Zebron™ GC Columns

GC Application Guide

Persistent Organic Pollutants (POPs)

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INTRODUCTION

Persistent organic pollutants (POPs) are organic chemical substances produced either intentionally or as byproducts of industrial activities.

Sources of pollution from POPs include the improper use and/or disposal of agrochemicals and industrial chemicals, combustion processes, and unwanted byproducts of industrial processes.

This guide offers a variety of applications for the determination of POPs listed below:

24/7 Chat

Contact us if you have questions or would like more information about the methods presented in this guide.

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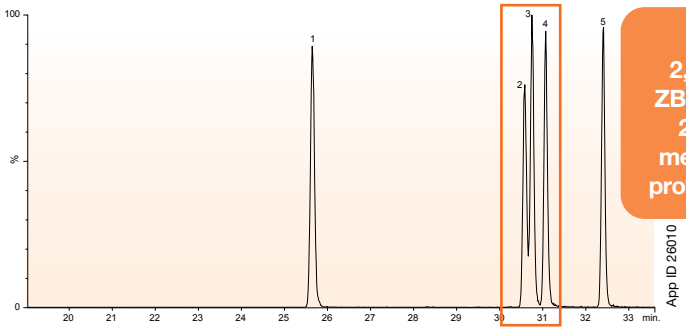
Enhanced Resolution of Critical Dioxins Using ZB-Dioxin GC Column

Zebron™ ZB-Dioxin GC Column

Part No.: 7KG-G045-10

60 meter x 0.25 mm x 0.20 µm



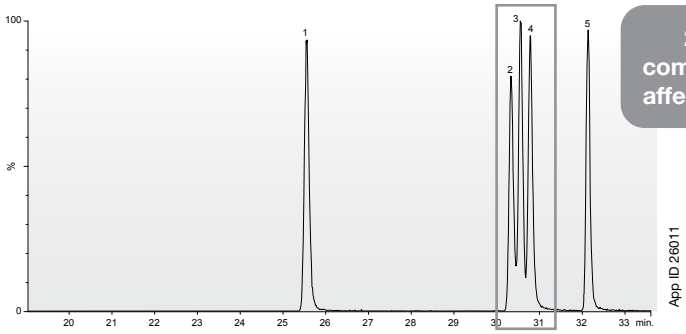
High Resolution of 2,3,7,8-TCDD by using ZB-Dioxin which exceeds 25% valley EPA-1613 method requirement and provided extended lifetime

Conditions for all separations:

Column 1: Zebron ZB-Dioxin
Column 1 Dimension: 60 meter x 0.25 mm x 0.20 µm
Column Part No.: 7KG-G045-10
Column 2: Brand A Premium 5MS
Column 2 Dimension: 60 meter x 0.25 mm x 0.25 µm
Recommended Z-Guard™: 5 meter Z-Guard™ Kit
Guard Kit Part No.: 7AG-G000-00-GZK
Injection: Pulse Splitless (2.0 min, 60 psi) @ 280 °C, 1 µL
Liner: Zebron PLUS 4 mm ID Single Taper Liner
Liner Part No: AG2-0A10-05
Carrier Gas: Helium @ 1.25 mL/min (constant flow)
Oven Program: 160 °C for 2.4 min to 200 °C @ 25 °C/min to 220 °C @ 5 °C/min for 19 min to 288 °C @ 4 °C/min to 300 °C @ 5 °C/min for 7.6 min
Detector: HRMS
Transfer Line Temp.: 300 °C

Brand A Premium 5MS Phase

60 meter x 0.25 mm x 0.25 µm



2,3,7,8-TCDD is not completely resolved which affects the column lifetime

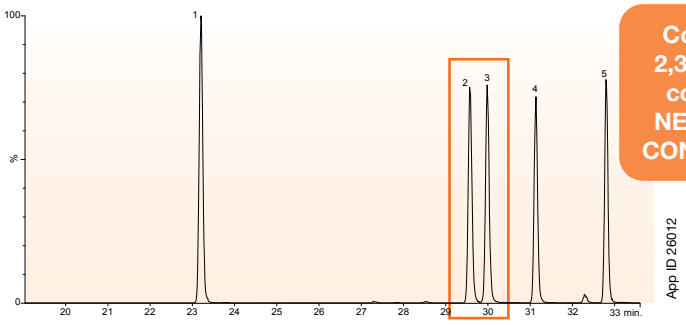
	Runtime (min)	
Sample:	ZB-Dioxin	Brand A
1,3,6,8-TCDD	25.65	23.20
1,2,3,7-TCDD	30.58	30.33
1,2,3,8-TCDD	30.75	30.55
2,3,7,8-TCDD	31.07	30.78
1,2,8,9-TCDD	32.41	32.13

TCDF on a Zebron ZB-Dioxin and a Popular Brand A

Zebron ZB-Dioxin GC Column

Part No.: 7KG-G045-10

60 meter x 0.25 mm x 0.20 µm

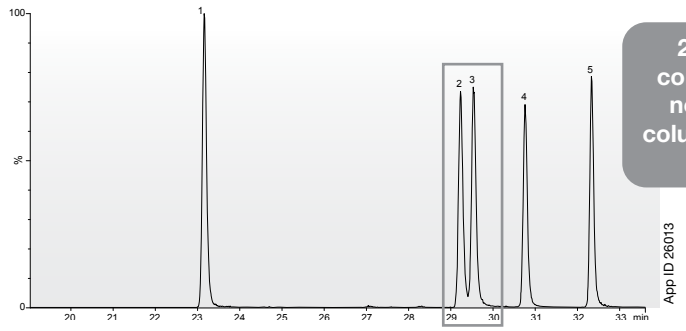


Complete resolution of 2,3,7,8-TCDF on a single column ZB-Dioxin–NO NEED FOR ADDITIONAL CONFIRMATION COLUMN

	Runtime (min)	
Sample:	ZB-Dioxin	Brand A
1,3,6,8-TCDF	23.20	23.16
1,3,4,7-TCDF	29.57	29.23
2,3,7,8-TCDF	29.98	29.53
1,2,3,9-TCDF	31.14	30.76
1,2,8,9-TCDF	32.79	32.33

Brand A Premium 5MS Phase

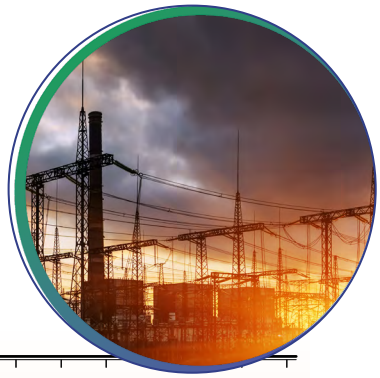
60 meter x 0.25 mm x 0.25 µm

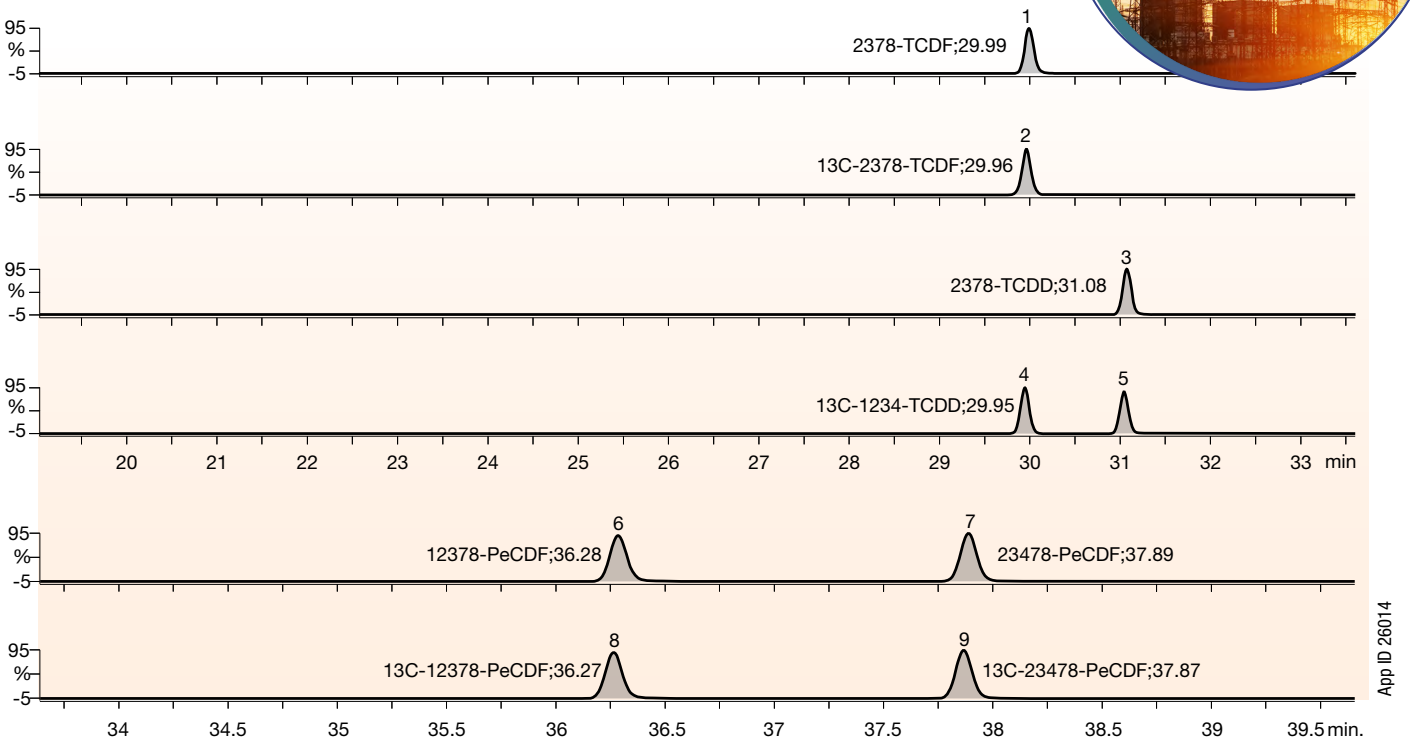


2,3,7,8-TCDF are not completely resolved and need an additional GC column to confirm isomers separation

Comparative separations may not be representative of all applications.

GC-HRMS Analysis of Tetra through Octa Dioxins and Furans on Zebron™ ZB-Dioxin GC Columns





GC-HRMS Conditions:

Column: Zebron ZB-Dioxin
Dimensions: 60 meter x 0.25 mm x 0.20 µm
Column Part No.: 7KG-G045-10
Recommended Z-Guard™: 7AG-G000-00-GZK
Injection: Pulse Splitless (2.0 min @ 60 psi) @ 280 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper
Liner Part No.: AG2-0A10-05 (for Agilent® systems)
Carrier Gas: Helium @ 1.25 mL/min (constant flow)
Oven Program: 160 °C for 2.4 min, 200 °C @ 25 °C/min, 220 °C @ 5 °C/min for 19 min, 288 °C @ 4 °C/min, 300 °C @ 5 °C/min for 7.6 min
Detector: GC-HRMS
Transfer Line Temp.: 300 °C
Solvent Delay: 2.0 min
Sample:

1. 2,3,7,8-TCDF
2. 13C-2,3,7,8-TCDF
3. 2,3,7,8-TCDD
4. 13C-1,2,3,4-TCDD
5. 13C-2,3,7,8-TCDD
6. 1,2,3,7,8-PeCDF
7. 2,3,4,7,8-PeCDF
8. 13C-1,2,3,7,8-PeCDF
9. 13C-2,3,4,7,8-PeCDF
10. 1,2,3,7,8-PeCDD
11. 13C-1,2,3,7,8-PeCDD
12. 1,2,3,7,8-PeCDF
13. 2,3,4,7,8-PeCDF
14. 13C-1,2,3,7,8-PeCDF
15. 13C-2,3,4,7,8-PeCDF
16. 1,2,3,6,7,8-HxCDF
17. 2,3,4,6,7,8-HxCDF
18. 13C-1,2,3,6,7,8-HxCDF
19. 13C-2,3,4,6,7,8-HxCDF
20. 1,2,3,6,7,8-HxCDD
21. 13C-1,2,3,6,7,8-HxCDD
22. 1,2,3,4,6,7,8-HpCDF
23. 1,2,3,4,7,8,9-HpCDF
24. 13C-1,2,3,4,6,7,8-HpCDF
25. 13C-1,2,3,4,7,8,9-HpCDF
26. ,2,3,4,6,7,8-HpCDD
27. 13C-1,2,3,4,6,7,8-HpCDD
28. OCDF
29. OCDD
30. 13C-OCDD
31. 37Cl-2,3,7,8-TCDD

The high efficiency and selectivity of ZB-Dioxin provides enhanced resolution for tetra through octa dioxin isomers on a single GC column.

