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Application Note
OI Analytical, a Xylem brand • 4361-01

Analysis of Volatile Organic Compounds Using USEPA Method 524.3, Eclipse 4760 Purge and Trap and 4100 Autosampler

GENERAL LABORATORY SERIES

Introduction

USEPA Method 524.2 has been used by laboratories for many years for the analysis of volatile organic compounds in drinking water by purge and trap concentration with detection using Gas Chromatography/Mass Spectrometry (GC/MS). This method requires an 11 minute purge at 40 mL/minute and a 4 minute desorb. The 4 minute desorb transfers a significant amount of water to the GC/MS, which has become more problematic as newer, more sensitive instruments are being used. Method 524.3 was released in 2009 and allows the user greater latitude when optimizing instrument and purge and trap parameters.

Figure 1. OI Analytical Eclipse 4760 Purge and Trap and the 4100 Autosampler

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Instrumentation

Instrumentation used for concentration was an OIA 4760 purge and trap with an OIA 4100 sample processor. An Agilent 7890A/5975C GC/MS was used for chromatographic separation and detection.

Methodology

The main benefit of this method is the allowance of a 0.5 minute desorb. The best purge and trap and GC parameters were found and utilized for the study. Cycle time was balanced so that when the purge and trap cycle ended the GC was ready for injection. Please see Table 1 for instrument parameters.

The method requires using 25 mg Ascorbic acid and 200 mg Maleic acid to preserve samples. The preservative should also be used for all QC runs. A procedural calibration using these preservatives was prepared and analyzed for 0.5 ppb to 40 ppb. Initial Demonstration of Capability (IDC) was analyzed at 10 ppb. As required by the method, 5 ml was purged.

Table 1. Instrument Parameters

Purge-and-Trap	Eclipse 4760 P&T Sample Concentrator
Trap	#10 trap; Tenax® / Silica gel / CMS
Purge Gas	Zero grade Helium at 40 mL/min
Purge Time	11 min
Sparge Mount Temperature	45 °C
Sample Temperature (purge)	45 °C
Sample Temperature (bake)	45 °C
Desorb Time	0.5 min
Bake Time	4 min
OI #10 Trap Temperature	Ambient during purge 180 °C during desorb pre-heat 190 °C during desorb 210 °C during bake
Water Management	120 °C during purge Ambient during desorb 240 °C during bake
Transfer Line Temperature	140 °C
Six-port Valve Temperature	140 °C

Autosampler	4100 Water/Soil Sample Processor
System Gas	Zero grade nitrogen
Purge Gas	Zero grade helium
LV20 Pressure	8.0 psi
Loop-based Time Settings	Default
Rinse Water	80 °C
Soil Sample Transfer	150 °C
Soil Oven	150 °C
Soil Lift Station	45 °C

Gas Chromatograph	Agilent 7890A
Column	Restek Rtx-VMS 30 meter, 0.25 mm ID, 1.4 µmdf
Carrier Gas	Zero grade helium
Inlet Temperature	250 °C
Inlet Liner	Agilent Ultra Inert, 1 mm straight taper
Column Flow Rate	0.8 mL/min
Split Ratio	50:1
Oven Program	Hold at 40 °C for 2 min 12 °C/minute to 170 °C 40 °C/minute to 220 °C Hold at 220 °C for 2 min Total GC Run is 16.1 min

Mass Spectrometer	Agilent 5975C
Mode	Scan 35 - 300 amu
Scans/Second	5.19
Solvent Delay	1.70 min
Transfer Line Temperature	250 °C
Source Temperature	300 °C
Quadrupole Temperature	200 °C
Draw Out Plate	6 mm

4100 Sample Processor Methods	
Sample Type	Waters Only
Vial Cap Color	Blue
Needle Rinses	1
SAM A (µL)	5
SAM B (µL)	0
SAM C (µL)	0
SAM D (µL)	0
Purge Time (min)	11.0
Desorb Time (min)	0.5
P&T Rinses	2
Rinse Water	Hot
Water Stir Time (min)	0.0
Water Settle Time (sec)	0

Results

Please see Tables 2, 3, and 4 for calibration and QC data. The calibration was validated by calculating the concentration of the analytes for each of the points used to generate the curve. All QC criteria were met.

