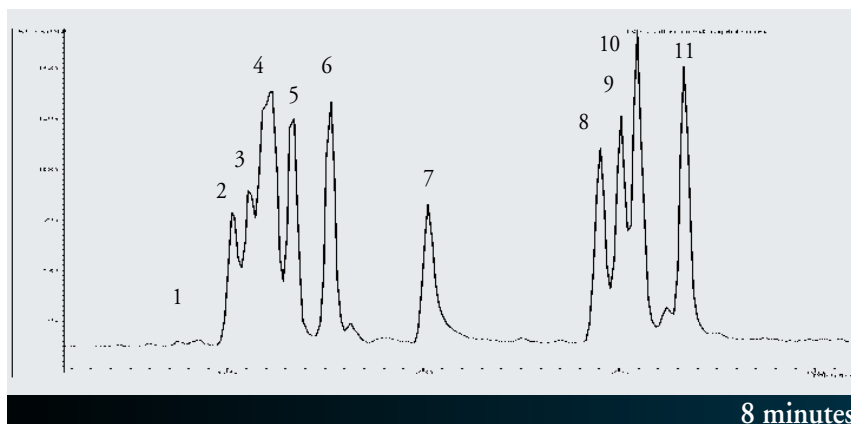


Rapid-MS of Nitrogen Pesticides

Fast analysis of trace nitrogen pesticides using Rapid-MS and Saturn 2000 ion trap detection



- **Faster analysis:** A factor 3-5 for temperature programmed up to a factor 10 for isothermal runs.
- **Higher sensitivity:** Typically signal-to-noise ratio will increase by at least a factor 3.
- **Compatible** with existing injection techniques and ion trap detection technology.
- **Positive inlet pressure** with short columns.
- **Less contamination** due to low elution temperatures.

- **Easy installation:** Standard fittings and ferrules can be used, no special skills required.
- **High loadability:** Filmthickness from 0.1 –1 microns.
- **More forgiving:** 0.53 mm ID capillaries can take more stress than smaller bore columns.
- **Easy setting of inlet flows/ pressures:** Optimum flowrate for ion trap is software controlled by Star Workstation (one button set-up).

Traces of nitrogen containing pesticides are difficult to determine. Usually these components are present at low levels, which requires optimum system performance to generate good data. Conventional (30-60 m) columns result in long analysis time and reduced response due to peak broadening. To solve this problem, the retention time in the separation column must be as short as possible. By using the new Rapid-MS with the Saturn 2000 ion trap, a significant reduction in retention time is obtained, which typically is a factor 3, but can be as high as a factor 10. Besides this, by using fast analysis, the peaks will be sharper and higher, which allows lower detection limits. In this datasheet the results are presented for the analysis of nitrogen pesticides using the Rapid-MS/Saturn 2000 combination. Analysis times, sensitivity, spectral integrity, linearity, repeatability and quantitation are shown. Comparisons are made with a conventional (30 m x 0.25 mm) capillary. The conclusion is that the Rapid-MS/Saturn combination offers a unique combination of advantages to improve the existing MS methods.



VARIAN

Faster analysis

The analysis using Rapid-MS technique can be done in very short time because the optimum carrier gas velocity is about 100 cm per second for helium. This allows components to elute at lower temperature, which can be beneficial for sensitive components. The conventional analysis takes typically 20 minutes or longer, while the Rapid-MS is completed in less than eight minutes.

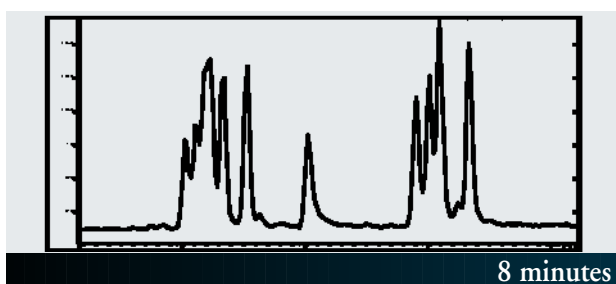
Conditions:

