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...breaking with tradition

EPA 8270C Analysis in Twenty Minutes

Introduction

Semivolatile organic compounds include a large number and variety of compounds with a multitude of physical properties. The need for monitoring semivolatile organic compounds arises from their toxic nature and associated environmental implications. The detection and identification of these compounds is regulated by the Environmental Protection Agency using EPA method 8270C. The large number of compounds (up to 150!) and the varying chemical properties of the analytes, (acid, base, neutral) present in a wide range of matrices significantly complicates the analysis. This application note demonstrates a method that will allow for separation and detection of 80 compounds in less than 20 minutes.

Experimental

Instrumentation:

Analysis was performed on a HP 6890 gas chromatograph equipped with a 5973 MSD and G2614A autosampler (Agilent Technologies, Palo Alto, California, USA) using HP Chemstation software (Version D.00.01) for data analysis. The GC column used was a Zebron ZB-5 30m x 0.25mm x 0.25µm. Carrier gas was UHP grade helium. Injector and MS transfer temperatures were 250ºC and 310ºC, respectively.

Sample Preparation:

The injected sample was prepared from a series of standards diluted in methylene chloride. An acid surrogate mixture and base/neutral surrogate mixture (Cat. No. 31083 and 31082, respectively) were obtained from Restek (Bellefonte, PA). A benzidine standard (Cat. No. US-105N) was obtained from ULTRA Scientific (North Kingstown, RI). Standard solutions containing phenols (Cat. No. CLP-HC-A-R4), a base/neutral mixture (Cat. No CLP-HC-BN-R), and additional components (Cat. No. Z-014E-R7) were obtained from AccuStandard (New Haven, CT).

Chromatographic Conditions:

Column flow was constant at 2.5 mL/min. Injections were 2 µL and split 20:1. The oven program started at 40ºC for 3 minutes then ramped to 70ºC at 20ºC/min then to 195°C at 16ºC/min with a final ramp of 30ºC/min to 335ºC for 2.5 minutes.

Results

A complete chromatogram of the analysis of semi-volatile organic compounds is shown in Figure 1. This method allows determination of all compounds using a mass selective detector in under 20 minutes. Figures 2-5 show exploded views of the chromatogram in more detail with peak labels. The identity of the peaks can be determined by finding the corresponding peak number listed in Table 1. Compounds that are not fully resolved are likely to be resolved by a difference in mass units with which the ions are quantified. Chemical retention times and common quantitation ions are also listed in Table 1.