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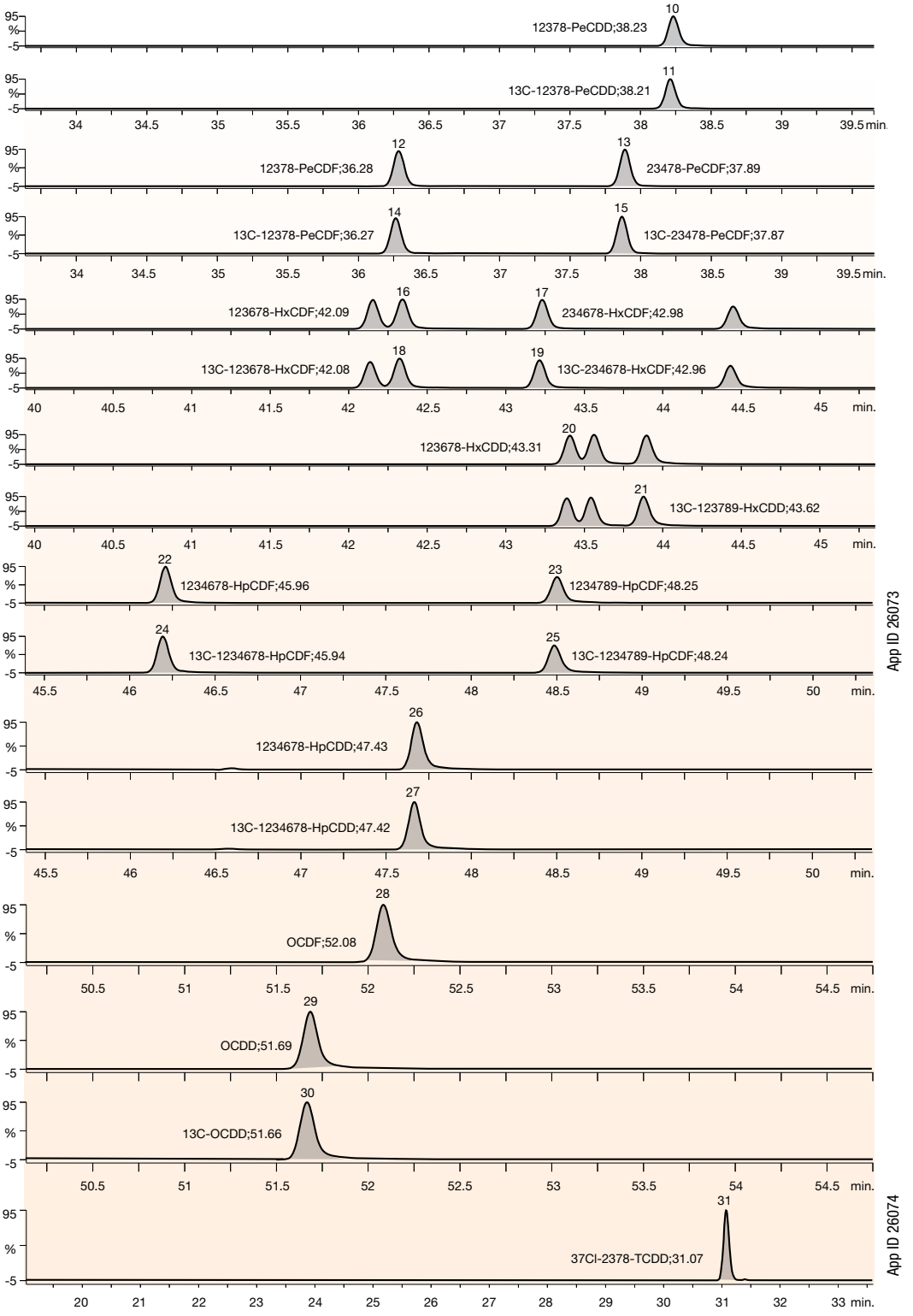
GC-HRMS Analysis of Tetra through Octa Dioxins and Furans on a Zebron™ ZB-Dioxin GC Columns (con't)



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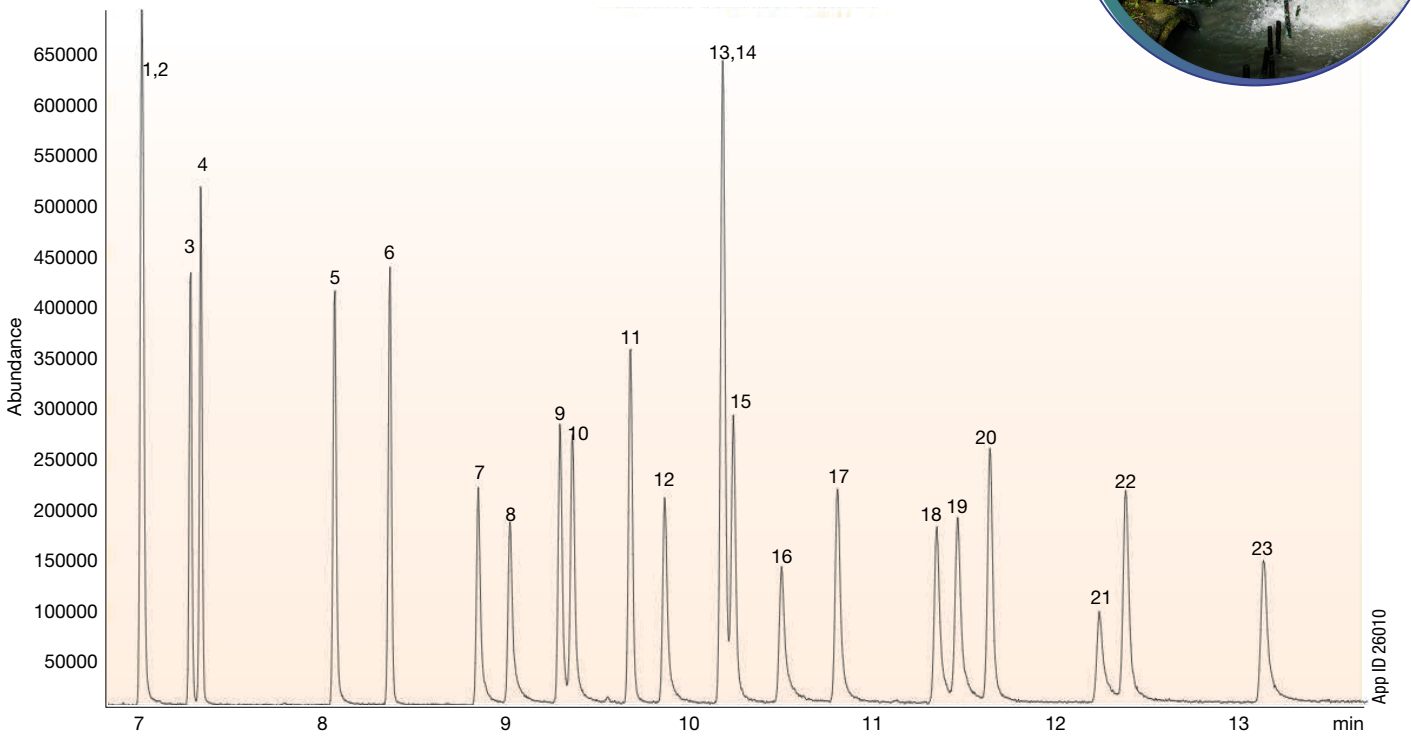
Fast Separation of PCBs using a Zebron™ ZB-Dioxin GC Column by GC-MS



GC-MS Conditions

Column: Zebron ZB-Dioxin
Dimensions: 40 meter x 0.18 mm x 0.14 µm
Column Part No.: 7PD-G045-47
Injection: Splitless for 1.0 min@ 280 °C, 1 µL
Recommended Liner: Zebron PLUS Z-Liner™ (Compatible with Agilent® & Thermo® GC instrument)
Part No: AG2-0A13-05
Carrier Gas: Helium @ 0.8 mL/min (constant flow)
Oven Program: 125 °C for 1.35 min to 250 °C @ 40.6 °C/min, to 285 °C @ 4 °C/min to 320 °C @ 15.7 °C/min for 5.1 min
Detector: GC-MS
Transfer Line Temp.: 300 °C
Mode: Scan (100-450 m/z)
Source Temp.: 230 °C
Quad Temp.: 150 °C
Solvent Delay: 2.0 min
Sample:

1. PCB 31
2. PCB 28
3. PCB 69
4. PCB 52
5. PCB 70
6. PCB 101
7. PCB 81
8. PCB 77
9. PCB 123
10. PCB 118
11. PCB 153
12. PCB 105
13. PCB 164
14. PCB 163
15. PCB 138
16. PCB 126
17. PCB 167
18. PCB 156
19. PCB 157
20. PCB 180
21. PCB 169
22. PCB 170
23. PCB 189

The ZB-Dioxin serves as a GC column selectivity that provides precise PCB analysis, offers optimal resolution of critical PCBs and provides fast analysis column dimensions for PCBs in addition to Dioxin analysis.

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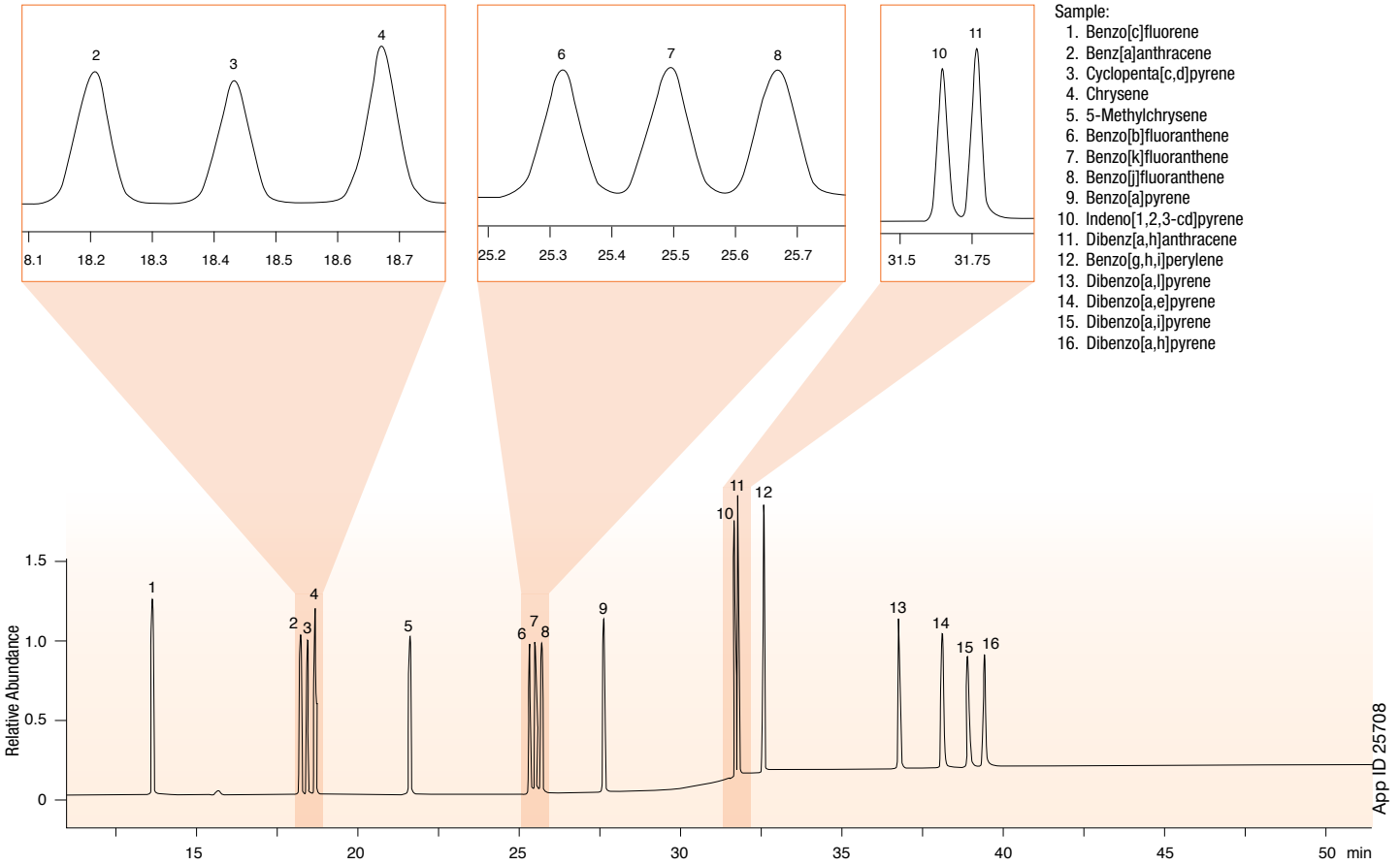
Complete Resolution of EU 15+1 and EPA 610 PAHs on a Zebron ZB-PAH-EU GC Column

Zebron™ ZB-EU-PAH GC column demonstrates excellent resolution and accurate quantitation of European regulated EU 15+1 and EPA 610 PAHs.

