 240 °C @ 4 °C/min to 320 °C @ 15 °C/min for 3 min
Detector: MSD @ 320 °C; 45-400 amu

Sample:

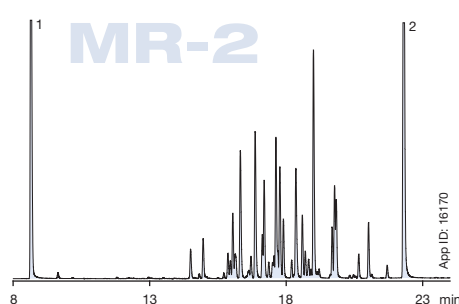
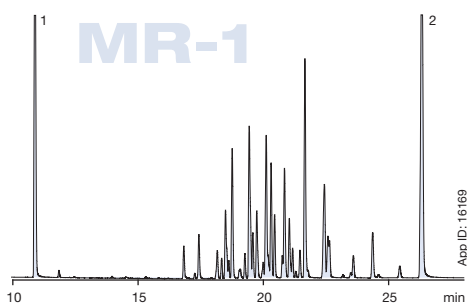
- | | | | |
|---|--------------------------------------|------------------------------|----------------------|
| 1. Dichlorvos | 28. Naled | 56. Dichlofenthion | 85. Diphenamid |
| 2. DEET | 29. Chlorpropham | 57. 2,4-DB (methyl ester) | 86. MGK-264 isomer |
| 3. EPTC | 30. Dicrotophos | 58. Phosphamidon | 87. Clofenvinfos |
| 4. 3,5-Dichlorobenzoic acid (methyl ester) | 31. Phorate | 59. Chlorpyrifos methyl | 88. Crotoxypfos |
| 5. Butylate | 32. Monocrotophos | 60. Alachlor | 89. Butachlor |
| 6. 4-Nitrophenol (methyl ester) | 33. Pentachlorophenol (methyl ester) | 61. Bentazon (methyl ester) | 90. Stirofos |
| 7. Vernolate | 34. Demeton | 62. Ronnel | 91. Tokuthion |
| 8. Mevinphos | 35. Atraton | 63. Prometryn | 92. Napropamide |
| 9. Mevinphos isomer | 36. Profluralin | 64. Methyl parathion | 93. Fenamiphos |
| 10. Pebulate | 37. Prometon | 65. Ametryn | 94. Merphos Oxide |
| 11. Trichlorfon | 38. Silvex (methyl ester) | 66. Simetryn | 95. Oxadiazon |
| 12. Dicamba (methyl ester) | 39. Terbufos | 67. Aspon | 96. Oxyflurofen |
| 13. Molinate | 40. Dimethoate | 68. Metribuzin | 97. Carboxin |
| 14. Tebuthiuron | 41. Simazine | 69. Terbutryn | 98. Tricyclazole |
| 15. MCPP (methyl ester) | 42. Propazine | 70. Malathion | 99. Acifluorfen |
| 16. Tetraethyl pyrophosphate (methyl ester) | 43. Atrazine | 71. Fenitrothion | 100. Ethion |
| 17. MCPA (methyl ester) | 44. Diazinon | 72. Pichloram (methyl ester) | 101. Fensulfothion |
| 18. Demeton isomer | 45. Dioxathion | 73. Metolachlor | 102. Carbofenotion |
| 19. Thionazin | 46. Terbutylazine | 74. Chlorpyrifos | 103. Famfur |
| 20. Dichloroprop (methyl ester) | 47. Fonofos | 75. DCPA | 104. Norflurazon |
| 21. Propachlor | 48. Pronamide | 76. Bromacil | 105. Hexazinone |
| 22. Cycloate | 49. Chloramben (methyl ester) | 77. Fenthion | 106. EPN |
| 23. Ethoprop | 50. 2,4,5-T Methyl ester | 78. Trichloronate | 107. Phosmet |
| 24. Trifluralin | 51. Phosphamidon isomer | 79. Triadimeton | 108. Leptophos |
| 25. Benefin | 52. Disulfoton | 80. Isopropalin | 109. Azinphos-methyl |
| 26. 2,4-D (methyl ester) | 53. Secbumeton | 81. Parathion | 110. Fenarimol |
| 27. Sulfotep | 54. Terbacil | 82. MGK-624 | 111. Azinphos-ethyl |
| | 55. Dinoseb (methyl ester) | 83. Merphos | 112. Coumaphos |
| | | 84. Pendimethalin | |



Aroclor 1242



Aroclor 1260



Column: Zebron MultiResidue-1
Zebron MultiResidue-2

Dimensions: 30 meter x 0.32 mm x 0.50 μ m
30 meter x 0.32 mm x 0.25 μ m

Part No.: 7HM-G016-17; 7HM-G017-11

Injection: Split 50:1 @ 210 °C, 1 μ L

Carrier Gas: Hydrogen @ 2.3 mL/min (constant pressure)

Oven Program: 120 °C (hold 1 min) to 300 °C @ 9 °C/min (hold 10 min)

Detector: ECD @ 310 °C

Sample: 1. Tetrachloro-m-xylene (TCMX) (surr)
2. Decachlorobiphenyl (DCB) (surr)

Notes: Columns connected using a 5 meter Z-Guard and a Y-splitter

How long will columns last?

The performance of a GC system will degrade over time requiring inlet maintenance, column trimming, and ultimately the replacement of the GC column. In order to accurately determine what your column lifetime will be it's better to ask yourself the question: What makes your columns fail? Is it bleed, activity, or poor resolution?

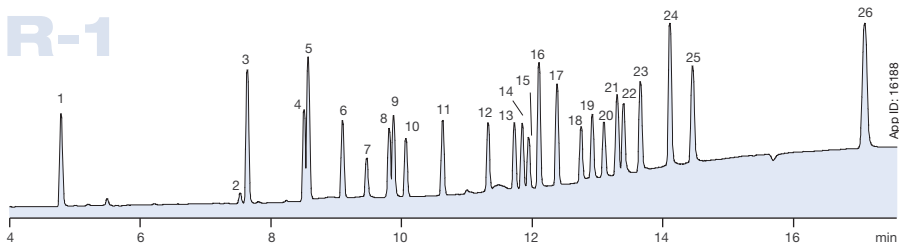
The better the column performance for that criteria initially will usually lead to better overall performance in the long term. Zebron MultiResidue columns provide the lowest activity, best resolution, and overall most stable performance of any pair of columns designed specifically for pesticide testing.



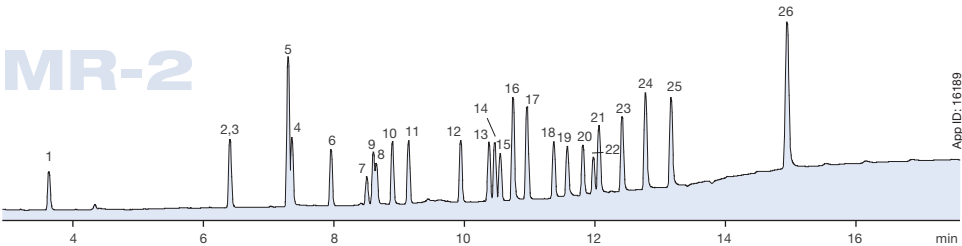
RCP/MCP States of Connecticut and Massachusetts Pesticide List

Column: Zebron MultiResidue-1
 Zebron MultiResidue-2
 Dimensions: 30 meter x 0.53 mm x 0.50 µm
 30 meter x 0.53 mm x 0.50 µm
 Part No.: 7HK-G016-17; 7HK-G017-17
 Injection: Splitless @ 250 °C, 2 µL
 Carrier Gas: Helium @ 6.7 psi (constant pressure)
 Oven Program: 130 °C for 1 min to 325 °C @ 15 °C/min
 (hold 5 min)
 Detector: ECD @ 380 °C

MR-1



MR-2



Sample:

- | | |
|--|-------------------------------------|
| 1. Hexachlorocyclopentadiene | 14. α-Chlordane |
| 2. Propaclor | 15. Endosulfan I |
| 3. Tetrachloro- <i>m</i> -xylene (TCMX) (surr) | 16. 4,4'-DDE |
| 4. α-BHC | 17. Dieldrin |
| 5. Hexachlorobenzene | 18. Endrin |
| 6. γ-BHC (Lindane) | 19. 4,4'-DDD |
| 7. β-BHC | 20. Endosulfan II |
| 8. Alachlor | 21. Endrin aldehyde |
| 9. δ-BHC | 22. 4,4'-DDT |
| 10. Heptachlor | 23. Endosulfan sulfate |
| 11. Aldrin | 24. Methoxychlor |
| 12. Heptachlor epoxide | 25. Endrin ketone |
| 13. γ-Chlordane | 26. Decachlorobiphenyl (DCB) (surr) |

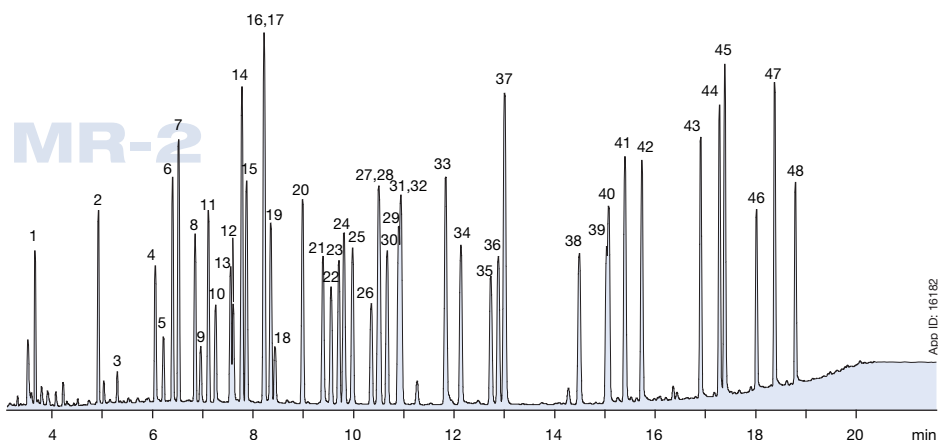
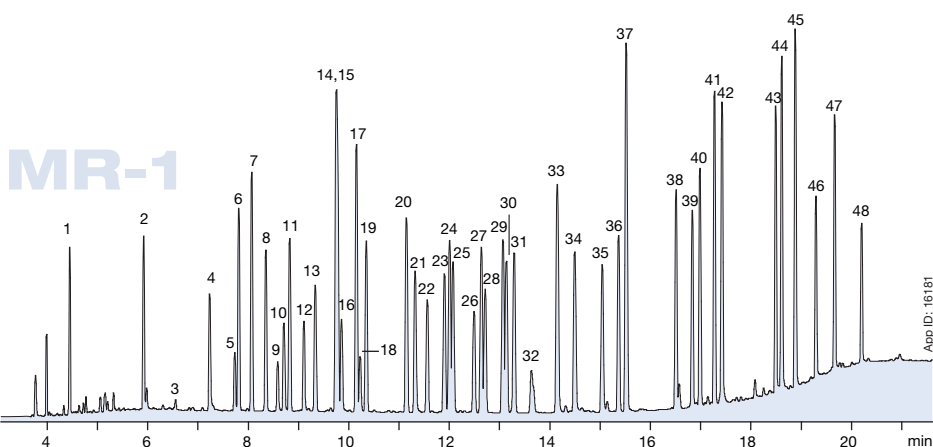


This application was supplied courtesy of Keith Aloisa at Phoenix Labs. Phoenix Labs (www.phoenixlabs.com) is a full service environmental lab that is NELAC accredited and certified in all of New England, New York, and New Jersey.