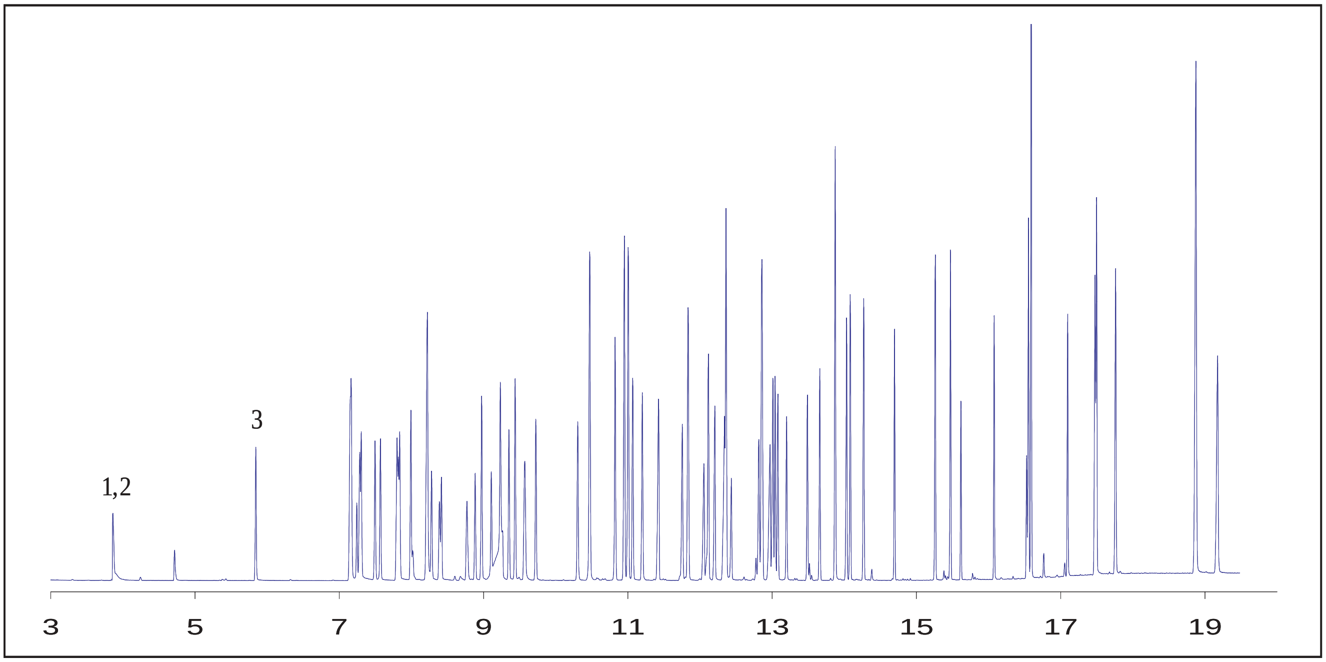

Figure 1. Complete chromatogram of EPA 8270C analysis. Labeled peaks are identified in Table 1.

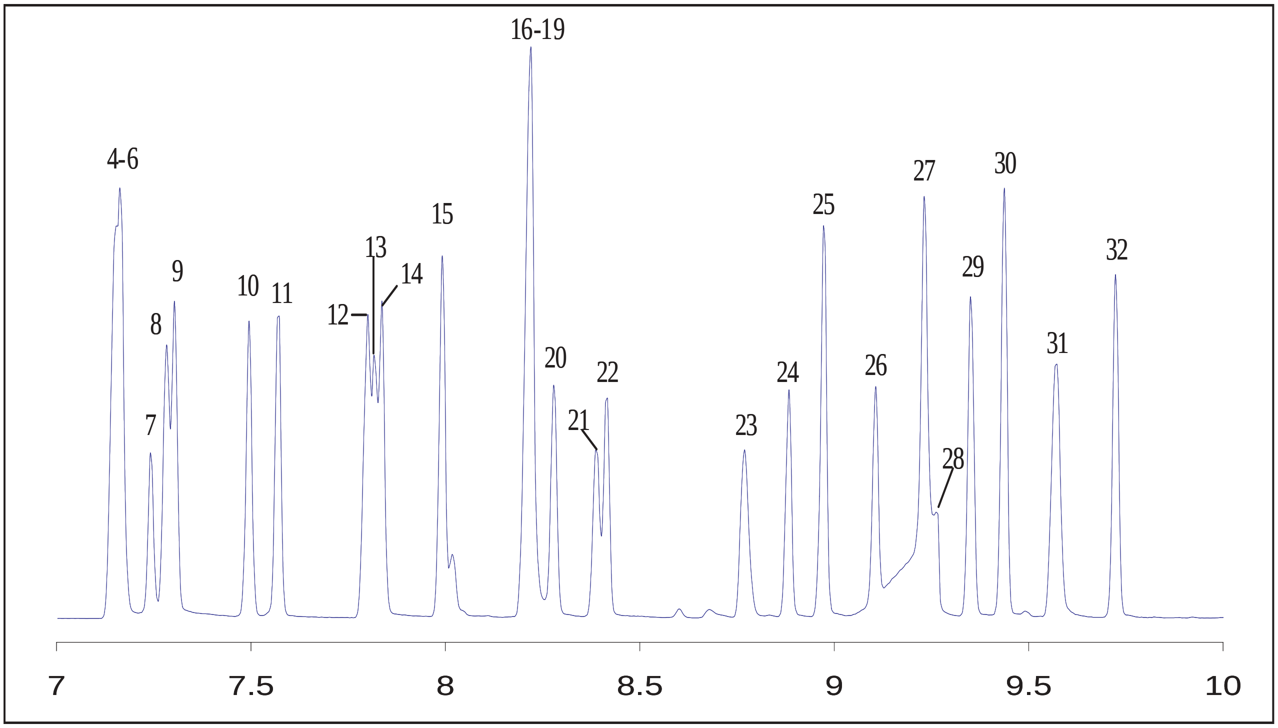

Figure 2. Chromatogram from 7 to 10 minutes. Corresponding numbers in Table 1 lists compound names for peaks.