GC: Varian 3800 with Saturn 2000 ion trap
 Column: Rapid-MS, CP-Sil 8 CB-low-bleed/MS 10 m x 0.53 mm, df = 0.25 um, #CP 8132
 Oven: 65° C, 1,5 min → 280° C, 18° C/min
 Carrier gas: Helium, 120kPa 1.2 ml/min, constant flow
 Injection: Splitless : 1.0 ul
 Splitless time : 90 s
 Sample: 1 ng/ul in hexane

Peak Identification

- 1 Atraton
- 2 Simazine
- 3 Prometon
- 4 Atrazine
- 5 Propazine
- 6 Terbutylazine
- 7 Secbumeton
- 8 Simetryn
- 9 Ametryn
- 10 Prometryn
- 11 Terbutyrin

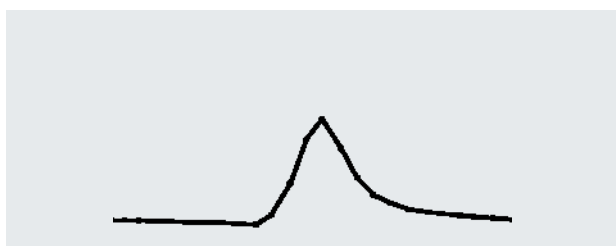
Rapid-MS short run times



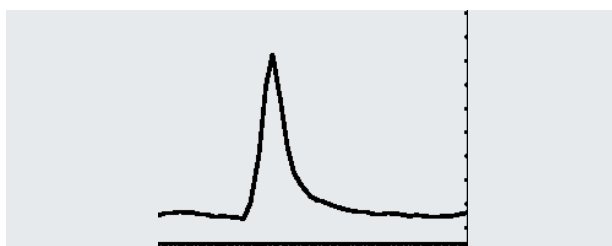
Increased sensitivity & higher signal-to-noise ratio

The signal of an eluting peak depends on its retention time and the peak broadening in the column. Rapid-MS allows peaks to elute up to 10 times faster, which improves the signal-to-noise ratio by a factor 2-3. An example of typical improvements in signal is shown in the figures below.

Conventional



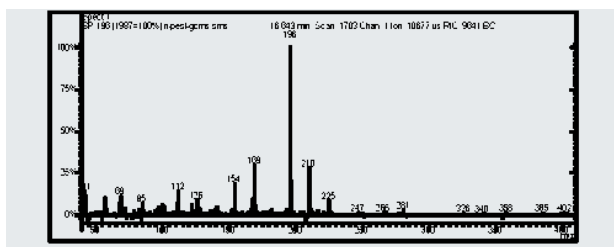
Rapid-MS



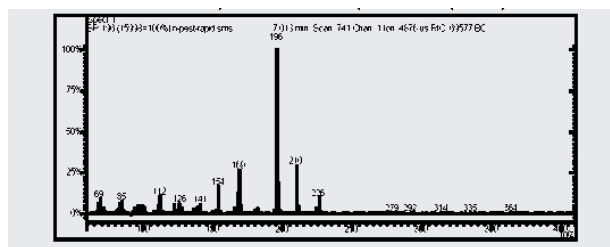
Spectral Integrity

The mass spectra produced with the Rapid-MS columns show direct equivalency with the spectra obtained with the conventional GC-MS. Below see the Rapid-MS spectrum of Sebumeton on conventional and Rapid-MS. Note that the amount of component analyzed here is around 0.5 nanogram.