Table 2. Calibration Data

Analyte	Compound	Avg RF	% RSD
1	1,4-Difluorobenzene (IS)	N/A	N/A
2	Dichlorofifluoromethane	0.313	13.13
3	Chlorodifluoromethane	0.410	7.65
4	Chloromethane	0.393	6.58
5	Vinyl chloride	0.411	8.45
6	1,3 - Butadiene	0.370	8.47
7	Bromomethane	0.336	10.60
8	Trichlorofluoromethane	0.630	8.42
9	Ethyl ether	0.175	8.57
10	1,1-Dichloroethene	0.319	7.34
11	Carbon disulfide	1.047	8.04
12	Methyl iodide	0.624	9.00
13	Allyl chloride	0.151	10.76
14	Methylene chloride	0.422	16.05
15	trans-1,2-Dichloroethene	0.334	9.43
16	Methyl acetate	0.321	9.45
17	Methyl tert-butyl ether-d3 (SS)	0.880	10.61
18	Methyl tert-butyl ether	0.902	10.16
19	tert-Butyl alcohol	0.801	11.88
20	Diisopropyl ether	0.902	11.09
21	1,1-Dichloroethane	0.644	7.11
22	tert-Butyl ethyl ether	0.801	11.88
23	cis-1,2-Dichloroethene	0.338	6.37
24	Bromochloromethane	0.198	8.15
25	Chloroform	0.670	8.64
26	Carbon tetrachloride	0.542	8.69
27	Tetrahydrofuran	0.044	11.73
28	1,1,1-Trichloroethane	0.585	6.91
29	1,1-Dichloropropene	0.400	10.52
30	1-Chlorobutane	0.559	9.84
31	Benzene	1.185	5.42
32	tert-Amyl methyl ether	0.652	13.70
33	1,2-Dichloroethane	0.562	5.43
34	Trichloroethene	0.368	3.94
35	tert-Amyl ethyl ether	0.602	7.23
36	Dibromomethane	0.250	8.42
37	1,2-Dichloropropane	0.323	9.18
38	Bromodichloromethane	0.470	6.21
39	cis-1,3-Dichloropropene	0.430	4.23
40	Chlorobenzene-d5 (IS)	N/A	N/A
41	Toluene	0.752	7.49
42	Tetrachloroethene	0.474	10.82
43	trans-1,3-Dichloropropane	0.488	8.07
44	1,1,2-Trichloroethane	0.307	2.05
45	Ethyl methacrylate	0.350	14.85
46	Chlorodibromomethane	0.454	9.78
47	1,3-Dichloropropane	0.510	8.75
48	1,2-Dibromoethane	0.393	8.00
49	Chlorobenzene	1.027	2.14
50	Ethylbenzene	1.502	8.02
51	1,1,1,2-Tetrachloroethane	0.374	2.94
52	m,p-Xylenes	0.569	15.84
53	o-Xylene	0.465	17.90
54	Styrene	0.824	21.94
55	Bromoform	0.336	7.82
56	Isopropylbenzene	1.218	19.84
57	1,4-Dichlorobenzene-d4 (IS)	N/A	N/A
58	4-Bromofluorobenzene (SS)	0.946	2.49
59	Bromobenzene	0.924	6.31
60	n-Propylbenzene	3.304	4.60
61	1,1,2,2-Tetrachloroethane	0.989	11.88
62	2-Chlorotoluene	2.049	5.62
63	1,3,5-Trimethylbenzene	2.177	15.75
64	1,2,3-Trichloropropane	0.865	7.47
65	4-Chlorotoluene	1.984	8.15
66	tert-Butylbenzene	1.988	8.76
67	1,2,4-Trimethylbenzene	2.044	19.08
68	sec-Butylbenzene	2.611	15.32
69	p-isopropyltoluene	2.061	20.9
70	1,3-Dichlorobenzene	1.509	2.43
71	1,4-Dichlorobenzene	1.573	5.17
72	n-Butylbenzene	1.989	10.80
73	Hexachloroethane	0.347	9.12
74	1,2-Dichlorobenzene-d4 (SS)	1.001	3.19
75	1,2-Dichlorobenzene	1.468	5.78
76	1,2-Dibromo-3-chloropropane	0.210	15.62
77	Hexachlorobutadiene	0.554	11.16
78	1,2,4-Trichlorobenzene	0.695	5.04
79	Napthalene	1.744	8.72
80	1,2,3-Trichlorobenzene	0.695	5.04

