Fast Separation of Chlorinated Pesticides Using Zebron™ GC Columns

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- *Fast analysis of chlorinated pesticides in under 10 minutes results in shorter cycle times and improved productivity*
- *Baseline separation of all analytes using Zebron ZB-MultiResidue™-1 and -2 columns provides greater confidence in identification*

Introduction

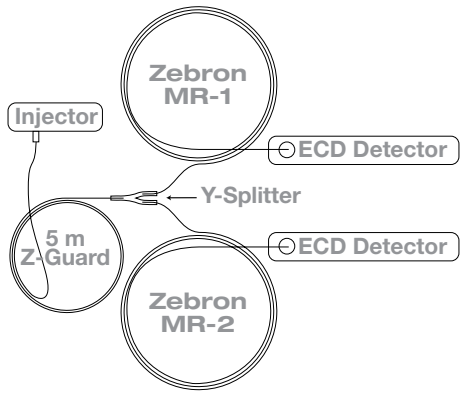
Pesticides are classes of chemicals that are used to treat or control outbreaks of pests, especially insects. Food production as well as safety and health organizations heavily rely on pesticides to increase food yields and / or control disease outbreak spread by insects. Some pesticides have proven hazardous to other animals or the environment and have either been restricted or banned. The need to monitor products, especially foods, for pesticides is essential as more pesticides are being discovered to have adverse effects.

One class of commonly used pesticides is chlorinated pesticides. These compounds are commonly detected using EPA Method 8081. This method determines the concentrations of various organochlorine pesticides in extracts from solid and liquid matrices, including food products, using gas chromatography with electron capture detectors (ECD). The following applications provide two options for analyzing chlorinated pesticides by EPA Method 8081. Two different sets of columns are shown that provide separation of all analytes while still keeping retention times less than ten minutes to allow for faster cycle times and higher lab throughput.

Methods

If a compound is identified using a single column, the compounds presence should be confirmed on a second column. Simultaneous identification and verification can be performed using a dual-column configuration as shown in **Figure 1**. Further experimental conditions are shown with each application.

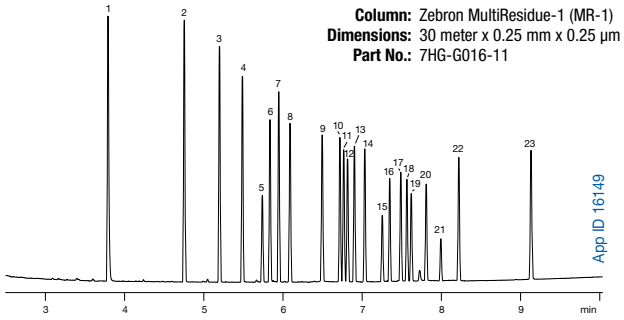
Figure 1.
Example of a Dual-Column Configuration.

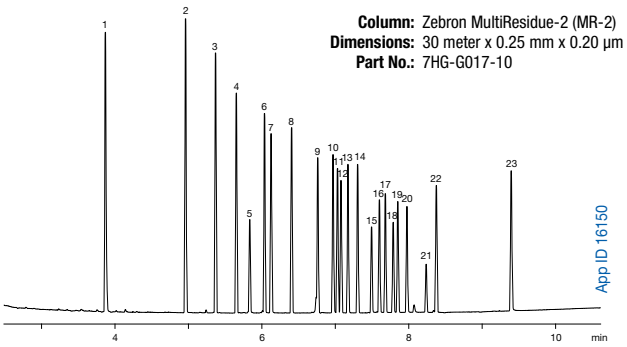


Discussion

Figure 2 shows a dual-column separation using Zebron Multi-Residue-1 and -2 columns. Each chromatogram shows complete resolution of all 20 analytes that are typically analyzed within EPA Method 8081 with run times less than 10 minutes. The chromatogram also includes surrogates to ensure that they don't co-elute with analytes. The two main advantages of using a Zebron Multi-residue-1 and -2 for these analyses are that all compounds have baseline resolution as well as the very short retention times. The improved resolution allows for more robust methods. The faster retention times result in short cycle times and increased lab productivity.

Figure 2.
Dual-Column Analysis of Chlorinated Pesticides using Zebron MultiResidue-1 and -2 Columns.



