INFICON

APPLICATION NOTE

EPA 524.2 Standard Quantitation Method for the HAPSITE® ER Portable GC/MS Chemical Identification System Using the SituProbe™ Purge and Trap Sampling System

INTRODUCTION

EPA 524.2 method requires Gas Chromatography/ Mass Spectrometry (GC/MS) separation and detection when monitoring purgeable Volatile Organic Compounds (VOCs) in surface water, ground water, and drinking water. The 524.2 method is specifically designed for analysis of VOCs in water samples that have high volatility and low solubility, and therefore amenable to a purge and trap removal techniques. Using the HAPSITE ER portable GC/MS along with the SituProbe accessory allows users to perform the 524.2 method on location directly in the water source.

INFICON has developed a quantitative method for the HAPSITE ER when used with the SituProbe configuration for situations in which users are monitoring for analytes in the 524.2 method. This method contains a calibration library of 54 analytes listed in the 524.2 method at detection limits in the mid to high ppt range. Using the HAPSITE ER and SituProbe with this quantitative method allows the user to analyze data on-site within minutes of sample collection.

EXPERIMENTAL

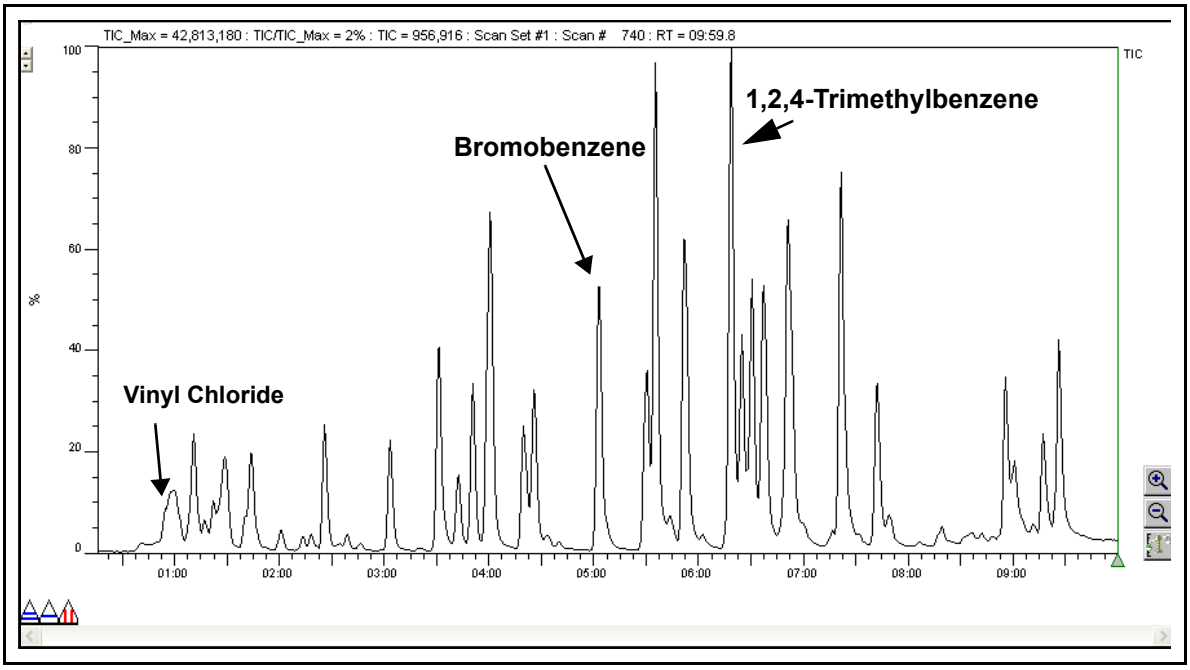
The HAPSITE ER was configured with a SituProbe and Tri-Bed concentrator for mid to high ppt detection levels. The appropriate amount of the 524.2 Volatiles MegaMix® with Gases standard from Restek was injected into 1 L VOC-free water to make five concentrations from 100-2000 ppt (0.1 to 2 ppb). The HAPSITE internal standards were automatically added during sampling.

Following analysis of the five standards, the 54-compound calibration library was built and stored in the method file. GC separation of the VOCs was performed during a 10-minute GC column variable temperature program. An example chromatogram using the method created, along with its parameters, is displayed in Figure 1. Table 1 is a list of the 54 compounds including the quantitation ion (Q. Ion), retention time, and RSD of average Rf of each analyte.

CONCLUSION

A quantitative method that fully complies with the EPA's 524.2 method conditions has been created for the HAPSITE ER with attached SituProbe accessory. The calibration method allows users to obtain analyte concentrations quickly from the source.