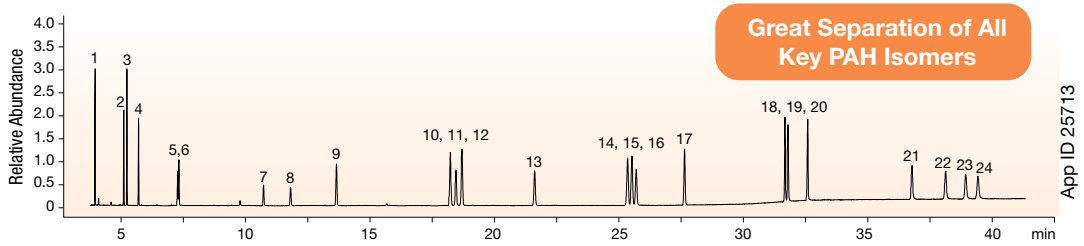
Analysis of EU 15+1 PAHs

Excellent Resolution of EU PAH Critical Pairs



Analysis of EU 15+1 and EPA 610 PAHs

Great Separation of All Key PAH Isomers



GC-MS conditions for both applications:

Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Split 5:1 @ 330 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z- Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 24 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 226 °C @ 3 °C/min for 0 min to 320 °C @ 10 °C/min for 20 min
Detector: MSD, 50-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

Sample:

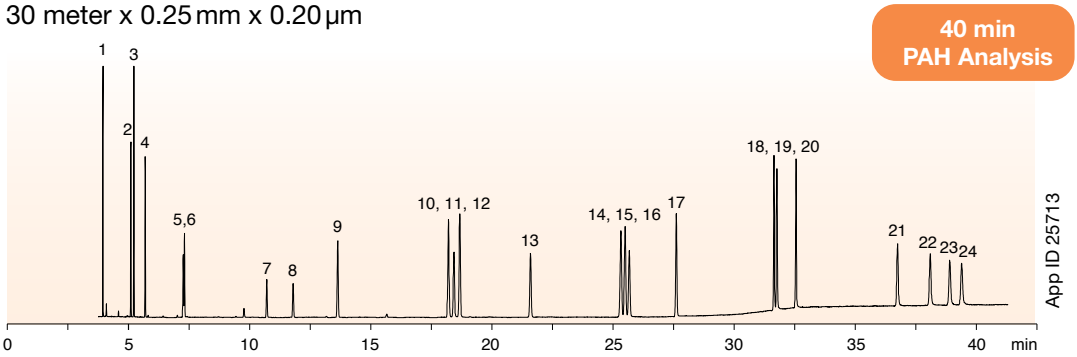
1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benzo[c]fluorene
10. Benz[a]anthracene
11. Cyclopenta[c,d]pyrene
12. Chrysene
13. 5-Methylchrysene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene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

Up to 70 % Faster PAH Analysis on a Zebron ZB-PAH-EU GC Column

Zebron™ ZB-PAH-EU will allow you to gain back your precious analysis time! You can easily optimize your column dimensions for greater speed and lab productivity.

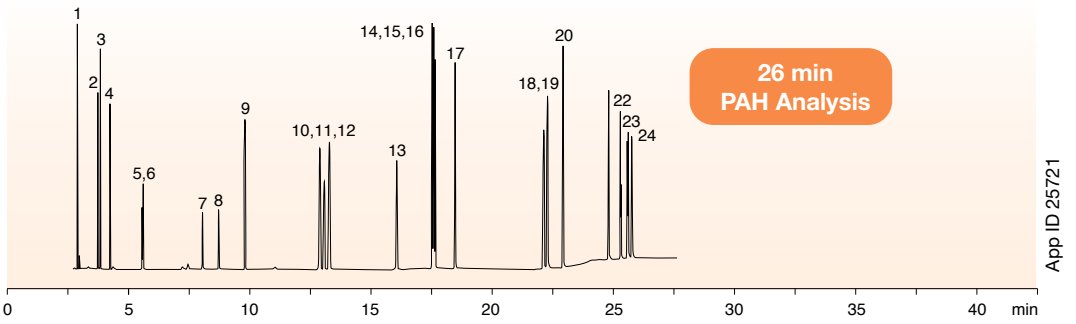
Fast Analysis of EU 15+1 and EPA 610 PAHs using Zebron ZB-PAH-EU

30 meter x 0.25 mm x 0.20 µm



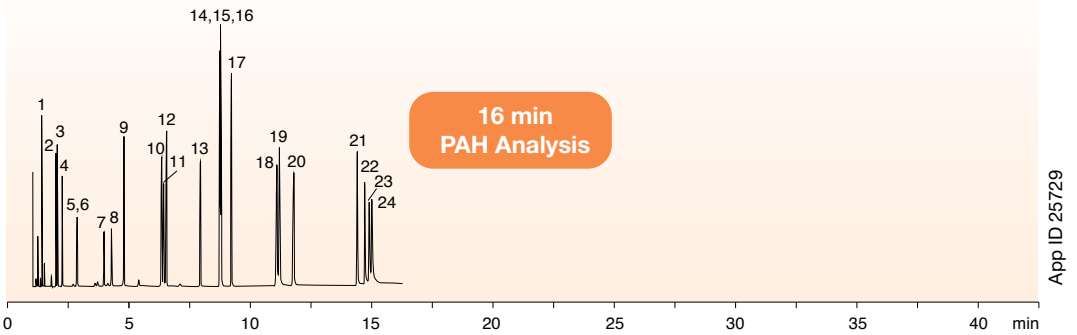
Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Split 5:1 @ 330 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 24 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 226 °C @ 3 °C/min for 0 min to 320 °C @ 10 °C/min for 20 min
Detector: MSD, 50-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

20 meter x 0.18 mm x 0.14 µm



Column: Zebron ZB-PAH-EU
Dimensions: 20 meter x 0.18 mm x 0.14 µm
Part No.: 7FD-G043-47
Injection: Split 5:1 @ 330 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner
Liner Part No.: AG2-4B13-05 (for Shimadzu 2010 GC)
Carrier Gas: Helium @ 1.75 mL/min (constant flow)
Oven Program: 70 °C for 0.8 min to 180 °C @ 70 °C/min to 230 °C @ 7 °C/min for 6 min to 280 °C @ 40 °C/min for 5 min to 335 °C @ 25 °C/min for 5 min
Detector: MSD, 100-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

10 meter x 0.10 mm x 0.08 µm

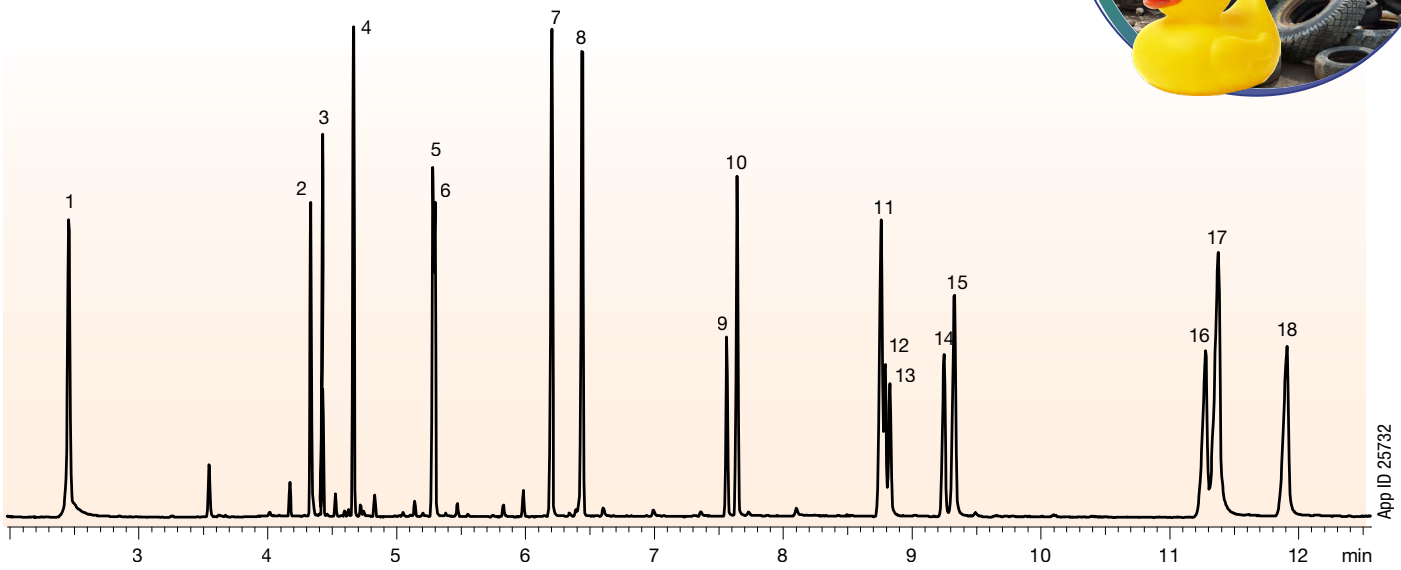


Column: Zebron ZB-PAH-EU
Dimensions: 10 meter x 0.10 mm x 0.08 µm
Part No.: 7CB-G043-59
Injection: Split 15:1 @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner
Liner Part No.: AG2-4B13-05 (for Shimadzu 2010 GC)
Carrier Gas: Helium @ 0.88 mL/min (constant flow)
Oven Program: 70 °C for 0.4 min to 180 °C @ 140 °C/min to 230 °C @ 14 °C/min for 3 min to 280 °C @ 85 °C/min for 5 min to 330 °C @ 40 °C/min for 5 min
Detector: MSD, 100-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

Sample for all applications:

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

Fast and Accurate GC-MS Analysis of PAHs in Rubber and Plastic



GC-MS Method Parameters

Column: Zebron™ ZB-PAH-EU
Dimensions: 10 meter x 0.10 mm x 0.08 µm
Part No.: 7CB-G043-59
Injection: Split (5:1) @ 320 °C, 1.0 µL
Recommended Liner: Zebron PLUS Single Taper Z- Liner™
Liner Part No.: AG2-3B03-05 (for Shimadzu® 2010 GC System)
Carrier Gas: Helium @ 0.68 mL/min (constant flow)
Oven Program: 100 °C for 3.0 min to 200 °C @ 60 °C/min to 270 °C @ 22 °C/min to 300 °C @ 4.5 °C/min to 330 °C @ 80 °C/min for 0.5 min
Detector: MDS, Scan (50-500 m/z)
Source Temp.: 300 °C
Transfer Line Temp.: 330 °C

Analyte details for 18 component PAHs analysis

Peak No	Analyte Name	Concentration (ppm)	Retention Time (min)
1	Naphthalene	20	2.50
2	Acenaphthylene	10	4.32
3	Acenaphthene	10	4.43
4	Fluorene	16	4.69
5	Phenanthrene	12	5.29
6	Anthracene	10	5.32
7	Fluoranthene	16	6.20
8	Pyrene	16	6.45
9	Benz[a]anthracene	4	7.57
10	Chrysene	8	7.65
11	Benzo[b]fluoranthene	10	8.80
12	Benzo[k]fluoranthene	5	8.83
13	Benzo[j]fluoranthene	4	8.87
14	Benzo[a]pyrene	8	9.27
15	Benzo[e]pyrene	5	9.35
16	Indeno[1,2,3-cd]pyrene	10	11.25
17	Dibenz[a,h]anthracene	16	11.35
18	Benzo[g,h,i]perylene	10	11.90

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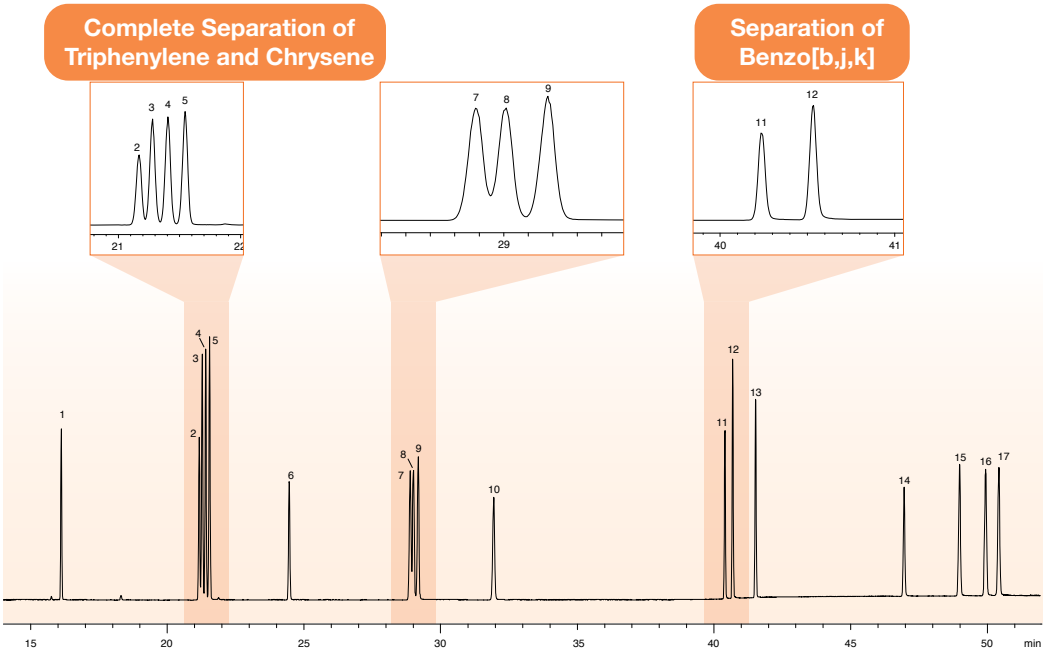
Excellent Resolution of PAHs including Chrysene and Triphenylene Using a Zebron ZB-PAH-CT-GC Column

We designed the Zebron™ ZB-PAH-CT GC column to achieve complete resolution of Chrysene from Triphenylene along with other EU 15+1 PAH compounds. Its unique selectivity helps eliminate false positives while resolving PAH isomers, providing easy, fast, and accurate quantification of PAHs in environmental and food samples.

