Featured Application: *Extractable Semivolatile Organic Compounds on Rxi-5Sil MS*

Analyze More Semivolatile Samples per Shift Using Split Injection and an Rxi-5Sil MS Column

- Faster oven cycle increases sample throughput.
- Split injection reduces maintenance frequency.
- Reliably meets or exceeds method requirements for sensitivity and linearity.

Semivolatiles are typically analyzed using splitless injection, but this approach results in slow analysis times, frequent maintenance due to matrix accumulation, and injection-to-injection variability. Combined, these factors reduce the number of samples that can be analyzed before quality control criteria are no longer met. Using split injection is a simple way to increase sample throughput for semivolatiles analysis because it provides faster oven cycle times due to the use of higher initial oven temperatures. In addition, because less matrix is injected onto the column, more samples can be analyzed before downtime is required for maintenance.

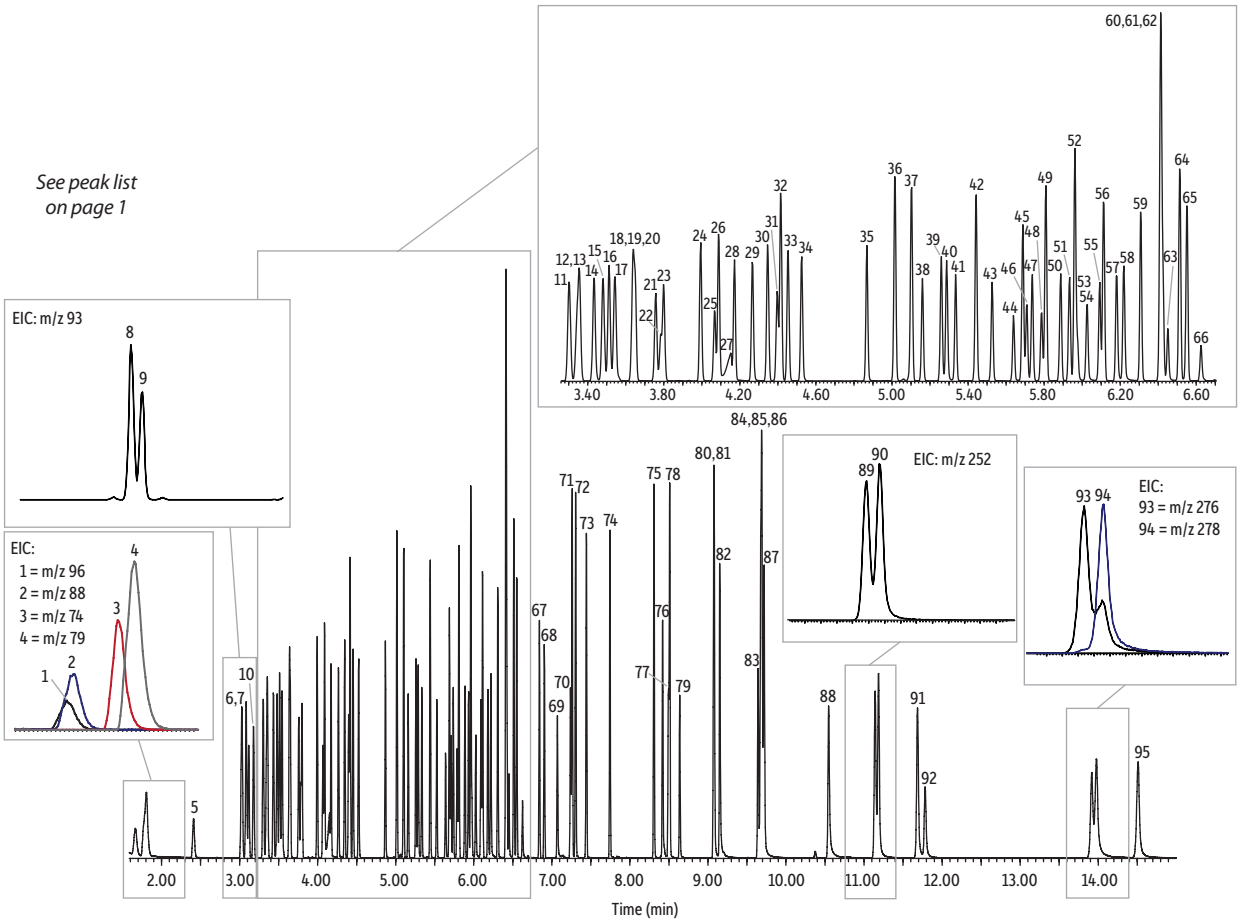
As an alternative to splitless injection, using split injection with a robust, low-bleed Rxi-5Sil MS column produces highly repeatable results for trace-level analysis of semivolatiles, such as those listed in EPA Method 8270D. The selectivity of this column ensures reliable separation of problematic compounds, like benzo[b]fluoranthene and benzo[k]fluoranthene. An Rxi-5Sil MS column was selected for this work because it provides consistent chromatographic performance for semivolatiles analysis, making it easier to meet Method 8270 requirements while benefiting from the faster sample throughput obtained with split injection.

