

Development of a Semivolatile Column Optimized for the Analysis of Hazardous Waste

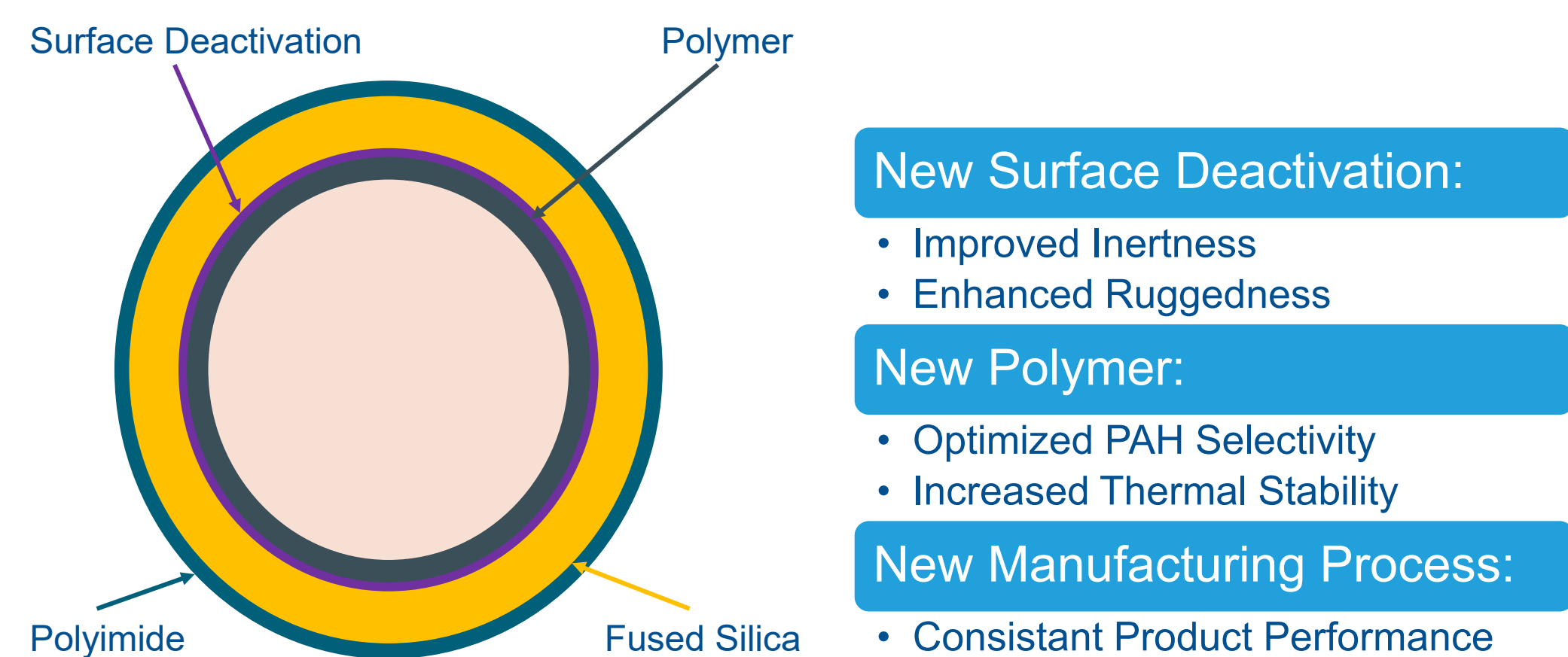
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Outline

Analyzing basic, neutral, and acidic semi-volatile environmental pollutants such as those found in US EPA 8270 at increasingly lower levels of detection puts demands on the entire analytical system. One of the greatest challenges is maintaining system performance following repeated injections of highly contaminated samples. The goal is to develop a column tuned for PAH selectivity while maintaining the same elution profile labs expect from other silarylene “5-type” columns along with improved lifetime.