**“Better resolution. Higher efficiency.
 Best results I’ve ever gotten with
 any column pair.”**

Do you have a noteworthy application using Zebron GC columns that you would like published?

For consideration, please send your chromatogram and a short abstract to skyc@Phenomenex.com or fax it to (310) 328-7768 attn: Sky Countryman. Any type of application is welcome.



Column: Zebron MultiResidue-1

Zebron MultiResidue-2

Dimensions: 30 meter x 0.32 mm x 0.50 μ m

30 meter x 0.32 mm x 0.25 μ m

Part No.: 7HM-G016-17; 7HM-G017-11

Injection: On-column @ 103 °C, 1 μ L

Carrier Gas: Helium @ 2.8 mL/min (constant flow)

Oven Program: 100 °C for 0.5 min to 180 °C @ 20 °C/min
to 240 °C @ 6 °C/min to 320 °C @ 15
°C/min for 2 min

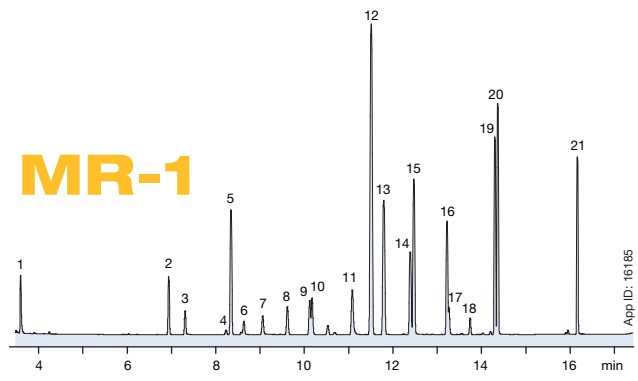
Detector: FID @ 340 °C

Notes: Analytes at 2 ppm in dichloromethane. Columns
connected using a 5 m Z-Guard and a Y-splitter

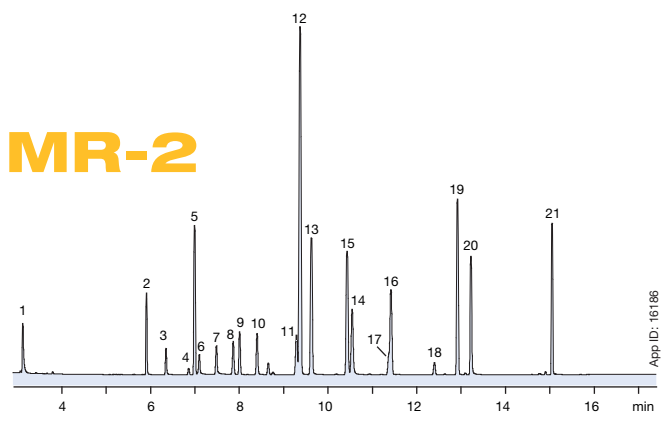
Sample:

- | | |
|---------------------------------------|------------------------------|
| 1. Dichlorvos | 26. Malathion |
| 2. Mevinphos | 27. Fenitrothion |
| 3. Trichlorfon | 28. Chlorpyrifos |
| 4. TEPP (Tetraethyl
Pyrophosphate) | 29. Fenthion |
| 5. Demeton isomer | 30. Trichloronate |
| 6. Thionazin | 31. Parathion |
| 7. Ethoprop | 32. Merphos |
| 8. Sulfotep | 33. Chlorfenvinphos |
| 9. Naled | 34. Crotoxyphos |
| 10. Dicrotophos | 35. Stirofos |
| 11. Phorate | 36. Tokuthion |
| 12. Monocrotophos | 37. Merphos oxide (tribufos) |
| 13. Demeton | 38. Ethion |
| 14. Terbufos | 39. Fensulfothion |
| 15. Diazinon | 40. Contaminant |
| 16. Dimethoate | 41. Carbofenthion |
| 17. Fonofos | 42. Famfur |
| 18. Phosphamidon isomer | 43. EPN |
| 19. Disulfoton | 44. Phosmet |
| 20. Dichlorfenthion | 45. Leptophos |
| 21. Phosphamidon | 46. Azinphos methyl |
| 22. Chlorpyrifos methyl | 47. Azinphos ethyl |
| 23. Ronnel | 48. Couphomos |
| 24. Aspon | |
| 25. Methyl parathion | |

MR-1



MR-2





Request Additional
EPA Methods

8082

Aroclors

507

Nitrogen- and Phosphorus-
Containing Pesticides

8081A

Chlorinated Pesticides

Column:

Zebtron MultiResidue-1
Zebtron MultiResidue-2

Dimensions:

30 meter x 0.32 mm x 0.50 µm
30 meter x 0.32 mm x 0.25 µm

Part No.:

7HM-G016-17; 7HM-G017-11

Injection:

Splitless @ 250 °C, 1 µL

Carrier Gas:

Helium @ 2.5 mL/min (constant flow)

Oven Program:

50 °C for 1 min to 180 °C @ 35 °C/min for
2 min to 205 °C @ 5 °C/min to 320 °C @
20 °C/min

Detector:

ECD @ 350 °C

- Sample:
1. Dalapon

2. 3,5-Dichlorobenzoic acid

3. 4-Nitrophenol

4. DCAA (surr)

5. Dicamba

6. MCPP

7. MCPA

8. Dichloroprop

9. Contaminant

10. 2,4-D

11. Pentachlorophenol

12. DBOB (IS)

13. Silvex

14. Chloramben

15. 2,4,5-T

16. Dinoseb

17. 2,4-DB

18. Bentazon

19. Picloram

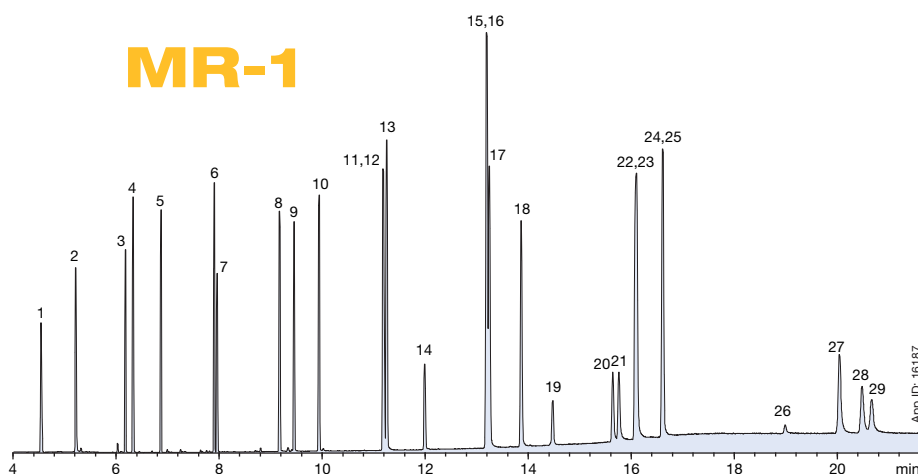
20. DCPA

21. Acifluorfen





MR-1



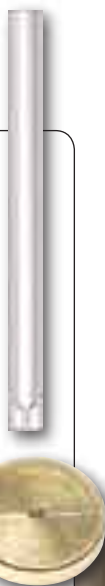
Column: Zebron MultiResidue-1
 Dimensions: 30 meter x 0.25 mm x 0.25 μ m
 Part No.: 7HG-G016-11
 Injection: Splitless @ 300 °C, 1 μ L
 Carrier Gas: Helium @ 1.4 mL/min (constant flow)
 Oven Program: 70 °C for 0.5 min to 275 °C @
 25 °C/min to 340 °C @ 8 °C/min for
 7 min
 Detector: MSD @ 320 °C; 45-400

Sample:

- | | |
|---------------------------|------------------------------|
| 1. Naphthalene | 16. Benzo[j]fluoranthene |
| 2. 2-Methylnaphthalene | 17. Benzo[k]fluoranthene |
| 3. Acenaphthylene | 18. Benzo[a]pyrene |
| 4. Acenaphthene | 19. 3-Methylcholanthrene |
| 5. Fluorene | 20. Dibenz[a,h]acridine |
| 6. Phenanthrene | 21. Dibenz[a,j]acridine |
| 7. Anthracene | 22. Indeno[1,2,3-cd]pyrene |
| 8. Fluoranthene | 23. Dibenz[a,h]anthracene |
| 9. Pyrene | 24. Benzo[g,h,i]perylene |
| 10. Benzo[c]fluorene | 25. 7H-Dibenzo[c,g]carbazole |
| 11. Benz[a]anthracene | 26. Dibenzo[a,l]pyrene |
| 12. Cyclopenta[c,d]pyrene | 27. Dibenzo[a,e]pyrene |
| 13. Chrysene | 28. Dibenzo[a,i]pyrene |
| 14. Methylchrysene | 29. Dibenzo[a,h]pyrene |
| 15. Benzo[b]fluoranthene | |

Tech Tip:

Inlet deactivation is critical for obtaining stable calibration curves. Use a liner style that has a taper at the bottom to help focus analytes onto the column. Avoid liners with glass wool because it adds activity. Also remember to change your gold seal regularly when working with Agilent® 5890 or 6890 instruments.