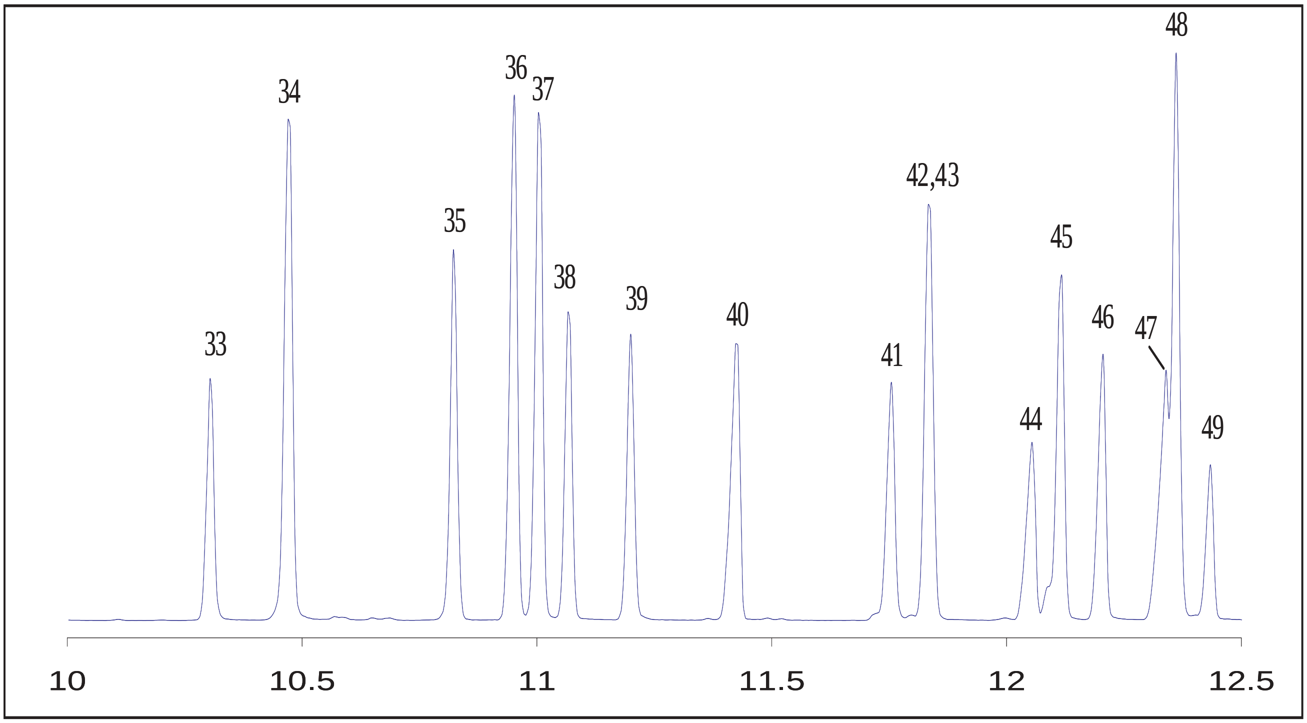

Figure 3. Chromatogram from 10 to 12.5 minutes. Compound names are listed in Table 1.