This presentation will review the details of the lifetime study results using contaminated extracts and will highlight the advantages of this column using a new deactivation and stationary phase.

Enhanced SVOC Performance



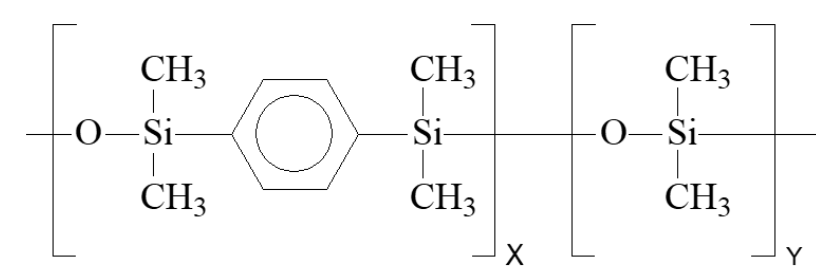
Inertness = Linear Calibrations

Average %RSDs for 6 Rxi-SVOCms columns (16623) calibrated from 1 ng/ μ L to 120 ng/ μ L

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New Polymer

The polymer used for the Rxi-SVOCms has a silphenylene backbone, like the Rxi-5Sil MS



Application specific formulation changes optimized the PAH separations and improved thermal stability

New maximum temperature of 340C

Designed to be a drop-in replacement for the DB-5ms and DB-5ms UI

Similar phase chemistries

DB-UI 8270D for Semivolatiles

ZB-Semivolatiles
