IMPROVED SEPARATION OF SEMI-VOLATILES

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INTRODUCTION

Semi-volatile contaminants in water and soil are some of the most targeted compounds for analysis in environmental laboratories today. Semi-volatile organic compounds are usually found in the soil and ground water as a result of industrial waste processes. Their presence has serious health and environmental implications, which requires monitoring. This class of contaminants constitutes a wide range of compounds with vastly different physical properties making this one of the most challenging analyses to perform and as such, is extremely difficult to analyze in a cost effective turnaround time. The requirement to meet low detection limits for even the highest boiling point contaminants has meant the use of low-bleed or mass-spectrum grade columns are required. The US environmental protection agency recommends that the analysis be carried out on a 5% phenyl column.

ADVANTAGES OF USING SolGel-1ms™ & BPX5

This poster shows improved separation of the US EPA 8270 mix on a BPX5-5% phenyl column and a SolGel-1ms — 100% polydimethylsiloxane column. The SolGel-1ms capillary column used for this analysis is an exceptionally low bleed, high temperature column. The sol-gel material used encapsulates the 100% polydimethylsiloxane into a sol-gel matrix. The sol-gel matrix, which is essentially a synthetic glass, is then chemically bonded to the fused silica surface. This type of bonding surface has certain advantages over conventional 100% polydimethylsiloxane.
These advantages include lower bleed at higher temperatures, excellent inertness and increased resistance to degradation.

The BPX5 column is also an extremely inert and low bleed capillary column with a maximum temperature of 360/370°C. The low bleed characteristics of these two columns is especially beneficial for the late eluting semi-volatiles. The lower bleed levels at elevated temperatures leads to better signal to noise ratios allowing for lower detection limits to be achieved. The high degree of inertness exhibited by these two capillary columns gives excellent peak shape allowing for reproducible quantitation.

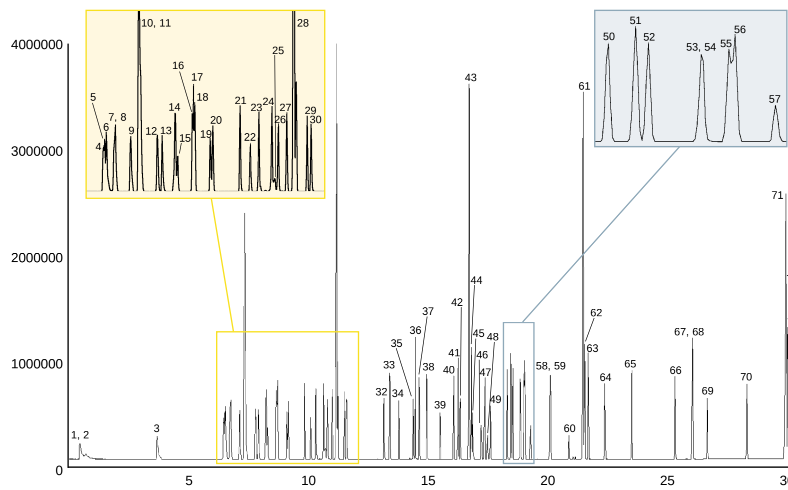
The upper temperature limits of the BPX5 and SolGel-1ms™ columns allows the user to bake out any high boiling contaminants out of the column after the analysis without damaging the stationary phase. Baking out high boiling contaminants ensures that they do not interfere with retention times or elevate baseline in future analyses and can be incorporated into the GC method resulting in less instrument downtime.

SUMMARY

The SolGel-1ms™ and the BPX5 capillary columns are the ideal choice for analysis of the US EPA 8270 semi-volatiles mixture. Excellent separation of the various components in less than 40 minutes is easily achieved. The low bleed levels at high temperatures allow for very low detection limits of even the most difficult analytes.

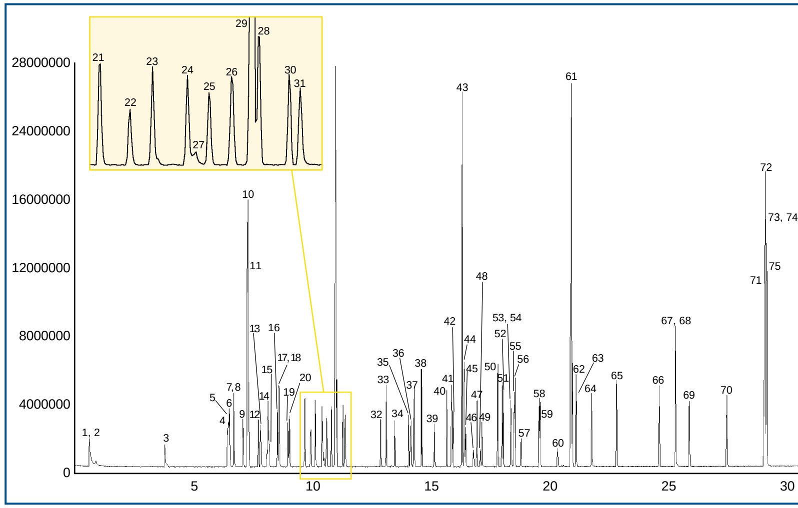
ACKNOWLEDGMENTS

We would like to thank Mark Ferry from ECS/MDL, USA for supplying the chromatograms and data for this poster.