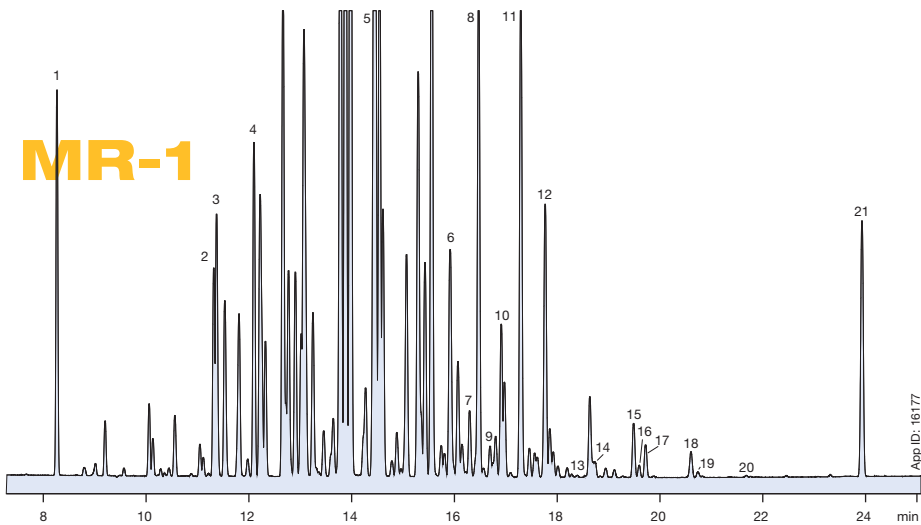


DIN Method 51527: Polychlorinated Biphenyls Separation

Resolving Critical Isomers

Polychlorinated Biphenyls (PCBs) are a class of priority environmental pollutants that have been identified for international regulation. The similarity in structure and polarity makes the resolution of certain isomers challenging on standard phases. German law requires separation of specific PCB congeners under DIN Method 51527.

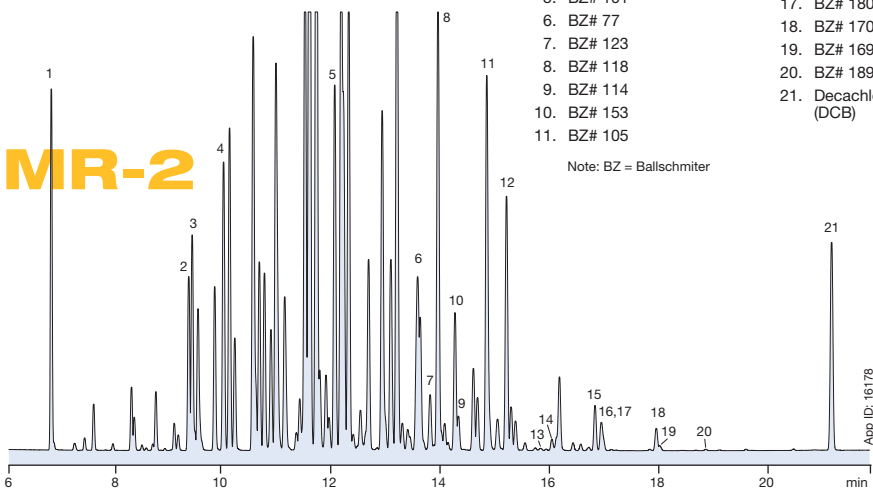
The unique selectivity offered by Zebron™ MultitResidue™ columns makes them a versatile solution for many applications outside of pesticide analysis. Both the MR-1 and the MR-2 columns provide resolution of all the required PCB congeners in less than 30 minutes, allowing for simultaneous confirmation of each sample.



Sample:

- | | |
|---------------------------------------|------------------------------|
| 1. Tetrachloro-m-xylene (TCMX) (surr) | 12. BZ# 138 |
| 2. BZ# 31 | 13. BZ# 126 |
| 3. BZ# 28 | 14. BZ# 167 |
| 4. BZ# 52 | 15. BZ# 156 |
| 5. BZ# 101 | 16. BZ# 157 |
| 6. BZ# 77 | 17. BZ# 180 |
| 7. BZ# 123 | 18. BZ# 170 |
| 8. BZ# 118 | 19. BZ# 169 |
| 9. BZ# 114 | 20. BZ# 189 |
| 10. BZ# 153 | 21. Decachlorobiphenyl (DCB) |
| 11. BZ# 105 | |

Note: BZ = Ballschmieder



Column: Zebron MultiResidue-1
Zebron MultiResidue-2
Dimensions: 30 meter x 0.32 mm x 0.50 µm
30 meter x 0.32 mm x 0.25 µm
Part No.: 7HM-G016-17; 7HM-G017-11
Injection: Splitless @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 200 °C @ 25 °C/min
to 320 °C @ 6 °C/min for 2 min
Detector: ECD @ 350 °C

ZB-MultiResidue™ -1 and -2

Ordering Information

Zebron ZB-MultiResidue -1 GC Columns

ID(mm)	df(μm)	Temp. Limits °C	Part No.
20-Meter			
0.18	0.18	-60 to 320/340	7FD-G016-08
30-Meter			
0.25	0.25	-60 to 320/340	7HG-G016-11
0.32	0.25	-60 to 320/340	7HM-G016-11
0.32	0.50	-60 to 320/340	7HM-G016-17
0.53	0.50	-60 to 320/340	7HK-G016-17

Ordering Information

Zebron ZB-MultiResidue -2 GC Columns

ID(mm)	df(μm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.20	-60 to 320/340	7HG-G017-10
0.32	0.25	-60 to 320/340	7HM-G017-11
0.53	0.50	-60 to 320/340	7HK-G017-17

Note: If you need a 5 in. cage, contact Technical support via Phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.



ZB-MultiResidue Column Kits

Ordering Information

0.25 mm ID (kit consists of products below)			Part No.: KG0-8237
Description	Dimension	Part No.	
ZB-MultiResidue-1 Column	30 meter x 0.25 mm x 0.25 μm df	7HG-G016-11	
ZB-MultiResidue-2 Column	30 meter x 0.25 mm x 0.20 μm df	7HG-G017-10	
Z-Guard™	5 meter x 0.25 mm	7AG-G000-00-GZ0	
Universal Capillary Column Y-connector, Fused Quartz		AG0-4717	
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722	
0.32 mm ID (kit consists of products below)			Part No.: KG0-8238
Description	Dimension	Part No.	
ZB-MultiResidue-1 Column	30 meter x 0.32 mm x 0.50 μm df	7HM-G016-17	
ZB-MultiResidue-2 Column	30 meter x 0.32 mm x 0.25 μm df	7HM-G017-11	
Z-Guard	5 meter x 0.32 mm	7AM-G000-00-GZ0	
Universal Capillary Column Y-connector, Fused Quartz		AG0-4717	
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722	
0.53 mm ID (kit consists of products below)			Part No.: KG0-8239
Description	Dimension	Part No.	
ZB-MultiResidue-1 Column	30 meter x 0.53 mm x 0.50 μm df	7HK-G016-17	
ZB-MultiResidue-2 Column	30 meter x 0.53 mm x 0.50 μm df	7HK-G017-17	
Z-Guard	5 meter x 0.53 mm	7AK-G000-00-GZ0	
Universal Capillary Column Y-connector, Fused Quartz		AG0-4717	
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722	



Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.



Extend column lifetime. Add a Z-Guard™ to your next Zebron GC order.

ZB-CLPesticides



 **phenomenex[®]**
...breaking with traditionSM

Customer Spotlight

Real-World Results with Zebtron™ ZB-CLPesticides

Run Faster Methods With Minimal Development Time

“ We installed Zebtron ZB-CLPesticides-1 and -2 columns with our current method and did no further optimization. Overall, the Zebtron columns are fairly impressive. ZB-CLPesticides columns are comparable to our current columns, with the added benefit of no co-eluting peaks. There is also the potential to optimize our method parameters using these columns to run a slightly faster analysis. ”

Shealy Environmental
Services, Inc.

Equivalent Elution Orders & Calibration Success

“ I tried the Zebtron ZB-CLPesticides column pair and compared them to the Restek® Rtx®-CLPesticides and Rtx-CLPesticides2 columns. The elution of the Aroclor 1016/1260 standards looked very similar to the Restek columns. I ran a five point curve for the 1016/1260 Aroclors and single points for the rest of the Aroclors (1221 through 1268). The % RSD for the 1016/1260 peaks were also very similar to the Restek column results.” ”

TriMatrix Laboratories, Inc.

Share With Us!

Our innovation is fueled by your feedback! We take every opportunity to learn about your GC challenges, how your dream column would perform, and how best to support you.

www.phenomenex.com/WeListen

ZB-CLPesticides-1 & -2

A Drop-In Alternative for Pesticide Testing by GC/ECD



Do More With Less

Run 7 EPA Methods On One Column Set
Save On Every Column & Kit
with Everyday Low List Pricing

Get All of the Benefits with None of the Risk

Choose A Direct Replacement for Restek® Rtx®-CLPesticides Phases
Guaranteed Performance With Quality by Design

See the Zebtron vs. Restek Comparison Tests

EPA 8081: Chlorinated Pesticides

EPA 8082: Polychlorinated Biphenyls (PCBs)

EPA 8151: Chlorinated Herbicides

EPA 504: EDB, DBCP, and TCP

EPA 505: Organohalide Pesticides

EPA 508: Chlorinated Pesticides, Herbicides, and Organohalides

EPA 552: Haloacetic Acids (HAAs) and Dalapon

Trust Real-World Results: Customer Spotlight

Get More Than Just A Column

Meet Your Pesticide Support Team

Access Free Resources 24/7

Keep in Calibration with Phenova® CRMs

Explore the Pesticide Column Family



guarantee

If Zebtron columns do not provide you with equivalent or better separations as compared to any other GC column of the same phase and comparable dimensions, return the column with comparative data within 45 days for a FULL REFUND.

Do More With Less

Run 7 EPA Methods On One Column Set

Zebron™ ZB-CLPesticides-1 and -2 allow you to run multiple methods without changing columns for faster, easier pesticide analysis. Save time and gain flexibility – run multiple pesticide classes on one instrument, on one column pair.

- **Resolve multiple pesticide classes with enhanced, fine-tuned selectivity**
- **Meet dual-column requirements for 7 EPA methods by GC/ECD**

8081: Chlorinated Pesticides

8082: Polychlorinated Biphenyls (PCBs)

8151: Chlorinated Herbicides

504: EDB, DBCP, and TCP

505: Organohalide Pesticides

508: Chlorinated Pesticides, Herbicides, and Organohalides

552: Haloacetic Acids (HAAs) and Dalapon

Wouldn't You Rather Be On Vacation?

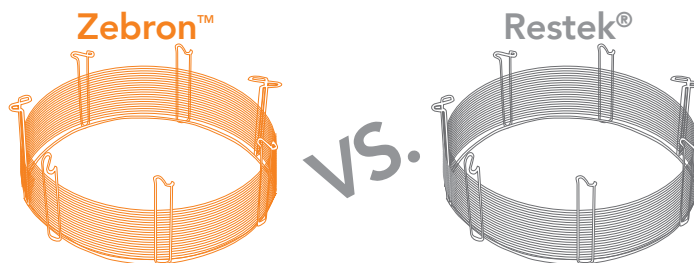
The time and money you save when you choose ZB-CLPesticides columns allows you to invest your resources elsewhere. Increase your lab's productivity and take a well-deserved break!