Figure 1: Example Chromatogram of the Analytes in the 524.2 Volatiles MegaMix with Gases



Column: HP-1MS, 15 m, 0.25 mm id, 1.0 µm df
Temperature Profile: 60°C (hold 1 min.) to 80°C at 6°C/min., to 120°C at 12°C/min, to 180°C at 26°C/min. (hold 2 sec)

Table 1: Q. Ion, Retention Time, and RSD of Average Rf for the 524.2 Volatiles MegaMix with Gases

Compound	Q. Ion (AMU	Retention Time (min:sec)	RSD of Average Rf (%)
Chloroethene (Vinyl Chloride)	62	00:46.9	10.43
Chloroethane (Ethyl Chloride)	64	00:48.9	26.87
Trichlorofluoromethane (CFC-11)	101	00:52.4	11.27
1,1-Dichloroethene	61	00:54.9	13.20
Methylene Chloride	49	00:56.9	29.71
(*Z*)-1,2-Dichloroethene	61	01:01.3	11.09
1,1-Dichloroethane	63	01:02.6	11.33
(*E*)-1,2-Dichloroethene	61	01:09.6	13.49
Trichloromethane (Chloroform)	83	01:11.2	10.05
Bromochloromethane	49	01:11.6	19.03
2,2-Dichloropropane	77	01:12.4	7.33
1,2-Dichloroethane	62	01:20.0	10.20
1,1,1-Trichloroethane	97	01:23.3	12.79
1,1-Dichloro-1-propene	75	01:27.1	10.07
Benzene	78	01:29.5	9.62
Carbon Tetrachloride	117	01:31.2	9.00

Table 1: Q. Ion, Retention Time, and RSD of Average Rf for the 524.2 Volatiles MegaMix with Gases

Compound	Q. Ion (AMU	Retention Time (min:sec)	RSD of Average Rf (%)
Dibromomethane	95	01:40.4	4.64
1,2-Dichloropropane	63	01:40.9	11.59
Bromodichloromethane	83	01:44.6	11.81
Trichloroethylene	130	01:45.2	12.00
(*Z*)-1,3-Dichloro-1-propene	75	02:01.7	13.05
(*E*)-1,3-Dichloro-1-propene	75	02:14.2	18.76
1,1,2-Trichloroethane	97	02:19.3	13.63
1,3-Dichloropropane	78	02:22.7	10.77
Toluene	91	02:26.6	7.90
Dibromochloromethane	129	02:39.7	16.41
1,2-Dibromoethane	107	02:47.5	19.16
Tetrachloroethylene	166	03:04.2	11.12
Chlorobenzene	112	03:32.3	10.25
1,1,1,2-Tetrachloroethane	131	03:32.3	12.04
Ethylbenzene	91	03:51.5	13.86
m- and *p*-Xylene	91	04:01.3	13.86
Tribromomethane (Bromoform)	173	04:02.2	15.61
Styrene	104	04:21.0	7.76
o-Xylene	91	04:26.8	14.89
1,1,2,2-Tetrachloroethane	83	04:27.5	20.00
1,2,3-Trichloropropane	75	04:34.6	14.89
(1-Methylethyl)-benzene (Cumene)	105	05:03.7	15.91
Bromobenzene	77	05:04.4	14.01
1-Chloro-4-methylbenzene	91	05:31.1	20.32
1-Chloro-2-methylbenzene	91	05:35.1	26.43
Propylbenzene	91	05:36.3	20.32
1,3,5-Trimethylbenzene	105	05:53.0	5.86
tert-Butylbenzene	119	06:19.0	13.91
1,2,4-Trimethylbenzene	105	06:19.4	20.39
1,3-Dichlorobenzene	146	06:26.0	12.22
1,4-Dichlorobenzene	146	06:31.3	12.22
(1-Methylpropyl)-benzene (*sec*-Butylbenzene)	105	06:38.3	20.39
1,2-Dichlorobenzene	146	06:54.3	13.78
Butylbenzene	91	07:22.7	25.54

Table 1: Q. Ion, Retention Time, and RSD of Average Rf for the 524.2 Volatiles MegaMix with Gases

Compound	Q. Ion (AMU	Retention Time (min:sec)	RSD of Average Rf (%)
1-Methyl-4-(1-methylethyl)-benzene (*p*-Cymene)	119	07:50.2	17.41
1,2,3-Trichlorobenzene	180	08:56.6	10.85
Naphthalene	128	09:01.7	11.10
1,2,4-Trichlorobenzene	180	09:18.1	7.56
1,1,2,3,4,4-Hexachloro-1,3-butadiene	225	09:26.9	13.12