Peaks

1. 1,4-Dioxane-d8 (IS)
2. 1,4-Dioxane
3. N-Nitrosodimethylamine
4. Pyridine
5. 2-Fluorophenol (SS)
6. Phenol-d6 (SS)
7. Phenol
8. Aniline
9. Bis(2-chloroethyl)ether
10. 2-Chlorophenol
11. 1,3-Dichlorobenzene
12. 1,4-Dichlorobenzene-D4 (IS)
13. 1,4-Dichlorobenzene
14. Benzyl alcohol
15. 1,2-Dichlorobenzene
16. 2-Methylphenol
17. Bis(2-chloroisopropyl)ether
18. 4-Methylphenol
19. 3-Methylphenol
20. N-nitroso-di-*n*-propylamine
21. Hexachloroethane
22. Nitrobenzene-D5 (SS)
23. Nitrobenzene
24. Isophorone
25. 2-Nitrophenol
26. 2,4-Dimethylphenol
27. Benzoic acid
28. Bis(2-chloroethoxy)methane
29. 2,4-Dichlorophenol
30. 1,2,4-Trichlorobenzene
31. Naphthalene-D8 (IS)
32. Naphthalene
33. 4-Chloroaniline
34. Hexachlorobutadiene
35. 4-Chloro-3-methylphenol
36. 2-Methylnaphthalene
37. 1-Methylnaphthalene
38. Hexachlorocyclopentadiene
39. 2,4,6-Trichlorophenol
40. 2,4,5-Trichlorophenol
41. 2-Fluorobiphenyl (SS)
42. 2-Chloronaphthalene
43. 2-Nitroaniline
44. 1,4-Dinitrobenzene
45. Dimethyl phthalate
46. 1,3-Dinitrobenzene
47. 2,6-Dinitrotoluene
48. 1,2-Dinitrobenzene
49. Acenaphthylene
50. 3-Nitroaniline
51. Acenaphthene-d10 (IS)
52. Acenaphthene
53. 2,4-Dinitrophenol
54. 4-Nitrophenol
55. 2,4-Dinitrotoluene
56. Dibenzofuran
57. 2,3,5,6-Tetrachlorophenol
58. 2,3,4,6-Tetrachlorophenol
59. Diethyl phthalate
60. 4-Chlorophenyl phenyl ether
61. Fluorene
62. 4-Nitroaniline
63. 4,6-Dinitro-2-methylphenol
64. N-nitrosodiphenylamine
65. 1,2-Diphenylhydrazine
66. 2,4,6-Tribromophenol (SS)
67. 4-Bromophenyl phenyl ether
68. Hexachlorobenzene
69. Pentachlorophenol
70. Phenanthrene-D10 (IS)
71. Phenanthrene
72. Anthracene
73. Carbazole
74. di-*n*-Butyl phthalate
75. Fluoranthene
76. Benzidine
77. Pyrene-D10 (SS)
78. Pyrene
79. *p*-Terphenyl-d14 (SS)
80. 3,3'-Dimethylbenzidine
81. Butyl benzyl phthalate
82. Bis(2-ethylhexyl)adipate
83. 3,3'-Dichlorobenzidine
84. Benz[a]anthracene
85. Chrysene-D12 (IS)
86. Bis(2-ethylhexyl)phthalate
87. Chrysene
88. Di-*n*-octyl phthalate
89. Benzo[b]fluoranthene
90. Benzo[k]fluoranthene
91. Benzo[a]pyrene
92. Perylene-D12 (IS)
93. Indeno[1,2,3-cd]pyrene
94. Dibenz[a,h]anthracene
95. Benzo[ghi]perylene