Learn more at
www.phenomenex.com/VacationCLP

All of the Benefit, None of the Risk

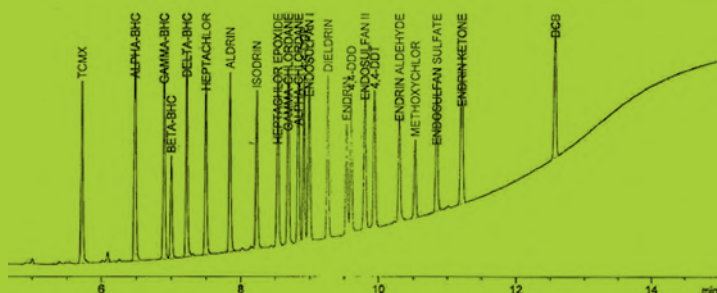
Direct Replacement for Restek® Rtx®-CLPesticides Phases

You asked for optimized performance for pesticides by GC/ECD detectors, without time-consuming method development. We've delivered a direct replacement*! ZB-CLPesticides-1 and -2 provide guaranteed drop-in performance compared to your current Rtx-CLPesticides column set, without the hassle.

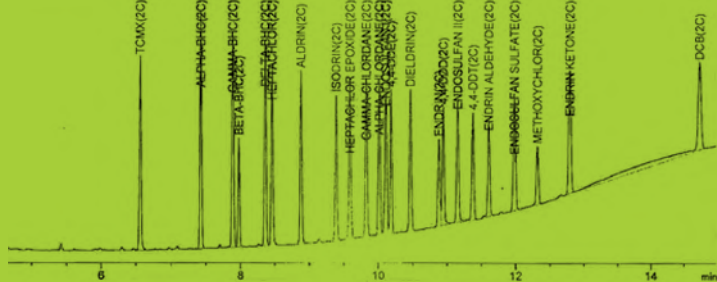


Drop-In Results: Real Customer Data, Real Performance

ZB-CLPesticides-1



ZB-CLPesticides-2



“ I was able to install the ZB-CLPesticides-1 and ZB-CLPesticides-2 columns as a direct replacement for the Restek Rtx-CLPesticides and Rtx-CLPesticides2 columns that I currently use. I made no changes to the method and saw very little difference between the two columns. ”

Joanne Foy, Chemist
TriMatrix Laboratories, Inc.

Ready To See The Method
Comparison Tests?

Go to page 8 ➡

* Direct Replacement: this category indicates an alternative column which will likely give a similar selectivity.

EPA 8081

Chlorinated Pesticides by GC/ECD

Drop-In Method Performance

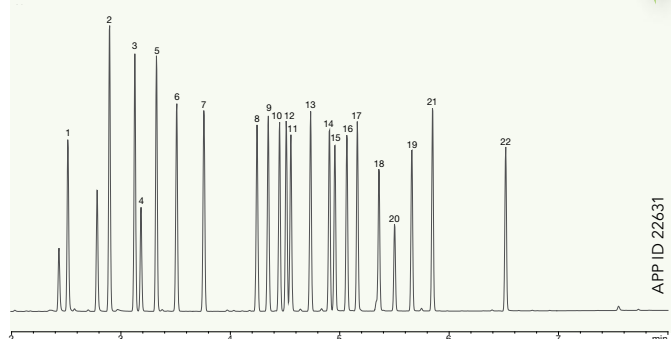
ZB-CLPesticides columns combine Zebron™ high quality with drop-in selectivity. Achieve near-exact elution profiles and run times, without the time-consuming method development and headaches typical of traditional selectivities!

Equivalent Elution Profile

Why pay more when you can drop in a direct replacement for less?

Zebron

ZB-CLPesticides-1
30 m x 0.32 mm x 0.32 µm



Conditions for all columns:

Columns: As listed

Dimensions: As listed

Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
7HM-G029-11 (ZB-CLPesticides-2)

Injection: Splitless (hold 0.3 min) @ 250 °C, 1 µL

Carrier Gas: Helium @ 3.9 mL/min (constant flow)

Oven Program: 120 °C to 200 °C @ 45 °C/min to 230 °C @ 15 °C/min to 330 °C @ 30 °C/min for 2 min

Detector: ECD @ 330 °C

Y-Connector: AG0-4717 (Borosilicate Glass)

Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)

Liner: AG0-8499 (Single Taper with Wool at Bottom)

Septum: AG0-4696 (PhenoRed™-400)

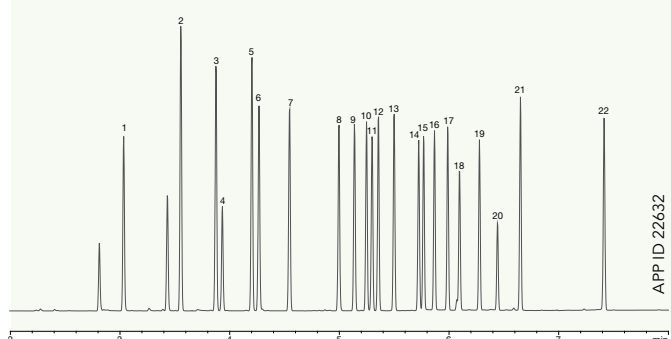
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal™)

Reference Standards: See page 21.

Sample: Analytes are 250 ng/mL in hexane.

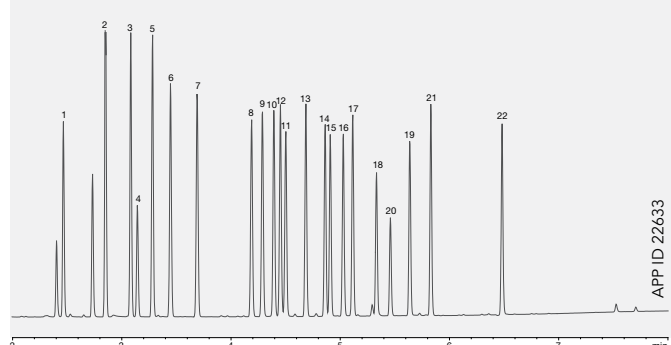
See p. 9 for analytes

ZB-CLPesticides-2
30 m x 0.32 mm x 0.25 µm

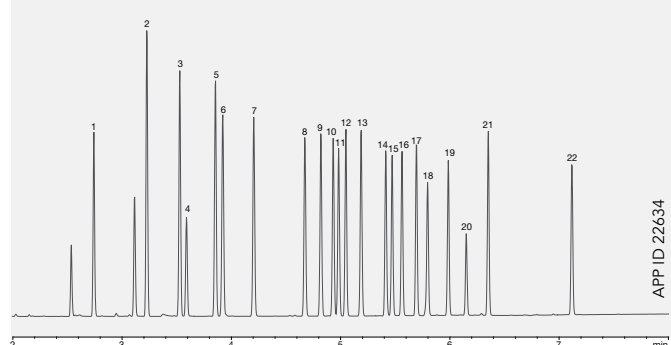


Restek®

Rtx®-CLPesticides
30 m x 0.32 mm x 0.32 µm



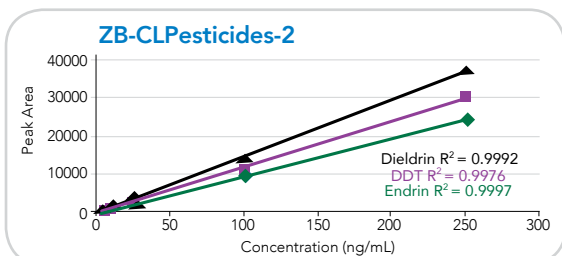
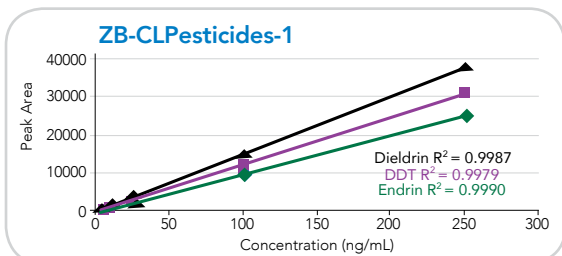
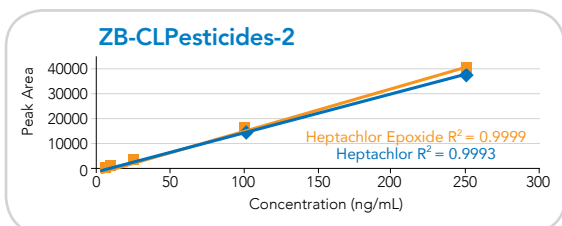
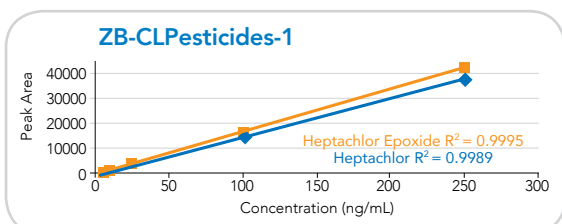
Rtx-CLPesticides2
30 m x 0.32 mm x 0.25 µm



Conditions for each method were the same for all columns tested.
Comparative separations are not representative of all applications.

Easily Meet EPA Specifications

The EPA outlines strict performance requirements for compound linearity, percent relative standard deviation (% RSD), and breakdown of DDT and Endrin. The ZB-CLPesticides column pair meets these guidelines, providing accurate data well-suited for your analysis.



Five-Point Calibration Curve at 5, 15, 25, 100, and 250 ng/mL

Peak No.	Analyte	ZB-CLPesticides-1 % RSD*	ZB-CLPesticides-2 % RSD*	US EPA Specifications
1	2,4,5,6-TCMX (Surr)	3.8	3.0	< 20
2	α -BHC	8.3	3.8	< 20
3	γ -BHC	5.9	5.6	< 20
4	β -BHC	6.9	6.9	< 20
5	δ -BHC	4.9	5.7	< 20
6	Heptachlor	8.0	6.5	< 20
7	Aldrin	4.2	2.3	< 20
8	Heptachlor epoxide	3.8	2.3	< 20
9	trans-Chlordane	4.1	3.8	< 20
10	cis-Chlordane	4.0	3.3	< 20
11	4,4'-DDE	4.8	2.9	< 20
12	Endosulfan I	6.0	2.5	< 20
13	Dieldrin	7.7	4.9	< 20
14	Endrin	9.4	6.6	< 20
15	4,4'-DDD	9.2	3.6	< 20
16	Endosulfan II	6.6	4.1	< 20
17	4,4'-DDT	11.6	6.9	< 20
18	Endrin aldehyde	8.3	7.3	< 20
19	Endosulfan sulfate	8.0	7.1	< 20
20	Methoxychlor	6.7	6.1	< 20
21	Endrin ketone	6.5	7.2	< 20
22	Decachlorobiphenyl (Surr)	6.7	6.6	< 20
Average		6.6%	4.9%	< 20

* Calculated as response factors as per EPA guidelines

Tech Tip: Minimize Activity

Inlet deactivation is critical for obtaining stable calibration curves. Use a well-deactivated liner and remember to change your gold seal regularly when working with Agilent® 5890, 6890, and 7890 instruments.