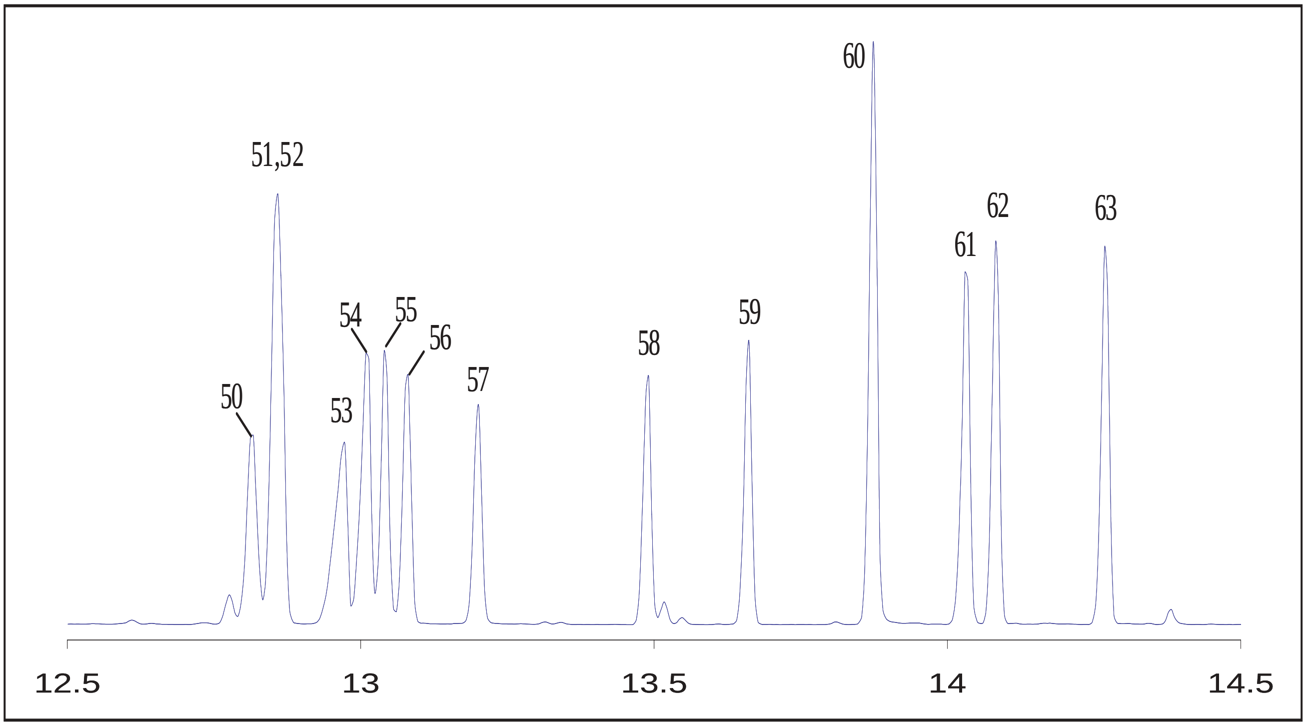

Figure 4. Chromatogram from 12.5 to 14.5 minutes. Compound names can be found next to corresponding numbers in Table 1.

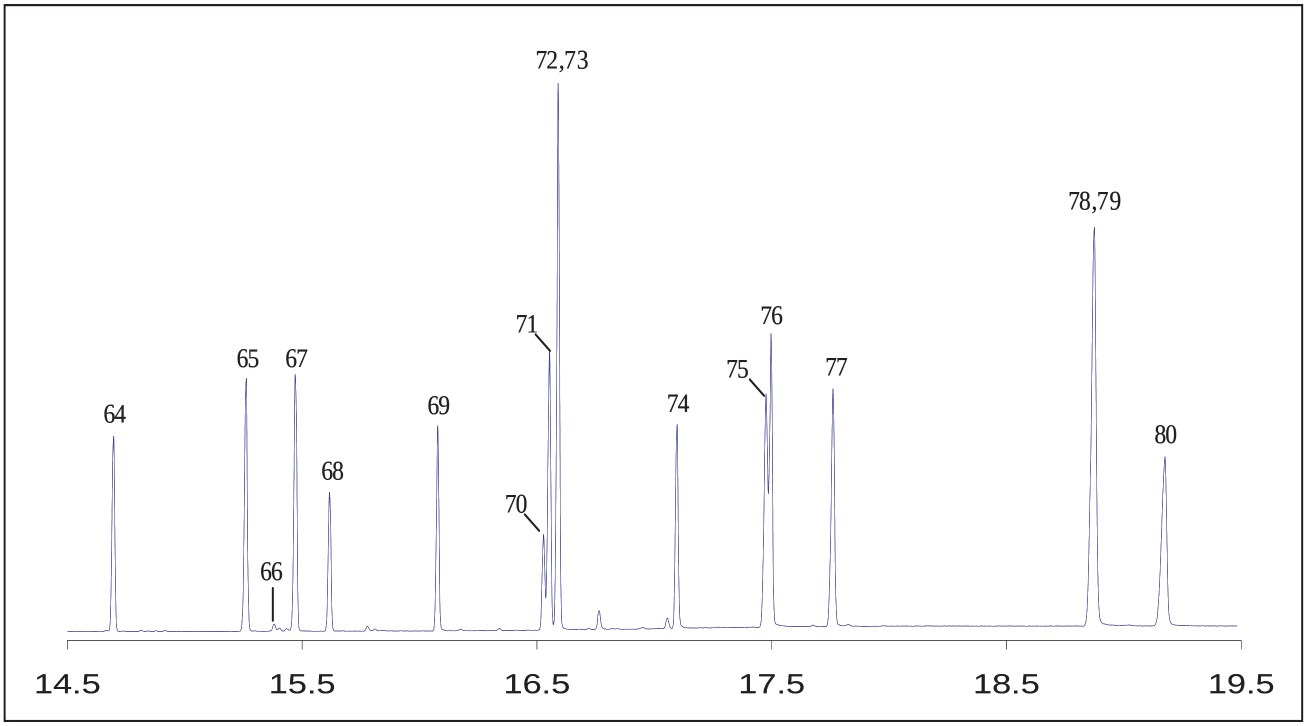

Figure 5. Chromatogram from 14.5 to 19.5 minutes. Peak identities are listed in Table 1.