Phase:	**BPX5, 0.25µm film**
Sample:	**5ppm solution**
Column:	**30m x 0.25mm ID**
Initial Temp:	40°C, 3min
Rate 1:	8°C/min to 300°C
Final Temp:	300°C, 9min
Detector Type:	Mass Spectrometer
Carrier Gas:	He
Inlet Pressure	16psi for 30sec then drops to 10psi
Pressure rate1:	10psi to 28psi at 0.5psi/min
Final Pressure:	28psi until end of run
Carrier Gas Flow:	1.1mL/min
Constant Flow:	On
Injection Mode:	Splitless
Purge on Time:	0.5min
Purge on (Split)Vent Flow:	40mL/min
Injection Volume:	1mL
Injection Temperature:	250°C
Autosampler:	No
Liner Type:	4mm ID Single Gooseneck
Liner Part Number:	**092017**
Column Part Number:	**054101**
Full Scan / SIM:	Full scan 41-450

Figure 1. Analysis of US EPA 8270 mix on BPX5.



Phase:	**SolGel-1ms, 0.25µm film**
Sample:	**5ppm solution**
Column:	**30m x 0.25mm ID**
Initial Temp:	40°C, 3min
Rate 1:	8°C/min to 300°C
Final Temp:	300°C, 9min
Detector Type:	Mass Spectrometer
Carrier Gas:	He
Inlet Pressure	16psi for 30sec then drops to 10psi
Pressure rate1:	10psi to 28psi at 0.5psi/min
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Injection Mode:	Splitless
Purge on Time:	0.5min
Purge on (Split)Vent Flow:	40mL/min
Injection Volume:	1mL
Injection Temperature:	250°C
Autosampler:	No
Liner Type:	4mm ID Single Gooseneck
Liner Part Number:	**092017**
Column Part Number:	**054795**
Full Scan / SIM:	Full scan 41-450

Figure 2. Analysis of US EPA 8270 mix on SolGel-1ms.

Components

1. Pyridine
2. *n*-Nitrosodimethylamine
3. 2-Fluorophenol
4. Phenol-d5
5. Phenol
6. Aniline
7. 2-Chlorophenol
8. *bis*-(2-chloroethyl) ether
9. 1,3-Dichlorobenzene
10. 1,4-Dichlorobenzene-d4
11. 1,4-Dichlorobenzene
12. 1,2-Dichlorobenzene
13. Benzyl alcohol
14. 2-Methyl phenol
15. *bis*-(2-chloroisopropyl)ether
16. *n*-Nitroso-di-n-propylamine
17. Hexachloroethane
18. 4-Methylphenol
19. Nitrobenzene-d5
20. Nitrobenzene
21. Isophorone
22. 2-Nitrophenol
23. 2,4-Xylenol
24. *bis*-(2-Chloroethoxy) methane
25. Benzoic acid
26. 2,4-Dichlorophenol
27. 1,2,4-Trichlorobenzene
28. Naphthalene-d8
29. Naphthalene
30. Hexachlorobutadiene
31. 4-Chloroaniline
32. 4-Chloro-3-methylphenol
33. 2-Methylnaphthalene
34. Hexachlorocyclopentadiene
35. 2,4,6-Trichlorophenol
36. 2,4,5-Trichlorophenol
37. 2-Fluorobiphenyl
38. 2-Chloronaphthalene
39. 2-Nitroaniline
40. Dimethyl phthalate
41. Acenaphthylene
42. 2,6-Dinitrotoluene
43. Acenaphthene-d10
44. Acenaphthene
45. 3-Nitroaniline
46. 2,4-Dinitrophenol
47. Dibenzofuran
48. 4-Nitrophenol
49. 2,4-Dinitrotoluene
50. Diethylphthalate
51. Fluorene
52. 4-Chlorophenyl phenyl ether
53. 2-Methyl-4,6-dinitrophenol
54. 4-Nitroaniline
55. *n*-Nitrosodiphenylamine
56. Azobenzene
57. 2,4,6-Tribromophenol
58. 4-Bromophenyl phenyl ether
59. Hexachlorobenzene
60. Pentachlorophenol
61. Phenanthrene-d10
62. Phenanthrene
63. Anthracene
64. Carbazole
65. Di-*n*-butyl phthalate
66. Fluoranthene
67. Benzidine
68. Pyrene
69. *p*-Terphenyl-d14
70. Butyl benzyl phthalate
71. Benz[a]anthracene
72. Chrysene-d12
73. Chrysene
74. 3,3-Dichlorobenzidine
75. bis(2-Ethylhexyl)phthalate
76. Di-*n*-octyl phthalate
77. Benzo[b]fluoranthene
78. Benzo[k]fluoranthene
79. Benzo[a]pyrene
80. Perylene-d12
81. Indeno[1,2,3-cd]perylene
82. Dibenz[a,h]anthracene
83. Benzo[g,h,i]perylene

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