EPA Method 8082

Polychlorinated Biphenyls (PCBs)

Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
 7HM-G029-11 (ZB-CLPesticides-2)
Injection: Pulsed Splitless @ 30 psi (hold 20 sec) @ 250 °C, 1 µL
Carrier Gas: Helium @ 60 cm/sec (constant flow)
Oven Program: 120 °C to 200 °C @ 45 °C/min to 330 °C @
 15 °C/min for 2 min
Detector: ECD @ 330 °C
Y-Connector: AG0-4717 (Borosilicate Glass)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Septum: AG0-4696 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal™)
Reference Standards: See page 21.
Sample: Aroclor is 1000 ng/mL and SS and IS are 100 ng/mL in hexane.
 1. Tetrachloro-meta-xylene (TCMX)*
 2. Decachlorobiphenyl**
 * surrogate standard
 ** internal standard

Compare All the PCB Aroclors

Download the full PCB application note and see comparisons for all 7 aroclors in EPA 8082 online!

Need Detailed Congener Resolution?

Zebtron ZB-MultiResidue™ columns provide enhanced separations in under 30 minutes.

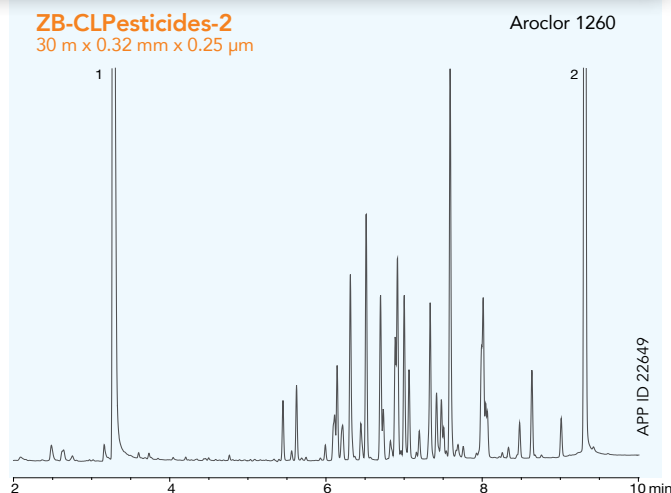
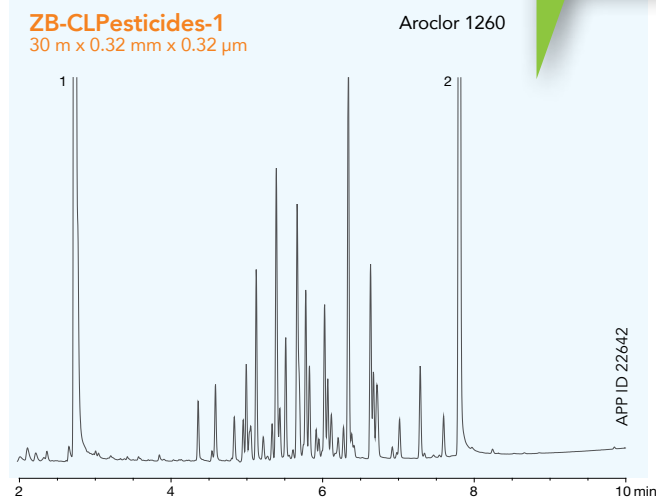
Learn more at

www.phenomenex.com/PesticidesGC

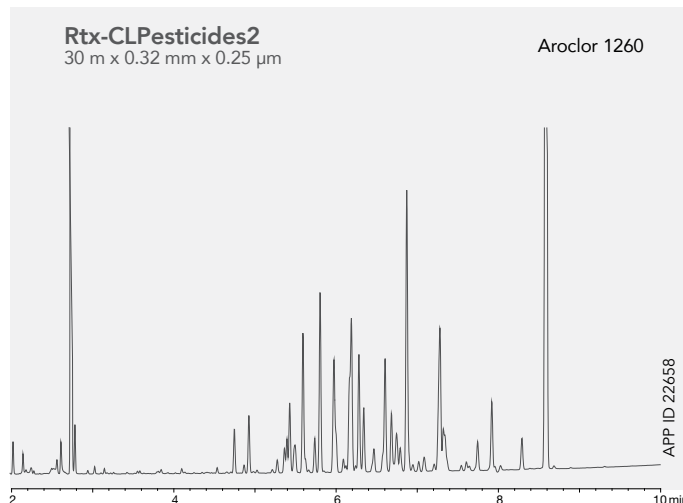
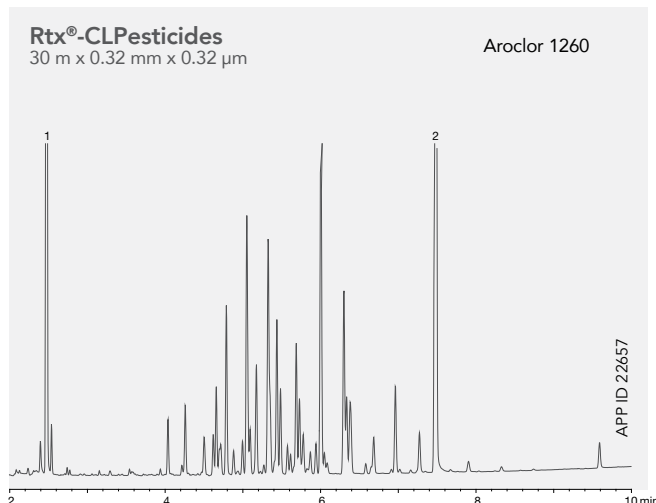
Would you pay more for your reflection's clothes?

No! With drop-in performance, making the smart choice to save with Zebtron is simple. Learn how you can do more with less on p. 5.

Zebtron™



Restek®



Conditions for each method were the same for all columns tested.
Comparative separations are not representative of all applications.

EPA Method 8151

Chlorinated Herbicides

Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
 7HM-G029-11 (ZB-CLPesticides-2)
Injection: Splitless (hold 0.75 min) @ 250 °C, 1 µL
Carrier Gas: Helium @ 36 cm/sec (constant flow)
Oven Program: 70 °C for 0.5 min to 190 °C @ 25 °C/min for
 1 min to 300 °C @ 11 °C/min for 5 min
Detector: ECD @ 325 °C
Y-Connector: AGO-4717 (Borosilicate Glass)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AGO-8499 (Single Taper with Wool at Bottom)
Septum: AGO-4696 (PhenoRed™-400)
Inlet Seal: AGO-8620 (Gold-Plated Easy Seal™)
Reference Standards: See page 21.

Sample: Analytes are 100 ng/mL in hexane.

- | | |
|---|--|
| 1. Dalapon methyl ester | 11. Pentachloroanisole |
| 2. 3,5-Dichlorobenzoic acid methyl ester* | 12. 2,4,5-TP methyl ester |
| 3. 4-Nitroanisole | 13. 2,4,5-T methyl ester |
| 4. DCAA methyl ester* | 14. Chloramben methyl ester |
| 5. Dicamba methyl ester | 15. 2,4-DB methyl ester |
| 6. MCPP methyl ester | 16. Dinoseb methyl ester |
| 7. MCPA methyl ester | 17. Bentazon methyl ester |
| 8. Dichloroprop, methyl ester | 18. DCPA methyl ester (Chlorthal-dimethyl) |
| 9. 4,4'-DBOB** | 19. Pichloram methyl ester |
| 10. 2,4-D methyl ester | 20. Acifluorfen methyl ester |

* surrogate standard
 ** internal standard

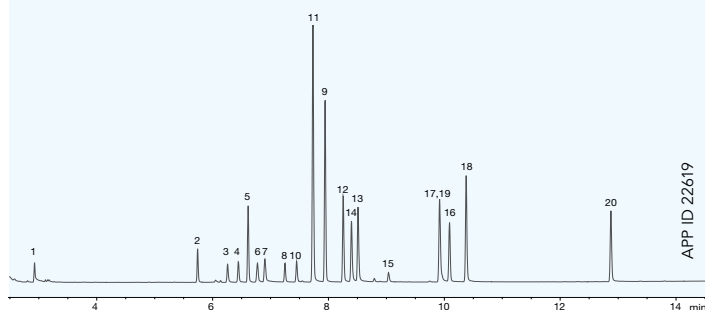
With drop-in, guaranteed performance, at a lower price, the ZB-CLPesticides pair is better than:

- a. Sliced Bread
- b. Rainbows and Unicorns
- c. @%\$#!

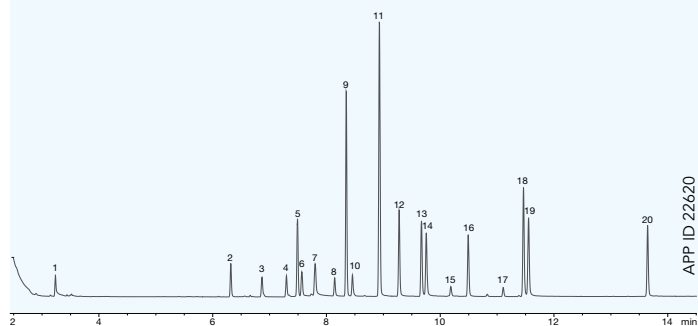
Answer: all of the above! Our customers said so. See more of their thoughts on p. 17.

Zebtron™

ZB-CLPesticides-1 30 m x 0.32 mm x 0.32 µm

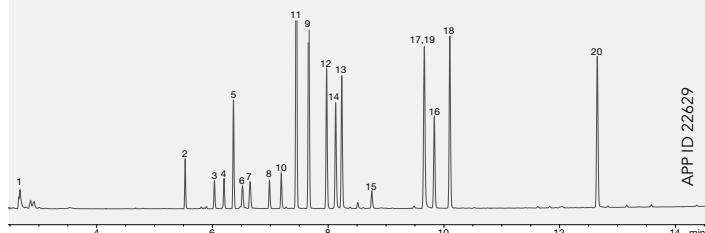


ZB-CLPesticides-2 30 m x 0.32 mm x 0.25 µm

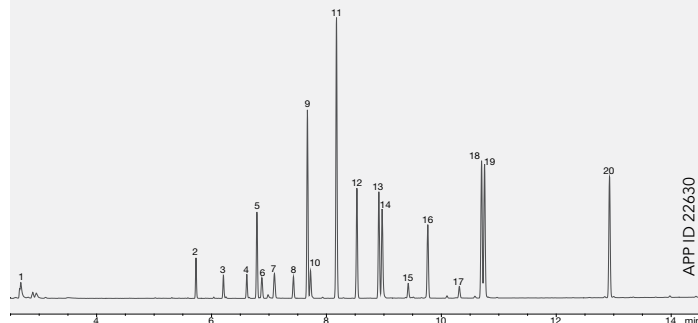


Restek®

Rtx®-CLPesticides 30 m x 0.32 mm x 0.32 µm



Rtx-CLPesticides2 30 m x 0.32 mm x 0.25 µm



Conditions for each method were the same for all columns tested.
 Comparative separations are not representative of all applications.