Conventional

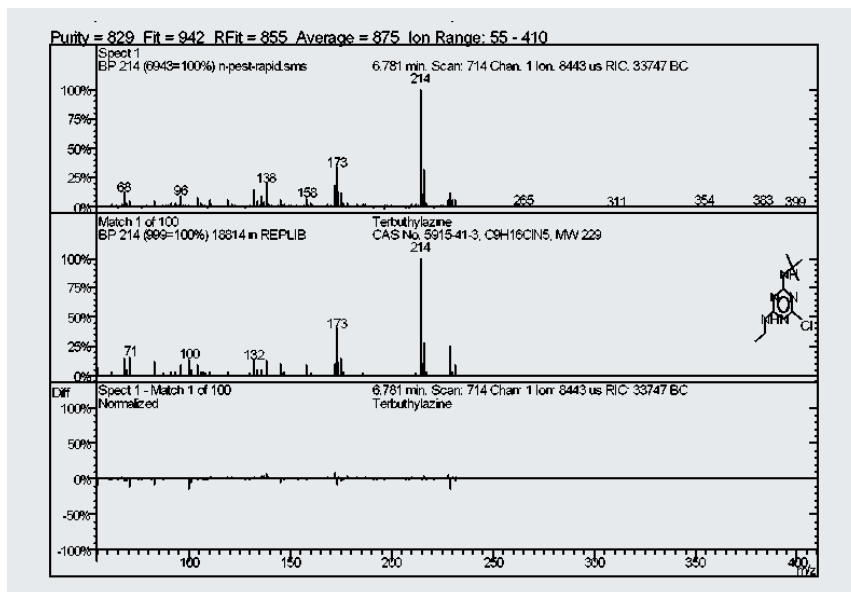


Rapid-MS



Comparison with NIST, Fit factors

The spectra below show the comparison of the terbutylazine spectrum of the Rapid-MS related to the NIST library. As can be seen, the spectra match quite well. A Fit(match) factor of 942 was found for terbutylazine. The Fit factors of a few other components measured on standard GC/MS and Rapid-MS are listed in the table below.

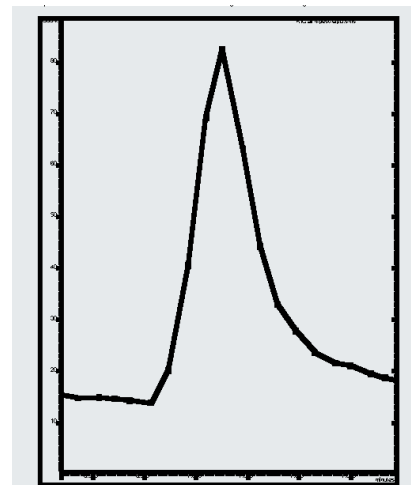


Fit factors

Rapid-MS	Rapid-MS		Conventional GC/MS	Conventional GC/MS	
	Fit	Rfit		Fit	Rfit
Sebumeton	765	868	Sebumeton	720	844
Terbutylazine	790	902	Terbutylazine	829	875
Atraton	670	806	Atraton	764	842

Quantification/data points

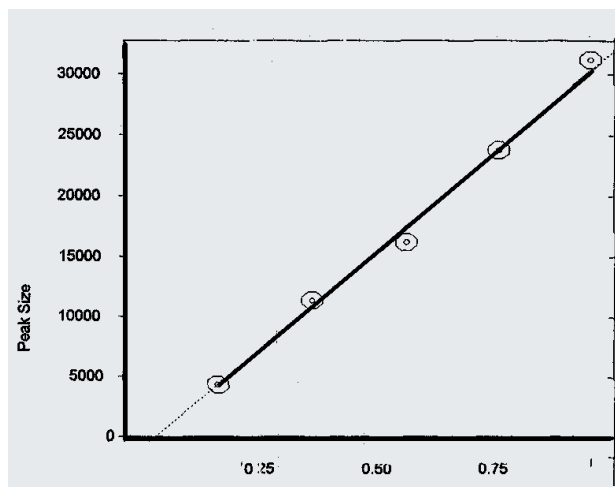
One of the unique characteristics of the Rapid-MS technology is that the eluting peaks from the Rapid-MS column are very fast, but relatively broad. This allows the ion trap system to collect a sufficient number of data points for accurate quantification. This can even be done for fast eluting components. For nitrogen pesticides, under the conditions mentioned, we have 10 data points per peak where each data point consists of 2 micro-scans. Accuracy is very good: Standard deviation on response factors is within 3%. One could speed up this analysis even more using a faster temperature program.



Sufficient datapoints per peak

Linearity

The linearity for nitrogen pesticides analyzed with Rapid-MS is very good: Five point calibration curves were prepared showing near perfect linearity. The graph for simazine is shown below. Correlation coefficients for other nitrogen pesticides are all higher than 0.98.



Correlation coefficients

Simazine	0.992
Prometon	0.993
Atrazine	0.995
Propazine	0.998
Terbutylazine	0.998
Simetryn	0.985
Prometryn	0.990
Terbutyrin	0.989



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