EU 15+1 PAH Analysis Using Zebron ZB-PAH-CT GC column



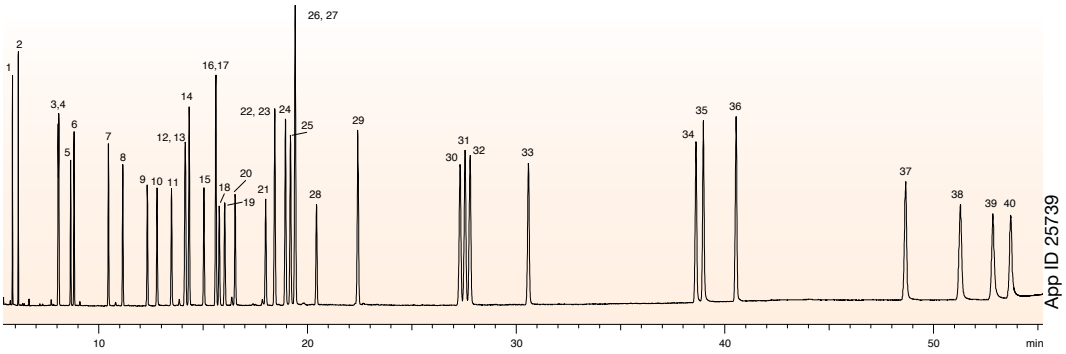
Column: Zebron ZB-PAH-CT
Dimensions: 40 meter x 0.18 mm x 0.14 µm
Part No.: 7PD-G044-47
Injection: Split 30:1 @ 320 °C, 1 µL
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Carrier Gas: Helium @ 78 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 265 °C @ 3 °C/min for 5 min to 270 °C @ 1 °C/min to 320 °C @ 10 °C/min for 15 min
Detector: MSD (Shimadzu® GC-MS-QP2010 Ultra)
Mode: SIM
SIM Ions: 216, 226, 228, 242, 252, 276, 278, 302 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C
Sample:
1. Benzo[c]fluorene
2. Cyclopenta[c,d]pyrene
3. Benz[a]anthracene
4. Triphenylene
5. Chrysene
6. 5-Methylchrysene
7. Benzo[b]fluoranthene
8. Benzo[j]fluoranthene
9. Benzo[k]fluoranthene
10. Benzo[a]pyrene
11. Indeno[1,2,3-c,d]pyrene
12. Dibenz[a,h]anthracene
13. Benzo[g,h,i]perylene
14. Dibenzo[a,l]pyrene
15. Dibenzo[a,e]pyrene
16. Dibenzo[a,i]pyrene
17. Dibenzo[a,h]pyrene

> **“The chromatography quality and performance [of Zebron GC columns] are excellent. Column bleed is minimal at 320 °C. Peak quality remains good for 5 to 6 months averaging 40 injections in a 24 hour period, 6 to 7 days per week.”**
>
> — Kevin Walkup, Specialized Assays, Inc., USA

One Column Solution for PAH, PCB, and Terphenyl Analysis!

The unique selectivity of Zebron™ ZB-PAH-EU will allow for successful separation of PAHs and polychlorinated biphenyls (PCBs) in one run, resolving false positives and inaccurate results while simplifying data processing.

PAH and PCB analysis using ZB-PAH-EU



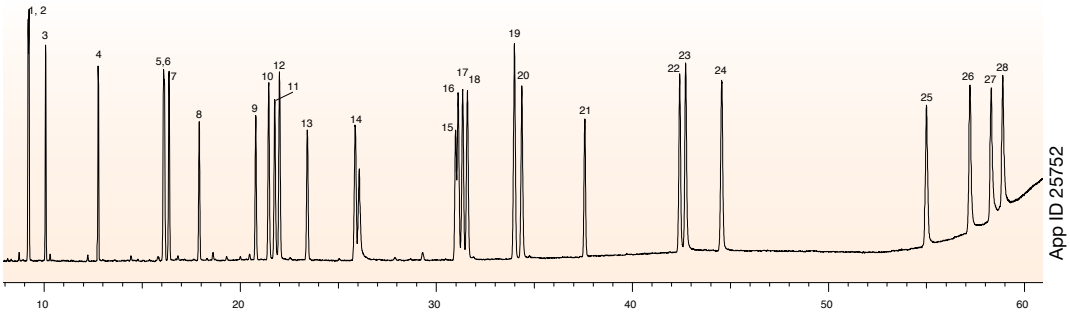
Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Splitless for 0.5 min @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 1.3 mL/min (constant flow)
Oven Program: 45 °C for 1 min to 200 °C @ 50 °C/min to 250 °C @ 3 °C/min for 5 min to 300 °C @ 3 °C/min for 10 min to 340 °C @ 5 °C/min for 0 min
Detector: MSD, 50-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

Sample:

1. TCMX
2. DCB 22
3. PCB 31
4. PCB 28
5. PCB 69
6. PCB 52
7. PCB 70
8. PCB101
9. PCB 81
10. PCB 77
11. PCB 123
12. PCB 153
13. PCB 118
14. Benzo[c]fluorene
15. PCB 105
16. PCB 164
17. PCB 163
18. PCB 138
19. PCB 126
20. PCB 167
21. PCB 156
22. PCB 180
23. PCB 157
24. Benz[a]anthracene
25. Cyclopenta[c,d]pyrene
26. PCB 169
27. Chrysene
28. PCB 170
29. 5-Methylchrysene
30. Benzo[b]fluoranthene
31. Benzo[k]fluoranthene
32. Benzo[j]fluoranthene
33. Benzo[a]pyrene
34. Indeno[1,2,3-cd]pyrene
35. Dibenz[a,h]anthracene
36. Benzo[g,h,i]perylene
37. Dibenzo[a,l]pyrene
38. Dibenzo[a,e]pyrene
39. Dibenzo[a,i]pyrene
40. Dibenzo[a,h]pyrene

Improve your lab's productivity by successfully combining separation of isomers and different compound classesin a single method using ZB-PAH-EU.

PAH, PCB, and Terphenyl analysis using ZB-PAH-EU



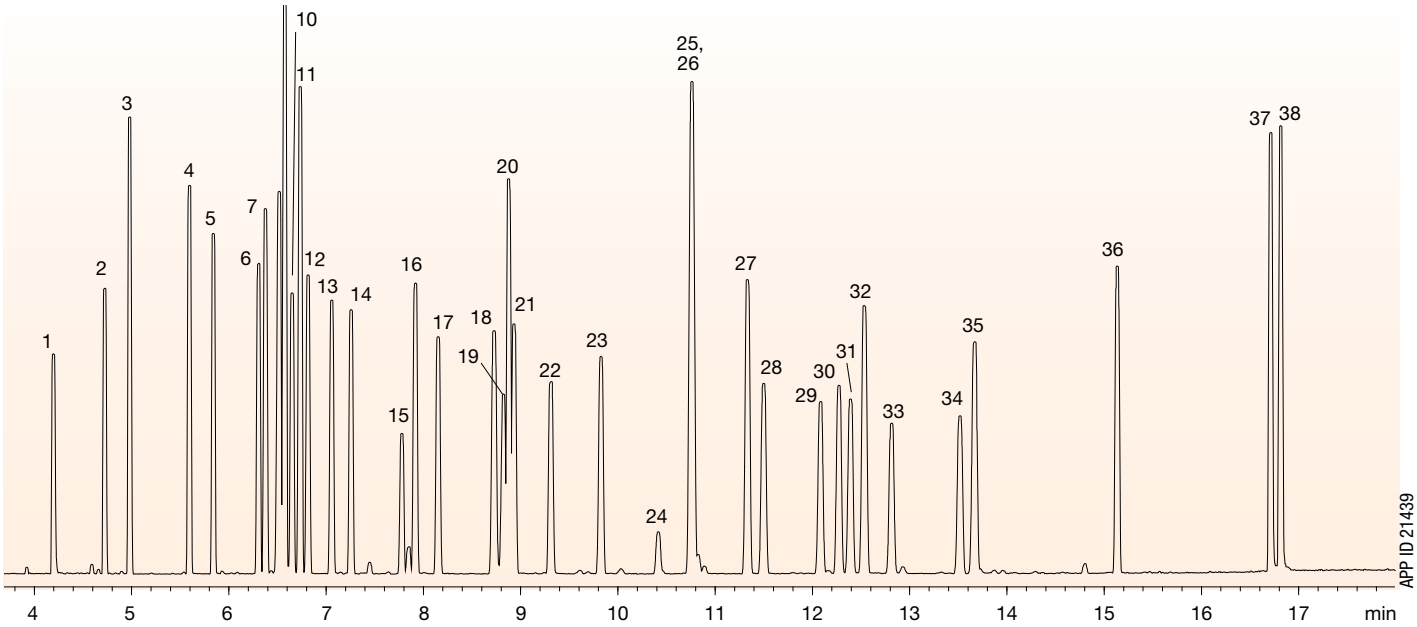
Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Split 2:1 @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner
Liner Part No.: AG2-4B13-05 (for Shimadzu 2010 GC)
Carrier Gas: Helium @ 72.8 kPa (constant pressure)
Oven Program: 45 °C for 1 min to 200 °C @ 50 °C/min to 250 °C @ 3 °C/min for 5 min to 300 °C @ 3 °C/min for 10 min to 340 °C @ 5 °C/min for 0 min
Detector: MSD, 100-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

Sample:

1. PCB 31
2. PCB 28
3. PCB-52
4. PCB 101
5. PCB 153
6. PCB118
7. Benzo[c]fluorene
8. PCB138
8. PCB180
10. [a]anthracene
11. [c,d]pyrene
12. Chrysene
13. Trichlorotriphenyl
14. 5-Methylchrysene
15. Tetrachloroterphenyl
16. Benzo[b]fluoranthene
17. Benzo[k]fluoranthene
18. Benzo[j]fluoranthene
19. Benzo[e]pyrene
20. Benzo[a]pyrene
21. Pentachloroterphenyl
22. Indeno[1,2,3-cd]pyrene
23. Dibenz[a,h]anthracene
24. Benzo[g,h,i]perylene
25. Dibenzo[a,l]pyrene
26. Dibenzo[a,e]pyrene
27. Dibenzo[a,i]pyrene
28. Dibenzo[a,h]pyrene

Organochlorine Pesticides by GC-MS

Testing Pesticides or Herbicides?
See the full pesticide solution guide at www.phenomenex.com/PesticidesGC



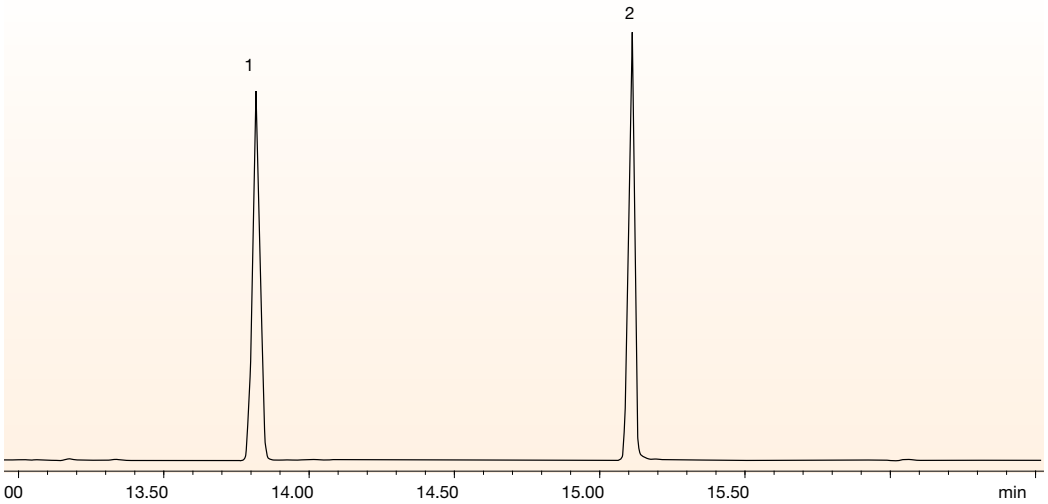
Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part Number: 7HG-G027-11
Injection: Pulsed Splitless 1 µL @ 260 ˚C @ 30 psi for 0.55 min
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal)

Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 80 °C for 0.75 min to 190 °C @ 35 °C/min to 240 °C @ 5 °C/min to 300 °C @ 20 °C/min for 2 min
Detector: MSD @ 320 °C; 30-450 amu

Sample:

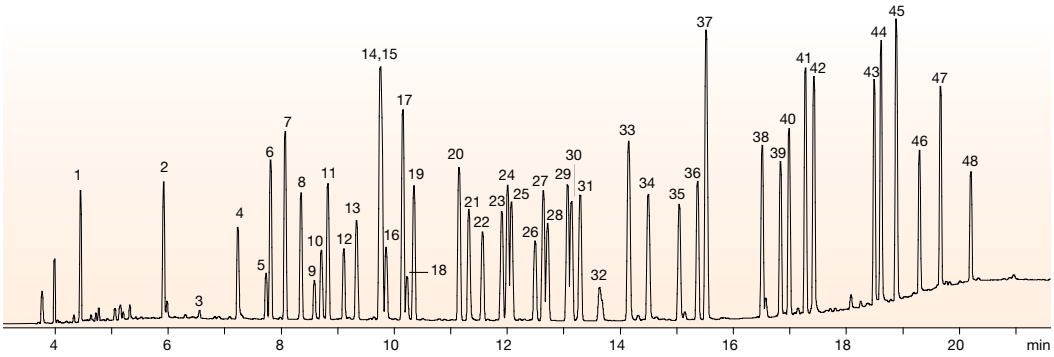
1. Hexachlorocyclopentadiene
2. Etridiazole
3. Chloroneb
4. Propachlor
5. Trifluralin
6. alpha-BHC
7. Hexachlorobenzene
8. Simazine
9. Atrazine
10. gamma-BHC
11. Pentachloronitrobenzene
12. beta-BHC
13. Chlorothalonil
14. delta-BHC
15. Metribuzin
16. Alachlor
17. Heptachlor
18. Metolachlor
19. Cyanazine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

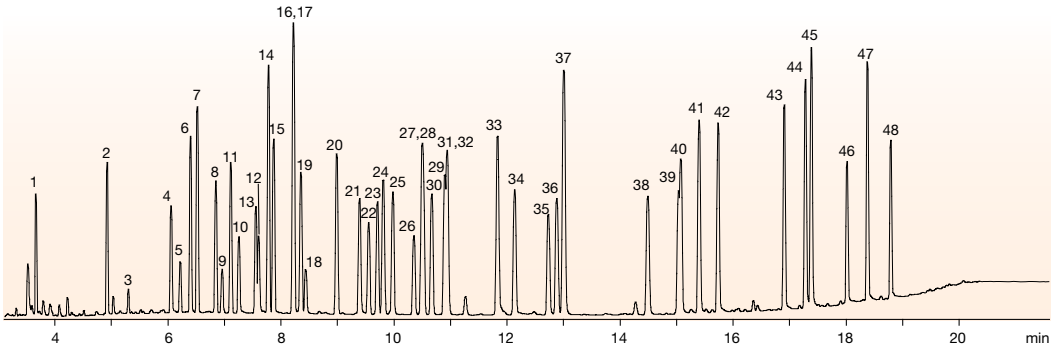
Endothall Analysis on a Zebron ZB-Semivolatiles GC Column



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
Sample: 1. Acenaphthene-d10
2. Endothall (derivatized)
Note: Pulsed splitless injection @ 30 psi for 0.55 min

Determination of Organophosphorus Pesticides





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: On-column @ 103 °C, 1 µL
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

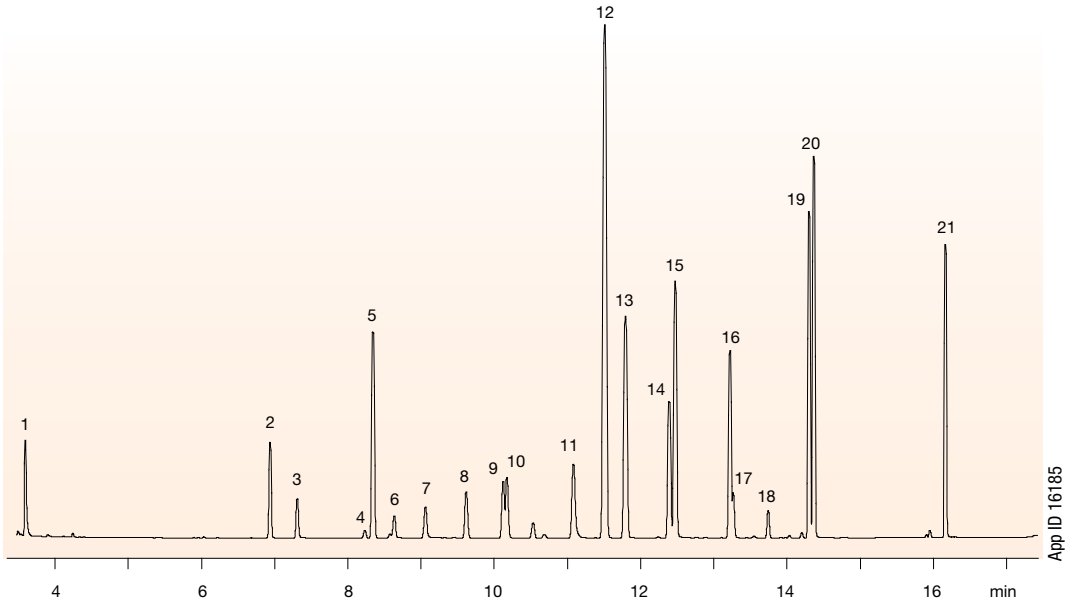
Sample:

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

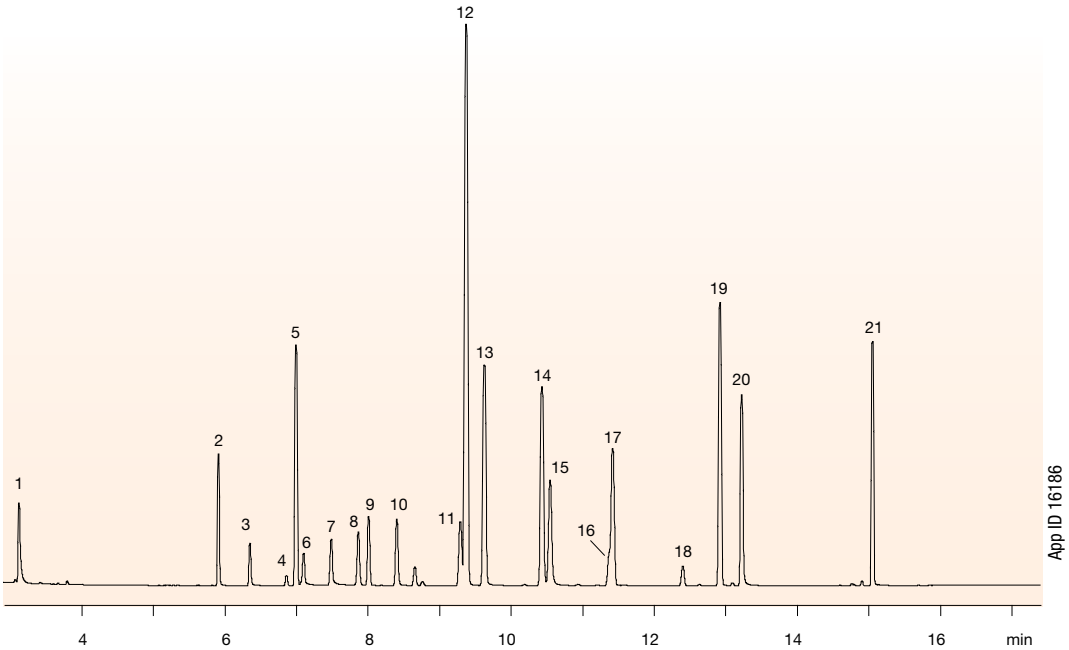
Notes: Analytes at 2 ppm in dichloromethane. Columns connected using a 5 m Z-Guard™ and a Y-splitter

Chlorophenoxy Acid Herbicides

ZB-MultiResidue-1



ZB-MultiResidue-2



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 @ 2.5 mL/min (constant flow)

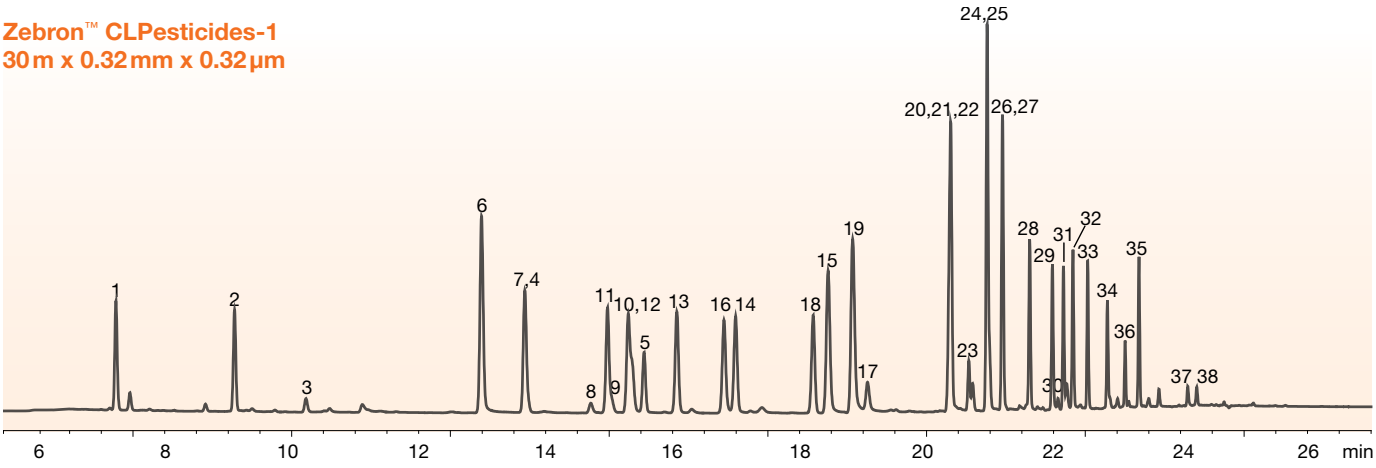
Oven Program: 50 °C for 1 min to 180 °C @ 35 °C/min for 2 min to 205 °C @ 5 °C/min to 320 °C

Detector: ECD @ 350 °C

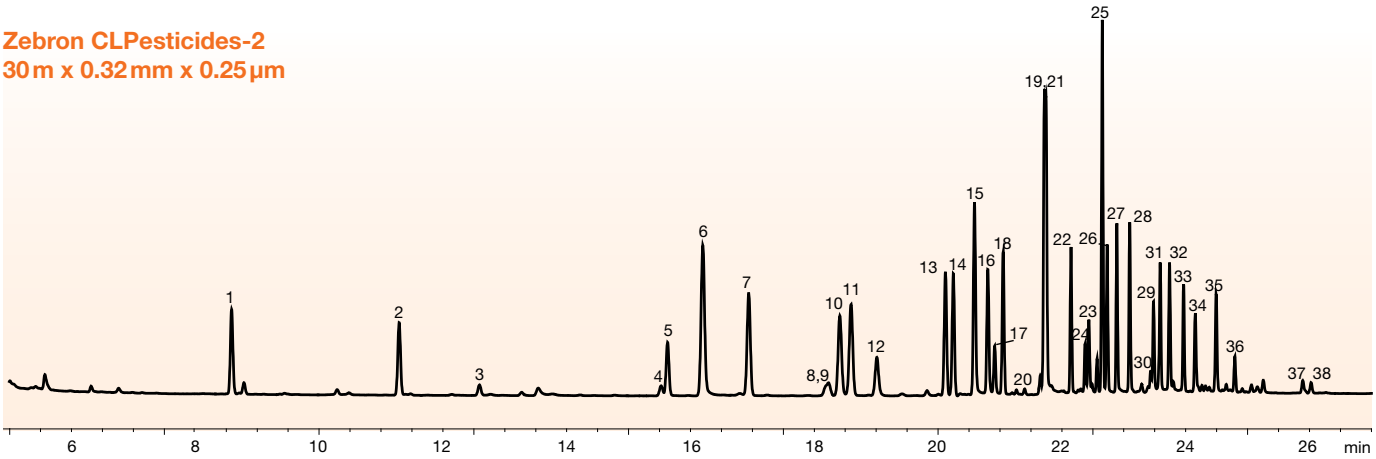
Sample:
1. Dalapon
2. 3,5-Dichlorobenzoic acid
3. 4-Nitrophenol
4. DCAA (surr)
5. Dicamba
6. MCPP
7. MCPA
8. Dichloroprop
9. Contaminant
10. 2,4-D
11. Pentachlorophenol
12. DBOB (IS)
13. Silvex
14. Chloramben
15. 2,4,5-T
16. Dinoseb
17. 2,4-DB
18. Bentazon
19. Picloram
20. DCPA
21. Acifluorfen