Table 3. Calibration Acceptance Data

	VOA014.D		VOA015.D		VOA016.D		VOA017.D		VOA018.D		VOA019.D		VOA020.D	
	30-Jun-16													
	VSTD0.5		VSTD001		VSTD002		VSTD005		VSTD010		VSTD020		VSTD040	
[Results Signal 1]	5ML 0.5PPB 524 STD	5ML 0.5PPB 524 STD	5ML 1PPB 524 STD	5ML 1PPB 524 STD	5ML 2PPB 524 STD	5ML 2PPB 524 STD	5ML5PPB 524 STD	5ML 5PPB 524 STD	5ML 10PPB 524 STD	5ML 10PPB 524 STD	5ML 20PPB 524 STD	5ML 20PPB 524 STD	5ML 40PPB 524 STD	5ML 40PPB 524 STD
Dichlorofifluoromethane	0.55	110%	0.96	96%	2.03	102%	5.07	101%	10.08	101%	21.4	107%	36.76	92%
Chlorodifluoromethane	0.5	100%	0.98	98%	1.95	98%	4.75	95%	11	110%	21.68	108%	35.19	88%
Chloromethane	0.53	106%	0.99	99%	1.97	99%	4.7	94%	10.72	107%	21.16	106%	35.95	90%
Vinyl chloride	0.51	102%	1	100%	1.94	97%	4	80%	11.14	111%	21.79	109%	36.53	91%
1,3-Butadiene	0.53	106%	1.01	101%	1.82	91%	0.44	9%	11.06	111%	21.77	109%	36.99	92%
Bromomethane	0.58	116%	0.99	99%	1.87	94%	4.57	91%	10.99	110%	20.69	103%	35.44	89%
Trichlorofluoromethane	0.51	102%	0.92	92%	1.95	98%	4.45	89%	11.17	112%	22.06	110%	35.9	90%
Ethyl ether	0.48	96%	1.01	101%	1.85	93%	4.82	96%	11.09	111%	22.44	112%	39.03	98%
1,1-Dichloroethene	0.48	96%	1	100%	1.91	96%	4.55	91%	11.07	111%	21.91	110%	36.72	92%
Carbon disulfide	0.51	102%	0.96	96%	1.87	94%	4.79	96%	10.94	109%	22.38	112%	36.84	92%
Methyl iodide	0.46	92%	0.98	98%	1.88	94%	4.72	94%	11.07	111%	22.95	115%	38.9	97%
Allyl chloride	0.49	98%	0.89	89%	1.78	89%	4.71	94%	11.2	112%	23.29	116%	40.64	102%
Methylene chloride	1.32	264%	1.66	166%	2.49	125%	4.73	95%	10.23	102%	19.53	98%	31.94	80%
trans 1,2-Dichloroethene	0.51	102%	1	100%	1.85	98%	4.79	96%	11	110%	22.45	112%	34.28	86%
Methyl acetate	0.45	90%	1.04	104%	2.07	104%	4.59	92%	10.54	105%	22.27	111%	33.59	84%
Methyl tert-butyl ether-d3	19.42	97%	19.2	96%	19	95%	18.79	94%	22.78	114%	23.19	116%	17.62	88%
Methyl tert-butyl ether	0.5	100%	1	100%	1.93	97%	4.63	93%	11.2	112%	22.67	113%	33.93	85%
tert-Butyl alcohol	0.51	102%	0.91	91%	1.77	88.5%	4.51	90.2%	10.96	110%	24.19	93%	39.06	78.1%
Diisopropyl ether	0.48	96%	0.87	87%	1.79	90%	4.7	94%	11.15	112%	22.98	115%	42.88	107%
1,1-Dichloroethane	0.48	96%	1.01	101%	1.95	98%	4.89	98%	10.81	108%	22.06	110%	35.92	90%
tert-Butyl ethyl ether	0.46	92%	0.91	91%	1.77	89%	4.51	90%	10.96	110%	24.19	121%	39.06	98%
cis-1,2-Dichloroethene	0.51	102%	1	100%	1.89	95%	4.81	96%	10.49	105%	21.76	109%	36.44	91%
Bromochloromethane	0.52	104%	1	100%	1.93	97%	4.89	98%	11.25	113%	20.73	104%	34.35	86%
Chloroform	0.52	104%	1.03	103%	1.95	98%	4.82	96%	11.09	111%	20.84	104%	33.48	84%
Carbon tetrachloride	0.54	108%	1.08	108%	1.94	97%	4.93	99%	11.31	113%	20.45	102%	34.6	87%
Tetrahydrofuran	0.49	98%	0.94	94%	1.9	95%	4.66	93%	11.95	120%	21.55	108%	41.15	103%
1,1,1-Trichloroethane	0.5	100%	1.06	106%	1.84	92%	4.68	94%	10.79	108%	21.38	107%	37.5	94%
1,1-Dichloropropene	0.45	90%	0.93	93%	1.81	91%	4.66	93%	10.82	108%	22.08	110%	45.79	114%
1-Chlorobutane	0.44	88%	0.93	93%	1.84	92%	4.79	96%	10.82	108%	21.52	108%	45.75	114%
Benzene	0.46	92%	1	100%	2.01	101%	5.01	100%	9.73	97%	20.17	101%	43.98	110%
tert-Amyl methyl ether	0.42	84%	0.89	89%	1.85	93%	4.87	97%	10.16	102%	22.21	111%	49.61	124%
1,2-Dichloroethane	0.51	102%	1.08	108%	2.05	103%	5.03	101%	9.25	93%	18.62	93%	40.72	102%
Trichloroethene	0.48	96%	1.08	108%	2.04	102%	4.97	99%	9.79	98%	19.99	100%	38.73	97%
tert-Amyl ethyl ether	0.49	98%	0.99	99%	1.85	93%	4.87	97%	9.63	96%	20.58	103%	45.94	115%
Dibromomethane	0.55	110%	1.1	110%	2.04	102%	4.88	98%	9.7	97%	19.4	97%	34.45	86%
1,2-Dichloropropane	0.56	112%	1.1	110%	2.08	104%	4.92	98%	9.49	95%	18.62	93%	34.94	87%
Bromodichloromethane	0.53	106%	1.07	107%	2.01	101%	5.08	102%	9.81	98%	19.53	98%	35.49	89%
cis-1,3-Dichloropropene	0.53	106%	1.05	105%	1.88	94%	4.89	98%	9.98	100%	20.33	102%	38.75	97%