Chromatogram and conditions on page 2

See peak list on page 1



GC_EV1248

Column	Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	8270 MegaMix (cat.# 31850) 8270 Benzidines mix (cat.# 31852) Benzoic acid (cat.# 31879) 1,4-Dioxane (cat.# 31853) Revised B/N surrogate mix (cat.# 31888) Acid surrogate mix (4/89 SOW) (cat.# 31063) Revised SV internal standard mix (cat.# 31886)
Diluent:	Methylene chloride
Conc.:	40 µg/mL (IS/SS 20 µg/mL)
Injection	
Inj. Vol.:	1 µL split (split ratio 10:1)
Liner:	Premium 4 mm Precision liner w/wool (cat.# 23305.5)
Inj. Temp.:	270 °C
Split Vent Flow Rate:	12 mL/min
Oven	
Oven Temp.:	70 °C (hold 1 min) to 285 °C at 28 °C/min to 305 °C at 3 °C/min to 320 °C at 30 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	270 °C
Quad Temp.:	150 °C
Electron Energy:	70 eV
Solvent Delay Time:	1.3 min
Tune Type:	DFTPP
Ionization Mode:	EI
Scan Range:	35-550 amu
Scan Rate:	5.36 scans/sec
Instrument	Agilent 7890A GC & 5975C MSD

Rxi-5Sil MS Columns (fused silica)

low-polarity phase; Crossbond 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane

Description	temp. limits	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm	-60 to 320/350 °C	ea.	13623

8270 MegaMix Standard (76 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Aniline (62-53-3)
Anthracene (120-12-7)
Azobenzene (103-33-3)*
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Benzyl alcohol (100-51-6)
Benzyl butyl phthalate (85-68-7)
Bis(2-chloroethoxy)methane (111-91-1)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-ethylhexyl)adipate (103-23-1)
Bis(2-ethylhexyl)phthalate (117-81-7)
4-Bromophenyl phenyl ether (101-55-3)
Carbazole (86-74-8)
4-Chloroaniline (106-47-8)
4-Chloro-3-methylphenol (59-50-7)
2-Chloronaphthalene (91-58-7)
2-Chlorophenol (95-57-8)
4-Chlorophenyl phenyl ether (7005-72-3)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Dibenzofuran (132-64-9)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
2,4-Dichlorophenol (120-83-2)
Diethylphthalate (84-66-2)
2,4-Dimethylphenol (105-67-9)
Dimethylphthalate (131-11-3)
Di-*n*-butyl phthalate (84-74-2)
1,2-Dinitrobenzene (528-29-0)
1,3-Dinitrobenzene (99-65-0)
1,4-Dinitrobenzene (100-25-4)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Di-*n*-octyl phthalate (117-84-0)
Diphenylamine (122-39-4)**
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachlorocyclopentadiene (77-47-4)
Hexachloroethane (67-72-1)
Indeno(1,2,3-cd)pyrene (193-39-5)
Isophorone (78-59-1)
1-Methylnaphthalene (90-12-0)
2-Methylnaphthalene (91-57-6)
2-Methylphenol (*o*-cresol) (95-48-7)
3-Methylphenol (*m*-cresol) (108-39-4)
4-Methylphenol (*p*-cresol) (106-44-5)
Naphthalene (91-20-3)
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)
Nitrobenzene (98-95-3)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
N-Nitrosodimethylamine (62-75-9)
N-Nitroso-di-*n*-propylamine (621-64-7)
2,2'-Oxybis(1-chloropropane) (108-60-1)
Pentachlorophenol (87-86-5)
Phenanthrene (85-01-8)
Phenol (108-95-2)
Pyrene (129-00-0)
Pyridine (110-86-1)
2,3,4,6-Tetrachlorophenol (58-90-2)
2,3,5,6-Tetrachlorophenol (935-95-5)
1,2,4-Trichlorobenzene (120-82-1)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

1,000 µg/mL each in methylene chloride (3-methylphenol and 4-methylphenol at 500 µg/mL), 1 mL/ampul	cat.# 31850 (ea.)