SLB-5ms Semivolatiles

Other Silphenylene type phases

Rxi-5Sil MS

DB-5ms UI

VF-ms
BPX-5

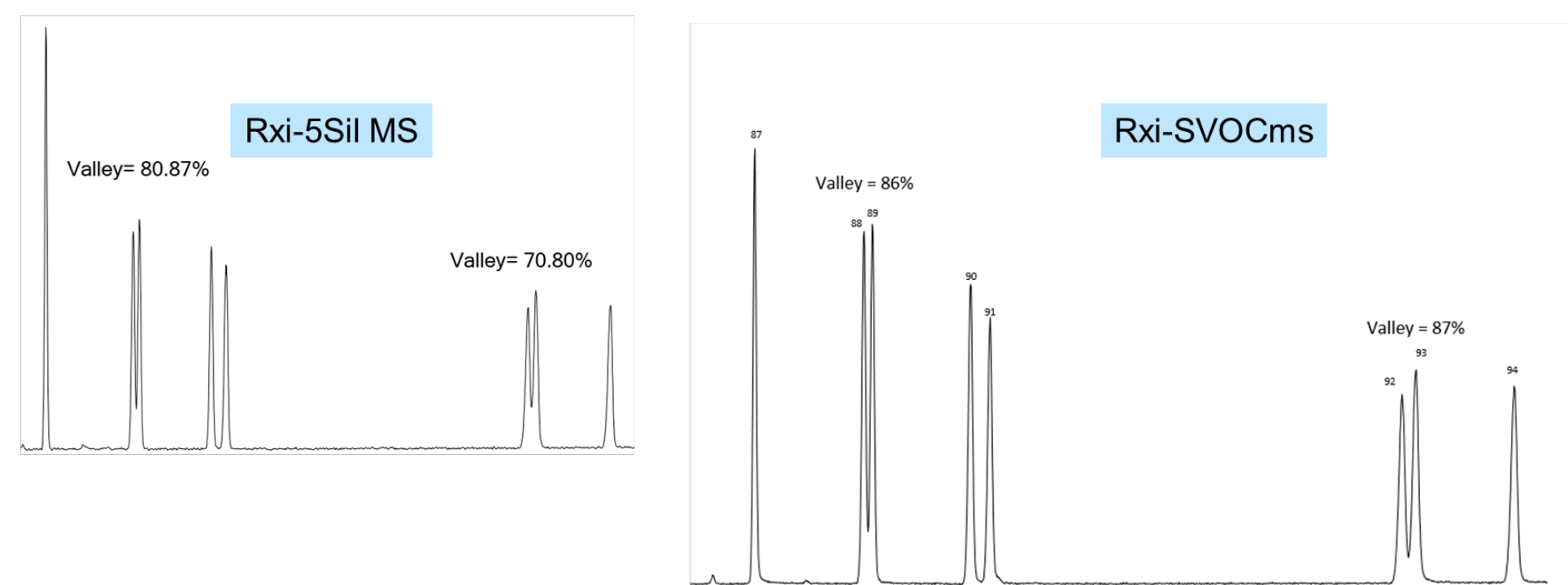
ZB-5ms
CP-Sil 8 CB LB/MS

Optima-5ms
PE-5ms

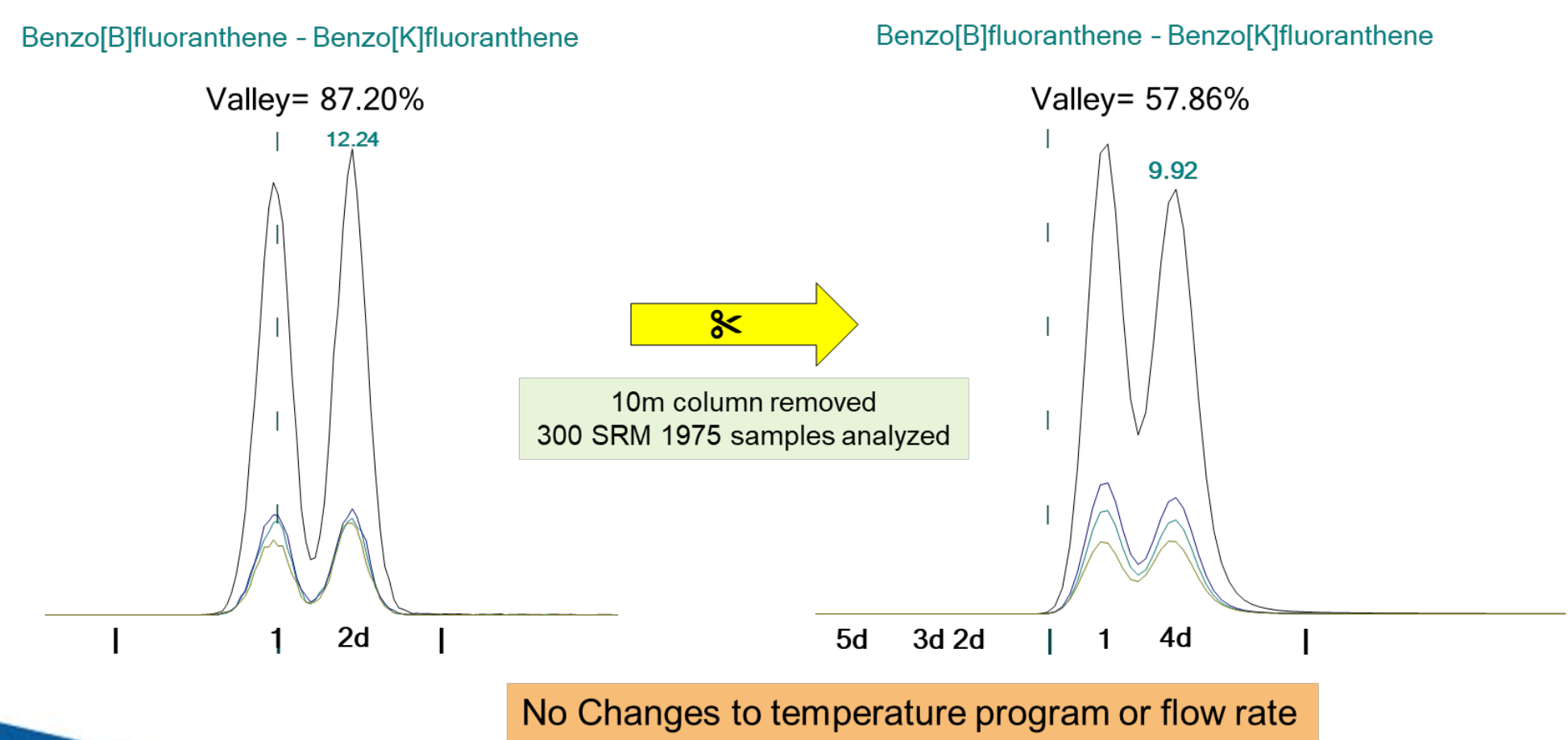
SLB-5ms

Optimized PAH Selectivity

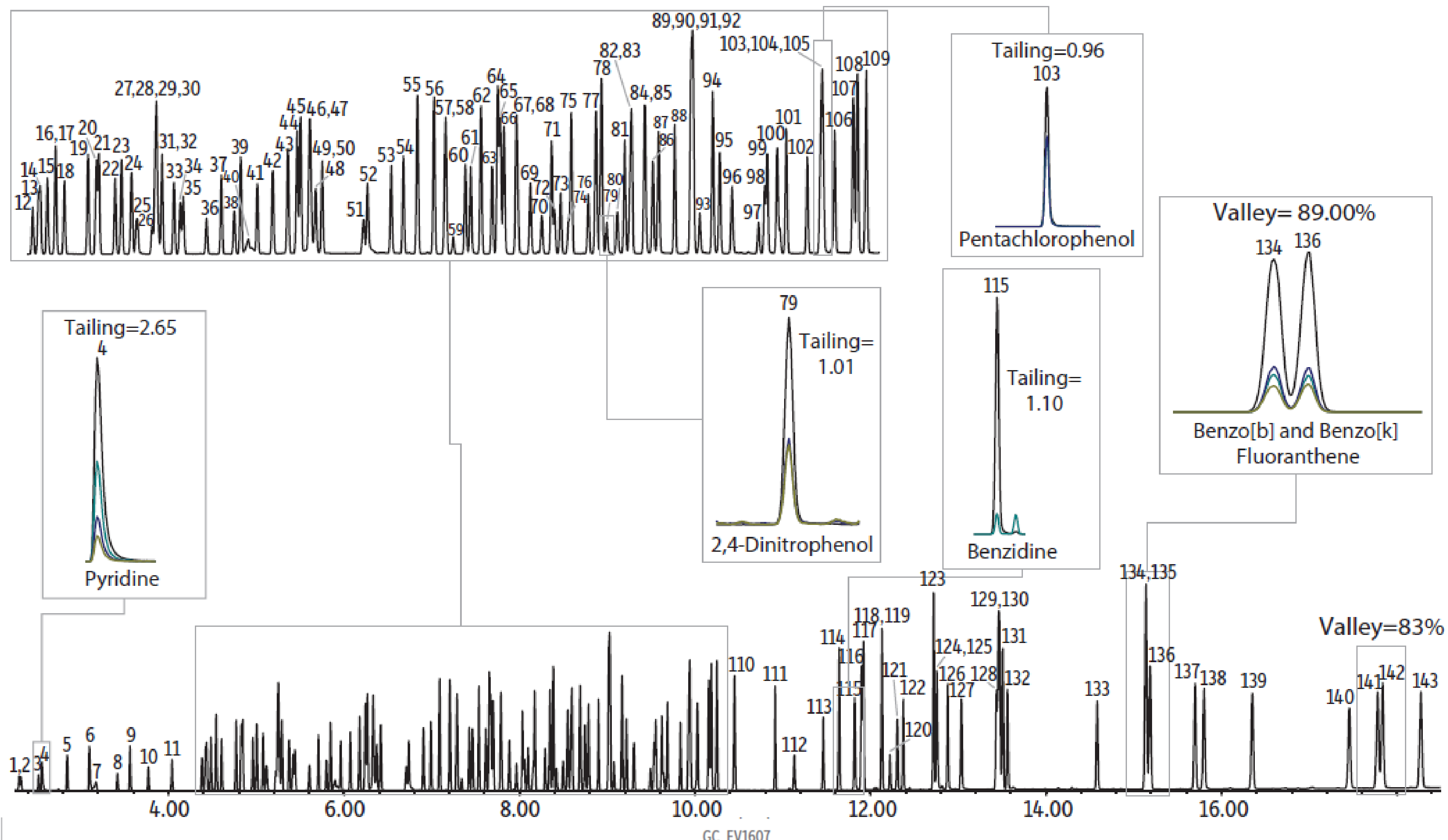
Improved Benzofluoranthene and Indeno[123-cd]pyrene – Dibenz[ah]anthracene Separations on the Rxi-SVOCms



