Boost Productivity with Simultaneous PAH and PCB GC-MS Analysis

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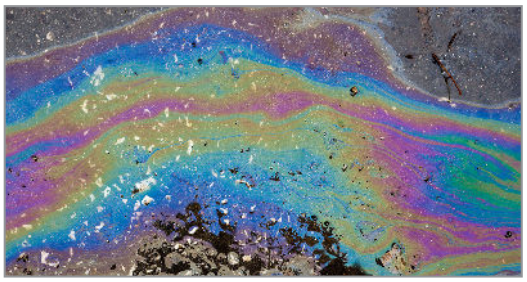
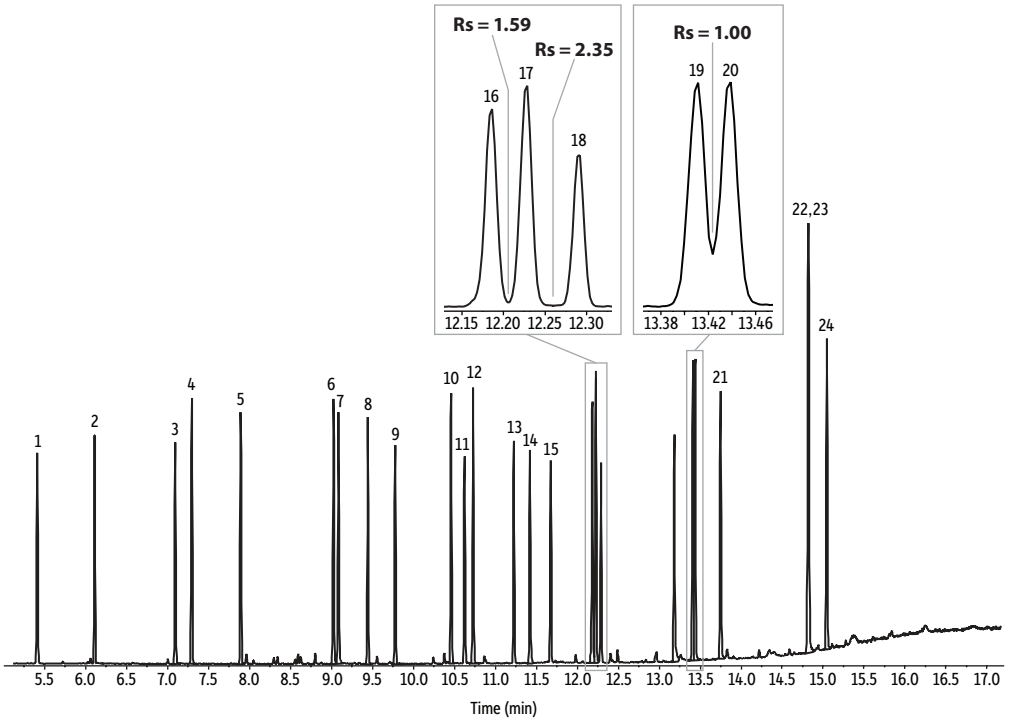
- Increase laboratory efficiency and profitability by consolidating PAH and PCB GC-MS methods.
- Next-generation TriMax column deactivation provides an exceptionally inert sample flow path, ensuring sharp peaks and consistent separations.
- Easily adaptable—add compounds, explore other column dimensions, and optimize in seconds with Restek's free *EZ*GC chromatogram modeler.



Polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) are persistent pollutants that are closely monitored in the environment as potential ecological and human health hazards. Routine testing is often performed by GC-MS, allowing labs to improve productivity and decrease cost per sample by consolidating GC-MS screening methods for PAHs and PCBs. Simultaneous analysis of these two contaminant groups often utilizes "XLB-type" columns for separation of PCB 28/31, but this comes at a cost as some PAH separations tend to suffer. A "5-type" column provides alternate selectivity, making it a suitable phase for method consolidation. The quick GC-MS method for PAHs and PCBs presented here can help labs operate more efficiently, providing excellent chromatography for concurrent analysis of both pollutant classes.

