The detection of semi-volatile contaminants in drinking water

Exceeding EPA method 525.2 requirements

ENVIRONMENTAL

The trace level determination of a wide range of basic, neutral and acidic semi-volatile analytes in drinking water is a common requirement worldwide. This note provides a basic overview of the analysis of 25 regulated compounds in water samples using the Agilent 7890/240 Ion Trap GC/MS system. The results exceed all requirements of US EPA Method 525.2, "Determination of Organic Compounds in Drinking Water by Liquid-Solid Extraction and Capillary Column Gas Chromatography/Mass Spectrometry."

Key Benefits

- The Agilent 240 Ion Trap GC/MS offers exceptional full scan sensitivity for the detection of trace level contaminants.
- The 240 Ion Trap GC/MS design provides robust operation without retuning, recalibrating or cleaning the MS for extended periods of time (months).
- Reliable qualitative and quantitative results are delivered even at trace level, easily exceeding the 525.2 method QC requirements.
- The Agilent 7890 Series GC and the Agilent 7693 ALS provides accurate and reliable sample introduction, fully controlled from the MS software.

The analysis was carried out using the Agilent 7890 Series GC with a splitless inlet and the Agilent 7693 ALS. The Agilent 240 Ion Trap GC/MS was configured in internal ionization mode and detection was performed in full scan.

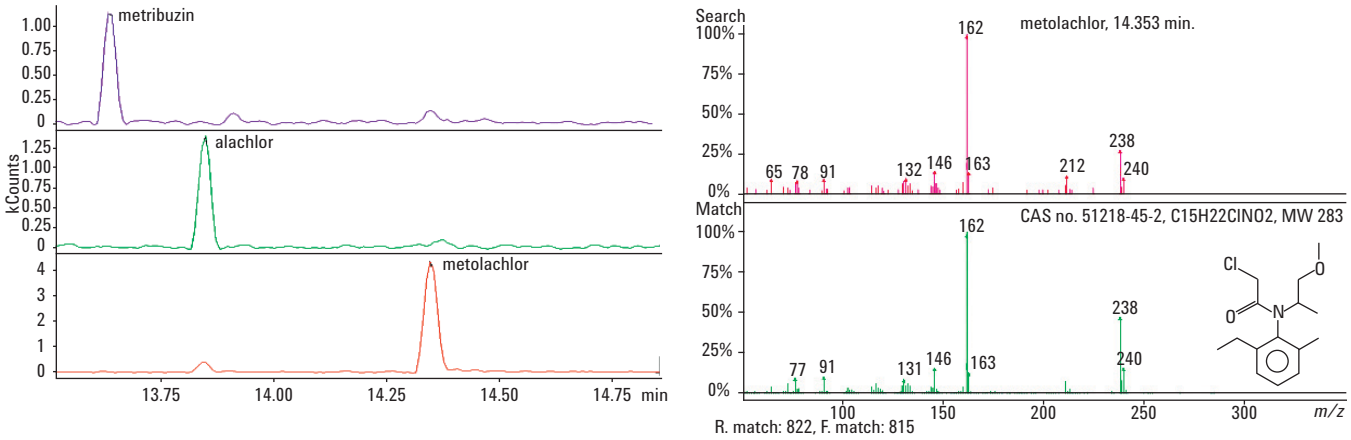
DFTPP tune conditions were readily met during the analysis. The system exhibited excellent sensitivity; strong signal was observed even at the 10 pg/uL level ensuring reliable quantification and identification, using the NIST11 library.

All compounds show excellent linearity in the 10 pg/µL to 10 ng/µL calibration range. The average correlation coefficient was 0.9976 and the %RSD of the relative response factors were from 5.2–16%, with an average of 11.2%.

Method detection limits (MDLs) were calculated based on the standard deviation of seven replicate injections at 10 pg/µL level, then multiplied by the Student's t value at 99% confidence level. The MDLs for the 25 compounds were ranging from 1.5–5.1pg.

In addition to excellent sensitivity, linearity, and precision, the Agilent 240 Ion Trap GC/MS along with the Agilent 7890 Series GC, and the Agilent 7693 ALS delivers robust, reliable operation ensuring high productivity.

The Agilent 240 MS connected to the Agilent 7890 Series GC and the Agilent 7693 ALS.



Extracted ion chromatogram for selected analytes and NIST library search results at 10 pg/µL concentration level. Excellent response for both qualitative and quantitative analysis was attained at this low level.

Table 1. Calibration and MDL Results

Compound name	Correlation coefficient	% RSD	Average amount (pg)	RSD (%)	MDL (pg)
2,4-dinitrotoluene	0.9991	9.1	9.0	6	1.8
2,6-dinitrotoluene	0.9991	10	11.4	7	2.5
alachlor	0.9989	7.2	9.7	5	1.5
aldrin-R	0.9986	15	11.6	5	1.7
alpha-chlordane	0.9994	14	9.9	11	3.4
atrazine	0.9996	14	10.3	5	1.5
benzo[a]pyrene	0.9985	14	10.7	12	3.9
bis(2-ethylhexyl)adipate	0.9992	18	11.7	6	2.4
bis(2-ethylhexyl)phthalate	0.9999	13	9.7	5	1.5
butachlor	0.9990	11	11.9	12	4.6
cyanazine	0.9994	9.0	9.6	10	3.1
dieldrin	0.9989	11	8.4	9	2.5
endrin	0.9986	16	10.3	12	3.9
gamma-chlordane	0.9996	11	10.9	10	3.4
heptachlor	0.9998	7.1	10.0	16	5.1
heptachlor epoxide	0.9991	6.6	9.6	6	1.7
hexachlorobenzene	0.9996	13	9.9	9	2.8
hexachlorocyclopentadiene	0.9984	5.2	9.9	14	4.2
lindane	0.9982	10	10.4	9	3.1
methoxychlor	0.9792	14	10.3	11	3.5
metolachlor	0.9987	8.4	9.1	8	2.2
metribuzin	0.9899	14	9.7	8	2.4
propachlor	0.9998	8.4	10.0	6	1.8
simazine	0.9974	10	8.1	18	4.6
trans-nonachlor	0.9932	11	9.9	9	2.8
Overall	**0.9976**	**11.2**	**10.8**	**9**	**2.9**

Calibration was performed in the 10 pg/uL to 10 ng/uL range. MDLs were calculated based on the standard deviation of seven replicate injections at 10pg/uL standard, then multiplied by the Student's t at 99% confidence level.

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