Benzofluoranthene isomers are still sufficiently resolved after removing ten meters of from a 30 m x 0.25 mm x 0.25 μ m Rxi-SVOCms



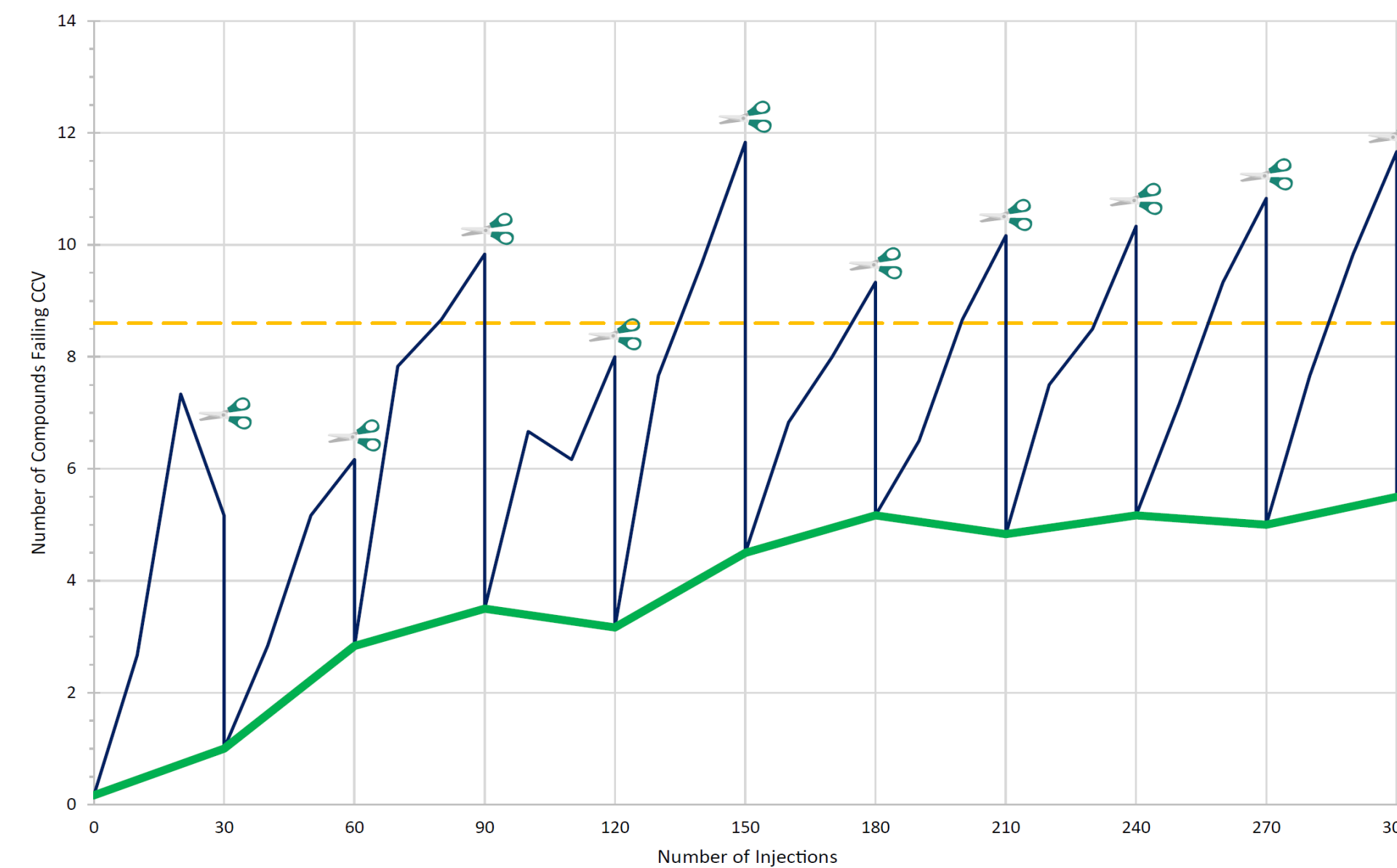
Semi-Volatile Analysis



Peaks	t _r (min)	Peaks	t _r (min)	Peaks	t _r (min)	Peaks	t _r (min)	Peaks	t _r (min)
1. (IS) 1,4-Dioxane-d8	2.30	30. Acetophenone	5.25	58. 1,2,4,5-Tetrachlorobenzene	7.29	87. 2-Naphthalamine	8.79	116. (SS) Pyrene-D10	11.90
2. 1,4-Dioxane	2.32	31. 4-Nitrosomorpholine	5.27	59. Isosafrole	7.34	88. Diethyl phthalate	8.90	117. Pyrene	11.92
3. N-Nitrosodimethylamine	2.52	32. o-Tolidine	5.29	60. 2,4,6-Trichlorophenol	7.43	89. Fluorene	9.01	118. (SS) p-terphenyl-d14	12.13
4. Pyridine	2.56	33. Hexachloroethane	5.37	61. 2,4,6-Trichlorophenol	7.47	90. 4-Chlorophenyl phenyl ether	9.03	119. Aramite-1	12.13
5. Ethyl methacrylate	2.85	34. (SS) Nitrobenzene-D5	5.42	62. (SS) 2-Fluorobiphenyl	7.54	91. 2-Methyl-5-nitroaniline	9.03	120. Aramite-2	12.22
6. 2-Picoline	3.10	35. Nitrobenzene	5.44	63. Safrole	7.62	92. 4-Nitroaniline	9.03	121. Dimethylaminoozobenzene	12.31
7. N-Nitrosomethylmethylaniline	3.16	36. N-Nitrosopiperidine	5.60	64. Biphenyl	7.65	93. 4,6-Dinitro-2-methylaniline	9.08	122. 4,4'-Dichlorobenzidine	12.37
8. Methyl methanesulfonate	3.42	37. Isophorene	5.71	65. 2-Chloronaphthalene	7.67	94. N-Diphenylphenylamine	9.17	123. 3,3'-Dimethylbenzidine	12.72
9. (SS) 2-Fluorophenol	3.56	38. 2-Nitrophenol	5.80	66. 1-Chloronaphthalene	7.70	95. N-N-Diphenylhydrazine	9.22	124. Butyl benzy phenyl phthalate	12.75