Table 3. Calibration Acceptance Data (continued)

	VOA014.D		VOA015.D		VOA016.D		VOA017.D		VOA018.D		VOA019.D		VOA020.D	
	30-Jun-16													
	VSTD0.5		VSTD001		VSTD002		VSTD005		VSTD010		VSTD020		VSTD040	
[Results Signal 1]	**5ML 0.5PPB 524 STD**	**5ML 0.5PPB 524 STD**	**5ML 1PPB 524 STD**	**5ML 1PPB 524 STD**	**5ML 2PPB 524 STD**	**5ML 2PPB 524 STD**	**5ML5PPB 524 STD**	**5ML 5PPB 524 STD**	**5ML 10PPB 524 STD**	**5ML 10PPB 524 STD**	**5ML 20PPB 524 STD**	**5ML 20PPB 524 STD**	**5ML 40PPB 524 STD**	**5ML 40PPB 524 STD**
Toluene	0.5	100%	0.95	95%	1.79	90%	4.77	95%	10.19	102%	21.72	109%	43.97	110%
Tetrachloroethene	0.41	82%	1.01	101%	1.99	100%	4.57	91%	10.62	106%	22.71	114%	43.02	108%
trans-1,3-Dichloropropane	0.46	92%	0.95	95%	1.81	91%	4.96	99%	10.22	102%	21.71	109%	44.78	112%
1,1,2-Trichloroethane	0.48	96%	1.01	101%	2.04	102%	5.02	100%	9.98	100%	20.41	102%	39.49	99%
Ethyl methacrylate	0.46	92%	0.86	86%	1.75	88%	4.52	90%	10.65	107%	23.03	115%	49.27	123%
Chlorodibromomethane	0.44	88%	0.97	97%	1.96	98%	4.83	97%	12.01	120%	20.29	101%	39.6	99%
1,3-Dichloropropane	0.49	98%	0.97	97%	1.87	94%	4.79	96%	11.95	120%	19.64	98%	39.43	99%
1,2-Dibromoethane	0.48	96%	0.99	99%	1.91	96%	4.88	98%	11.8	118%	19.4	97%	38.84	97%
Chlorobenzene	0.5	100%	1.02	102%	1.93	97%	4.97	99%	10.2	102%	20.28	101%	39.15	98%
Ethylbenzene	0.45	90%	0.98	98%	1.83	92%	4.87	97%	10.28	103%	21.97	110%	44.05	110%
1,1,1,2-Tetrachloroethene	0.51	102%	1.05	105%	2.02	101%	5.05	101%	9.63	96%	19.79	99%	38.63	97%
m,p-Xylenes	0.83	83%	1.62	81%	3.57	89%	10.14	101%	22.25	111%	47.33	118%	92.97	116%
o-Xylene	0.39	78%	0.85	85%	1.7	85%	5.01	100%	11.05	111%	23.59	118%	49.66	124%
Styrene	0.41	82%	0.76	76%	1.55	78%	5.06	101%	11.3	113%	25	125%	50.52	126%
Bromoform	0.43	86%	1	100%	1.91	96%	4.89	98%	10.5	105%	21.08	105%	43.23	108%
Isopropylbenzene	0.4	80%	0.79	79%	1.69	85%	4.97	99%	11.31	113%	24.35	122%	49.84	125%
4-Bromofluorobenzene	20.73	104%	20.53	103%	20.11	101%	20.01	100%	19.41	97%	19.66	98%	19.55	98%