Peak #	Compound	Ret. Time	Quant. Ion
1	N-Nitrosodimethylamine	3.87	74
2	Pyridine	3.87	79
3	2-Fluorophenol	5.85	112
4	d6-Phenol	7.15	99
5	Aniline	7.16	93
6	Phenol	7.16	94
7	bis(2-Chloroethyl) ether	7.24	93
8	2-Chlorophenol-d4	7.28	132
9	2-chlorophenol	7.31	128
10	1,3-Dichlorobenzene	7.50	146
11	1,4-Dichlorobenzene	7.57	146
12	Benzyl Alcohol	7.80	79
13	1,2-Dichlorobenzene-d4	7.82	150
14	1,2-Dichlorobenzene	7.84	146
15	bis(2-Chloroisopropyl)ether	8.06	45
16	o-Cresol	8.21	108
17	p-Cresol	8.21	107
18	m-Cresol	8.21	108
19	N-Nitroso-di-n-propylamine	8.23	70
20	Hexachloroethane	8.28	201
21	Nitrobenzene-d5	8.39	82
22	Nitrobenzene	8.41	77
23	Isophorone	8.76	82
24	2-Nitrophenol	8.88	139
25	2,4-Dimethylphenol	8.97	107
26	bis(2-Chloroethoxy)methane	9.10	93
27	2,4-Dichlorophenol	9.23	162
28	Benzoic Acid	9.23	122
29	1,2,4-Trichlorobenzene	9.35	180
30	Naphthalene	9.44	128
31	4-Chloroaniline	9.57	127
32	Hexachlorobutadiene	9.72	225
33	4-Chloro-3-methyl phenol	10.30	107
34	2-Methyl naphthalene	10.47	142
35	Hexachlorocyclopentadiene	10.82	237
36	2,4,6-Trichlorophenol	10.94	196
37	2,4,5-Trichlorophenol	11.00	196
38	2-fluorobiphenyl	11.07	107
39	2-Chloronaphthalene	11.20	162
40	2-Nitroaniline	11.42	138
41	Dimethyl phthalate	11.75	163
42	2,6-Dinitrotoluene	11.83	165
43	Acenaphthylene	11.83	152
44	3-Nitroaniline	12.05	138
45	Acenaphthene	12.11	153
46	2,4-Dinitrophenol	12.20	184
47	4-Nitrophenol	12.33	139
48	Dibenzofuran	12.36	168
49	1-Methyl-2,4-dinitrobenzene	12.43	165
50	Diethyl Phthalate	12.81	149
51	Fluorene	12.85	166
52	4-Chlorophenyl phenyl ether	12.87	20
53	4-Nitroaniline	12.96	138
54	2-Methyl-4,6-dinitrophenol	13.00	198
55	N-Nittrosodiphenylamine	13.04	169
56	Azobenzene	13.08	77
57	2,4,6-Tribromophenol	13.20	330
58	4-Bromophenyl phenyl ether	13.49	248
59	Hexachlorobenzene	13.66	284
60	Pentachlorophenol	13.87	266
61	Phenanthrene	14.03	178
62	Anthracene	14.08	178
63	Carbazole	14.27	167
64	Dibutyl phthalate	14.70	149
65	Fluoranthene	15.26	202
66	Benzidine	15.38	184
67	Pyrene	15.47	202
68	p-Terphenyl-d14	15.62	244
69	Benzyl butyl phthalate	16.08	149
70	3, 3'-Dichlorobenzidine	16.53	252
71	Benzo[a]anthracene	16.56	228
72	Chrysene	16.59	228
73	Bis(2-ethylhexyl) phthalate	16.59	149
74	Di-n-octyl phthalate	17.10	149
75	Benzo[b]fluoranthene	17.47	252
76	Benz[k]fluoroanthene	17.49	252
77	Benzo[a]pyrene	17.76	252
78	Dibenz[a,h]anthracene	18.87	278
79	Indenol(1,2,3) pyrene	18.88	276
80	Dibenzo(g,h,i)pyrlene	19.17	276

Ordering Information

Order Number	Description
7HG-G002-11	ZB-5 - 30m x 0.25mm x 0.25µm