EPA Method 504

EDB, DBCP, and TCP

Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
 7HM-G029-11 (ZB-CLPesticides-2)
Injection: Pulsed Splitless @ 25 psi (hold 0.5 min) @ 200 °C, 2 µL
Carrier Gas: Helium @ 60 cm/sec (constant flow)
Oven Program: 30 °C for 2 min to 200 °C @ 30 °C/min
Detector: ECD @ 220 °C
Y-Connector: AGO-4717 (Borosilicate Glass)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AGO-8499 (Single Taper with Wool at Bottom)
Septum: AGO-4696 (PhenoRed™-400)
Inlet Seal: AGO-8620 (Gold-Plated Easy Seal™)

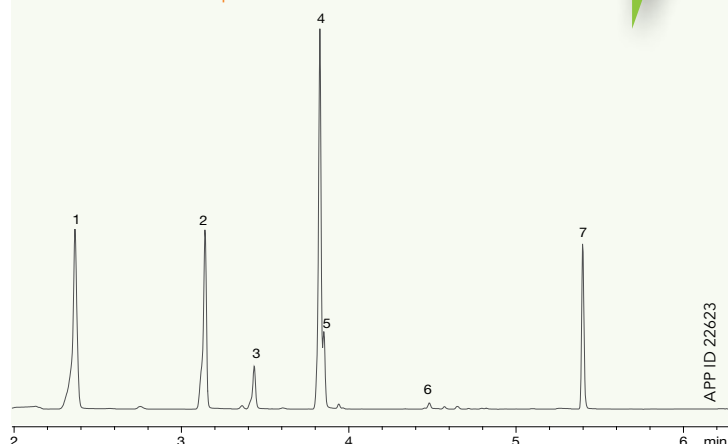
Sample:

- Analytes are 250 ng/mL in hexane.
1. Bromodichloromethane
 2. Chlorodibromomethane
 3. 1,2-Dibromomethane (EDB)
 4. 1,1,1,2-Tetrachloroethane
 5. Bromoform
 6. 1,2,3-Trichloropropane
 7. 1,2-Dibromo-3-chloropropane (DBCP)

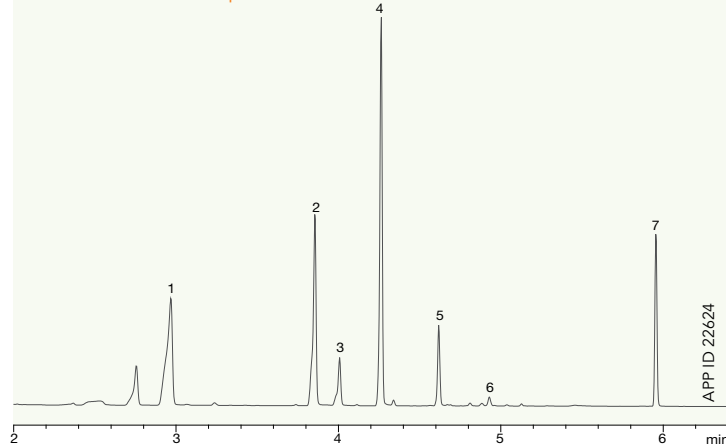
Reference Standards: See page 21.

Zebron™

ZB-CLPesticides-1
 30 m x 0.32 mm x 0.32 µm



ZB-CLPesticides-2
 30 m x 0.32 mm x 0.25 µm

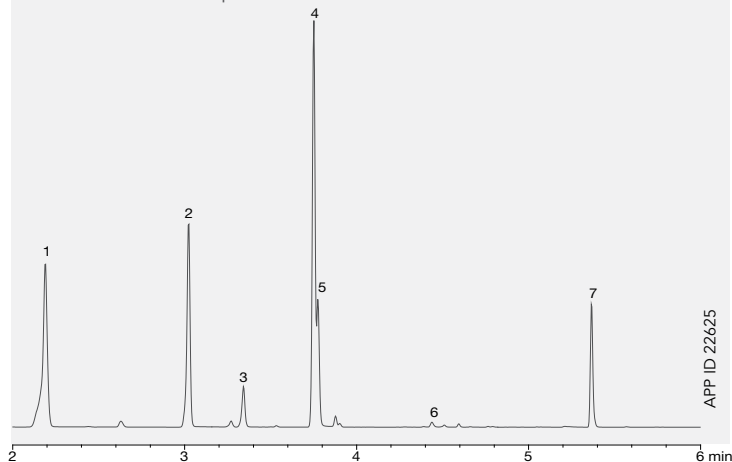


Don't Rely On Magic To Save You Money

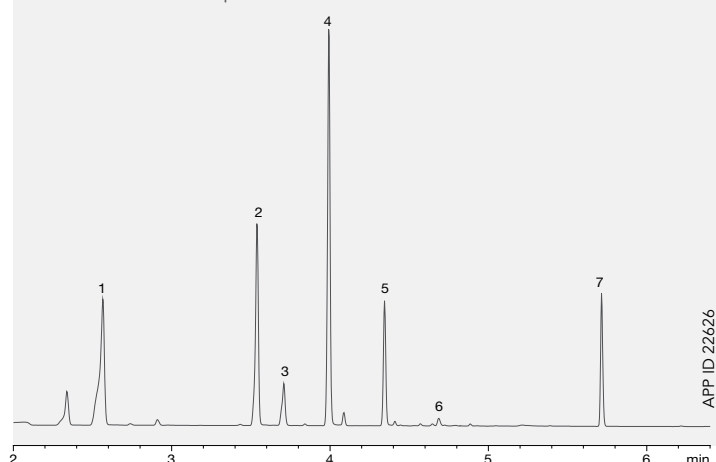
Trust guaranteed performance. Try ZB-CLPesticides columns and get the same results you're used to, risk-free. Learn more on p. 7.

Restek

Rtx®-CLPesticides
 30 m x 0.32 mm x 0.32 µm



Rtx-CLPesticides2
 30 m x 0.32 mm x 0.25 µm



Conditions for each method were the same for all columns tested.
 Comparative separations are not representative of all applications.

Tech Tip: Improve Signal-to-Noise

Proper column conditioning reduces unnecessary column bleed and improves your analysis. For best results, be sure to condition your Zebron column at max isothermal temperature until a constant baseline is achieved.

EPA Method 505

Organohalide Pesticides

Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
 7HM-G029-11 (ZB-CLPesticides-2)
Injection: Splitless (hold 0.75 min) @ 250 °C, 2 µL
Carrier Gas: Helium @ 40 cm/sec (constant flow)
Oven Program: 90 °C for 1 min to 310 °C @ 10 °C/min for 5 min
Detector: ECD @ 325 °C
Y-Connector: AG0-4717 (Borosilicate Glass)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Septum: AG0-4696 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal™)

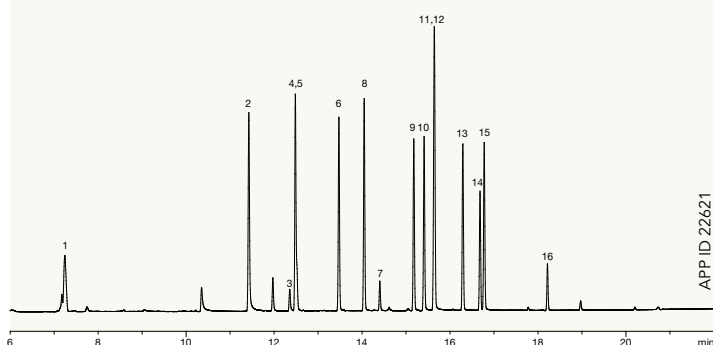
Sample: Analytes are 200 ng/mL in ethanol except atrazine and simazine at 4.2 µg/mL.

- | | |
|------------------------------|-----------------------|
| 1. Hexachlorocyclopentadiene | 9. Heptachlor Epoxide |
| 2. Hexachlorobenzene | 10. γ-Chlordane |
| 3. Simazine | 11. trans-Nonachlor |
| 4. Atrazine | 12. α-Chlordane |
| 5. γ-BHC | 13. Dieldrin |
| 6. Heptachlor | 14. Endrin |
| 7. Alachlor | 15. cis-Nonachlor |
| 8. Aldrin | 16. Methoxychlor |

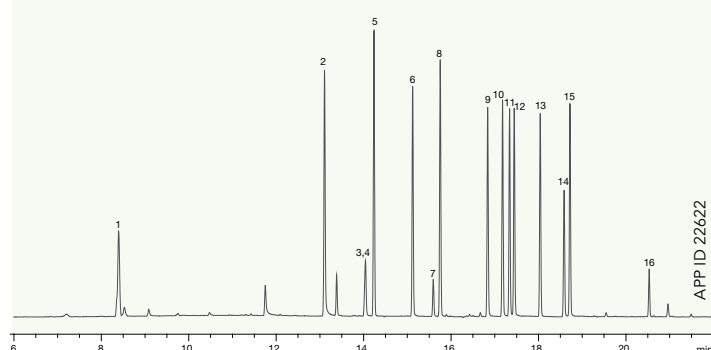
Reference Standards: See page 21.