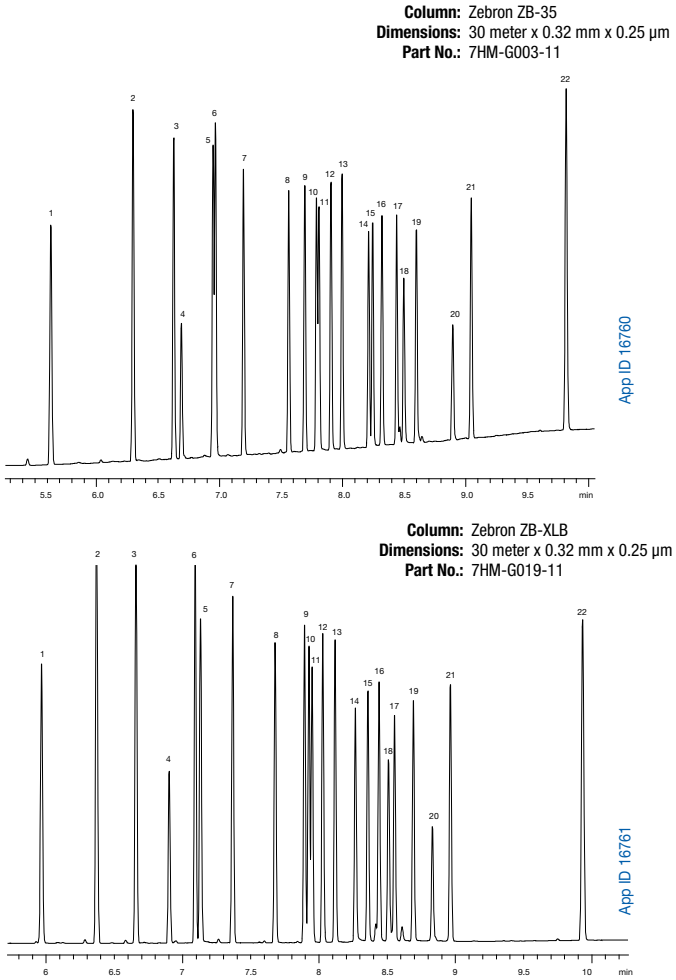


Conditions the same except where noted:
Injection: Splitless @ 250 °C, 1 µL
Carrier Gas: Helium @ 2.7 mL/min (constant flow)
Oven Program: 90 °C for 0.5 min to 200 °C at 35 °C/min to 340 °C at 25 °C/min for 1.5 min
Detector: Electron Capture (ECD) @ 350 °C
Sample:

1 TCMX (Surr)
2 1-Bromo-2-nitrobenzene (IS)
3 a-BHC
4 g-BHC (Lindane)
5 b-BHC
6 d-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 4,4'-DDD
17 Endosulfan II
18 Endrin aldehyde
19 4,4'-DDT
20 Endosulfan sulfate
21 Methoxychlor
22 Endrin ketone
23 Decachlorobiphenyl (Surr)

Figure 3 shows separation of the same chlorinated pesticides using an alternative set of Zebron™ ZB-35 and ZB-XLB columns. These two chromatograms also show separation of all analytes and surrogates in under ten minutes. The short run time again shows advantages of shorter cycle times as well as increased lab productivity

Figure 3.
Dual-Column Analysis of Chlorinated Pesticides using Zebron ZB-35 and ZB-XLB Columns.



Conditions the same except where noted:

Injection: Splitless @ 250 °C, 1 µL
Carrier Gas: Helium @ 2.6 mL/min (constant flow)
Oven Program: 110 °C for 0.5 min to 190 °C @ 18 °C/min to 330 °C @ 35 °C/min for 2 min
Detector: Electron Capture (ECD) @ 335 °C
Sample:

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

Conclusions

In this application note, two column pairs were exhibited for organochlorine pesticide analysis. The Zebron ZB-XLB and ZB-35 are traditionally used for this analysis but the Zebron ZB-MultiResidue-1 and -2 pair show additional benefits of improved resolution. Both pairs were tested using a dual-column analysis technique that provides separation of all compounds in less than ten minutes. Very short run times for all columns tested allow for fast cycle times resulting in improved productivity for environmental labs under production deadlines. The Zebron ZB-MultiResidue columns also offer improved baseline resolution of all compounds. This could result in more consistent quantitation and greater method robustness by minimizing the possibility of misidentified peaks and removing quantitation complications due to closely eluting peaks.

APPLICATIONS

Ordering Information

Zebron ZB-35 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	50 to 340/360	7EG-G003-11
0.25	0.50	50 to 340/360	7EG-G003-17
0.53	1.00	50 to 340/360	7EK-G003-22
30-Meter			
0.25	0.25	50 to 340/360	7HG-G003-11
0.25	0.50	50 to 340/360	7HG-G003-17
0.32	0.25	50 to 340/360	7HM-G003-11
0.53	0.50	50 to 340/360	7HK-G003-17
0.53	1.00	50 to 340/360	7HK-G003-22
60-Meter			
0.25	0.25	50 to 340/360	7KG-G003-11
0.32	0.25	50 to 340/360	7KM-G003-11

ZB-35 Test Mix Part No.: AG0-5156

Zebron ZB-XLB GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	30 to 340/360	7EG-G019-11
20-Meter			
0.18	0.18	30 to 340/360	7FD-G019-08
30-Meter			
0.25	0.25	30 to 340/360	7HG-G019-11
0.25	0.50	30 to 340/360	7HG-G019-17
0.32	0.25	30 to 340/360	7HM-G019-11
0.32	0.50	30 to 340/360	7HM-G019-17
0.53	1.50	30 to 320/340	7HK-G019-28
60-Meter			
0.25	0.25	30 to 340/360	7KG-G019-11

ZB-XLB Test Mix Part No.: AG0-7578

Zebron ZB-MultiResidue™ GC Columns (MR-1)

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

Zebron ZB-MultiResidue™ GC Columns (MR-2)

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

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

APPLICATIONS

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