Chlorinated Pesticides, Herbicides & Organohalides

Zebron™ CLPesticides-1
30 m x 0.32 mm x 0.32 µm



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



Conditions for all columns:

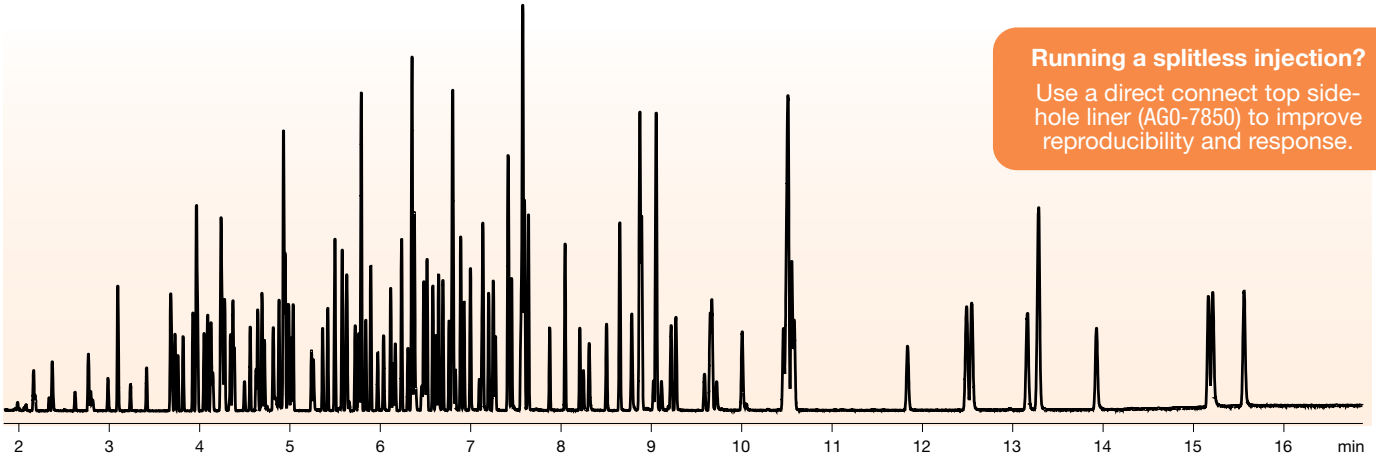
Columns: see above
Dimensions: see above
Part Number: 7HM-G028-51 (ZB-CLPesticides-1)
7HM-G029-11 (ZB-CLPesticides-2)
Y-Connector: AG0-4717 (Borosilicate Glass)
Recommended Z-Guard™: 7AM-G000-00-GZ0 (5 m)
Injection: Splitless (hold 0.75 min) @ 250 °C, 2 µL
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Septum: AG0-4696 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seal™)
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
Sample: Analytes are various concentrations in ethyl acetate.

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

** Internal Standard

Peak No.	Analyte	Concentration (ng/mL)
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

Determination of Semivolatile Organic Compounds



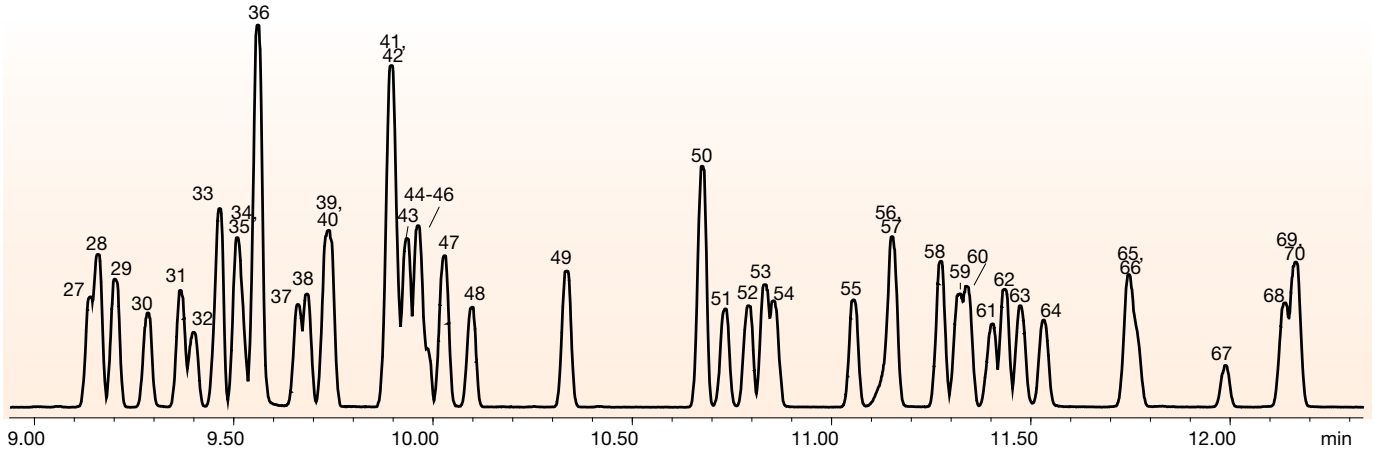
Running a splitless injection?
Use a direct connect top side-hole liner (AG0-7850) to improve reproducibility and response.

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
Liner: AG0-8499 (Single Taper with Wool)
Septum: AG0-4697 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Easy Seals™ Inlet Base Seal)
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
Sample: Analytes are 25 ppm in Dichloromethane

Analytes:

1. 1,4-Dioxane-d8
2. 1,4-Dioxane
3. NNitrosodimethylamine
4. Pyridine
5. 2-Picoline
6. NNitrosomethylethylamine
7. Methyl methanesulfonate
8. 2-Fluorophenol
9. N-Nitrosodiethylamine
10. Ethyl methanesulfonate
11. Phenol-d5
12. Phenol
13. Aniline
14. bis(2-Chloroethyl)ether
15. 2-Chlorophenol
16. 1,3-Dichlorobenzene
17. 1,4-Dichlorobenzene-D4
18. 1,4-Dichlorobenzene
19. Benzyl alcohol
20. 1,2-Dichlorobenzene
21. 2-Methylphenol
22. bis(2-Chloro-1-methylethyl)ether
23. 3-Methylphenol
24. 4-Methylphenol
25. N-Nitrosopyrrolidine
26. N-Nitrosodi-npropylamine
27. Acetophenone
28. N-Nitrosomorpholine
29. o-Toluidine
30. Hexachloroethane
31. Nitrobenzene-d5
32. Nitrobenzene
33. N-Nitrosopiperidine
34. Isophorone
35. 2-Nitrophenol
36. 2,4-Dimethylphenol
37. Benzoic acid
38. ,0,0Triethylphosphorothioate
39. bis(2-Chloroethoxy)methane
40. 2,4-Dichlorophenol
41. alpha,alpha-Dimethylphenethylamine
42. 1,2,4-Trichlorobenzene
43. Naphthalene-d8
44. Naphthalene
45. 4-Chloroaniline
46. 2,6-Dichlorophenol
47. Hexachloropropene
48. Hexachlorobutadiene
49. N-Nitrosodi-nbutylamine
50. p-Phenylenediamine
51. 4-Chloro-3-methylphenol
52. Isosafrole
53. 2-Methylnaphthalene
54. 1-Methylnaphthalene
55. Hexachlorocyclopentadiene
56. 1,2,4,5-Tetrachlorobenzene
57. 2,4,6-Trichlorophenol
58. 2,4,5-Trichlorophenol
59. 2-Fluorobiphenyl
60. Safrole
61. 2-Chloronaphthalene
62. 2-Nitroaniline
63. 1,4-Naphthoquinone
64. Dimethyl phthalate
65. 1,3-Dinitrobenzene
66. 2,6-Dinitrotoluene
67. Acenaphthylene
68. 3-Nitroaniline
69. Acenaphthene-d10
70. 2,4-Dinitrophenol
71. Acenaphthene
72. 4-Nitrophenol
73. Pentachlorobenzene
74. 2,4-Dinitrotoluene
75. Dibenzofuran
76. 1-Naphthylamine
77. 2,3,4,6-Tetrachlorophenol
78. 2-Naphthylamine
79. Diethyl phthalate
80. Thionazin
81. 4-Chlorodiphenyl ether
82. Fluorene
83. 4-Nitroaniline
84. 2-Methyl-4,6-dinitrophenol
85. Diphenylamine
86. Azobenzene
87. 2,4,6-Tribromophenol
88. 1,3,5-Trinitrobenzene
89. Di-allate 90. Phorate
91. Phenacetin
92. 4-Bromophenyl phenyl ether
93. Hexachlorobenzene
94. Dimethoate
95. 4-Aminobiphenyl
96. Pentachloronitrobenzene
97. Pentachlorophenol
98. Pronamide
99. Dinoseb
100. Disulfoton
101. Phenanthrene-d10
102. Phenanthrene
103. Anthracene
104. Methyl parathion
105. Di-n-butyl phthalate
106. Parathion
107. 4-Nitroquinoline-1-oxide
108. Methapyrilene
109. Isodrin
110. Fluoranthene
111. Benzidine
112. Pyrene-d10
113. Pyrene
114. Aramite
115. p-Terphenyl-d14
116. p-Dimethylaminoazobenzene
117. Chlorobenzilate
118. o-Tolidine
119. Butyl benzyl phthalate
120. Kepone
121. 2-Acetylaminofluorene
122. 3,3'-Dichlorobenzidine
123. Benz[a]anthracene
124. Chrysene-d12
125. Chrysene
126. bis(2-Ethylhexyl)phthalate
127. Dioctyl phthalate
128. Benzo[b]fluoranthene
129. Benzo[k]fluoranthene
130. Benzo[a]pyrene
131. Perylene-d12
132. 3-Methylcholanthrene
133. Indeno[1,2,3-cd]pyrene
134. Dibenz[a,h]anthracene
135. Benzo[g,h,i]perylene

Determination of Semivolatiles in Drinking Water

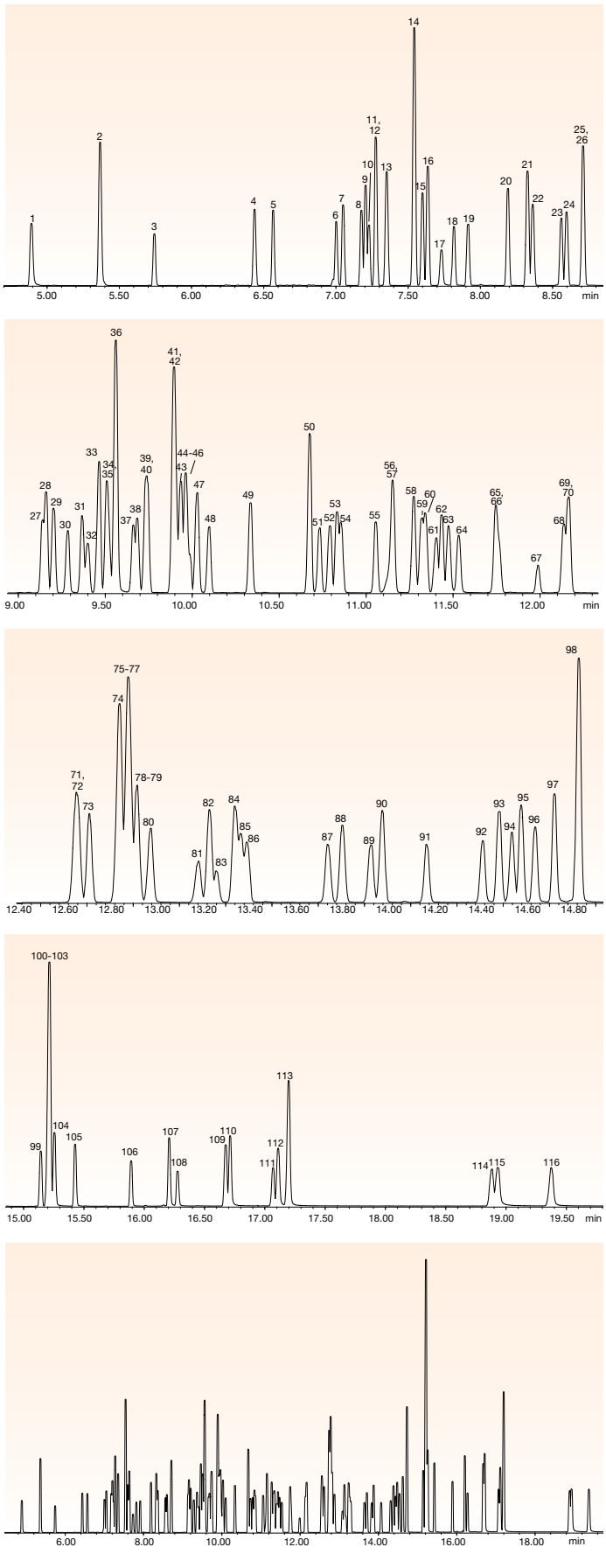


Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part Number: 7HG-G027-11
Injection: Pulsed Splitless 1 µL @ 260 ˚C
Liner: AG0-8499 (Single Taper with Wool)
Septum: AG0-4697 (PhenoRed™- 400)
Inlet Seal: AG0-8620 (Easy Seals™ Inlet Base Seal)
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 60 °C for 0.75 min to 180 °C @ 20 °C/min to 250 °C @ 10 °C/min to 310 °C @ 25 °C/min for 5 min
Detector: MSD @ 320 °C; 30-440 amu