Bromobenzene	0.55	110%	1.05	105%	2.06	103%	4.97	99%	9.34	93%	19.44	97%	36.97	92%
n-Propylbenzene	0.48	96%	0.96	96%	1.94	97%	4.05	81%	10.03	100%	21.47	107%	42.03	105%
1,1,2,2-Tetrachlroethane	0.59	118%	1.09	109%	2.16	108%	4.93	99%	9.13	91%	17.9	90%	34.35	86%
2-Chlorotoluene	0.49	98%	0.93	93%	1.88	94%	5.3	106%	10.72	107%	20.61	103%	39.91	100%
1,3,5-Trimethylbenzene	0.41	82%	0.84	84%	1.73	87%	5.17	103%	11.08	111%	23.55	118%	46.45	116%
1,2,3-Trichloropropane	0.56	112%	1.07	107%	2.06	103%	4.95	99%	9.44	94%	19.07	95%	36.59	91%
4-Chlorotoluene	0.45	90%	0.93	93%	1.83	92%	5.18	104%	10.37	104%	22.08	110%	42.86	107%
tert-Butylbenzene	0.49	98%	0.89	89%	1.77	89%	5.1	102%	10.38	104%	21.95	110%	43.76	109%
1,2,4-Trichlorobenzene	0.39	78%	0.82	82%	1.66	83%	4.96	99%	11.38	114%	24.4	122%	48.46	121%
sec-Butylbenzene	0.4	80%	0.83	83%	1.82	91%	5.19	104%	11.01	110%	23.4	117%	46.1	115%
p-Isopropyltoluene	0.31	62%	0.65	65%	1.34	67%	4.01	80%	9.28	93%	19.95	100%	40.38	101%
1,3-Dichlorobenzene	0.51	102%	1.04	104%	1.99	100%	4.98	100%	9.89	99%	19.99	100%	38.44	96%
1,4-Dichlorobenzene	0.53	106%	1.08	108%	1.98	99%	5.02	100%	9.69	97%	19.58	98%	37.09	93%
n-Butylbenzene	0.44	88%	0.92	92%	1.7	85%	4.86	97%	10.7	107%	22.6	113%	45.17	113%
Hexachloroethane	0.53	106%	1.11	111%	2.12	106%	5.16	103%	9.67	97%	18.65	93%	33.75	84%
1,2-Dichlorobenzene-d4	20.93	105%	20.46	102%	20.41	102%	19.7	99%	19.93	100%	19.46	97%	19.1	96%
1,2-Dichlorobenzene	0.53	106%	1.07	107%	2.06	103%	5	100%	9.84	98%	19.12	96%	36.24	91%
1,2-Dibromo-3-chloropropane	0.63	126%	1.17	117%	2.02	101%	4.55	91%	9	90%	17.67	88%	34.71	87%
Hexachlorobutadiene	0.61	122%	1.05	105%	2.03	102%	4.82	96%	9.74	97%	18.53	93%	34.3	86%
1,2,4-Trichlorobenzene	0.53	106%	0.99	99%	1.97	99%	4.71	94%	10.7	107%	19.92	100%	38.11	95%
Naphthalene	0.5	100%	0.91	91%	1.8	90%	4.69	94%	10.6	106%	21.74	109%	44.38	111%
1,2,3-Trichlorobenzene	0.53	106%	0.99	99%	1.97	99%	4.71	94%	10.7	107%	19.92	100%	38.11	95%

