Fast and High Throughput GC Analysis of Pesticides

Technical Overview

Introduction

Using large volume injection and rapid mass spectroscopy with an Agilent Rapid-MS column reduces the length of the analysis by up to five times when compared to traditional approaches. Fast analysis also increases sensitivity and lowers detection limits. In addition, the MS creates a near vacuum inside the column that greatly reduces compound decomposition. It also leads to lower column bleed, which delivers improved signal to noise ratios. Using large volume injection methods with a Rapid-MS column creates a powerful analytical tool that delivers fast analysis of many pesticides at very low detection levels.

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The pesticide column incorporates a pre-column restrictor in front of an Agilent 0.53 mm ID FactorFour column. Combining a restrictor with the vacuum produced by the MS lets the column run at very high carrier gas velocities with no adverse consequences on the efficiency or resolution of the column.

In a typical analysis, the fast MS method reduces analysis duration by four or five times in comparison to the usual technique that employs a 30 m x 0.25 mm column. The high-speed performance of the Rapid-MS column is demonstrated in the analysis of a mixture of pesticides. PCB180, the last compound of interest, elutes in less than 12 minutes.

Conditions

Column:	VF Rapid-MS pesticide column (part number CP8138) with a 2.5 m x 0.53 mm retention gap
Injection Volume:	50 µL large volume injection (LVI)
Sample Concentration:	0.8 ppb of pesticide and PCB standards
Injection Speed:	5 µL/s
Liner:	Carbofrit liner
Column Oven:	40 °C (3.00 min) → 20 °C/min → 250 °C (0 min)
Injector Type:	1079
Injector Temperature:	65 °C (0.50 min) → 200 °C/min → 350 °C (5 min)
Detection:	Agilent 240-MS

Time	Split Ratio
Initial	1:25
0.45 m	Off
2.10 m	1:50

Table 1. Peak Identification

Peak	RT	Peak Name
1	4.99	hexachlorobutadiene
2	6.96	penatchlorobenzene
3	7.93	hexachlorobenzene
4	8.30	a-HCH
5	8.67	b-HCH
6	8.88	c-HCH
7	8.90	PCB28
8	8.98	heptachlor
9	9.02	d-HCH
10	9.20	PCB52
11	9.22	aldrin
12	9.51	telodrin
13	9.55	isodrin
14	9.94	o,p′-DDE
15	9.95	cis-heptachlor epoxide
16	9.98	PCB101
17	9.99	trans-heptachlor epoxide
18	10.28	p,p′-DDE
19	10.28	alfa-endosulfan
20	10.46	o,p′-DDD
21	10.62	o,p′-DDT
22	10.52	dieldrin
23	10.59	PCB118
24	10.71	endrin
25	10.73	PCB138
26	10.87	p,p′-DDD
27	10.97	beta-endosulfan
28	10.98	PCB153
29	11.06	p,p′-DDT
30	11.54	PCB180

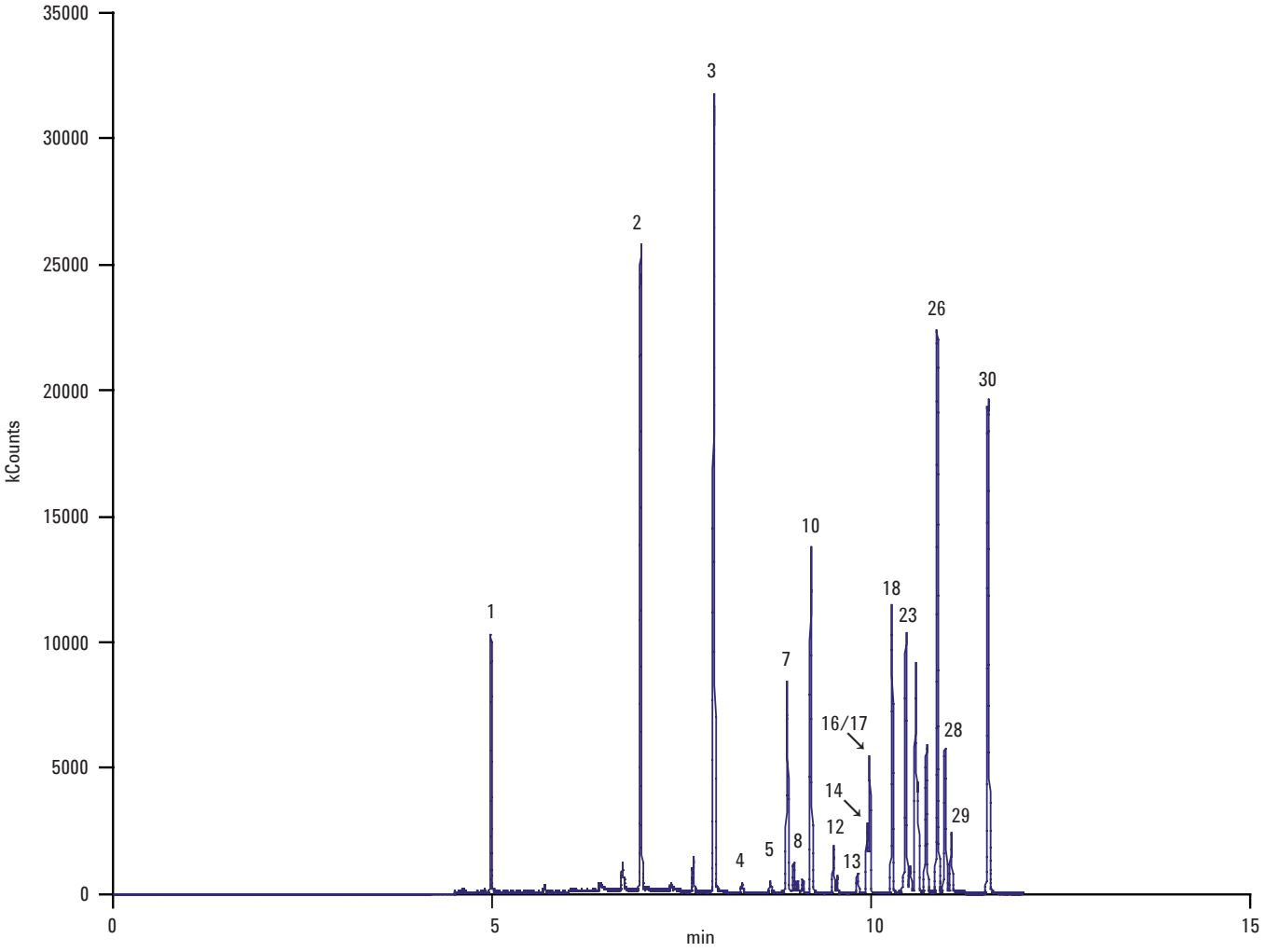

Figure 1. Chromatogram to demonstrate how Rapid-MS and large volume injection techniques combine fast analysis with extremely low detection levels

Combining large volume injection, an Agilent Rapid-MS column and the Agilent 240-MS deliver fast analysis of pesticides at very low levels of detection. The 240-MS offers a range of advanced ionization and scanning techniques to enhance selectivity and limits of detection. MS/MS and MSn reduce matrix influences and provide more detailed structural information. Positive or negative chemical ionization delivers advantages in compound confirmation and enhanced selectivity.

The Agilent MS Workstation controls the 240-MS with a full complement of productivity, reporting and regulatory compliance tools.

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