Sample:

1. Isophorone
2. 1,3-Dimethyl-2-nitrobenzene(surrogate)
3. Dichlorvos(DDVP)
4. Hexachlorocyclopentadiene
5. EPTC(Eptam)
6. Mevinphos(Phosdrin)
7. Butylate
8. Vernolate
9. Dimethylphthalate
10. Etridiazole
11. 2,6-Dinitrotoluene
12. Pebulate(Tillam)
13. Acenaphthylene
14. Acenaphthene-d10 (internal standard)
15. Chloroneb
16. BZ#1
17. Tebuthiuron
18. 2,4-Dinitrotoluene
19. Molinate
20. Diethylphthalate
21. Fluorene
22. Propachlor
23. Ethoprop(Ethoprophos)
24. Cycloate
25. Trifluralin
26. Chlorpropham
27. alpha-BHC
28. BZ#5
29. Hexachlorobenzene
30. Atraton
31. Prometon
32. Simazine
33. Atrazine
34. beta-BHC
35. Propazine
36. Pentachlorophenol
37. gamma-BHC
38. Terbufos(Terbuphos)
39. Pronamide(Propyzamide)
40. Diazinon
41. Phenanthrene-d10 (internal standard)
42. Chlorthalonil
43. Phenanthrene
44. Disulfoton
45. Methylparaoxon
46. Terbacil
47. Anthracene
48. delta-BHC
49. BZ#29
50. Alachlor
51. Simetryn
52. Ametryn
53. Prometryn
54. Heptachor
55. Terbutryn
56. Bromacil
57. Dibutylphthalate
58. BZ#47
59. Metolachlor
60. Chloropyrifos
61. Cyanazine
62. Dacthal(DCPA)
63. Aldrin
64. Triadimefon
65. Diphenamide
66. MGK-264
67. MGK-264(isomer)
68. Heptachlorepoxide
69. Merphos
70. BZ#98
71. trans-Chlordane
72. Tetrachlorvinphos
73. Butachlor
74. Pyrened10
75. Pyrene
76. cis-Chlordane
77. Endosulfanl
78. Fenamiphos
79. trans-Nonachlor
80. Napropamide
81. Tricyclazole
82. DDE
83. DEF
84. BZ#154
85. Dieldrin
86. Carboxin
87. Endrin
88. Chlorobenzilate
89. EndosulfanII
90. DDD
91. Endrinaldehyde
92. Norflurazon
93. Benzylbutylphthalate
94. Endosulfansulfate
95. DDT(Chlorophenothane)
96. Hexazinone
97. bis(2-Ethylhexyl)adipate
98. Triphenylphosphate (DisflamollTP, surrogate)
99. BZ#171
100. Benz[a]anthracene
101. BZ#200
102. Methoxychlor
103. Chrysene-d12 (internal standard)
104. Chrysene
105. Bis(2-ethylhexyl)phthalate
106. Fenarimol
107. cis-Permethrin
108. trans-Permethrin
109. Benzo[b]fluoranthene
110. Benzo[k]fluoranthene
111. Fluridone
112. Benzo[a]pyrene
113. Perylene-d12 (internal standard)
114. Indeno[1,2,3-cd]pyrene
115. Dibenz[a,h]anthracene
116. Benzo[g,h,i]perylene

SEMIVOLATILE ORGANIC COMPOUNDS



Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part Number: 7HG-G027-11
Injection: Pulsed Splitless 1 µL @ 260 ˚C
Liner: AG0-8499 (Single Taper with Wool)
Septum: AG0-4697 (PhenoRed™- 400)
Inlet Seal: AG0-8620 (Easy Seals™ Inlet Base Seal)
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 60 °C for 0.75 min to 180 °C @ 20 °C/min to 250 °C @ 10 °C/min to 310 °C @ 25 °C/min for 5 min
Detector: MSD @ 320 °C; 30-440 amu

Sample:

1. Isophorone
2. 1,3-Dimethyl-2-nitrobenzene(surrogate)
3. Dichlorvos(DDVP)
4. Hexachlorocyclopentadiene
5. EPTC(Eptam)
6. Mevinphos(Phosdrin)
7. Butylate
8. Vernolate
9. Dimethylphthalate
10. Etridiazole
11. 2,6-Dinitrotoluene
12. Pebulate(Tillam)
13. Acenaphthylene
14. Acenaphthene-d10 (internal standard)
15. Chloroneb
16. BZ#1
17. Tebuthiuron
18. 2,4-Dinitrotoluene
19. Molinate
20. Diethylphthalate
21. Fluorene
22. Propachlor
23. Ethoprop(Ethoprophos)
24. Cycloate
25. Trifluralin
26. Chlorpropham
27. alpha-BHC
28. BZ#5
29. Hexachlorobenzene
30. Atraton
31. Prometon
32. Simazine
33. Atrazine
34. beta-BHC
35. Propazine
36. Pentachlorophenol
37. gamma-BHC
38. Terbufos(Terbuphos)
39. Pronamide(Propyzamide)
40. Diazinon
41. Phenanthrene-d10 (internal standard)
42. Chlorthalonil
43. Phenanthrene
44. Disulfoton
45. Methylparaoxon
46. Terbacil
47. Anthracene
48. delta-BHC
49. BZ#29
50. Alachlor
51. Simetryn
52. Ametryn
53. Prometryn
54. Heptachor
55. Terbutryn
56. Bromacil
57. Dibutylphthalate
58. BZ#47
59. Metolachlor
60. Chloropyrifos
61. Cyanazine
62. Dacthal(DCPA)
63. Aldrin
64. Triadimefon
65. Diphenamide
66. MGK-264
67. MGK-264(isomer)
68. Heptachlorepoxide
69. Merphos
70. BZ#98
71. trans-Chlordane
72. Tetrachlorvinphos
73. Butachlor
74. Pyrened10
75. Pyrene
76. cis-Chlordane
77. EndosulfanI
78. Fenamiphos
79. trans-Nonachlor
80. Napropamide
81. Tricyclazole
82. DDE
83. DEF
84. BZ#154
85. Dieldrin
86. Carboxin
87. Endrin
88. Chlorobenzilate
89. EndosulfanII
90. DDD
91. Endrinaldehyde
92. Norflurazon
93. Benzylbutylphthalate
94. Endosulfansulfate
95. DDT(Chlorophenothane)
96. Hexazinone
97. bis(2-Ethylhexyl)adipate
98. Triphenylphosphate (DisflamollTP, surrogate)
99. BZ#171
100. Benz[a]anthracene
101. BZ#200
102. Methoxychlor
103. Chrysene-d12 (internal standard)
104. Chrysene
105. Bis(2-ethylhexyl)phthalate
106. Fenarimol
107. cis-Permethrin
108. trans-Permethrin
109. Benzo[b]fluoranthene
110. Benzo[k]fluoranthene
111. Fluridone
112. Benzo[a]pyrene
113. Perylene-d12 (internal standard)
114. Indeno[1,2,3-cd]pyrene
115. Dibenz[a,h]anthracene
116. Benzo[g,h,i]perylene

COLUMN SELECTION BY METHOD

Zebron™ GC Columns

EPA offices and laboratories, and outside organizations, have developed approved methods for measuring the concentration of a substance or pollutant.

In supporting regulatory analyses, Phenomenex offers a wide array analytical columns. Here is a selection of GC columns by EPA method.

Drinking Water

Method #	Description	Primary Column	Confirmation Column
501.3	Trihalomethanes by GC-MS with Selected Ion Monitoring (SIM)	ZB-624, ZB-624*PLUS*™	
502.2	Volatile Halogenated Organics by Purge & Trap GC/PID/ELCD	ZB-624, ZB-624*PLUS*	
503.1	Volatile Aromatics and Unsaturated Organics by Purge & Trap GC	ZB-624, ZB-624*PLUS*	
504.1	1,2-Dibromoethane (EDB), 1,2-Dibromo-3-chloropropane (DBCP), and 1,2,3-Trichloropropane (123TCP) by GC	ZB-CLPesticides-1 ZB-MultiResidue™-1	ZB-CLPesticides-2 ZB-MultiResidue-2
505	Organohalide Pesticides & Aroclors by GC-ECD	ZB-CLPesticides-1 ZB-MultiResidue-1	ZB-CLPesticides-2 ZB-MultiResidue-2
507	Nitrogen & Phosphorus Containing Pesticides by GC/NPD	ZB-MultiResidue-1 ZB-CLPesticides-2	ZB-MultiResidue-2 ZB-CLPesticides-2
508	Chlorinated Pesticides by GC-ECD	ZB-CLPesticides-1 ZB-MultiResidue-1	ZB-CLPesticides-2 ZB-MultiResidue-2
509	Ethylene Thiourea (ETU) by GC/NPD	ZB-WAX*PLUS*™	ZB-1701
513	2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin by GC/HRMS	ZB-SemiVolatiles	
515.3	Chlorinated Acids by Liquid-Liquid Extraction, Derivatization and GC-ECD	ZB-XLB	ZB-35
521	Nitrosamines by Solid Phase Extraction (SPE) and GC-MS/MS with Large Volume Injection	ZB-SemiVolatiles	
522	1,4-Dioxane by Solid Phase Extraction (SPE) and GC-MS with Selected Ion Monitoring (SIM)	ZB-SemiVolatiles	
523	Triazine Pesticides and their Degradates by GC-MS	ZB-50	
524.3	Purgeable Organic Compounds by GC-MS	ZB-624, ZB-624*PLUS*	
525.2	Semi-volatile Organic Chemicals by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles	
526	Selected Semi-volatile Organic Compounds by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles	
527	Selected Pesticides and Flame Retardants by Solid Phase Extraction (SPE) and GC-MS	ZB-5*PLUS*™	
528	Phenols by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles	ZB-35
529	Explosives and Related Compounds by Solid Phase Extraction (SPE) and GC-MS	ZB-5*PLUS*™	
548	Endothall by Aqueous Derivatization, Liquid-Solid Extraction, and GC-ECD	ZB-SemiVolatiles	ZB-35
551.1	Chlorinated Solvents & Disinfection Byproducts by Liquid-Liquid Extraction and GC-ECD	ZB-35	
552.3	Haloacetic Acids and Dalapon by Liquid-Liquid Extraction, Derivatization, and GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35
556	Carbonyl Compounds by Pentafluorobenzylhydroxylamine Derivatization and GC-ECD	ZB-SemiVolatiles	ZB-1701