Table 4. Initial Demonstration of Proficiency

10 ppb (true concentration)

	VOA032	VOA033	VOA034	VOA035	VOA036	VOA037	VOA038	Precision	Accuracy
	IDC 1	**IDC 2**	**IDC 3**	**IDC 4**	**IDC 5**	**IDC 6**	**IDC 7**	**% RSD**	**% Recovery**
								<= 20 %	+ - 20%
Dichlorofifluoromethane	7.14	8.22	7.71	7.91	8.76	8.68	8.71	7.49	81.61
Chlorodifluoromethane	7.43	8.78	8.16	8.2	9.8	9.43	9.94	10.70	88.20
Chloromethane	8.45	8.73	8.37	8.46	10.01	9.52	10.14	8.50	90.97
Vinyl chloride	8.2	8.03	8.04	8.36	9.95	9.82	10.35	11.43	89.64
1,3-Butadiene	7.92	7.68	7.64	7.74	9.36	9.31	9.61	10.72	84.66
Bromomethane	8.2	7.99	8.01	8.18	9.64	9.55	10.12	10.39	88.13
Trichlorofluoromethane	8.33	8.03	7.72	7.91	9.1	9.29	9.43	8.33	85.44
Ethyl ether	8.56	8.88	8.82	8.71	10.94	10.8	11.65	13.38	97.66
1,1-Dichloroethene	8.75	8.51	8.52	8.56	9.92	10.37	10.77	10.49	93.43
Carbon disulfide	8.74	8.72	8.46	8.51	9.89	10.18	10.56	9.51	92.94
Methyl iodide	8.82	8.86	8.79	8.87	10.27	10.42	11.1	10.18	95.90
Allyl chloride	9.08	9.05	8.87	8.8	10.26	10.97	11.37	11.04	97.71
Methylene chloride	8.37	8.44	8.24	8.28	9.33	10.09	10.44	10.28	90.27
trans-1,2-Dichloroethene	8.83	8.99	8.72	8.84	10.04	10.79	11.22	10.84	96.33
Methyl acetate	9.36	9.89	9.67	9.63	11.1	12.29	12.17	11.83	105.87
Methyl tert-butyl ether-d3	18.76	19.04	18.78	19.18	21.85	22.79	24.1	10.79	103.21
Methyl tert-butyl ether	9.09	9.2	9.04	9.07	10.39	10.99	11.7	11.07	99.26
tert-Butyl alcohol	9.31	9.42	9.4	9.55	10.65	11.19	11.91	10.25	102.5
Diisopropyl ether	9.11	9.27	9.26	9.18	10.53	10.88	11.93	11.02	100.23
1,1-Dichloroethane	9.28	9.28	9.05	9.07	10.38	10.68	11.29	9.20	98.61
tert-Butyl ethyl ether	9.31	9.42	9.4	9.55	10.65	11.19	11.91	10.25	102.04
cis-1,2-Dichloroethene	9.29	9.14	9.12	9.09	10.19	10.65	10.7	7.64	97.40
Bromochloromethane	9.24	9.3	9.49	9.24	8.78	10.35	10.76	7.30	95.94
Chloroform	9.45	9.35	9.11	9.01	8.81	10.24	10.75	7.41	95.31
Carbon tetrachloride	9.39	9.13	8.85	8.8	8.9	10.07	10.19	6.23	93.33
Tetrahydrofuran	8.86	10.11	10.12	10.21	11	13.15	12.1	13.27	107.93