This method was developed on an RMX-5Sil MS column because it combines standard "5sil" selectivity with a next-generation TriMax deactivation, creating a highly inert sample flow path. Figure 1 demonstrates that across a fast, <20-minute run, the target PAHs and PCBs exhibited excellent peak shapes and separations. For example, while benz[a]anthracene; chrysene; and PCB 180 normally elute as a triplet, baseline USP resolution (≥1.5) was achieved on the RMX-5Sil MS column. To assess how consistent column performance was for key parameters, 100 injections at 1 ng on-column were made, and the results were extremely stable with tailing %RSD ranging 3.9-6.6% and retention time %RSD ranging 0.01-0.02%. While this analysis is not a comprehensive view of all PAHs and PCBs of interest, it can be customized for user-specific compound lists—even on different column dimensions—using Restek's free Pro *EZ*GC chromatogram modeling software.

Figure 1: Excellent peak shapes and separations were achieved for simultaneous PAH and PCB analysis on an RMX-5Sil MS column.



Peaks	t_R (min)	Conc. (µg/mL)	Peaks	tR (min)	Conc. (µg/mL)
1. Naphthalene	4.854	1	13. PCB 118	8.976	1
2. 2-Methylnapthalene	5.408	1	14. PCB 153	9.113	1
3. Acenaphthylene	6.134	1	15. PCB 138	9.290	1
4. Acenaphthene	6.277	1	16. Benz[a]anthracene	9.654	1
5. Fluorene	6.700	1	17. Chrysene	9.685	1
6. Phenanthrene	7.481	1	18. PCB 180	9.725	1
7. Anthracene	7.524	1	19. Benzo[b]fluoranthene	10.548	1
8. PCB 28	7.764	1	20. Benzo[k]fluoranthene	10.559	1
9. PCB 52	7.993	1	21. Benzo[a]pyrene	10.806	1
10. Fluoranthene	8.461	1	22. Dibenz[a,h]anthracene	11.658	1
11. PCB 101	8.564	1	23. Indeno[1,2,3-cd]pyrene	11.658	1
12. Pyrene	8.644	1	24. Benzo[g,h,i]perylene	11.846	1

Column RMX-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 17323)
Standard/Sample
2-Methylnaphthalene (cat.# 31285)
SV calibration mix #5 (cat.# 31011)
PCB congener mix #2 (cat.# 32294)
Diluent: Methylene chloride
Conc.: 1 µg/mL
Injection
Inj. Vol.: 1 µL splitless (hold 1.26 min)
Liner: Topaz 4.0 mm ID single taper inlet liner w/wool (cat.# 23303)
Inj. Temp.: 250 °C
Purge Flow: 3 mL/min
Oven
Oven Temp.: 40 °C (hold 1 min) to 120 °C at 30 °C/min to 350 °C at 20 °C/min (hold 2 min)
Carrier Gas He, constant flow
Flow Rate: 1.2 mL/min
Linear Velocity: 39.7 cm/sec
Detector MS
Mode: Scan
Scan Program:

Group	Start Time (min)	Scan Range (amu)	Scan Rate (scans/sec)
1	3	50-550	5

Transfer Line Temp.: 280 °C
Analyzer Type: Quadrupole
Source Temp.: 330 °C
Quad Temp.: 180 °C
Solvent Delay Time: 3 min
Tune Type: PFTBA
Ionization Mode: EI
Instrument Agilent 7890B GC & 5977B MSD

Featured Products

RMX-5Sil MS GC Capillary Column

Catalog No.	Product Name	Units
17323	RMX-5Sil MS GC Capillary Column, 30 m, 0.25 mm ID, 0.25 µm	ea.

Topaz Single Taper Inlet Liner

Catalog No.	Product Name	Units
23303	Topaz, Single Taper Inlet Liner, 4.0 mm x 6.5 x 78.5, for Agilent GCs, w/Quartz Wool, Premium Deactivation	5-pk.

Restek Electronic Leak Detector

Catalog No.	Product Name	Units
28500	Restek Electronic Leak Detector (includes carrying case; universal AC power adaptor [U.S., UK, Europe, Australia, Japan]; 6-ft USB charging cable)	ea.