Wastewater

Method #	Description	Primary Column	Confirmation Column
601	Purgeable Halocarbons by Purge & Trap GC	ZB-624, ZB-624*PLUS*	
602	Purgeable Aromatics by Purge & Trap GC	ZB-624, ZB-624*PLUS*	
603	Acrolein & Acrylonitrile Purge & Trap GC	ZB-624, ZB-624*PLUS*	
604	Phenols by GC-ECD	ZB-SemiVolatiles	
606	Phthalate Esters by GC-ECD	ZB-5*PLUS*™	
607	Nitrosamines by GC/NPD	ZB-SemiVolatiles	
608	Organochlorine Pesticides and PCBs by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2
609	Nitroaromatics & Isophorone by GC-FID and GC-ECD	ZB-SemiVolatiles	
610	Polynuclear Aromatic Hydrocarbons by GC-FID	ZB-PAH-EU ZB-PAH-CT	
611	Haloethers by GC-ECD	ZB-SemiVolatiles	ZB-SemiVolatiles
612	Chlorinated Hydrocarbons by GC-ECD	ZB-SemiVolatiles	
613	2,3,7,8-Tetrachlorodibenzo-p-dioxin by GC-MS	ZB-SemiVolatiles	
615	Chlorinated Herbicides by GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35
619	Triazine Herbicides by GC-MS	ZB-50	
622	Organophosphorus Pesticides by GC-MS	ZB-MultiResidue-1	
624	Purgeable Volatiles by Purge & Trap GC-MS	ZB-624	
625	Base/Neutral and Acids by GC-MS	ZB-SemiVolatiles	
1613	Tetra- through Octa-Chlorinated Dioxins & Furans by Isotope Dilution HRGC/HRMS	ZB-Dioxin	ZB-SemiVolatiles
1614	Polybrominated Diphenyl Esters (PBDEs) by HRGC/HRMS	ZB-5HT Inferno™ ZB-SemiVolatiles	
1618	Organohalide Pesticides, Organophosphorus Pesticides, and Phenoxy-Acid Herbicides by GC	ZB-MultiResidue-1	ZB-MultiResidue-2
1624	Volatile Organic Compounds by Isotope Dilution GC-MS	ZB-624, ZB-624*PLUS*	
1625	Semi-volatile Organic Compounds by Isotope Dilution GC-MS	ZB-SemiVolatiles	
1653	Chlorinated Phenols by In-Situ Acetylation and GC-MS	ZB-SemiVolatiles	
1657	Organophosphorous Pesticides by GC/FPD	ZB-MultiResidue-1	ZB-MultiResidue-2
1658	Phenoxy-Acid Herbicides by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2
1659	Dazomet by GC/NPD	ZB-MultiResidue-1	ZB-MultiResidue-2
1666	Pharmaceutical Volatile Organic Compounds by Purge & Trap GC or Isotope Dilution GC-MS	ZB-SemiVolatiles (Direct Injection) ZB-624 (Purge & Trap), ZB-624*PLUS*	
1668	Polychlorinated Biphenyl (PCB) Congeners by HRGC/HRMS	ZB-MultiResidue-1	ZB-1
1671	Pharmaceutical Manufacturing Volatile Organic Compounds by GC-FID	ZB-1, ZB-624*PLUS*	
7850	White Phosphorus (P4) by Solvent Extraction and GC/NPD	ZB-1	

COLUMN SELECTION BY METHOD

Zebron™ GC Columns

Solid Waste

Method #	Description	Primary Column	Confirmation Column
8010B	Halogenated Volatile Organics by GC/ELCD	ZB-624, ZB-624*PLUS*™	
8015C	Nonhalogenated Organics by GC	ZB-5HT	
8020A	Aromatic Volatile Organics by GC/PID	ZB-WAX, ZB-WAX*PLUS*™	
8021B	Aromatic and Halogenated Volatiles by GC/PID or GC/ELCD	ZB-624, ZB-624*PLUS*	ZB-1 (thick film stationary phase)
8030A	Acrolein and Acrylonitrile by GC-FID	ZB-624, ZB-624*PLUS*	
8032A	Acrylamide by GC-ECD	ZB-5HT Inferno™	
8041	Phenols by GC-ECD or GC-FID	ZB-SemiVolatiles	
8061A	Phthalate Esters by GC-ECD	ZB-SemiVolatiles	ZB-1701
8081B	Organochlorine Pesticides by GC-ECD	ZB-MultiResidue™-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2
8082A	Polychlorinated Biphenyls (PCBs) by GC-ECD	ZB-MultiResidue-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2
8091	Nitroaromatics and Cyclic Ketones by GC-ECD or GC/NPD	ZB-SemiVolatiles	ZB-1701
8095	Explosives by GC-ECD	ZB-50	
8100	Polynuclear Aromatic Hydrocarbons by GC-FID	ZB-SemiVolatiles, ZB-35	
8121	Chlorinated Hydrocarbons by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2
8131	Aniline and Selected Derivatives by GC/NPD	ZB-SemiVolatiles	ZB-1
8141B	Organophosphorus Pesticides by GC/FPD or GC/NPD	ZB-MultiResidue-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2
8151A	Chlorinated Herbicides by GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35
8260B	Volatile Organic Compounds by GC-MS	ZB-624, ZB-624*PLUS*	
8270D	Semi-volatile Organic Compounds by GC-MS	ZB-SemiVolatiles	
8272	Polynuclear Aromatic Hydrocarbons (PAHs) by SPME and GC-MS with Selected Ion Monitoring (SIM)	ZB-SemiVolatiles, ZB-35	
8280B	Polychlorinated Dibenzo-P-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) By HRGC/LRMS	ZB-SemiVolatiles, ZB-Dioxin	
8290A	Polychlorinated Dibenzo-P-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) By HRGC/HRMS	ZB-SemiVolatiles, ZB-Dioxin	
8410	Semi-Volatile Organic Compounds by GC/FTIR	ZB-SemiVolatiles	
8430	Bis(2-chloroethyl) Ether and Hydrolysis Products by Direct Aqueous Injection GC/FT-IR	ZB-WAX*PLUS*	

Air

Method #	Description	Primary Column
TO-1	Volatile Organic Compounds by Thermal Adsorption and GC-MS	ZB-1*PLUS*™, ZB-624, ZB-624*PLUS*
TO-2	Volatile Organic Compounds by Carbon Molecular Sieve Adsorption and GC-MS	ZB-1*PLUS*, ZB-624, ZB-624*PLUS*
TO-3	Volatile Organic Compounds by Cryogenic Preconcentration Techniques and GC-FID /ECD	ZB-1*PLUS*, ZB-624, ZB-624*PLUS*
TO-4A	Pesticides and Polychlorinated Biphenyls (PCBs) by High Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1
TO-7	N-Nitrosodimethylamine by GC-MS	ZB-WAX*PLUS*
TO-9A	Polychlorinated, Polybrominated, and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans by HRGC/HRMS	ZB-SemiVolatiles, ZB-5MS
TO-10A	Pesticides and Polychlorinated Biphenyls (PCBs) by Low Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1
TO-13A	Polycyclic Aromatic Hydrocarbons (PAHs) by GC-MS	ZB-SemiVolatiles, ZB-PAH-EU, ZB-PAH-CT
TO-14A	Volatile Organic Compounds by Specially Prepared Canisters and GC	ZB-1*PLUS*
TO-15	Volatile Organic Compounds by Specially Prepared Canisters and GC-MS	ZB-1*PLUS*, ZB-624*PLUS*

Zebron™ GC Columns

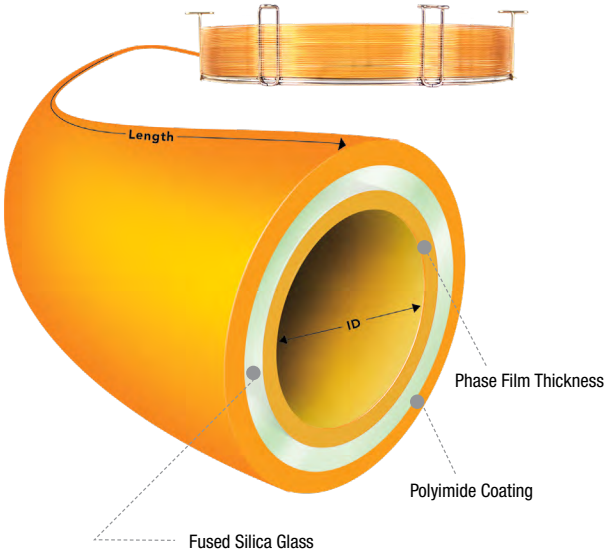
GC Solutions for Quality Analysis

Quality GC analysis requires selectivities that are able to resolve complex compounds with high resolution and proper retention time for quantification and qualitation of critical compounds.

Zebron GC columns provide:

- Excellent sensitivity
- High reproducibility and stability
- Low bleed
- Long lifetime
- Optimized resolution of critical pairs

Zebron GC columns are well suited to work with all types of GC detectors.



Explore all GC Solutions

Zebron GC Columns

Check the full portfolio of GC columns to fit your needs.

Inlet Liners

Enhanced the analysis of dirty samples, samples with wide boiling points, or samples with wide molecular weights with Zebron PLUS liner/quartz wool.

GC Management

Avoid costly repairs and downtime. Protect your equipment using gas management tools. Enhance your analysis, and extend the life of your columns.

Visit www.phenomenex.com/GC
to see all GC products

24/7 Chat

Have questions or need support with your GC analysis?
Chat live at any time with our analytical experts.

www.phenomenex.com/Chat

ORDERING INFORMATION

Zebron™ ZB-Dioxin GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
40-Meter			
0.18	0.14	40 to 320/340	7PD-G045-47
60-Meter			
0.25	0.20	40 to 320/340	7KG-G045-10
60-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.20	40 to 320/340	7KG-G045-10-GGA

Zebron ZB-PAH-EU GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.08	40 to 340/360	7CB-G043-59
20-Meter			
0.18	0.14	40 to 340/360	7FD-G043-47
30-Meter			
0.25	0.20	40 to 340/360	7HG-G043-10
60-Meter			
0.25	0.20	40 to 340/360	7KG-G043-10

Zebron ZB-PAH-CT GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
20-Meter			
0.18	0.14	40 to 320/340	7FD-G044-47
30-Meter			
0.25	0.20	40 to 320/340	7HG-G044-10
40-Meter			
0.18	0.14	40 to 320/340	7PD-G044-47

ZB-CLPesticides GC Columns

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

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

Zebron ZB-MultiResidue GC Columns

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

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™ Gas Management Filters

Part No.	Description	Unit
AG6-1010	Gas Filter Oxygen	ea
AG6-1020	Gas Filter Moisture	ea
AG6-1030	Gas Filter Hydrocarbon	ea
AG6-1040	Gas Filter Universal	ea
AG6-1070	Gas Filter Universal (Helium specific)	ea
AG6-1050	Gas Filter Hydrocarbon/moisture for LC-MS	2/pk
AG6-1060	Ring nut for Gas Filter	ea

Zebron Gas Management Traps

Part No.	Description	Unit
AG6-3110	Click-On Oxygen Trap	ea
AG6-3120	Click-On Moisture Trap	ea
AG6-3130	Click-On Hydrocarbon Trap	ea
AG6-3140	Click-On Universal Trap	ea
AG6-3150	Click-On Carbon Dioxide Trap	ea

Zebron Connecting Units

Part No.	Description	Unit
AG6-2101	1-position Connecting Unit ¼ in. Brass	ea
AG6-2102	2-position Connecting Unit ¼ in. Brass	ea
AG6-2103	4-position Connecting Unit ¼ in. Brass	ea
AG6-2201	1-position Connecting Unit ⅛ in. Brass	ea
AG6-2202	2-position Connecting Unit ⅛ in. Brass	ea
AG6-2203	4-position Connecting Unit ⅛ in. Brass	ea
AG6-2204	High flow 2-position connecting unit for LC-MS	ea
AG6-2205	Particle Filter for LC-MS	ea
AG6-2206	O-ring replacement for gas filter baseplate	20/pk
AG6-2301	1-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2302	2-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2303	4-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2304	1-position Connecting Unit ⅛ in. Stainless Steel	ea
AG6-2305	2-position Connecting Unit ⅛ in. Stainless Steel	ea
AG6-2306	4-position Connecting Unit ⅛ in. Stainless Steel	ea

Column Installs This End

Liners for Agilent® Technologies (HP) GC Systems (GC Model No. 5880/5890/6890/7890)

Description	Benefits / Uses	Dimensions ID x L x OD (mm)	Units	Similar to Mfr. No.**		Part No.	Unit
Split / Splitless, FocusLiner™ Single Taper with wool	General use or dirty samples	4 x 78.5 x 6.3	ea 5/pk 25/pk	5183-4711 5183-4712 5183-4713	20994 20995 20996	– AG0-4680 AG0-7514	 5/pk 25/pk
Splitless, Single Taper Liner with wool	Large injection, trace analysis	4 x 78.5 x 6.3	5/pk 25/pk	5183-4693 5183-4694		AG0-8499 AG0-9170	5/pk 25/pk
Split / Splitless Liner with wool	Large injection, trace analysis	4 x 78.5 x 6.3	5/pk 25/pk	5183-4691 5183-4692		AG0-8653 AG0-8654	5/pk 25/pk
Single Taper Direct Connect with Side Hole (top)	Great recovery and linearity for trace analysis of active compounds	4 x 78.5 x 6.3	ea 5/pk 25/pk	G1544	21054 21055 20998	– AG0-7850 –	 5/pk

Liners for Shimadzu® GC Systems (GC Model No. 17A, 17B, 2010,2014)

Description	Benefits / Uses	Dimensions ID x L x OD (mm)	Units	Similar to Mfr. No.**	Part No.	Unit
Split/Splitless Single Taper / Gooseneck Tapered FocusLiner with wool	Great recovery and linearity for trace analysis of active compounds	3.4 x 95 x 5	–	092068	AG0-4683	5/pk
Splitless Straight Liner	Small injection, trace analysis	2.6 x 95 x 5	–	–	AG0-4667	5/pk

Note: Large injection ≥ 2 µL. Small injection ≤ 2 µL ** Similar to but not always an exact equivalent to the original manufacturer's product.

Zebron™
GC Columns

GC Application Guide

Persistent Organic Pollutants (POPs)

Phenomenex products are available worldwide. For the distributor in your country/region, contact Phenomenex USA, International Department at international@phenomenex.com

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