1,1,1-Trichloroethane	8.92	8.81	8.5	8.61	8.33	9.73	9.9	6.80	89.71
1,1-Dichloropropene	9.11	9.18	9.1	9.24	8.84	10.45	11.09	8.85	95.73
1-Chlorobutane	9.56	9.72	9.51	9.35	8.89	10.66	11.13	7.97	98.31
Benzene	9.73	9.81	9.73	9.84	9.07	11.11	11.09	7.57	100.54
tert-Amyl methyl ether	9.97	10.16	10.15	10.07	9.97	11.67	10.86	6.11	104.07
1,2-Dichloroethane	9.78	9.73	9.64	9.4	8.66	11.13	9.11	7.98	96.36
Trichloroethene	9.51	9.88	9.64	9.64	9.44	9.81	9.65	1.60	96.53
tert-Amyl ethyl ether	9.74	9.83	9.8	9.77	9.75	9.27	9.98	2.26	97.34
Dibromomethane	9.8	9.79	9.77	9.46	8.97	9.09	9.61	3.62	94.99
1,2-Dichloropropane	9.6	9.54	9.78	9.45	8.79	8.95	9.41	3.83	93.60
Bromodichloromethane	9.98	9.75	9.71	9.55	9.07	8.94	9.61	3.95	95.16
cis-1,3-Dichloropropene	9.36	9.61	9.49	9.59	11.23	9.41	9.57	6.75	97.51
Toluene	9.69	9.62	9.64	9.87	12.04	9.95	8.54	10.60	99.07
Tetrachloroethene	11.54	11.83	11.79	12.43	11.44	11.97	9.57	7.94	115.10
trans-1,3-Dichloropropane	9.81	9.85	9.74	9.94	9.65	10.11	8.37	6.00	96.39
1,1,2-Trichloroethane	9.99	9.98	10.1	10.2	9.79	9.85	8.32	6.61	97.47
Ethyl methacrylate	9.98	10.09	10.28	10.75	10.2	10.58	9.23	4.83	101.59
Chlorodibromomethane	9.75	9.78	9.62	9.61	9.46	9.6	8.06	6.43	94.11
1,3-Dichloropropane	9.71	9.62	9.55	9.88	9.29	9.66	8.11	6.35	94.03
1,2-Dibromoethane	9.58	9.66	9.33	9.57	9.47	9.65	7.97	6.50	93.19
Chlorobenzene	10	9.88	9.78	9.85	9.54	9.81	9.9	1.46	98.23
Ethylbenzene	10.1	10.08	9.88	10.13	9.94	10.13	10.14	1.03	100.57
1,1,1,2-Tetrachloroethene	10.06	9.55	9.81	9.56	9.49	9.67	9.63	2.03	96.81
m,p-Xylenes	21.51	21.29	21.22	21.53	21.25	21.87	21.19	1.14	107.04
o-Xylene	10.63	10.64	10.22	11	10.96	11.15	9.49	5.41	105.84
Styrene	11.05	10.8	10.91	11	11.17	11.42	9.84	4.61	108.84
Bromoform	10.06	10.41	10.08	10.14	10.41	10.2	8.66	6.06	99.94
Isopropylbenzene	10.6	10.83	10.64	10.93	10.96	11.17	9.46	5.28	106.56
4-Bromofluorobenzene	20.07	19.15	19.48	20.18	19.49	16.97	19.61	5.59	96.39
Bromobenzene	9.53	9.01	9.02	9.38	9.32	8.11	9.15	5.14	90.74