2-Methylnaphthalene

1000 µg/mL, Methylene Chloride, 1 mL/ampul

Catalog No.	Contains	Units
31285	2-Methylnaphthalene (91-57-6)	ea.

SV Calibration Mix #5

2000 µg/mL, Methylene Chloride, 1 mL/ampul

Catalog No.	Contains	Units
31011	Acenaphthene (83-32-9) Acenaphthylene (208-96-8) Anthracene (120-12-7) Benz[a]anthracene (56-55-3) Benzo[a]pyrene (50-32-8) Benzo[b]fluoranthene (205-99-2) Benzo[k]fluoranthene (207-08-9) Benzo[g,h,i]perylene (191-24-2) Chrysene (218-01-9) Dibenz[a,h]anthracene (53-70-3) Fluoranthene (206-44-0) Fluorene (86-73-7) Indeno[1,2,3-cd]pyrene (193-39-5) Naphthalene (91-20-3) Phenanthrene (85-01-8) Pyrene (129-00-0)	ea.

PCB Congener Mix #2

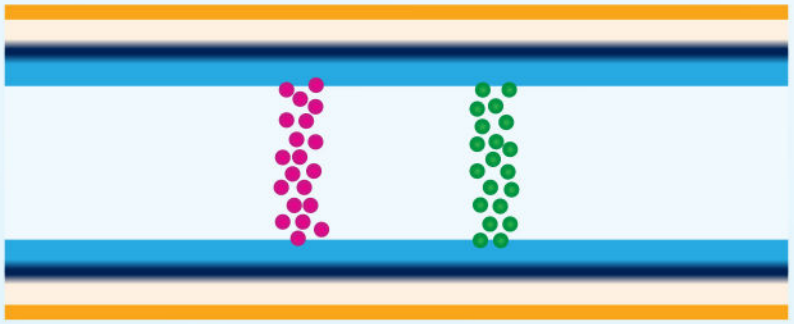
10 µg/mL, Isooctane, 1 mL/ampul

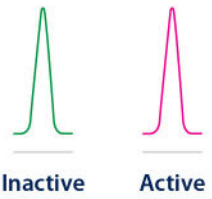
Catalog No.	Contains	Units
32294	2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5) 2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3) 2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2) 2,3',4,4',5-Pentachlorobiphenyl (BZ #118) (31508-00-6) 2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2) 2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1) 2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)	ea.

What Makes RMX Columns Better?

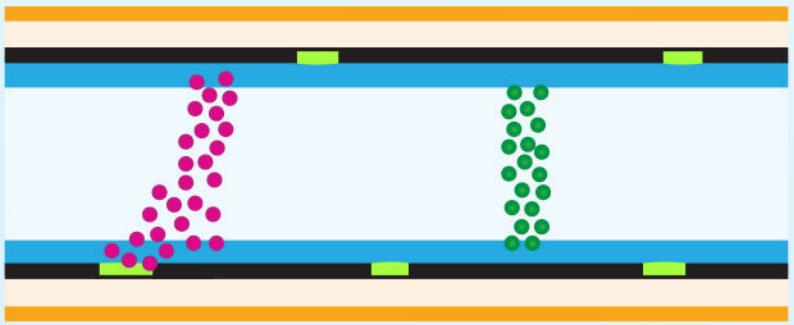
Highly Effective TriMax Deactivation Protects Analytes From Surface Interactions, Improving Peak Shape and Sensitivity for a Wide Range of Compound Chemistries

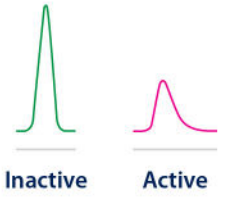
TriMax Deactivation

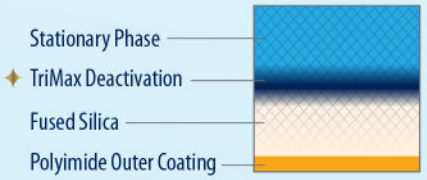




Non-TriMax Deactivation







- Inactive compounds: *alkanes, alkenes, alkynes, etc.*
- Active compounds: *acids, bases, alcohols, esters, ethers, etc.*
- Residual active site

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