Zebron™

ZB-CLPesticides-1
 30 m x 0.32 mm x 0.32 µm

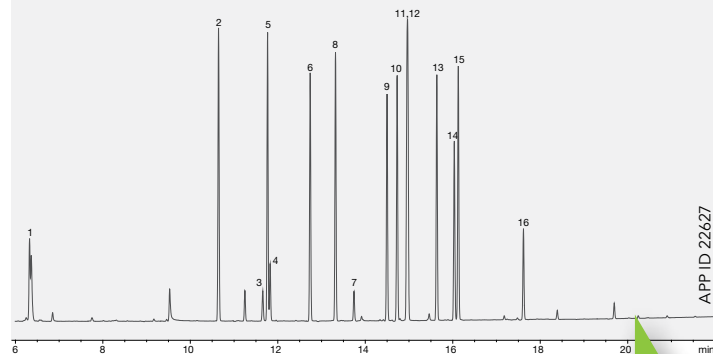


ZB-CLPesticides-2
 30 m x 0.32 mm x 0.25 µm

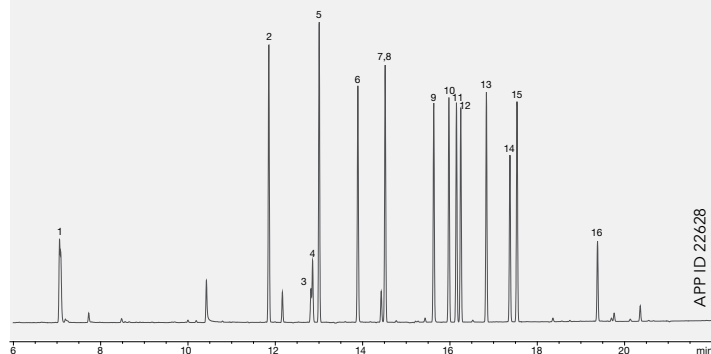


Restek

Rtx®-CLPesticides
 30 m x 0.32 mm x 0.32 µm



Rtx-CLPesticides2
 30 m x 0.32 mm x 0.25 µm



Looking For Love In Aldrin Places?

Start a cheap romance with Zebron ZB-CLPesticides columns. Their elution orders and run times are consistent, so they show up on time for dates. And they bring flowers and chocolates, too.

Conditions for each method were the same for all columns tested.
 Comparative separations are not representative of all applications.

EPA Method 508

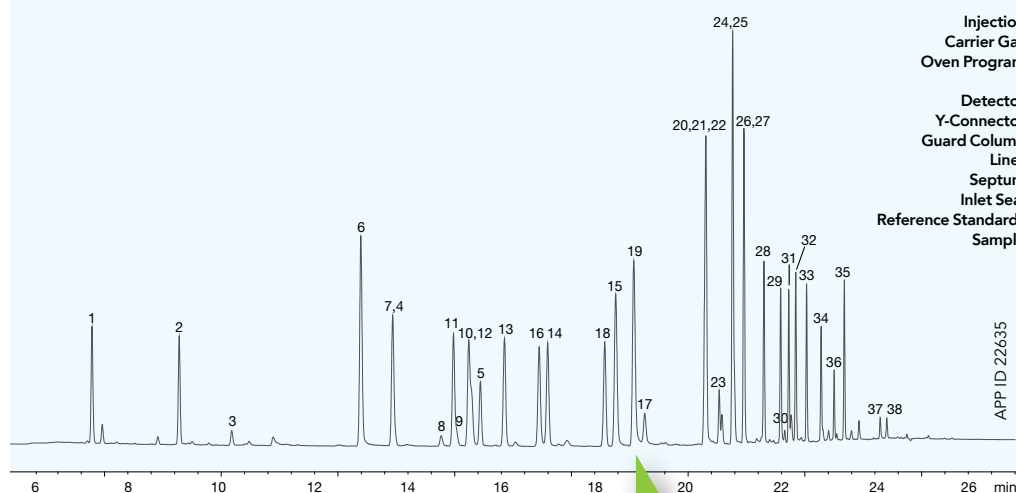
Chlorinated Pesticides, Herbicides, & Organohalides

Zebron™

ZB-CLPesticides-1
30 m x 0.32 mm x 0.32 µm

Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
 7HM-G029-11 (ZB-CLPesticides-2)
Injection: Splitless (hold 0.75 min) @ 250 °C, 2 µL
Carrier Gas: Helium @ 26 cm/sec (constant flow)
Oven Program: 80 °C for 0.5 to 155 °C @ 19 °C/min for 1 min to
 210 °C @ 4 °C/min to 310 °C @ 25 °C/min for 10 min
Detector: ECD @ 325 °C
Y-Connector: AG0-4717 (Borosilicate Glass)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Septum: AG0-4696 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal™)
Reference Standards: See page 21.
Sample: Analytes are various concentrations in ethyl acetate.



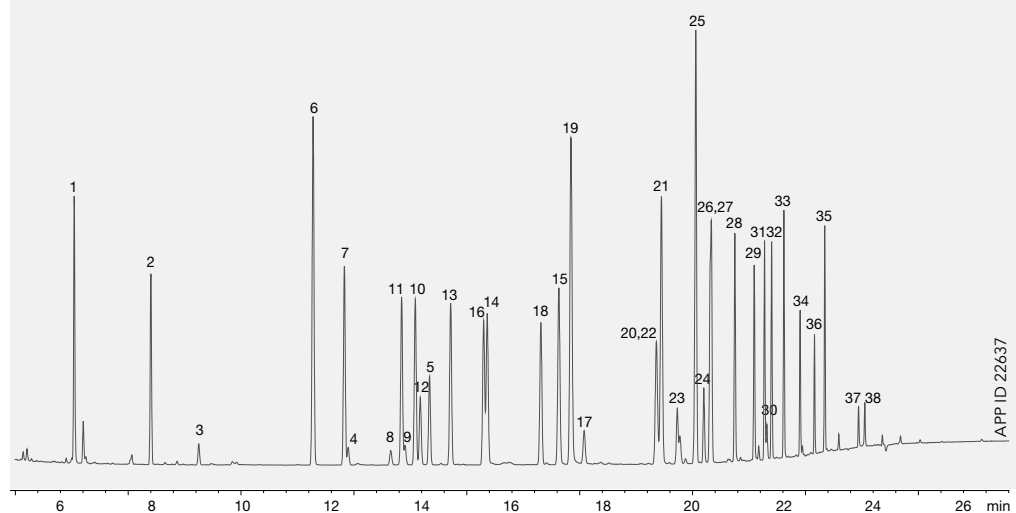
See p. 15 for analytes

Restek

Rtx-CLPesticides
30 m x 0.32 mm x 0.32 µm

ZB-CLPesticides Columns Are Tastier Than DDT!

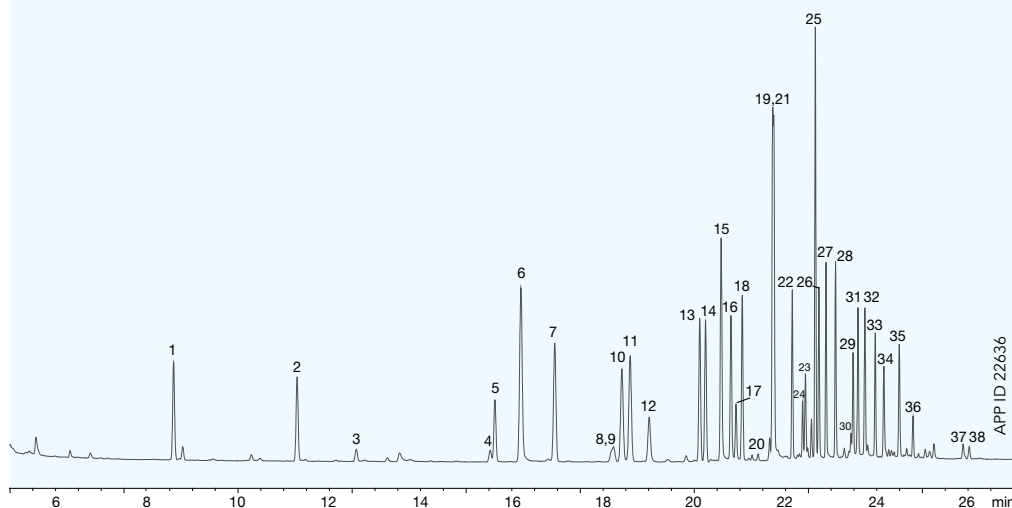
That doesn't make any sense, but saving money does. Why pay more when you get equivalent or better results with Zebron?



Conditions for each method were the same for all columns tested.
 Comparative separations are not representative of all applications.

Zebbron™

ZB-CLPesticides-2 30 m x 0.32 mm x 0.25 µm

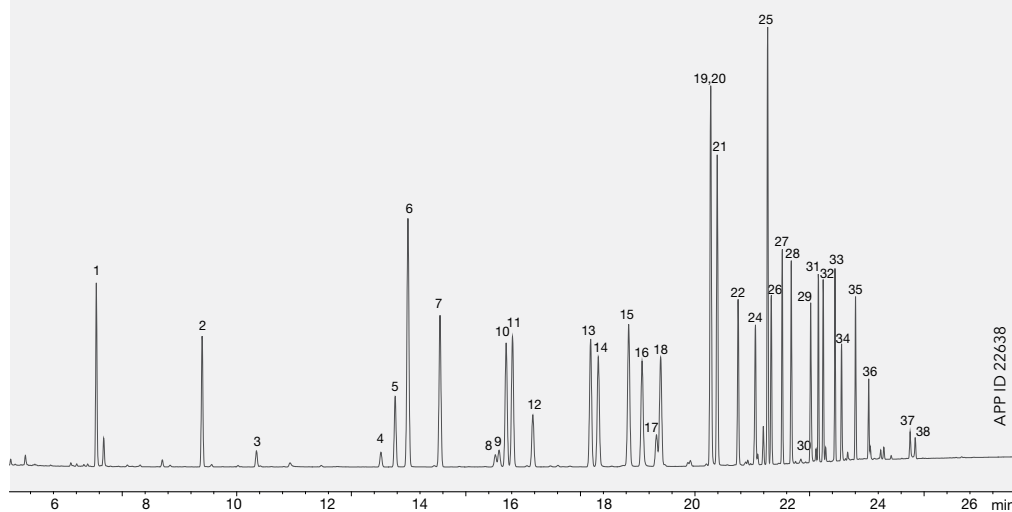


Peak No.	Analyte	Concentration (ng/mL)
1.	Hexachlorocyclopentadiene	100
2.	Etridiazole	100
3.	Chloroneb	100
4.	Propachlor	100
5.	Trifluralin	100
6.	Hexachlorobenzene	100
7.	α-BHC	50
8.	Simazine	100
9.	Atrazine	100
10.	Pentachloronitrobenzene**	50
11.	γ-BHC	50
12.	β-BHC	50
13.	δ-BHC	50
14.	Heptachlor	50
15.	Chlorothalonil	100
16.	Metribuzin	100
17.	Alachlor	100
18.	Aldrin	50
19.	4,4'-Dibromobiphenyl*	250
20.	Metachlor	100
21.	DCPA(dacthal)	100
22.	Heptachlor epoxide (isomer B)	50
23.	trans-Chlordane	100
24.	Cyanazine	100
25.	cis-Chlordane	100
26.	Endosulfan I	50
27.	4,4'-DDE	50
28.	Dieldrin	50
29.	Endrin	50
30.	Chlorobenzilate	100
31.	4,4'-DDD	50
32.	Endosulfan II	50
33.	4,4'-DDT	50
34.	Endrin aldehyde	50
35.	Endosulfan sulfate	50
36.	Methoxychlor	50
37.	cis-Permethrin	100
38.	trans-Permethrin	100

* surrogate standard
** internal standard

Restek

Rtx-CLPesticides2 30 m x 0.32 mm x 0.25 µm



Keep In Calibration!