Table 4. Initial Demonstration of Proficiency (continued)

	VOA032	VOA033	VOA034	VOA035	VOA036	VOA037	VOA038	Precision	Accuracy
	IDC 1	**IDC 2**	**IDC 3**	**IDC 4**	**IDC 5**	**IDC 6**	**IDC 7**	**% RSD**	**% Recovery**
								<= 20 %	+ - 20%
n-Propylbenzene	9.93	9.62	9.53	9.92	9.59	8.4	9.53	5.43	95.03
1,1,2,2-Tetrachlroethane	8.88	8.82	8.86	8.6	8.66	7.32	8.71	6.46	85.50
2-Chlorotoluene	10.67	9.29	9.4	9.63	9.47	8.59	10.34	7.17	96.27
1,3,5-Trimethylbenzene	10.76	10.37	10.54	10.65	10.59	9.17	10.51	5.23	103.70
1,2,3-Trichloropropane	9.86	9.33	9.41	9.5	9.06	7.87	9.17	6.85	91.71
4-Chlorotoluene	10.19	9.93	9.91	10.04	11.21	8.65	10.1	7.47	100.04
tert-Butylbenzene	9.49	9.16	9.18	9.37	9.53	8.11	9.6	5.56	92.06
1,2,4-Trimethylbenzene	11.1	10.67	10.9	11.02	11.1	9.56	10.92	5.08	107.53
sec-Butylbenzene	10.74	10.49	10.4	10.46	10.46	9.17	10.57	5.06	103.27
p-Isopropyltoluene	8.56	8.45	8.53	8.69	8.65	8.91	8.55	1.74	86.20
1,3-Dichlorobenzene	9.78	9.73	9.64	9.8	9.57	9.71	9.58	0.95	96.87
1,4-Dichlorobenzene	9.7	9.43	9.29	9.51	9.18	9.5	9.36	1.79	94.24
n-Butylbenzene	9.78	9.68	9.58	9.9	9.85	10.45	9.95	2.83	98.84
Hexachloroethane	9.47	9.17	9.52	9.28	9.57	9.38	9.32	1.51	93.87
1,2-Dichlorobenzene-d4	19.96	19.46	19.48	19.64	19.76	19.76	19.67	0.88	98.38
1,2-Dichlorobenzene	9.83	9.55	9.46	9.44	9.42	9.61	9.33	1.72	95.20
1,2-Dibromo-3-chloropropane	9.09	9.36	9.46	8.93	8.84	8.52	9.51	4.01	91.01
Hexachlorobutadiene	8.77	8.96	8.94	8.38	9.05	7.94	8.72	4.54	86.80
1,2,4-Trichlorobenzene	9.75	9.83	10.78	9.66	10.16	9.56	10.3	4.33	100.06
Naphthalene	9.99	10.55	11.27	10.57	10.89	10.28	11.02	4.14	106.53
1,2,3-Trichlorobenzene	9.75	9.83	10.78	9.66	10.16	9.56	10.3	4.33	100.06

Conclusion

This analysis offers a fast, accurate method for analyzing drinking water samples. Not having to use the previously required 4 minute desorb was beneficial to the analysis as a whole. For example, internal standards did not decrease significantly as samples were run throughout the day since less water was injected to the GC/MS.

The preservative for this method can build up in the purge and trap so care must be taken by running unpreserved cleaning blanks, rinsing the sparger twice between samples, and occasionally rinsing the sample pathway.

Reference

Prakash, B,; Munch, D.; Pepich, B. Method 524.3.Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry, Version 1.0; EPA-815-09-009; U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water: Cincinnati, Ohio, June 2009.

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