INFICON

APPLICATION NOTE

HAPSITE Smart Portable GC/MS: Calibration Curves for 52 Volatile Organic Compounds in Water or Soil

INTRODUCTION

The ability to rapidly identify and quantify volatile organic compound (VOC) contaminants in water and soil is important when decisions regarding health and safety must be made quickly, such as in emergency response situations. Data must be as accurate as possible so that responders can be confident that their decisions are correct. It is unacceptable for measured concentrations to be off an order of magnitude in either direction when the results may determine whether immediate action is required. The HAPSITE® portable gas chromatograph/mass spectrometer (GC/MS), when connected to a Headspace Sampling System (HSS) can accurately determine concentrations of VOC in water by utilizing stored methods containing carefully created calibration curves. As a result, actionable laboratory quality data can be generated right on-site.

CALIBRATION CURVES

Response data for all 52 analytes were collected in one 25-minute run (Figure 1) at each concentration. The quantitative analysis range is between 1 and 100 ppb. Linear calibration curves were created from five calibration standards (1, 5, 10, 40, 100 ppb) (standard deviations < 34%).

Table 1 is a list of the fifty-two analytes in the calibration curve, showing the internal standard reference number, quantitation mass, retention time, average relative response factor, and %RSD for each analyte. An RTX-1 column (30 m, 0.32 mm I.D, 1.0 mm d.f.), which is the standard column that comes with the HAPSITE, was used to separate the analytes before being analyzed by the MS. A qualitative match purity of 75% was required for positive identification of compounds.

CURVE PORTABILITY

VOC curves, created at INFICON, are fairly consistent from instrument to instrument. Combining calibration data from three different HAPSITEs resulted in calibration curve RSDs averaging 34%. As a result, these curves are considered to be portable and are usable with any HAPSITE when on-site calibration curve creation is not possible. The system provides results equivalent to running EPA method 8260 in a laboratory, but within minutes of sampling and without leaving the site.

Figure 1: Chromatogram of 52 Compounds using 25-minute Method

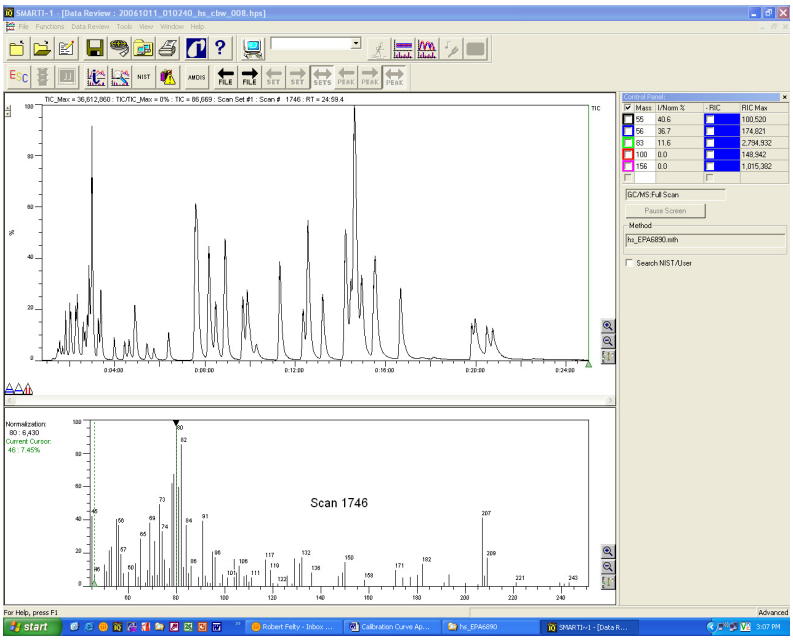

Table 1: List Of Analytes						
No.	Analyte Name	Int. Std.	Q-ion	Ret. Time	Ave. Rel. RF	%RSD
1	1,1-dichloroethylene	1	49	1:47	0.46	13.9
2	methylene chloride	1	49	1:48	0.46	14.0
3	*trans*-1,2-dichloroethylene	1	61	2:00	0.61	16.0
4	1,1-dichloroethane	1	63	2:02	0.60	15.9
5	*cis*-1,2-dichloroethylene	1	61	2:15	0.46	15.0
6	Bromochloromethane	1	49	2:18	0.42	19.1
7	chloroform	1	83	2:20	0.41	16.6
8	2,2-dichloropropane	1	77	2:21	0.56	15.5
9	1,2-dichloroethane	1	62	2:35	0.36	13.8
10	1,1,1-trichloroethene	1	97	2:41	0.29	20.4
11	1,1-dichloropropene	1	75	2:48	0.68	19.3
12	Benzene	1	78	2:52	1.44	13.2
13	carbon tetrachloride	4	117	2:56	0.48	15.9
14	dibromomethane	3	93	3:16	1.11	16.6
15	1,2-dichloropropane	1	63	3:17	0.28	17.0
16	Bromodichloromethane	1	83	3:23	0.38	13.5
17	trichloroethene	3	95	3:24	3.41	21.3
18	cis-1,2-dichloropropylene	1	75	3:59	0.59	24.6
19	*trans*-1,3-dichloropropene	1	75	4:25	0.47	30.0
20	1,1,2-trichloroethane	3	97	4:36	1.47	17.3
21	toluene	3	91	4:52	12.49	30.0
22	1,3-dichloropropane	1	76	4:54	1.67	15.6
23	dibromochloromethane	4	129	5:23	0.49	20.0
24	1,2-dibromoethane (EDB)	4	107	5:42	0.44	24.8
25	tetrachloroethylene	5	166	6:24	1.61	13.4
26	chlorobenzene	4	112	7:41	2.69	13.3
27	1,1,1,2-tetrachloroethane	4	131	7:41	0.64	8.6
28	ethylbenzene	3	91	8:32	19.09	33.7
29	Bromoform	2	73	8:40	0.11	1.7
30	*m&p*-xylene	3	91	8:53	4.15	27.5
31	styrene	4	104	9:43	2.89	26.1
32	*o*-xylene	3	91	9:55	2.89	10.6
33	1,1,2,2-tetrachloroethane	3	83	9:59	2.40	5.8
34	1,2,3-trichloropropane	3	75	10:15	2.39	3.9
35	Bromobenzene	3	77	11:22	13.50	3.4
36	isopropylbenzene	4	105	11:23	5.17	29.7
37	1-chloro-2-methylbenzene	3	91	12:22	12.45	13.8
38	*n*-propylbenzene	3	91	12:42	0.79	12.4
39	1,3,5-trimethylbenzene	4	105	13:14	4.62	3.6
40	*tert*-butylbenzene	3	91	14:14	16.00	3.4
41	1,2,4-trimethylbenzene	4	105	14:16	4.86	28.3
42	1,3-dichlorobenzene	5	146	14:31	3.04	17.0
43	1,4-dichlorobenzene	5	146	14:31	3.04	17.0
44	*sec*-butylbenzene	4	105	15:03	7.14	21.8
45	p-isopropyltoluene	4	119	15:27	5.94	29.4
46	1,2-dichlorobenzene	4	119	15:34	5.95	26.8
47	*n*-butylbenzene	3	91	16:41	25.90	3.9
48	1,2-dibromo-3-chloropropane	3	75	16:51	0.63	29.0
49	1,2,4-trichlorobenzene	5	180	19:49	0.92	3.5
50	naphthalene	4	128	19:58	0.98	3.5
51	1,2,3-trichlorobenzene	5	180	20:33	0.52	3.7
52	hexachloro-1,3-butadiene	6	225	20:47	0.58	3.5

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