10. N-Nitrosodimethylamine	3.77	39. 2,4-Dimethylphenol	5.85	67. Diphenyl ether	7.79	96. (SS) 2,4,6-Tribromophenol	9.30	125. Kepone	12.77
11. Methyl methanesulfonate	4.04	40. Benzoic acid	5.91	68. 2-Nitroaniline	7.79	97. 1,3,5-Trinitrobenzene	9.49	126. Bis(2-(isopropyl) adipate	12.88
12. Benzaldehyde	4.38	41. Bis(2-chloroethoxy)methane	5.96	69. 1,4-Naphthoquinone	7.88	98. Diallate	9.54	127. 2-(Acetylaminio)fluorene	13.04
13. (SS) Phenol-d6	4.42	42. 2,4-Dichlorophenol	6.07	70. 1,2-Dinitrobenzene	7.97	99. Phenacetin	9.55	128. 3,3'-Dichlorobenzidine	13.43
14. Phenol	4.44	43. 1,2,4-Trichlorobenzene	6.18	71. Dimethyl phthalate	8.03	100. 4-Bromophenyl phenyl ether	9.62	129. Benzo[a]anthracene	13.46
15. Aniline	4.48	44. (IS) Naphthalene-D8	6.24	72. 1,3-Dinitrobenzene	8.05	101. Hexachlorobenzene	9.69	130. (IS) Chrysene-D12	13.47
16. Bis(2-chloroethyl) ether	4.54	45. Naphthalene	6.27	73. 2,6-Dinitrotoluene	8.10	102. Atrazine	9.83	131. Chrysene	13.51
17. Pentachloroethane	4.54	46. 4-Chloroaniline	6.33	74. 1,4-Dinitrobenzene	8.15	103. Pentachlorophenol	9.93	132. Bis(2-(isopropyl) phthalate	13.56
18. 2-Chlorophenol	4.60	47. 2,6-Dichlorophenol	6.34	75. Acenaphthylene	8.17	104. 4-Aminobiphenyl	9.94	133. Di-n-octyl phthalate	14.58
19. 1,3-Dichlorobenzene	4.77	48. Hexachloropropene	6.37	76. 3-Nitroaniline	8.29	105. Pentachloronitrobenzene	9.94	134. Benzo[b]fluoranthene	15.14
20. (IS) 1,4-Dichlorobenzene-D4	4.83	49. Hexachlorobutadiene	6.42	77. (IS) Acenaphthene-d10	8.35	106. Propylazamide	10.03	135. 7,12-Dimethylbenzo[a]anthracene	15.14