*1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.
**N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

Easier calibration!

8270 MegaMix and 8270 Matrix Spike Mix include 3-methylphenol and 4-methylphenol at 1/2 x concentration of other components.

Benzoic Acid

Benzoic acid (65-85-0)

2,000 µg/mL in methylene chloride, 1 mL/ampul	cat.# 31879 (ea.)
1,000 µg/mL in methanol, 1 mL/ampul	cat.# 31415 (ea.)

8270 Benzidines Mix (3 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)
3,3'-Dimethylbenzidine (*o*-tolidine) (119-93-7)

2,000 µg/mL each in methanol, 1 mL/ampul	cat.# 31688 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul	cat.# 31852 (ea.)

Acid Surrogate Mix (4/89 SOW) (3 components)

2-Fluorophenol (367-12-4)
Phenol-d6 (13127-88-3)
2,4,6-Tribromophenol (118-79-6)

2,000 µg/mL each in methanol, 1 mL/ampul	cat.# 31025 (ea.)
2,000 µg/mL each in methanol, 1 mL/ampul	cat.# 31025.15 (15-pk.)
2,000 µg/mL each in methanol, 1 mL/ampul	cat.# 31025.25 (25-pk.)

1,4-Dioxane

1,4-Dioxane (123-91-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul	cat.# 30287 (ea.)
2,000 µg/mL in methylene chloride, 1 mL/ampul	cat.# 31853 (ea.)
1.9 mg/mL in dimethyl sulfoxide, 1 mL/ampul	cat.# 36294 (ea.)

Revised B/N Surrogate Mix (4 components)

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)
Pyrene-d10 (1718-52-1)

1,000 µg/mL each in methylene chloride, 1 mL/ampul	cat.# 31887 (ea.)

SV Internal Standard Mix (6 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul	cat.# 31206 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul	cat.# 31206.15 (15-pk.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul	cat.# 31206.25 (25-pk.)

Topaz 4.0 mm ID Precision Inlet Liner w/ Wool

for Agilent GCs equipped with split/splitless inlets

ID x OD x Length	qty.	cat.#
Precision, Premium Deactivation, Borosilicate Glass with Quartz Wool		
4.0 mm x 6.3 mm x 78.5 mm	5-pk.	23305

* 100% SATISFACTION GUARANTEE: If your Topaz inlet liner does not perform to your expectations for any reason, simply contact Restek Technical Service or your local Restek representative and provide a sample chromatogram showing the problem. If our GC experts are not able to quickly and completely resolve the issue to your satisfaction, you will be given an account credit or replacement product (same cat.#) along with instructions for returning any unopened product. (Do not return product prior to receiving authorization.) For additional details about Restek's return policy, visit www.restek.com/warranty

Restek Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek leak detector.

Description	qty.	cat.#
Leak Detector with Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657
Car Charger/Adaptor	ea.	22652
Universal AC Power Adaptor	ea.	22653

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system and/or into the leak detector.

*Caution: The Restek electronic leak detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek electronic leak detector may only be used for determining trace amounts in a GC environment.

Restek Recommends: If you think that your Restek electronic leak detector needs service or repair, please contact Restek Customer Service before sending your unit in (cat.# 22655-R). Leak detector service/repair will include inspection and testing of the unit.

RESTEK
Pure Chromatography

Questions about this or any other Restek product?
Contact us or your local Restek representative (www.restek.com/contact-us).

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Lit. Cat.# EVSS2679A-UNV