Improve your pesticide analysis and throughput with Phenova® Certified Reference Materials.

Learn more on page 20 ➡

Conditions for each method were the same for all columns tested.
Comparative separations are not representative of all applications.

EPA Method 552

Haloacetic Acids (HAAs) and Dalapon

Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
 7HM-G029-11 (ZB-CLPesticides-2)
Injection: Pulsed Splitless @ 25 psi (hold 0.75 min) @ 250 °C,
 1 µL
Carrier Gas: Helium @ 25 cm/sec (constant flow)
Oven Program: 35 °C for 4 min to 250 °C @ 15 °C/min, hold 5 min
Detector: ECD @ 300 °C
Y-Connector: AG0-4717 (Borosilicate Glass)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Septum: AG0-4696 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal™)
Reference Standards: See page 21.
Sample: Analytes are various concentrations in ethyl acetate.

Peak No.	Analyte	Concentration (ng/mL)
1.	Methyl chloroacetate	1500
2.	Methyl bromoacetate	1000
3.	Methyl dichloroacetate	1500
4.	Dalapon methyl ester	1000
5.	Methyl trichloroacetate	500
6.	1,2,3-Trichloropropane**	4000
7.	Methyl bromochloroacetate	1000
8.	Methyl bromodichloroacetate	1000
9.	Methyl dibromoacetate	500
10.	Methyl chlorodibromoacetate	2500
11.	2,3 dibromopropionate*	2000
12.	Methyl tribromoacetate	5000

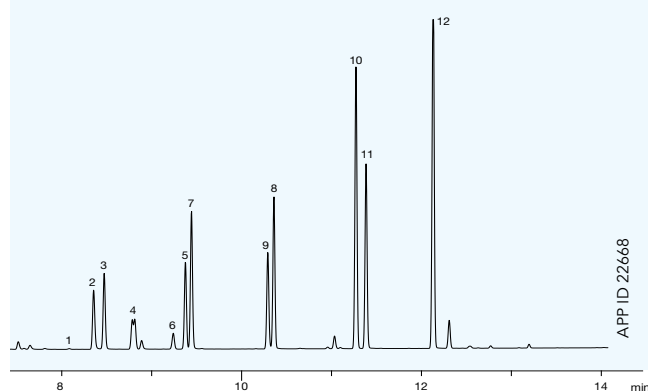
* surrogate standard
 ** internal standard

Wow, These Chromatograms Look The Same

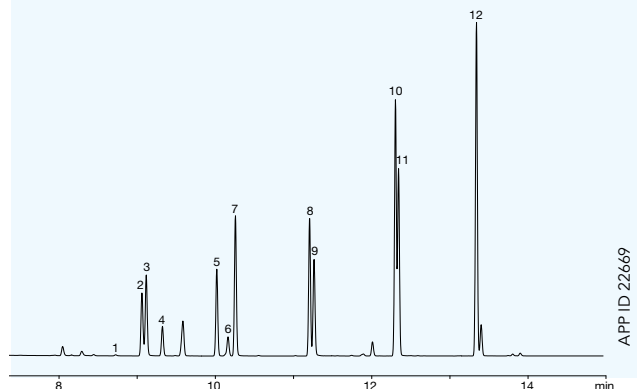
Good thing they do – they're supposed to! Performance is headache and hassle-free, so you can drop-in and run with minimal method development – and pay less!

Zebtron™

ZB-CLPesticides-1
 30 m x 0.32 mm x 0.32 µm

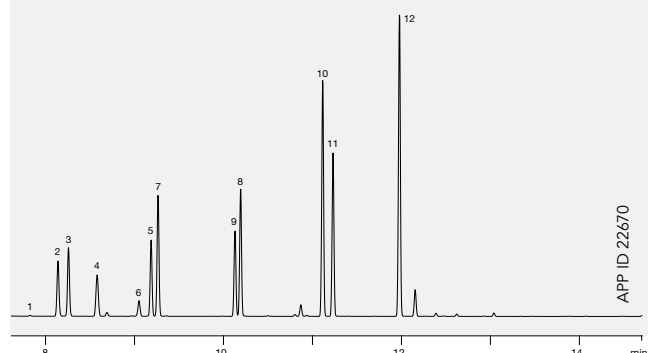


ZB-CLPesticides-2
 30 m x 0.32 mm x 0.25 µm

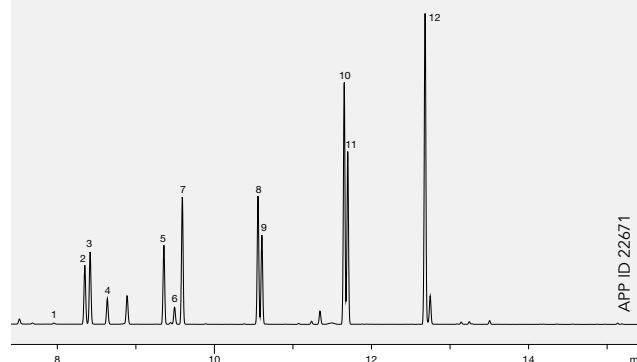


Restek®

Rtx®-CLPesticides
 30 m x 0.32 mm x 0.32 µm



Rtx-CLPesticides2
 30 m x 0.32 mm x 0.25 µm



Conditions for each method were the same for all columns tested.
 Comparative separations are not representative of all applications.

ZB-CLPesticides-1 and -2

Five-Point Calibration Curve at 5, 15, 25, 100, and 250 ng/mL

Peak No.	Analyte	ZB-CLPesticides-1 % RSD*	ZB-CLPesticides-2 % RSD*	US EPA Specifications
1	2,4,5,6-TCMX (Surr)	3.8	3.0	< 20
2	α-BHC	8.3	3.8	< 20
3	γ-BHC	5.9	5.6	< 20
4	β-BHC	6.9	6.9	< 20
5	δ-BHC	4.9	5.7	< 20
6	Heptachlor	8.0	6.5	< 20
7	Aldrin	4.2	2.3	< 20
8	Heptachlor epoxide	3.8	2.3	< 20
9	trans-Chlordane	4.1	3.8	< 20
10	cis-Chlordane	4.0	3.3	< 20
11	4,4'-DDE	4.8	2.9	< 20
12	Endosulfan I	6.0	2.5	< 20
13	Dieldrin	7.7	4.9	< 20
14	Endrin	9.4	6.6	< 20
15	4,4'-DDD	9.2	3.6	< 20
16	Endosulfan II	6.6	4.1	< 20
17	4,4'-DDT	11.6	6.9	< 20
18	Endrin aldehyde	8.3	7.3	< 20
19	Endosulfan sulfate	8.0	7.1	< 20
20	Methoxychlor	6.7	6.1	< 20
21	Endrin ketone	6.5	7.2	< 20
22	Decachlorobiphenyl (Surr)	6.7	6.6	< 20
Average		6.6%	4.9%	< 20

*Calculated using response factors as per EPA guidelines

ZB-CLPesticides GC Column Kits

Ordering Information

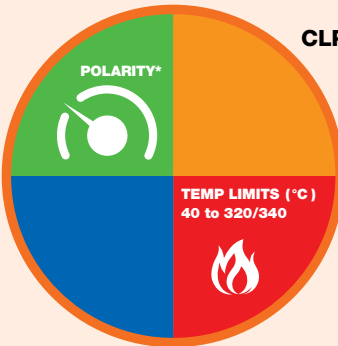
0.25 mm ID Kit (includes 1 of each below) Part No.: KGO-9285		
Description	Dimension	Part No.
ZB-CLPesticides-1	30 meter x 0.25 mm x 0.25 µm	7HG-G028-11
ZB-CLPesticides-2	30 meter x 0.25 mm x 0.20 µm	7HG-G029-10
Z-Guard™ Column	5 meter x 0.25 mm	7AG-G000-00-GZ0
Y-Connector	Fused Quartz	AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

0.32 mm ID Kit (includes 1 of each below) Part No.: KGO-9286		
Description	Dimension	Part No.
ZB-CLPesticides-1	30 meter x 0.32 mm x 0.32 µm	7HM-G028-51
ZB-CLPesticides-2	30 meter x 0.32 mm x 0.25 µm	7HM-G029-11
Z-Guard Column	5 meter x 0.32 mm	7AM-G000-00-GZ0
Y-Connector	Fused Quartz	AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

0.53 mm ID Kit (includes 1 of each below) Part No.: KGO-9290		
Description	Dimension	Part No.
ZB-CLPesticides-1	30 meter x 0.53 mm x 0.50 µm	7HK-G028-17
ZB-CLPesticides-2	30 meter x 0.53 mm x 0.42 µm	7HK-G029-16
Z-Guard Column	5 meter x 0.53 mm	7AK-G000-00-GZ0
Y-Connector	Fused Quartz	AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

 Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Column Profile

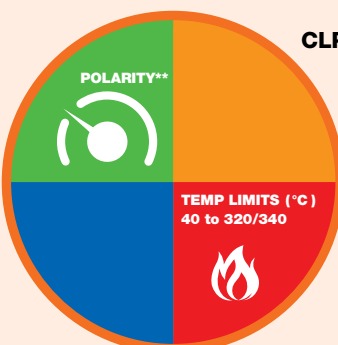


CLP-1

POLARITY*

TEMP LIMITS (°C)
40 to 320/340

*Similar polarity to ZB-35.



CLP-2

POLARITY**

TEMP LIMITS (°C)
40 to 320/340

**Similar polarity to ZB-MultiResidue-2

Phase Chemistry

- Proprietary

Recommended Applications

- Dual-Column Chlorinated Pesticide Methods
- EPA Methods (8081 and 8081 extended, 8082, 8151, 504, 505, 508, 552)

ZB-CLPesticides GC Columns

Ordering Information

ZB-CLPesticides-1 GC Columns			
ID (mm)	df (µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.25	40 to 320/340	7HG-G028-11
0.32	0.32	40 to 320/340	7HM-G028-51
0.32	0.50	40 to 320/340	7HM-G028-17
0.53	0.50	40 to 320/340	7HK-G028-17
ZB-CLPesticides-2 GC Columns			
ID (mm)	df (µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.20	40 to 320/340	7HG-G029-10
0.32	0.25	40 to 320/340	7HM-G029-11
0.32	0.50	40 to 320/340	7HM-G029-17
0.53	0.42	40 to 320/340	7HK-G029-16

Complete Solution for Pesticides and SemiVolatile Testing

SemiVolatiles | Multi-Residue | CL Pesticides

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