21. 1,4-Dichlorobenzene	4.85	50. α,α -Dimethylphenethylamine	6.43	78. Acenaphthene	8.39	107. (IS) Phenanthrene-D10	10.16		15.14
22. Benzyl alcohol	4.96		6.43	79. 2,4-Dinitrophenol	8.42	108. Phenanthrene	10.19	136. Benzo[k]fluoranthene	15.19
23. 1,2-Dichlorobenzene	5.01	51. Caprolactam	6.71	80. 4-Nitrophenol	8.50	109. Anthracene	10.25	137. Benzo[a]pyrene	15.70
24. 2-Methylphenol	5.08	52. N-Nitroso-N-butylamine	6.74	81. Pentachlorobenzene	8.55	110. Carbazole	10.45	138. (IS) Perylene-D12	15.80
25. Bis(2-chloroisopropyl)ether	5.12	53. 4-Chloro-3-methylphenol	6.91	82. 2,4-Dinitrotoluene	8.58	111. di-n-Butyl phthalate	10.91	139. 3-Methylcholanthrene	16.35
26. Nitrosopropylidene	5.22	54. Isosafrole	6.99	83. Dibenzofuran	8.60	112. 4-Nitroquinoline 1-oxide	11.13	140. Dibenz[a,j]acridine	17.46
27. 4-Methylphenol	5.24	55. 2-Methylnaphthalene	7.09	84. 1-Naphthalamine	8.69	113. Isodrin	11.46	141. Indeno[1,2,3-cd]pyrene	17.78
28. 3-Methylphenol	5.24	56. 1-Methylnaphthalene	7.21	85. 2,3,5,6-Tetrachlorophenol	8.69	114. Fluoranthene	11.64	142. Dibenz[a,h]anthracene	17.84
29. N-Nitrosodi-N-propylamine	5.25	57. Hexachlorocyclopentadiene	7.28	86. 2,3,4,6-Tetrachlorophenol	8.75	115. Benzidine	11.82	143. Benzo[ghi]perylene	18.27

Diesel Particulate Extract Injections

Standard inlet maintenance every 30 sample injections restores column performance.



Fast GC Method Translation Preserves Elution Profiles

